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Final

Munitions and Explosives of Concern (MEC) Master Work Plan

Former Vieques Naval Training Range (VNTR)
Vieques, Puerto Rico



Prepared for
Department of the Navy
Naval Facilities Engineering Command
Atlantic

Contract No. N62470-02-D-3052
CTO-0047

Prepared by
CH2MHILL

December 2006

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Contract Task Order 0047

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Under the
**LANTDIV CLEAN III Program
Contract N62470-02-D-3052**

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Contents

Acronyms and Abbreviations	xi
1 Introduction	1-1
1.1 Background.....	1-1
1.2 Work Plan Purpose and Objective.....	1-2
1.3 Former VNTR Description.....	1-6
1.3.1 Location and Mission	1-6
1.3.2 Structures, Roads, and Other Site Improvements	1-6
1.3.3 Vicinity Characteristics	1-7
1.3.4 Land Use	1-7
1.4 Topography, Climate and Weather, Vegetation, Geology, and Hydrology.....	1-7
1.4.1 Topography	1-7
1.4.2 Climate and Weather.....	1-7
1.4.3 Vegetation	1-12
1.4.4 Geology	1-12
1.4.5 Hydrology.....	1-13
1.4.6 Surface Water	1-13
1.4.7 Groundwater	1-13
1.5 Former VNTR History.....	1-14
1.5.1 Regulatory History	1-15
1.6 Summary of Munitions Response Areas (MRAs)	1-15
1.6.1 Live Impact Area (MRA-LIA)	1-15
1.6.2 Surface Impact Area (MRA-SIA)	1-16
1.6.3 Eastern Maneuver Area (MRA-EMA).....	1-16
1.6.4 Eastern Conservation Area (MRA-ECA).....	1-16
1.6.5 Contiguous Off-Shore Areas	1-17
1.7 Previous Investigations	1-17
1.8 Work Plan Organization	1-17
1.9 Work Plan Revisions	1-18
2 Technical Management Plan	2-1
2.1 General	2-1
2.2 Guidance, Regulations, and Policy.....	2-1
2.3 Project Team Organizational Structure.....	2-3
2.3.1 General	2-3
2.3.2 NAVFAC Atlantic East Vieques Remedial Program Manager (RPM).....	2-3
2.3.3 NAVFAC Atlantic Vieques Field Representative	2-4
2.3.4 Navy CLEAN Program Manager	2-4
2.3.5 Navy CLEAN/Title 2 Services Vieques Activity Manager	2-4
2.3.6 Navy CLEAN/Title 2 Services Munitions Response Program (MRP) Director.....	2-4
2.3.7 Navy CLEAN Project Manager.....	2-4
2.3.8 Title 2 Services Project Manager	2-5

2.3.9	Navy CLEAN Site Manager.....	2-5
2.3.10	Title 2 Services Site Manager	2-5
2.3.11	Navy CLEAN MRP Site Manager.....	2-5
2.3.12	Title 2 Services MRP Site Manager	2-6
2.3.13	Navy Contractors and Navy CLEAN Subcontractors	2-6
2.3.14	Composition and Management of MEC Investigation/Removal Teams	2-8
2.4	Technical Approach	2-10
2.4.1	Project Planning.....	2-10
2.4.2	Archive Records Search.....	2-10
2.4.3	Mobilization	2-11
2.4.4	Site Safety and Communications	2-13
2.4.5	Visitor Access and Control.....	2-13
2.4.6	Field Documentation and Data Management	2-13
2.4.7	Surface MEC Survey/Clearance	2-14
2.4.8	Vegetation Removal.....	2-14
2.4.9	Digital Geophysical Mapping.....	2-15
2.4.10	Anomaly Excavation.....	2-16
2.4.11	MEC Procedures	2-17
2.4.12	Operations in Sensitive Areas.....	2-20
2.4.13	MEC Disposal/Demolition Operations	2-20
2.4.14	Statistical Sampling	2-22
2.4.15	Demobilization.....	2-23
2.4.16	Management of Material Potentially Presenting an Explosive Hazard (MPPEH)	2-23
2.4.17	Community Relations	2-23
2.4.18	MEC Reporting.....	2-24
3	Explosives Management Plan	3-1
3.1	General.....	3-1
3.2	Licenses and Permits.....	3-1
3.3	Procedures	3-1
3.3.1	Acquisition	3-1
3.3.2	Initial Receipt	3-2
3.4	Explosive Storage	3-2
3.4.1	Magazines.....	3-2
3.4.2	Magazine Type.....	3-2
3.4.3	Physical Security.....	3-3
3.4.4	Placards.....	3-3
3.4.5	Lightning Protection System.....	3-3
3.4.6	Fire Protection.....	3-3
3.4.7	Stocking Procedures.....	3-4
3.5	Transportation	3-4
3.5.1	Onsite Transportation Procedures	3-4
3.5.2	Vehicle Requirements	3-5
3.6	Receipt Procedures	3-5
3.6.1	Inventory Control and Records Management.....	3-5

3.6.2	Responsible Persons and Employee Possessors	3-5
3.6.3	End User Certification	3-6
3.6.4	Reconciling Discrepancies	3-6
3.6.5	Remote Firing Device Management and Control.....	3-6
3.7	Inventory	3-6
3.8	Lost, Stolen, or Unauthorized Use of Explosives	3-6
3.9	Return of Explosives.....	3-7
3.10	Disposal of Explosives.....	3-7
4	Explosives Siting Plan	4-1
4.1	General	4-1
4.2	MEC Areas	4-1
4.2.1	Restricted Area	4-1
4.2.2	Exclusion Zones (EZ).....	4-1
4.3	Inhabited Building Distance (IBD) and Public Transportation Route (PTR) Distance	4-3
4.4	Preliminary Site Work.....	4-4
4.5	Team Separation Distances.....	4-4
4.5.1	Team Separation Distances in the ECA and LIA.....	4-4
4.5.2	Team Separation Distance in the SIA.....	4-4
4.5.3	Team Separation Distance in the EMA.....	4-4
4.6	Planned or Established Treatment Sites	4-4
4.7	Footprint Areas	4-4
4.7.1	Blow-in-Place (BIP).....	4-4
4.7.2	Collection Points	4-5
4.7.3	In-Grid Consolidation Shots.....	4-6
5	Geophysical Plan	5-1
5.1	Introduction	5-1
5.2	Personnel Qualifications	5-1
5.3	Geophysical Investigation Objective and Flow Chart	5-1
5.4	Geophysical Prove-Out	5-4
5.5	Boundary Survey	5-4
5.6	Vegetation Removal.....	5-4
5.7	Grid/Transect Survey	5-5
5.8	Surface Clearance.....	5-5
5.9	QA/QC Seeding.....	5-5
5.10	Digital Geophysical Mapping	5-5
5.10.1	Instrumentation.....	5-5
5.10.2	DGM Survey	5-6
5.11	Data Processing and Interpretation.....	5-6
5.11.1	Data Processing.....	5-6
5.11.2	Interpretation/Anomaly Selection.....	5-7
5.11.3	Dig Sheets.....	5-7
5.11.4	Grid Maps	5-8
5.12	Anomaly Reacquisition.....	5-8
5.13	Data Quality Objectives	5-8
5.13.1	MEC Detection	5-9

5.13.2	Lane Spacing (Sensor Separation)	5-9
5.13.3	False Positives	5-10
5.13.4	Positioning Accuracy	5-10
5.13.5	Reacquisition	5-10
5.13.6	Data Handling	5-10
5.14	Quality Control and Quality Assurance	5-11
5.14.1	Quality Control	5-11
5.14.2	Quality Assurance	5-14
5.15	Records Management	5-14
5.16	Feedback Process	5-14
5.17	Corrective Measures	5-15
5.18	Interim Reporting	5-15
5.19	Data Delivery	5-15
6	Site Safety and Health Plan	6-1
7	Location Surveys and Mapping Plan	7-1
7.1	Surveying	7-1
7.2	Mapping	7-1
7.2.1	Digital Data	7-1
7.2.2	Digital Format	7-1
7.3	Deliverables	7-2
8	Sampling and Analysis Plan	8-1
9	Quality Control Plan	9-1
9.1	Introduction	9-1
9.1.1	Project Background	9-1
9.1.2	Project Scope of Work	9-1
9.2	QC Personnel Organization and Responsibilities	9-2
9.2.1	QC Personnel Qualifications and Training	9-2
9.2.2	Documentation of Qualification and Training	9-2
9.2.3	Navy Contractor/Navy CLEAN Subcontractor Project Manager	9-2
9.2.4	Navy Contractor/Navy CLEAN Subcontractor Site Manager	9-3
9.2.5	Navy Contractor/Navy CLEAN Subcontractor UXO Quality Control Specialist	9-3
9.2.6	Navy Contractor/Navy CLEAN Subcontractor Program QC Manager	9-4
9.3	Definable Features of Work and the Three-Phase Control Process	9-4
9.3.1	Definable Features of Work	9-4
9.3.2	Mobilization	9-5
9.3.3	Location Surveying and Mapping	9-5
9.3.4	Vegetation Removal	9-5
9.3.5	MEC Surface Removal	9-5
9.3.6	MEC Disposal	9-6
9.3.7	Scrap Disposal	9-6
9.3.8	Site Restoration	9-6
9.3.9	Demobilization	9-6
9.3.10	Three Phases of Control	9-6
9.4	Inspection/Audit Procedures	9-9
9.5	QC Testing	9-9

9.5.1	Testing Procedures	9-9
9.5.2	Level of QC Inspection.....	9-9
9.5.3	QC Pass/Fail Criteria	9-10
9.5.4	Documentation of Testing	9-19
9.6	Calibration and Maintenance	9-19
9.7	Government QA Activities	9-19
9.7.1	QA Manager	9-19
9.7.2	Quality Assessor(s).....	9-20
9.7.3	QA Testing Procedures	9-20
9.7.4	Level of QA Inspection.....	9-20
9.7.5	QA Pass/Fail Criteria	9-20
9.8	Deficiency Management	9-21
9.8.1	Deficiency Identification and Resolution	9-21
9.8.2	Corrective Action Request.....	9-21
9.8.3	Deficiency and Corrective Action Tracking.....	9-22
9.8.4	Documentation.....	9-22
9.9	Reports.....	9-22
9.10	Submittal Management.....	9-22
9.10.1	Project Records	9-23
9.10.2	Transmittal to the Title 2 Services/Navy CLEAN Contractor	9-23
10	Environmental Protection Plan	10-1
10.1	Cultural and Archaeological Resources within the Project Site	10-1
10.2	Surface Water and Groundwater Resources within the Project Site	10-1
10.3	Coastal Zones within the Project Site	10-1
10.4	Protection and/or Mitigation of Ecological Resources	10-1
11	Investigation-Derived Waste Management Plan.....	11-1
11.1	Objective.....	11-1
11.2	Types of Potential IDW and Planned Disposition	11-1
11.3	Non-Hazardous Debris Disposal.....	11-1
11.4	Disposition of Material that Presents a Potential Explosive Hazard (MPPEH)/Munitions Debris (MD).....	11-2
11.5	Clearing and Grubbing	11-2
11.6	Contaminated Soil and Hazardous Waste	11-2
11.7	Transportation.....	11-2
12	Geographical Information System.....	12-1
12.1	Geographical Information System Incorporation	12-1
12.2	Computer Files	12-4
13	References	13-1

Appendixes

- A Historical Munitions Use at the Former VNTR
- B Site Safety and Health Plan
- C VNTR Access Protocol
- D BIP/Demolition Operations Notification Protocol
- E Management of MPPEH/MD
- F Geophysical Prove-Out Plan
- G Master Field Sampling Plan
- H Master Investigation-Derived Waste Management Plan
- I Response to Comments
- J Prescribed Burn Plan

Tables

1-1	Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements under CERCLA	1-2
1-1a	ARARs	1-2
1-1b	TBCs	1-3
4-1	MGFD Fragmentation and Over Pressure Safety Distances	4-2
4-2	Inhabited Building (IB) and Public Transportation Route (PTR) Distances	4-3
5-1	Geophysical Instrument Standardization Tests and Acceptance Criteria	5-13
5-2	Processing Documentation Requirements	5-17
9-1	Definable Features of Work Auditing Procedures	9-11

Figures

- 1-1 Regional Location Map
- 1-2 Former VNTR Site Map
- 1-3 MRA, Parcel, and MRS Boundaries
- 1-4 Topographic Map
- 2-1 Vieques MEC Project Team
- 5-1 Geophysical Investigation Tasks Flow Chart
- 5-2 Target Objective Performance Box

Forms

- 3-1 Motor Vehicle Inspection
- 3-2 Magazine Data Card
- 3-3 ATF Form 5400.5, Report of Theft or Loss – Explosive Materials
- 9-1 Personnel Qualification Verification Form
- 9-2 Preparatory Inspection Checklist
- 9-3 Initial Phase Inspection Checklist
- 9-4 Follow-up Phase Inspection Checklist
- 9-5 Final Inspection Checklist
- 9-6 Inspection Schedule and Tracking Form
- 9-7 Corrective Action Request
- 9-8 Corrective Action Plan
- 9-9 Weekly Quality Control Report
- 9-10 Document Review and Release Form
- 9-11 Deficiency Log
- E-1 DD Form 1348-1A

Acronyms and Abbreviations

AFWTA	Atlantic Fleet Weapons Training Area
AFWTF	Atlantic Fleet Weapons Training Facility
amsl	above mean sea level
AQAPS	Automated Quality Assessment Program System
ARAR	Applicable or Relevant and Appropriate Requirement
ATF	Bureau of Alcohol, Tobacco and Firearms
ATG	air-to-ground
BIP	Blow-in-Place
BRAC	Base Realignment and Closure
CAP	Corrective Action Plan
CAR	Corrective Action Request
CCLI	Commerce Control List Items
CD	compact disk
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
DDESB	DoD Explosives Safety Board
DFOW	Definable Features of Work
DGM	Digital Geophysical Mapping
DID	Data Item Description
DMM	Discarded Military Munitions
DoD	Department of Defense
DoI	Department of Interior
DOT	Department of Transportation
DQO	Data Quality Objective
DU	depleted uranium
ECA	Eastern Conservation Area
EIS	Environmental Impact Statement
EMA	Eastern Maneuver Area
EMM	Earth Moving Machinery
EP	Engineering Pamphlet
EPA	U.S. Environmental Protection Agency
ER	Engineering Regulation
EZ	Exclusion Zone
F°	Fahrenheit
FFA	Federal Facility Agreement
FM	Field Manual

FMF	Fleet Marine Force
FMFLANT	Fleet Marine Force Atlantic
FP	follow-up phase
GIS	Geographical Information System
GP	Gun Position
GPO	Geophysical Prove-Out
GPS	Global Positioning Satellite
HD	Hazard Division
HTRW	Hazardous, Toxic, and Radioactive Waste
IAW	In Accordance With
IBD	Inhabited Building Distance
IDW	Investigation-Derived Waste
IP	initial phase
IR	Installation Restoration
IRP	Installation Remediation Program
LANTDIV	Atlantic Division
LIA	Live Impact Area
MC	Munitions Constituents
MCX	Mandatory Center of Expertise
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MGFD	Munition with the Greatest Fragmentation Distance
MLI	Munitions List Items
MPPEH	Material Potentially Presenting an Explosive Hazard
MR	Munitions Response
MRA	Munitions Response Area
MRP	Munitions Response Program
MRS	Munitions Response Site
MR-SIMS	Munitions Response Site Information Management System
M&TE	Measuring and Test Equipment
NASD	Former U.S. Naval Ammunitions Support Detachment
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NEW	Net Explosives Weight
NGFS	Naval Gun Fire Support
NOSSA	Naval Ordnance Safety and Security Activity
NOTAM	Notice to Airmen
OB/OD	Open Burn/Open Detonation
OE	Ordnance and Explosives
OP	Observation Post
OSHA	Occupational Safety and Health Administration
PA/SI	Preliminary Assessment/Site Investigation

PDF	Adobe Acrobat Portable Document Format
PP	preparatory phase
PRASA	Puerto Rico Aqueduct and Sewer Authority
PREQB	Puerto Rico Environmental Quality Board
PTR	Public Transportation Route
QA	Quality Assurance/Quality Assessment
QC	Quality Control
QCP	Quality Control Plan
Q-D	Quantity-Distance
RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Materiel
RPM	Remedial Project Manager
RTK	Real-Time Kinematic
SDS	Spatial Data Standards
SIA	Surface Impact Area
SOP	Standard of Practice/Standard Operating Procedure
SOW	Scope of Work
SSHIP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TBC	to be considered
TSDS	Tri-Spatial Data Standards
USACE	U.S. Army Corps of Engineers
USAESCH	States Army Engineering and Support Center - Huntsville
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
UXOSP	UXO Sweep Personnel
UXOTI	UXO Technician I
UXOTII	UXO Technician II
UXOTIII	UXO Technician III
VL	Verification Level
VNTR	Vieques Naval Training Range
WP	White Phosphorus

SECTION 1

Introduction

This Munitions and Explosives of Concern (MEC) Master Work Plan for the Former Vieques Naval Training Range (VNTR)¹ has been prepared by CH2M HILL for the Naval Facilities Engineering Command (NAVFAC) Atlantic under Navy Contract N62470-02-D-3052, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order 0047. This Work Plan covers response actions to be taken to minimize risks to human health and the environment from potential exposure to MEC that may have resulted from past Department of Defense (DoD) activities at the Former VNTR on Vieques Island, Puerto Rico.

The objective of this Work Plan is to provide a description of general standard operating procedures for conducting MEC investigation, removal, and disposal actions at the Former VNTR. Specific locations and operating procedures for each site will be provided in separate Site Specific Work Plans (SSWPs). Standard operating procedures from this master work plan may be modified to meet site specific conditions or to provide up-to-date revisions for procedures that have changed and are agreed to by the Navy and regulatory agencies. Deviations from procedures listed in this work plan will be noted in SSWPs. This Master Work Plan applies to terrestrial sites at the former VNTR; areas below the low tide line will be addressed during future work following the terrestrial investigations/removal actions”

1.1 Background

The U.S. Navy’s training exercises on the eastern end of Vieques ceased on May 30, 2003, as naval and other operations at the facility ended. Public Law 107-117, Title X, Sec. 1049, provided the Secretary of the Navy authority to close the VNTR. On January 10, 2003, the Secretary of the Navy certified to the President and Congress that an alternative training facility or facilities that provide equivalent or superior training exist and are available, thereby confirming that the Navy will cease operations at Vieques.

Following termination of training operations on Vieques, the Former VNTR was transferred to the jurisdiction of the Secretary of the Interior. Interior administers the Munitions Response Area-Live Impact Area (MRA-LIA), a 900-acre area used for live ordnance in training by the Navy and Marine Corps, as a “Wilderness Area” with no public access. The remaining 13,514 acres of the Former VNTR is administered by Interior as a wildlife refuge. A munitions response area (MRA) is any area on a defense site that is known or suspected to contain unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites (MRSs). A MRS is a discrete location within a MRA that is known to require a munitions response.

¹ In many documents written before 2004, VNTR was referred to as the Atlantic Fleet Weapons Training Facility (AFWTF).

1.2 Work Plan Purpose and Objective

The purpose of this work plan is to describe the general approach and methods, including the operational and safety procedures, to be used by the contractor and its subcontractors to perform MEC response actions at potential MEC sites throughout the Former VNTR. This work plan provides the framework and basic guidance for the performance of MEC site investigations, evaluations, and responses as required to allow the safe and effective use of the sites potentially affected by MEC for their intended purpose. The specific locations and procedures for the response actions will be provided in separate SSWPs.

This Master Work Plan is meant to be used as a reference document for standard operating procedures for MEC work performed at the Former VNTR. Each section may be used separately as a reference for specific procedures. This Master Work Plan is supplemented by the SSWP for each MEC investigation or remedial action conducted in the Former VNTR.

The MEC response actions will be consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). MEC investigations and response actions will be executed in accordance with NAVSEA OP 5 Volume 1 (Revision 7), Ammunition and Explosives Ashore; OPNAVINST 8020.14, Department of the Navy Explosives Safety Policy; NOSSAINST 8020.15, Military Munitions Response Program Oversight; U.S. Army Engineering and Support Center, Huntsville (CEHNC) EP385-1-95a, *Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) Response Action Operations*; Title 40, Code of Federal Regulations (CFR), Part 260 (40 CFR 260) et Al. – *Military Munitions Rule*; the MEC requirements of DoD 6055.9-STD; and any other applicable or relevant and appropriate (ARAR) requirements and to be considered (TBC) requirements listed in Table 1-1.

TABLE 1-1

Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements under CERCLA

TABLE 1-1A
ARARs

Reference	Title
Federal Requirements	
27 CFR Part 55	Commerce in Explosives
29 CFR Part 1910	Occupational Safety and Health Standards
32CFR Part 179 (10/2005)	Munitions Response Site Prioritization Protocol
40 CFR Part 300	National Oil and Hazardous Substances Pollution Contingency Plan (CERCLA Process)
40 CFR Parts 260-279	Hazardous Waste Management (Resource Conservation and Recovery Act [RCRA] ARARs)* Military Munitions Rule
40 CFR Parts 355, 370, and 372	Emergency Planning & Community Right-to-Know (Inventories and Release Reporting)
40 CFR Parts 50-73	Clean Air Act (Release Limits)
49 CFR Parts 100-199	Department of Transportation (Truck Transportation on Public Roads)
Bureau of Alcohol, Tobacco and Firearms P 5400.7 (09/00)	Federal Explosives Law and Regulations 2000

TABLE 1-1
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements under CERCLA

TABLE 1-1A
ARARs

Reference	Title
16 USC 1531 et seq., per 50 CFR 402	Endangered Species Act
16 USC 703, et seq.	Migratory Bird Treaty Act
16 USC 469, et seq., and 36 CFR 65	National Archaeological and Historic Preservation Act
16 USC 668dd	National Wildlife Refuge System Improvement Act
33 USC 1251-1387	Clean Water Act
16 USC 1801	Magnuson-Stevens Fishery Conservation and Management Act
16 USC 2901-2911	Fish and Wildlife Conservation Act
Commonwealth of Puerto Rico	
28 June 1969, Law Number 134	Law of Explosives of Puerto Rico
Chapter XVIII	Guidance for the Administration, Application and Oversight of the Puerto Rico Explosive's Law, Puerto Rico explosives law Chapter XVIII.
U.S. Environmental Protection Agency (EPA)	
Title 126	Hazardous Waste Regulations*
Title 126	Emergency Planning & Community Right-to-Know and Contingency Planning Regulations (Reporting Requirements)
Title 129	Air Quality Regulations (Release Limits)

* Denotes substantive requirements of this regulation only.

TABLE 1-1B
TBCs

Reference	Title
U.S. Environmental Protection Agency (EPA)	
March 21, 2002	EPA Policy Towards Privately Owned Formerly Used Defense Sites
May 2005	EPA Handbook on the Management of Munitions Response Actions
October 24, 2003	Draft EPA Guidelines for Munitions Response Actions
EPA 505-F-03-001, July 2004	Uniform Federal Policy for Implementing Environmental Quality Systems
EPA 505-B-04-900A	Uniform Federal Policy for Quality Assurance Project Plans (UFP_QAPP) Manual
OSWER Directive 9272.0-17	Implementation of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) at Federal Facility Hazardous Waste Sites
March 7, 2000	DoD and EPA Management Principles for implementing Response actions at Closed, Transferring, and Transferred (CTT) Ranges
Department of Defense (DoD)	
DDESB Technical Paper (TP) 18	Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel
DoD 4145.26M	DoD Contractors Safety Manual for Ammunition and Explosives
DoD 4160.21-M	Defense Reutilization and Marketing Manual
DoD 4160.21-M-1	Defense Demilitarization Manual

TABLE 1-1B
TBCs

Reference	Title
DoD 4715.11	Environmental and Explosives Safety Management on DoD Active and Inactive Ranges Within the United States
DoD 4715.12	Environmental and Explosives Safety Management on DoD Active and Inactive Ranges Located Outside the United States
DoD MIL-STD-882D	Standard Practice for System Safety
DoD MIL-STD-1916	Test Method Standard
DoD MIL-HDBK-1916	Companion Document to MIL-STD-1916
DoD 6055.9-STD	Ammunition and Explosives Safety Standards
NOSSA 8020.15	Military Munitions Response Program Oversight
Department of the Army	
AR 75-14	Inter-service Responsibilities for Explosive Ordnance Disposal
AR 190-11	Physical Security of Arms, Ammunition, and Explosives
AR 385-64	U.S. Army Explosive Safety Program
AR 740-32	Responsibilities for Technical Escort of Dangerous Materials
DAP 385-64	Ammunition and Explosives Safety Standards
U.S. Army Corps of Engineers	
EM 385-1-1	Safety and Health Requirements Manual
EM 1110-1-4009	Ordnance and Explosives Response
EP 75-1-2	Unexploded Ordnance Support for Hazardous, Toxic and Radioactive Waste and Construction Support Activities
EP 385-1-95a	Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) Response Action Operations
EP 1110-1-17	Establishing a Temporary Open Burn/ Open detonation Site for Conventional Ordnance and Explosives Projects
EP 1110-1-18	Ordnance and Explosives Response
EP 1110-1-24	Establishing and Maintaining Institutional Controls for Ordnance and Explosives Projects
ER 1110-1-12	Quality Management
ER 1110-1-8153	Engineering and Design Ordnance Explosives Response
U.S. Army Corps of Engineers Engineering and Support Center (CEHNC), Huntsville	
Interim Guidance Documents	
IGD 98-04	Reportable Material at Ordnance Explosives Response Sites
IGD 99-02	Small Arms Determination
Procedural Documents and Plans	
March 2000	Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives Sites
Memorandum of Agreement (MOA)	
MOA, July 18, 1997	U.S. Army 52nd Ordnance Group and CEHNC
MOA, June 13, 1995	Chemical Support Division, U.S. Army Edgewood Research, Development and Engineering Center and (then) U.S. Army Engineer Division, Huntsville
MEC Guidance Memoranda	
December 19, 2000	Interim Final Management Principles for Implementing Response Action at Closed, Transferring, and Transferred Ranges

TABLE 1-1B
TBCs

Reference	Title
January 20, 1994	Application of the Hazardous Waste Operations and Emergency Response Regulation to Ordnance and Explosives Sites
November 27, 1996	Base Realignment and Closure (BRAC) Ordnance and Explosives (OE) Response Projects
May 7, 1997	Coordination with the Ordnance and Explosives Center of Expertise (OE CX)
July 6, 1994	OE Center of Expertise Technical Advisory Group (TAG) for Archive Search Reports (ASRs)
NAVSEA OP 5 Vol 1	Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping
NAVSEA OP 2165	Navy Transportation Safety Handbook for Ammunition, Explosives, and Related Hazardous Materials
NAVSEA OP 2239	Motor Vehicle Driver's Handbook, Ammunition, Explosives, and Related Hazardous Materials
NAVSEA 4570.1	Demilitarization and Disposal of Excess, Surplus, and Foreign Excess Ammunition, Explosives and Other Dangerous Articles and Inert Ordnance Material
NAVSEA 8020.9	Non-Nuclear Ordnance AND Explosives Handling Qualification and Certification Program
NAVSEAINST 8020.1H	DoD Ammunition and Explosives Hazard Classification Procedures Joint Technical Bulletin
OPNAVINST 3500.39A	Operational Risk Management
OPNAVINST 5090.1	Environmental and Natural Resources Protection Manual
OPNAVINST 5100.23E	Navy Occupational Safety and Health Program
OPNAVINST 5102.1C	Mishap Investigation and Reporting
OPNAVINST 5530.13	Department of the Navy Physical Security Instruction for Sensitive Conventional Arms, Ammunition, and Explosives
OPNAVINST 8020.14	Department of the Navy Explosives Safety Policy
OPNAVINST 8023.2	U.S. Navy Explosives Safety Policies, Requirements, and Procedures
OPNAVINST 8026.2	Assignment for the Responsibility for Management of the Navy Munitions Disposition Program
OPNAVINST 8026.2A	Navy Munitions Disposition Policy
OPNAVINST 8027.1	Inter-service Responsibilities for Explosive Ordnance Disposal
OPNAVINST 8027.6E	Naval Responsibilities for Explosive Ordnance Disposal
OPNAVINST 8070.1B	Responsibilities for Technical Escort of Dangerous Materials
SECNAVINST 8023.3C	Responsibilities for Issuance and Administration of Waivers and Exemptions from DoD Explosive Safety Standards
SWO60-AA-MMA-010	Demolition Materials
U.S. Marine Corps	
MCO P3570.1B	Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat
MCO P3570.2	Regulations for Firing Guided Missiles, and Heavy Rockets for Training, Target Practice, and Combat
MCO 3571.2	Explosive Ordnance Disposal Program
MCO 8020.1	Handling, Transportation, Storage, Reclassification and Disposal of Class V (W) Material

TABLE 1-1B
TBCs

Reference	Title
MCO 8020.10	Ammunition and Explosives Safety Policies, Programs, Requirements, and Procedures for Class V Material
MCO P8020.11	Department of the Navy Explosives Safety Policy
MCO 8023	Qualification and Certification Program for Class V Munitions and Explosive Devices
MCO 8027.1	Inter-service Responsibilities for Explosive Ordnance Disposal

Applicable Requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited (appropriate) to the particular site. Requirements must be relevant and appropriate to be an ARAR of this type.

TBCs are non-promulgated, non-enforceable guidelines or criteria that may be useful for establishing a cleanup level or for designing the remedial action, especially when no ARARs exist or they are not sufficiently protective.

1.3 Former VNTR Description

1.3.1 Location and Mission

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the island of Puerto Rico and 20 miles southwest of St. Thomas, U.S. Virgin Islands. Vieques is the largest offshore island that is part of the Commonwealth of Puerto Rico. It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles). Vieques lies between 18°10'N and 18°05'N latitude and between 65°35'W and 65°16'W longitude. Figure 1-1 shows the location of Vieques relative to the main Island of Puerto Rico and the U.S. Virgin Islands.

1.3.2 Structures, Roads, and Other Site Improvements

The Former VNTR is traversed in different directions by paved asphalt and dirt roads. Camp Garcia, the former Marine Corps Base located in the southeast corner of the MRA-Eastern Maneuver Area (MRA-EMA) is the most developed area in the Former VNTR. Camp Garcia was once a fully-operational military post to include a small airfield. Other structures in the Former VNTR include several observation posts (OP), gun positions (GP), and range target areas (Figure 1-2).

1.3.3 Vicinity Characteristics

The Former VNTR is situated in the eastern third of the island, and is bordered to the west by the community of Isabel Segunda, to the north by the Vieques Sound, and to the south by the Caribbean Sea. The entire Former VNTR consist of approximately 14,600 acres and is divided operationally into four MRAs that from west to east include: the MRA-EMA, which comprises an area approximately 10,673 acres; the MRA-Surface Impact Area (MRA-SIA); comprised of approximately 2,500 acres; the MRA-LIA comprised of approximately 900 acres; and the 200-acre Eastern Conservation Area (ECA) which is situated on the easternmost tip of Vieques. Additionally, all beach area is designated as on independent MRA (Beach-MRA). The MRAs are further divided into parcels and MRSs. The parcel and MRS boundaries are dynamic, in that they may be redefined as data is gathered to better classify the areas that will require various levels and types of remedial actions. Figure 1-3 presents a site map of Former VNTR showing MRAs, parcels, and currently identified MRSs.

1.3.4 Land Use

The largest portion of the Former VNTR has been designated a Wildlife Refuge and the MRA-LIA designated as a wilderness area. The entire VNTR is required by Section 1049 of the Nation Defense Authorization Act for Fiscal Year 2002 to be managed by the Department of Interior (DoI) as part of the National Wildlife Refuge System. The wilderness area will be managed as such with no public access allowed.

However, public access will be permitted in some areas designated wildlife refuges (reference Public Law 106-398; Public Law 107-107). The DoI is currently developing a comprehensive land use plan for eastern Vieques that is anticipated to be completed by 2006.

1.4 Topography, Climate and Weather, Vegetation, Geology, and Hydrology

1.4.1 Topography

The topography of Vieques is characterized by gentle to steep rolling hills and valleys throughout the island, with the eastern side exhibiting a more rugged terrain. Figure 1-4 illustrates the topography of the VNTR. The LIA is relatively flat with elevations ranging from 0 to approximately 50 ft above mean sea level (amsl). Cerro Matias, located within the EMA as OP-1 (Figure 1-4) is the highest point on VNTR, at approximately 420 ft amsl. The average elevation across Vieques is approximately 246 ft amsl. The coastal area is relatively narrow; however, the southern coast exhibits wider expanses of beach.

1.4.2 Climate and Weather

The climate of Vieques is tropical-marine. Temperatures are nearly constant, with an annual average of approximately 79 degrees Fahrenheit (°F). August is the warmest month (82°F) and February is the coolest (76°F). Vieques lies directly in the path of the prevailing easterly trade winds that regulate the climate of Puerto Rico and result in a rainfall pattern characterized by a dry season from December through July and a rainy season from August through November. Heavy precipitation may be induced by tropical storms from June to November. The eastern half of Vieques and annual rainfall averages 25 in. per year.

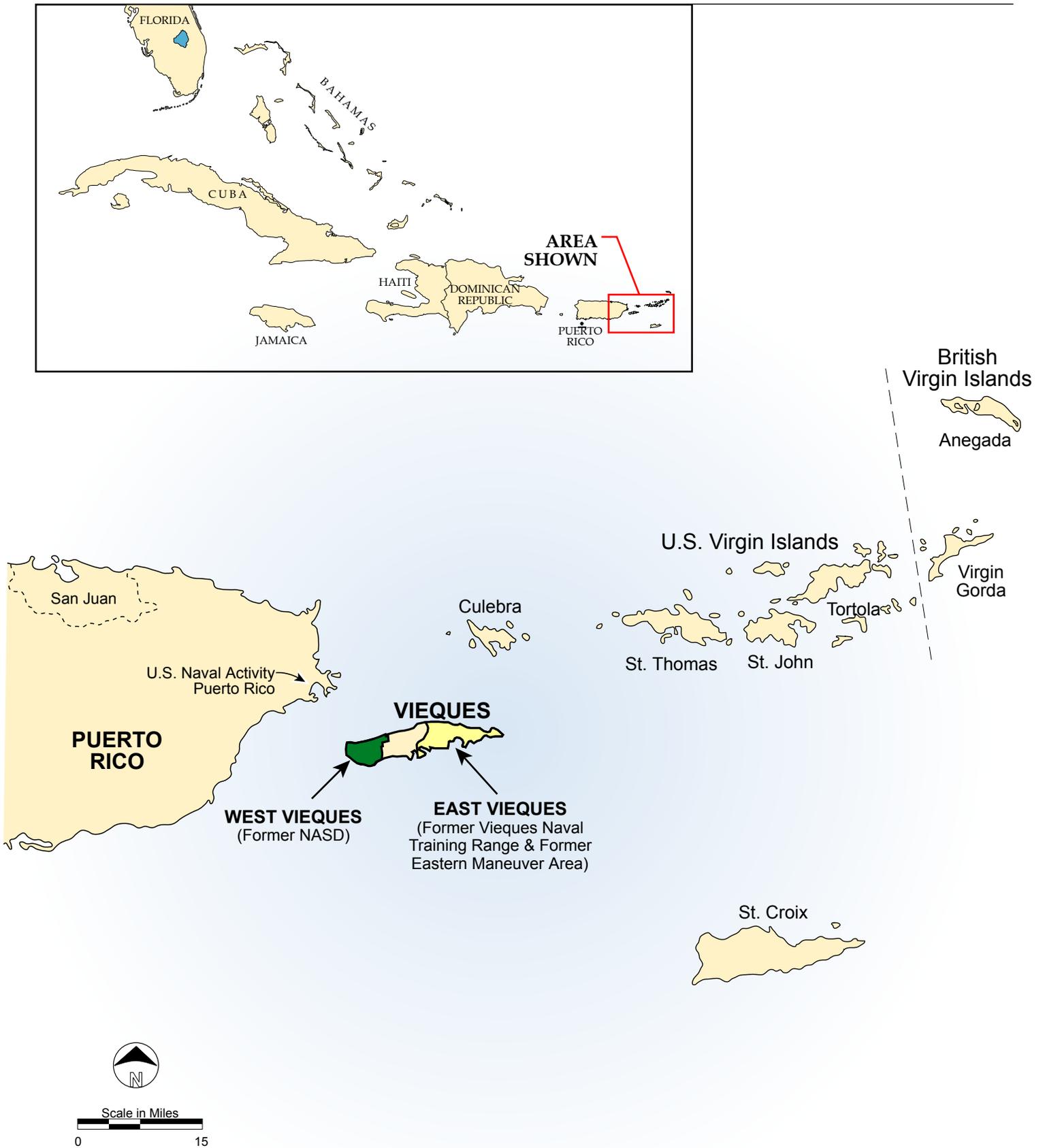
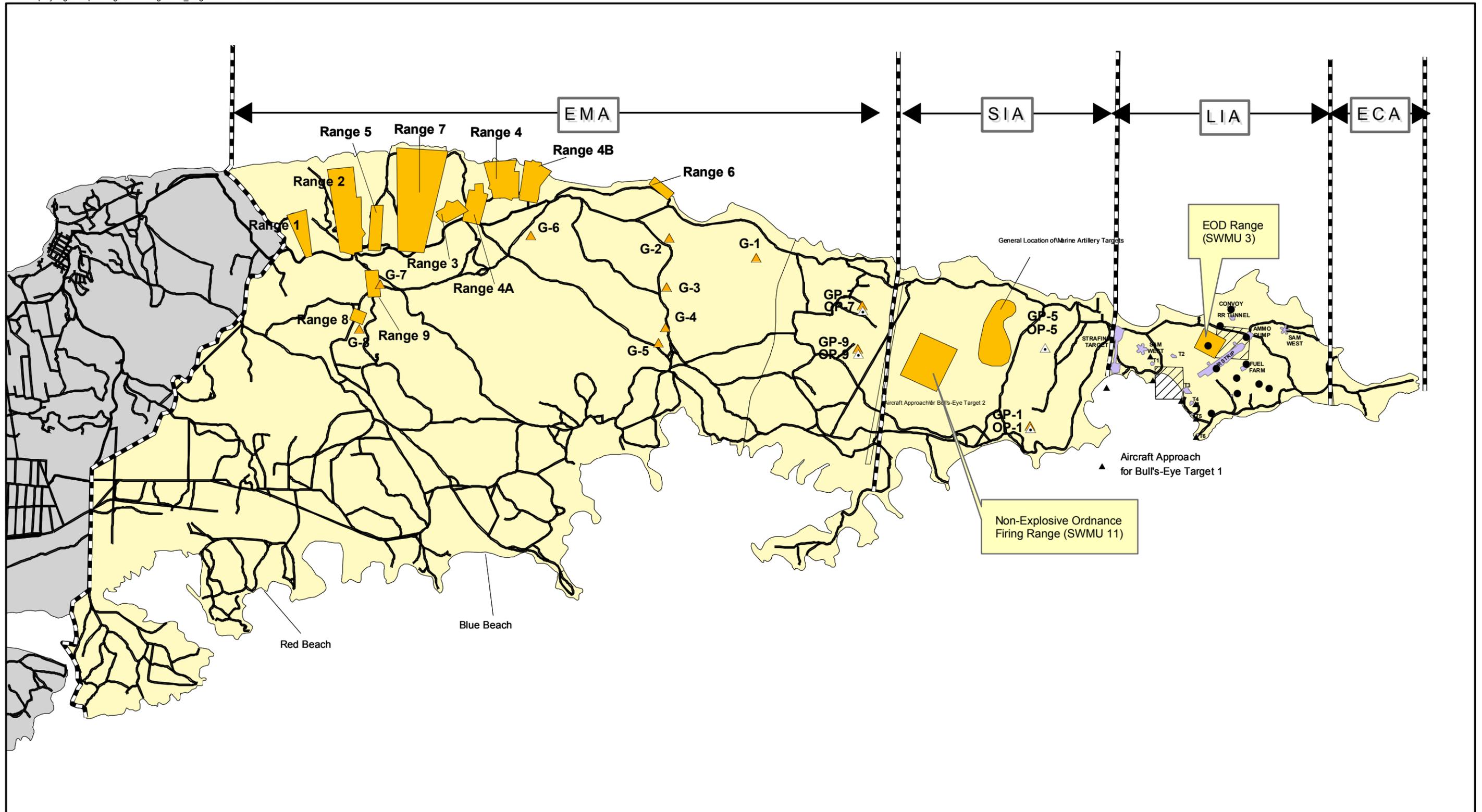


Figure 1-1
Regional Location Map
Former VNTR, Vieques, Puerto Rico



LEGEND

- | | | | |
|--|--|--|-------------------------------------|
| | Naval Gunfire Support (NGFS) Area Target | | Gun Position |
| | Small Arms/Artillery Ranges | | Observation Point |
| | Navy Property | | Air-To-Ground (ATG) Target |
| | Non-Navy Property | | Naval Gunfire Support (NGFS) Target |
| | Property Line | | |

Definitions:
 EMA - Eastern Maneuver Area
 SIA - Surface Impact Area
 LIA - Live Impact Area
 ECA - Eastern Conservation Area

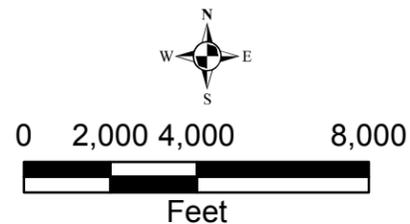
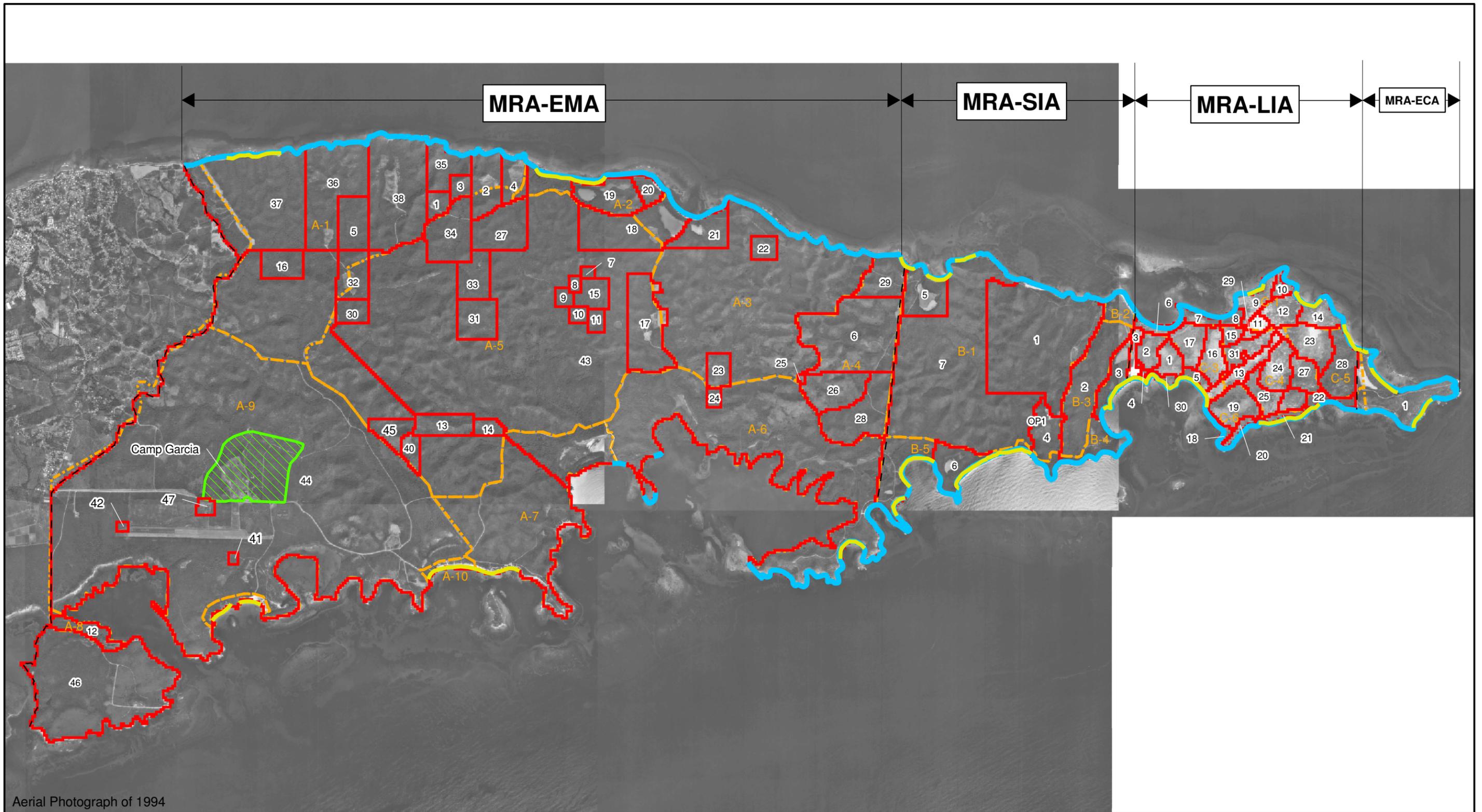


Figure 1-2
 Map of Range Related Site Features
 Former VNTR, Vieques, Puerto Rico



Aerial Photograph of 1994

Legend

- Beach MRS
- Sea Turtle Nesting Areas
- 1 MRS Boundary and MRS Number
- Parcel Boundary and Designation
- MRA Boundary

Notes :

- MRS Numbers Do Not Signify Priority
- EMA-MRS 43 and SIA-MRS 7 include all terrestrial area within the range fan(s) not designated as other MRSs.
- EMA-MRS 44 includes all terrestrial area outside of range fan(s) not designated as other MRSs.

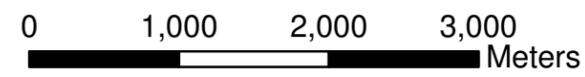
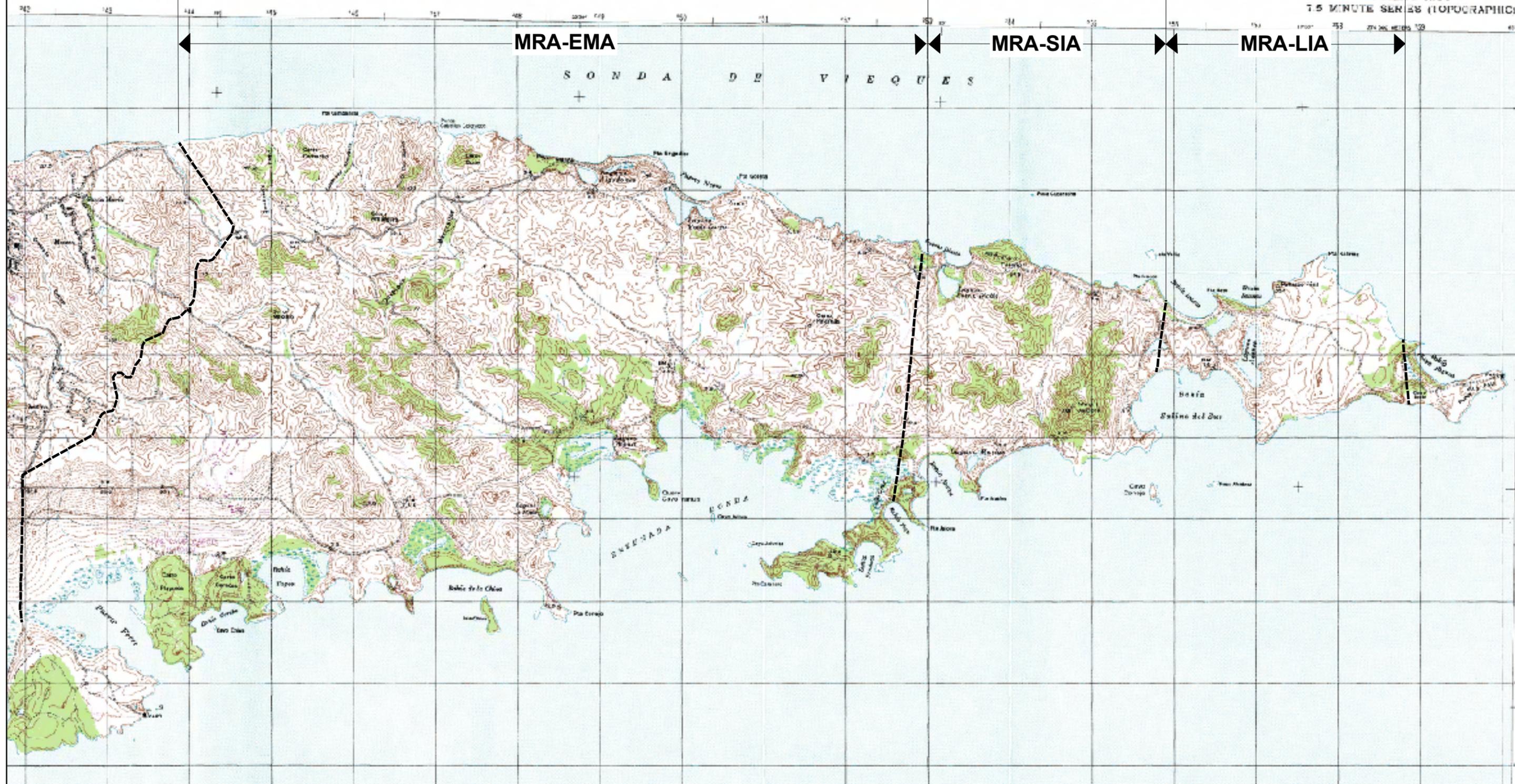


Figure 1-3
MRA, Parcel, and MRS Boundaries
Former VNTR, Vieques, Puerto Rico

\\variadn\proj\18gis\vieques2\figures\mxd\figure1-3_mra_mrs_bounds.mxd 10/25/06 mrm



MRAs - Munitions Response Areas
EMA - Eastern Maneuver Area
LIA - Live Impact Area
SIA - Surface Impact Area

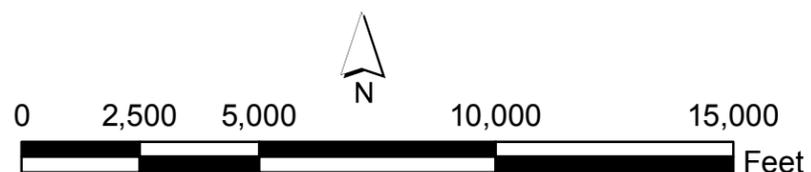


Figure 1-4
Topographic Map
Former VNTR, Vieques, Puerto Rico

1.4.3 Vegetation

Vegetative cover on the eastern third of Vieques consists of thick vegetation dominating most available land space. The canopy consists primarily of deciduous trees, with the non-native mesquite dominating the species distribution. A number of tree species are thorny, and low-lying brush is present throughout. Tall grasses also populate the landscape in areas where the thorny tree and brush species have not populated. Most of the Former VNTR's vegetation tends to form a complete ground cover. Leaves are mostly small and sclerophyllous (hard and dry).

Vegetation on the island's eastern side is slightly less dense than on the western side, with a larger percentage of thorny species, especially young to mid-age mesquite trees. Lower precipitation levels on the island's eastern end contribute to the thornier, rugged terrain observed there. The hillsides are densely vegetated, similar to the western side of the island.

The coastal areas in the island's eastern side contain level terrain made up primarily of lagoons and mangrove swamps. Coastal dunes and associated vegetation, including sea oats, are present throughout open beach areas on both the northern and southern sides of the EMA and SIA.

1.4.4 Geology

The geology of Vieques is characterized by volcanic rocks generally overlain by alluvial deposits and patches of limestone. The upland areas contain three rock types consisting of sedimentary rocks composed of limestone and volcanic rocks composed of granodiorite and diorite.

The Upper Cretaceous volcanic rocks in the upland areas appear to be the oldest exposed rocks on Vieques, and are believed to have been in a marine environment, as were rocks of the same age on the island of Puerto Rico. Limestone of Upper Tertiary age is found on peninsulas extending into the sea from the southern and eastern coasts. Limestone of the Tertiary-Miocene age is also found along these coasts, and is referred to as the "Puerto Ferro" limestone. Quaternary age deposits are found in the valleys and coastal areas and include beach, swamp, and alluvial deposits. Deposits of sand, swamp, and salt mud occur in the coastal areas and floodplains.

Limestone occurs in sectors of the island's northern, southern, and eastern parts. The most extensive areas of limestone are found on the southern coastal peninsulas. The limestone is generally soft, yellowish, and well-indurated where exposed to the atmosphere. The sedimentary deposits consist of a mixture of sand, silt, and clay.

Alluvial deposits are found in the valleys and coastal areas and include beach, swamp, and alluvial deposits. Deposits of sand, swamp, and salt mud occur in the coastal areas and floodplains. A recent investigation of the eastern end of Vieques indicated that the alluvial deposits there range from 5 to 50 ft thick (Baker, 1999).

Soils on Vieques Island are primarily residual, due to both climatic and subsurface rock conditions. They typically are classified into five groups and range from rock land soils where bedrock is exposed to deep, well-drained soils within the alluvial deposits to shallow soils (U.S. Department of Agriculture, 1977).

1.4.5 Hydrology

The streambeds found on Vieques flow either northerly or southerly until they reach the Caribbean Sea or Atlantic Ocean. Vieques does not have any perennial surface drainage, and receives an average of 36 in. of rainfall per year, of which approximately 90 percent is lost to evaporation, based on statistics from the U.S. Virgin Islands. Of the remaining 10 percent, approximately 5 percent infiltrates into the groundwater system and 5 percent becomes surface runoff.

1.4.6 Surface Water

Surface water deposits in the VNTR occur primarily in coastal lagoons and intermittent streams, known locally as arroyos and quebradas that channel water downward from hills during rain events. Some of these arroyos and quebradas have standing water year-round, especially in areas abutting the coastline where terrain has leveled sufficiently to allow for standing water. Several mid- to large-sized lagoons are present near the Purple Beach area just east of Puerto Negro and to the south within the Ensanada Honda area, the Bahia de la Chiva area, and the South Coast Bays area.

Surface water features are less prominent on the island's eastern side than they are on the western side, and exist primarily very close to the coast as lagoons. Some rainwater does pool for some time in low-lying areas following storm events, but these features dissipate within a few days.

1.4.7 Groundwater

The groundwater on Vieques is derived from rainfall. The water flows downhill as intermittent stream runoff or seeps into the soil and underlying deposits. Water in pore space, cracks, and fractures in bedrock eventually flows into alluvial deposits or to the ocean. Yearly variations in island-wide rainfall influence groundwater levels locally. Ground levels also exhibit fluctuations near the coastline because of tidal influences.

Two types of aquifers are present on Vieques. The first is found in the upper portion of the bedrock and sedimentary rocks in the EMA. At the eastern end of Vieques, a groundwater divide occurs near the center of the island. From this location, the groundwater flow is toward the northeast and the southwest (Baker, 1999). The second type of aquifer is within the alluvial deposits found below the hills in the low flat valleys along the coast. The Camp Garcia aquifer is an alluvial aquifer within Esperanza Valley, the largest alluvial valley in Vieques.

The Valle de Esperanza aquifer is located beneath the island's southern portion near Camp Garcia. As discussed above, approximately 5 percent of the annual precipitation infiltrates through the ground and supplies the aquifer. The aquifer was previously used as a source of drinking water by the Navy. The Puerto Rico Aqueduct and Sewer Authority (PRASA) managed a series of 16 wells which pumped approximately 450,000 gallons of water per day, although these wells are no longer active because of the installation of a water line from the island of Puerto Rico to Vieques in 1978.

The U.S. Geological Survey performed a groundwater study throughout Vieques island, including tests on wells near Esperanza. The results indicated that the groundwater

contained high concentrations of sodium bicarbonate. Because of its high sodium content, the groundwater on Vieques is not suitable for extended use for irrigation or other potable water use. The high levels of sodium result from sea spray infiltrating into the ground and saltwater entering the groundwater supply through excessive groundwater withdrawal (Vargas, 1995).

1.5 Former VNTR History

The Navy has owned portions of Vieques since 1941, when land was purchased for use as an ammunition storage facility in support of World War II training requirements. Construction of facilities for ammunition storage, located on the west end of Vieques, was completed in 1943. These facilities operated until 1948 when they were closed. In 1947 the Navy purchased the land on the eastern end of the island, now known as the former VNTR. Training for amphibious and ground warfare commenced shortly after the U.S. government purchased the land. To support the deployment of a Marine regiment (3,000 people) on Vieques, the Fleet Marine Force (FMF) constructed a camp (Camp Garcia) in 1954 and 1955. Fleet Marine Force Atlantic (FMFLANT) designated Camp Garcia a separate organization in 1960 and tasked it with providing logistical and training support to FMFLANT units using the EMA. At the height of activity at Camp Garcia in the mid 1950s and early 1960s over 300 military and 60 civilians were employed at the camp. However, both military and civilian employment have declined steadily, and Camp Garcia was closed on December 14, 1978. Although the Island of Culebra was the focal point for naval gunfire in the 1960s and early 1970s, AFWTF began developing facilities on the eastern end of Vieques in 1964 when it established a gunnery range in the MRA-LIA. In 1965, the Navy established a LIA, also known as the air impact area, and began construction activities at OP-1 on Cerro Matias.

By the 1970s, the MRA-LIA maintained several targets for aerial bombing including old tanks and vehicles which were used as mock-ups, two bulls-eye targets and a strafing target. In addition, several point and area targets for ships to practice naval gunfire support were established in the MRA-LIA.

The Environmental Impact Statement (EIS) for Vieques (Tippetts, et al., 1979) provides a detailed discussion on the development of training facilities in the VNTR leading up to 1979. The VNTR provided logistics support, scheduling assistance, and facilities for Naval Gun Fire Support (NGFS) and air-to-ground (ATG) ordnance delivery training for Atlantic Fleet ships, North Atlantic Treaty Organization ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic, conducted training for Marine amphibious units, battalion landing teams, and combat engineering units in the EMA. Occasionally, naval units of allied nations having a presence in the Caribbean and the Puerto Rican National Guard also utilized the EMA.

Adjacent to and west of the SIA, the 10,673-acre EMA provided maneuvering space and ranges for the training of marine amphibious units and battalion landing teams in exercises of amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. The EMA was first established in 1947. It is demarcated by the western property line east to the western front friendly-fire line where the SIA begins. Marine artillery was fired from gun positions in the EMA and SIA toward targets in the LIA and SIA.

Portions of the training areas within the VNTR were in continuous use since World War II, when the Navy acquired title to the land, until 2003. The Atlantic Fleet's ships, aircraft, and marine forces carried out training in all aspects of NGFS, ATG ordnance delivery, air-to-surface mine delivery, amphibious landings, small-arms fire, artillery and tank fire, and combat engineering. As part of normal operations, UXO was cleared periodically from the LIA and treated on-site by detonation. The Navy also operated a waste munitions open burn and open detonation (OB/OD) facility under an EPA interim status Subpart X permit within the LIA.

1.5.1 Regulatory History

A RCRA Part B Hazardous Waste Facility Operations Permit Application was submitted by the Navy to USEPA in 1988 for the operation of an OB/OD unit. A Draft Closure Plan for the OB/OD site was submitted to the stakeholder agencies, comprising the USEPA Region II, PREQB, and the DOI, by the Navy in February 2004 (CH2M HILL, February 2004). Comments were addressed from these agencies and the Draft Final Closure Plan (CH2M HILL, July 2004) was submitted for public comment; the public comment period was held from December 1, 2004 through January 31, 2005. The USEPA prepared responses to the public comments and submitted them on May 17, 2005. Based on the response to comments, the implementation of the Closure Plan will be delayed pending completion of clearance work for MEC throughout the VNTR.

In 2003, the Governor of Puerto Rico requested USEPA to list the VNTR (and Former U.S. Naval Ammunitions Support Detachment [NASD]) on the NPL. On May 26, 2004, the President of PREQB sent a letter to the Regional Administrator of USEPA acknowledging that USEPA, PREQB, and DOI concurred with the designation of the former Naval facilities of eastern and western Vieques as an NPL site. In addition, a clarification of the Atlantic Fleet Weapons Training Area (AFWTA) was provided and stated that initial areas of Preliminary Assessment/Site Investigation (PA/SI) under CERCLA will focus on "Agreed Areas" in and around Vieques and Culebra where the Navy conducted operations, including "those waters in and around Vieques where contamination has come to be located." On February 7, 2005, Vieques was placed on the NPL.

As a result of the NPL listing, a Federal Facility Agreement (FFA) is being developed that will be signed by the Navy, USEPA, and DOI. The purpose of the FFA is to ensure that potential environmental contamination from past activities are adequately evaluated and appropriate remedial actions are implemented, as necessary, to protect human health and the environment. The FFA will also establish the procedural framework and schedule for implementing these activities. With the listing on the NPL and the creation of an FFA, all future environmental restoration activities on Vieques will be conducted under CERCLA, with USEPA as the lead regulatory agency.

1.6 Summary of Munitions Response Areas (MRAs)

1.6.1 Live Impact Area (MRA-LIA)

In 1965, ATG training activity began in the MRA-LIA where several mock-ups, such as old tanks and vehicles, were used as targets for aerial bombing. Since the mid-1970s, naval

gunfire was practiced at the MRA-LIA, where several point and area targets for ships were constructed. Based on the naval gunfire and ATG gunfire that occurred from the 1970s through 2003, the entire 900 acres (364 hectares) of the LIA has been impacted by MEC.

1.6.2 Surface Impact Area (MRA-SIA)

The SIA was established in the 1950s, when several Marine targets were constructed in the SIA. Marine artillery ranging from 76- to 175-mm rounds was directed toward these targets from artillery gun positions within the MRA-SIA and MRA-EMA. During 1969, the construction of bulls-eye targets 1 and 2, used for inert bombing, established the eastern and western boundaries of the MRA-SIA. At that time, a permanent OP with a helicopter pad was also constructed on Cerro Matais. In 1971, a strafing target was installed adjacent to one of the targets. The aerial photo analysis identified numerous craters within the eastern two-thirds of the MRA-SIA that were caused by mortar and artillery fire, naval gunfire, and aerial bombing. The craters were most visible on the 1962 aerial photographs. In addition, the aerial photo analysis identified several artillery gun positions and OPs within the MRA-SIA that may have been used for artillery fire.

1.6.3 Eastern Maneuver Area (MRA-EMA)

The MRA-EMA, encompassing 10,673 acres (4,320 hectares), was established in 1947 and provided maneuvering areas and ranges for the training of Marine amphibious units and battalion landing teams in exercises that included amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. The heaviest training events occurred from the mid-1950s until the early 1960s.

In 1966, six ranges were established along the northern coast of the MRA-EMA. The Preliminary Range Assessment Report (CH2M HILL, April 2003) describes each of these ranges in detail. The descriptions include the current field conditions of the ranges, as well as a summary of the archival data and aerial photo analysis for each range.

The aerial photo analysis identified eight artillery gun positions within the MRA-EMA from which Marine artillery gunfire was directed toward the MRA-SIA and MRA-LIA. The artillery fired from the gun positions ranged from 60- to 175-mm rounds. A detailed field reconnaissance for each of these gun positions was completed and is summarized in the Preliminary Range Assessment Report (CH2M HILL, April 2003). The aerial photo analysis identified 19 additional gun positions that were used for either mortar or artillery gunfire. The area impacted by MEC within the MRA-EMA is estimated to be approximately 6,000 acres (2,430 hectares).

1.6.4 Eastern Conservation Area (MRA-ECA)

The MRA-ECA, encompassing 200 acres (81 hectares) on the eastern tip of Vieques, was not an operational area for munitions use. However, its close proximity to the MRA-LIA, where extensive naval gunfire and ATG bombing took place, identifies the MRA-ECA as a potential area for MEC impacts. In addition, the OB/OD area within the LIA generated an explosive safety arc that extended well into the MRA-ECA.

1.6.5 Contiguous Off-Shore Areas

Information regarding MEC densities located contiguous to but off-shore of the above areas is provided in the ERA/Phase I SI Report (CH2M HILL, March 2006). Because the general scope for underwater work has not yet been developed by the Navy, specific procedures for work to be conducted underwater have not been addressed in this work plan. Future waterborne surveys and applicable work plans will be developed to cover these areas when the general scopes are developed.

1.7 Previous Investigations

Previous environmental investigations have been conducted for CERCLA-related contaminants. A Preliminary Range Assessment was conducted at select locations in the Former VNTR in November 2002. The *Preliminary Range Assessment Report* (CH2M HILL, April 2003) also contains a summary of range usage archival searches. Appendix A provides the historical munitions use at the Former VNTR.

1.8 Work Plan Organization

This Work Plan contains 13 sections, the remainder of which are organized as follows:

Section 2, Technical Management Plan—Identifies the approach, methods, and operational procedures to be employed during MEC activities. Specific procedures for certain tasks are included by reference to the appropriate sub-plan of this Work Plan.

Section 3, Explosives Management Plan—Details the specific method for management of acquisition, receipt, storage, inventory, reporting, and return of explosives in accordance with applicable regulations.

Section 4, Explosives Siting Plan—Details the explosives safety criteria for planning and siting explosives operations.

Section 5, Geophysical Investigation Plan—Describes the approach, methods, and operational procedures employed to perform geophysical investigations during MEC activities.

Section 6, CH2M HILL Site Safety and Health Plan—Describes the Safety and Health Program and presents safety and health information and requirements during MEC activities.

Section 7, Location Surveys and Mapping Plan—Describes the methods, equipment and accuracy requirements for location surveys and mapping in support of MEC activities.

Section 8, Sampling and Analysis Plan—Describes the requirements for sampling and analysis, quality assurance/quality control, laboratory qualification, data acquisition and chain-of-custody for samples that will be collected during MEC activities.

Section 9, Quality Control Plan—Describes the approach, methods, and operational procedures to be used for the performance of quality control during MEC activities.

Section 10, Environmental Protection Plan—Describes the approach, methods, and operation procedures to be implemented to protect the natural environment during MEC activities.

Section 11, Investigation-Derived Waste Management Plan – Describes the requirements for managing investigation-derived waste (IDW) generated during MEC activities.

Section 12, Geographical Information System Plan – Describes the requirements for the geographical information system (GIS) to be utilized during MEC assessment activities.

Section 13, References – Lists documents cited in this Work Plan.

1.9 Work Plan Revisions

Changes to this Work Plan may be required during execution of MEC investigations and removal projects, mainly for two reasons:

1. The Navy project team determines a technical procedure needs to be added, deleted, or modified.
2. The contractor proposes a change as a result of observations made during the course of the project. The contractor will request the changes, in writing, to the Navy Remedial Project Manager (RPM). Upon review and approval of the proposed change, the contractor will issue updates to the Work Plan.

If the change to the Work Plan involves the discovery and/or disposition of MEC, then Naval Ordnance Safety and Security Activity (NOSSA) will be notified via e-mail. NOSSA is part of the CERCLA Technical Committee and will be updated appropriately throughout the project. NOSSA, in conjunction with the USEPA and PREQB, will review all proposed Work Plan revisions.

To easily determine whether a Work Plan copy has been updated, a footer has been included on all sections, reflecting the date of the section revision and whether the section is part of the original plan (Revision 0), or a subsequent numbered revision.

Technical Management Plan

2.1 General

This section of the Master Work Plan further identifies the general approach, methods, and operational procedures that may be employed throughout the Former VNTR for characterization, remediation, or removal activities. The section provides general approaches and methods for conducting MR activities. Site-specific work plans will be developed to meet the unique operational requirements of Munitions Response (MR) activities based on the scope of work, site location, and type and quantity of MEC expected to be encountered.

2.2 Guidance, Regulations, and Policy

The following is a list of primary MEC guidance, regulations, and policies applicable or potentially applicable during implementation of MR activities throughout the Former VNTR. Additional guidance, regulations, and policies that are potentially applicable or to be considered for work at the Former VNTR (ARARs and TBCs) are referenced in Table 1-1 of this Master Work Plan. These resources will be followed when planning projects and developing SSWPs.

DoD 6055.9-STD, Ammunition and Explosives Safety Standards. Primary DoD regulation that establishes uniform safety standards for ammunition and explosives, to associated personnel and property, and to unrelated personnel and property exposed to the potential damaging effects of an accident involving ammunition and explosives. To be considered for determining safety distances, explosives storage requirements, facility construction and siting (for example, OB/OD, magazines, etc.), and quantity-distance requirements.

DoD 4165.26-M, DoD Contractors Safety Manual for Ammunition and Explosives. Provides safety standards common to DoD and private industry ammunition and explosives operations and facilities.

DoD 4160.21-M, Defense Materiel Disposition Manual. Implements the Federal Property Management Regulation and other laws and regulations applying to the disposition of excess, surplus, and foreign excess personal property.

DoD 4160.21-M-1, Defense Demilitarization and Trade Security Control Manual. Contains specific guidance for property identified as Munitions List Items (MLI) and Commerce Control List Items (CCLI). To be considered for the demilitarization and disposal of MEC-related scrap material.

DDESB Technical Paper 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel. Provides the minimum qualification standards for personnel conducting UXO-related operations in support of the DoD.

NAVSEA OP 5 Volume 1, Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping. These regulations prescribe information regarding conventional ammunition, ammunition components, explosives, and other hazardous materials, as well as the conditions for safe production, handling, storage, shipment, maintenance, and disposal of these materials at all Navy and Marine Corps activities. They are to be considered for protecting the environment during all Hazardous, Toxic, and Radioactive Waste (HTRW) and MEC actions.

OPNAVINST 5530.13, Department of the Navy Physical Security Instruction for Sensitive Conventional Arms, Ammunition, and Explosives. This instruction prescribes standards and criteria for the physical security of sensitive conventional arms, ammunition, and explosives in the custody of any Navy Component, or contractor and subcontractor. It is to be considered for determining appropriate requirements for security of explosives when maintained onsite.

OPNAVINST 5090.1, Environmental and Natural Resources Protection Manual. This manual prescribes Navy policies, responsibilities, and procedures to protect and preserve the quality of the environment. It is to be considered for protecting the environment during all HTRW and MEC actions.

OPNAVINST 8020.14, Department of the Navy Explosives Safety Policy. This policy prescribes Department of the Navy safety policy for contractors handling ammunition and explosives at Department of the Navy facilities. It is to be considered for MEC-related projects.

NOSSAINST 8020.15, Military Munitions Response Program Oversight. This policy establishes procedures and reporting requirements for oversight, review, and verification of the explosive safety aspects of the Navy Military Munitions Response Program.

U.S. Army Corps of Engineers (USACE) ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities. Prescribes responsibilities and procedures for planning and executing chemical data acquisition including sampling and analysis. To be considered in all phases of all projects, including MEC projects where environmental samples are collected for chemical analysis.

USACE EP 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional MEC Projects. Provides general guidance compiled from many different DoD and Department of the Army sources for establishing and utilizing a temporary OB and/or OD site for the destruction of small quantities of MEC. To be considered in the event that an OB or OD site is needed.

USACE EP 1110-1-18, Ordnance and Explosives Response. Provides the procedures on the process to be used to manage and execute all aspects of MEC response actions. To be considered in all phases of all MEC projects.

USACE EP 75-1-3, Recovered Chemical Warfare Materiel (RCWM) Response. Provides actions taken to reduce the risk to human health and the environment from exposure to RCWM resulting from past DoD operations at a site.

USACE EP 385-1-95a. Unites States Army Engineering and Support Center - Huntsville (USAESCH) Mandatory Center of Expertise (MCX), Basic Safety Concepts and

Considerations for OE Operations. Establishes the safe operating procedures for dealing with OE and UXO items on formerly used defense sites, base realignment and closure, and installation restoration projects. To be considered in all MEC-related projects.

USAESCH OE MCX Data Item Descriptions. Describes standards and requirements for conducting all phases of MEC response. Referenced in various Scope(s) of Work (SOWs), Engineering Regulation (ER), Engineering Pamphlet (EPs), and Interim Guidance. To be considered for all phases of all MEC projects.

USAESCH Interim Safety Alerts. Provides important safety warnings and recommendations that are too new to have been incorporated into other guidance documents. To be considered for all phases of all MEC projects.

Bureau of Alcohol, Tobacco, and Firearms (ATF) ATF P 5400.7, Explosives Law and Regulations. Prescribes regulations for transportation and storage of explosive materials. To be considered when determining appropriate requirements for transportation and storage of explosives when maintained onsite.

USACE, CECW-ET, EM 110-1-1200, Conceptual Site Models for OE and HTRW Projects. Provides guidance to develop Conceptual Site Models at sites potentially containing MECs and/or hazardous, toxic, and radioactive waste environmental contamination.

2.3 Project Team Organizational Structure

2.3.1 General

The VNTR Munitions Response Project Team is depicted graphically in Figure 2-1. The project team consists of NAVFAC Atlantic and three entities that provide contract services to NAVFAC:

- Title II Services contractor provides overall site management and on-site support to NAVFAC
- Navy CLEAN contractor provides environmental investigation services to NAVFAC
- Navy contractors are contracted directly to NAVFAC to carry out services requested.

All communications with the landowner, stakeholders, and regulators will be made through the NAVFAC RPM or NAVFAC Field Representative. Other project personnel may be identified as points of contact on a project specific basis.

2.3.2 NAVFAC Atlantic East Vieques Remedial Program Manager (RPM)

The NAVFAC Atlantic RPM is responsible for the management of the Installation Remediation Program (IRP) at the installation level. The RPM's responsibilities include identifying the resources needed to effectively implement the remedial action process. The RPM coordinates the work of Navy technical support agencies and contractors to accomplish IRP goals and policies. The RPM is the single individual involved in all aspects of the project including interagency relationships, funding, scheduling, design, and remedial actions.

2.3.3 NAVFAC Atlantic Vieques Field Representative

The NAVFAC Atlantic Field Representative is responsible to the NAVFAC RPM. The functions of the Field Representative include but are not limited to: providing on-site safety and technical support for MEC activities; verify the UXO qualifications of contractor employees; and is designated as the Quality Assessment (QA) Manager. The Field Representative is a qualified UXO Technician who will meet or exceed the requirements for a Senior Unexploded Ordnance Supervisor (SUXOS) as presented in the DoD Explosive Safety Board (DDESB) approved "UXO Personnel Training and Experience Hierarchy: found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

2.3.4 Navy CLEAN Program Manager

The Navy CLEAN Program Manager has complete management authority and responsibility for all work performed under the contract. The Navy CLEAN Program Manager directs the program management organization as a central resource for management, continuity, and control of all program activities.

The centralized program management is organized to facilitate communication with and reporting to NAVFAC Atlantic and to expedite and support project execution. The Navy CLEAN Program Manager has total authority, responsibility, and accountability for managing the contract. He will be involved in the decision-making process, and in oversight of the management of the project.

2.3.5 Navy CLEAN/Title 2 Services Vieques Activity Manager

Responsible to the Navy CLEAN Program Manager, the Navy CLEAN/Title 2 Services Vieques Activity Manager maintains client relations for the duration of the contract. He/she will undertake final quality control measures for all deliverables to ensure accurate and sufficient reporting, as well as team performance. The Navy CLEAN/Title 2 Services Vieques Activity Manager will assist in coordinating community relations, oversee subcontracting processes, and support the Vieques management plan.

2.3.6 Navy CLEAN/Title 2 Services Munitions Response Program (MRP) Director

The Vieques MRP Director is responsible to the management team for providing senior level consulting on all Munitions Response matters. Specifically, the Vieques MRP Director represents the program team at all meetings involving the client, the regulatory community, other consultants/contractors, and other stakeholders associated with the NAVFAC Vieques MRP. The meetings will include, but are not limited to, the quarterly CERCLA Technical Committee Meetings, the monthly MR Subcommittee Meetings, and the Vieques Program Project Management Meetings. Additional responsibilities include senior review of all project documents, involvement in Vieques MRP strategic planning, and managerial support to all MR UXO qualified staff working on the NAVFAC MRP.

2.3.7 Navy CLEAN Project Manager

Responsible to the Navy CLEAN/Title 2 Services Vieques Activity Manager, the Navy Clean Project Manager has the primary responsibility for the planning, staffing, scheduling,

budget management, quality control, safety, and coordination of Navy CLEAN subcontractors and internal technical and support staff. The Navy CLEAN VNTR Project Manager works closely with all project team members to facilitate safe and effective project delivery. The Navy CLEAN Project Manager may also serve concurrently as the Navy Title 2 Services Project Manager.

2.3.8 Title 2 Services Project Manager

Responsible to the Navy CLEAN/Title 2 Services Vieques Activity Manager, the Title 2 Services Project Manager provides management support to Navy contractors conducting MEC removal actions and site related work to include: reviewing the contractors' Site Specific Work Plans, Health and Safety Plans, ensuring that work is being performed in accordance with the NAVFAC Scope of Work, and reviewing contractor change orders and invoices for the work performed. the Navy Title 2 Services Project Manager may also serve concurrently as the Navy CLEAN Project Manager.

2.3.9 Navy CLEAN Site Manager

Responsible to the Navy CLEAN Project Manager, the Navy CLEAN Site Manager(s) provide on-site data management, logistical support and field oversight of all operational activities ensuring that field related activities conducted by Navy CLEAN subcontractors are performed in accordance with specified plans. The Navy CLEAN Site Managers work closely with the Navy CLEAN MRP Site Managers to ensure that all MEC-related activities are conducted safely and in accordance with specified plans. The Navy CLEAN Site Manager(s) may also serve concurrently as the Navy Title 2 Services Site Manager.

2.3.10 Title 2 Services Site Manager

Responsible to the Title 2 Project Manager, the Title 2 Services Site Manager(s) provide on-site data management, logistical support and works closely with the NAVFAC Field Representative and MPR Site Manager to provide field oversight of the Navy MEC removal contractor(s) to ensure the removal actions are completed in accordance with the work plans and contract documents and ensure that the work is conducted in a safe environment and within the specified timeframes. The Navy Title 2 Services Site Manager(s) may also serve concurrently as the Navy CLEAN Site Manager.

2.3.11 Navy CLEAN MRP Site Manager

Responsible to the Navy CLEAN Project Manager and Vieques MRP Director, the Navy CLEAN MRP Site Manager provides on-site Safety and MEC technical support to ensure that all MEC field activities conducted by Navy CLEAN subcontractors are performed in accordance with all approved specified procedures, plans, and regulations. The Navy CLEAN MRP Site Manager is a qualified UXO Technician who will meet or exceed the requirements for an SUXOS as presented in the DDESB approved "UXO Personnel Training and Experience Hierarchy: found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004. The Navy CLEAN MRP Site Manager(s) may also serve concurrently as the Navy Title 2 Services MRP Site Manager.

2.3.12 Title 2 Services MRP Site Manager

Responsible to the Title 2 Project Manager and Vieques MRP Director, the Title 2 MRP Site Manager performs QA activities as directed by the NAVFAC Atlantic Field Representative (QA Manager) and assist the NAVFAC Field Representative in field oversight and safety of the Navy MEC removal contractor(s) to ensure the removal actions are completed in accordance with the work plans and contract documents. The Title 2 Services MRP Site Manager is a qualified UXO Technician who will meet or exceed the requirements for an SUXOS as presented in the DDESB approved "UXO Personnel Training and Experience Hierarchy: found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004. The Navy CLEAN MRP Site Manager(s) may also serve concurrently as the Navy CLEAN MRP Site Manager.

2.3.13 Navy Contractors and Navy CLEAN Subcontractors

Navy contractors and Navy CLEAN subcontractors will be used for major work elements on the Former VNTR. Navy contracted and Navy CLEAN subcontracted work will be identified in site-specific work plans, as will points of contact, and lines of authority. In the field, each contractor and subcontractor's senior member reports directly to their respective NAVFAC Field Representative/Site Manager(s). Contractor/Subcontractor personnel requirements and qualifications are as follows:

Project Manager(s)

The Project Manager(s) report to their respective Navy CLEAN/Title 2 Services Program Manager. They are responsible for ensuring all activities performed at the Former VNTR are conducted in accordance with contractual specifications and approved SSWPs. The Project Manager is responsible for management of all operations conducted for the project.

The project manager will ensure all personnel assigned to the project, including subcontractors, have reviewed the technical plans before any task associated with the project begins. The Project Manager will monitor the budget and schedule to ensure availability of necessary personnel, equipment, subcontractors, and services. They will participate in the development of the field program, evaluation of data, and reporting.

Senior UXO Supervisor (SUXOS)

The SUXOS is the contractor's/subcontractor's senior UXO Technician onsite. He controls operations of all field teams performing MEC activities and will spend most of the day in the field monitoring their performance and helping them achieve maximum operational safety and efficiency. He reports directly to the Project Manager and receives guidance from their respective NAVFAC Field Representative/Title 2 Services MRP Site Manager/Navy CLEAN MRP Site Manager concerning technical MEC and operational issues. He will implement the approved plans in the field and must review and approve any changes. He supervises all UXO teams on a project, not to exceed a total of 10. The SUXOS is authorized to temporarily stop work to correct an unsafe condition or procedure. The SUXOS will meet or exceed the requirements for that position as presented in the DDESB-approved "UXO Personnel Training and Experience Hierarchy" found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

UXO Technician III (UXOTIII)

UXOTIII personnel, also referred to as field team leaders, are responsible for the safety and efficiency of the performance of their assigned field team, and report directly to the SUXOS. The UXOTIII can temporarily stop work in order to bring an unsafe condition or procedure to the attention of the SUXOS. The UXOTIII will meet or exceed the requirements for that position as presented in the DDESB approved “UXO Personnel Training and Experience Hierarchy” found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

UXO Technician II (UXOTII)

UXOTII personnel report directly to their assigned UXOTIII and are responsible for the safe and efficient performance of specific field tasks as assigned by the UXOTIII. They are also responsible for complete familiarity with the approved plans and for adherence to the procedures described in the plans. A UXOTII has the authority to temporarily stop work in order to bring an unsafe condition or procedure to the attention of the assigned UXOTIII. The UXOTII will meet or exceed the requirements for that position as presented in the DDESB approved “UXO Personnel Training and Experience Hierarchy” found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

UXO Technician I (UXOTI)

UXOTI personnel report directly to their assigned UXOTII or TIII and are responsible for the safe and efficient performance of specific field tasks as assigned. They are also responsible for complete familiarity with the approved plans and for adherence to the procedures described in the plans. A UXOTI has the authority to temporarily stop work in order to bring an unsafe condition or procedure to the attention of their assigned UXOTII or TIII. The UXOTI will meet or exceed the requirements for that position as presented in the DDESB approved “UXO Personnel Training and Experience Hierarchy” found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

UXO Sweep Personnel (UXOSP)

UXOSP assist UXO Technicians and supervisory personnel in the clearance of MEC, operating only under the direct supervision of a qualified UXOTIII. This position requires site and job specific contractor training (which may include ordnance recognition, safety precautions, donning and doffing personnel protective equipment, etc.) but does not require UXO Technician qualifications. UXOSP are not involved in the execution of explosives operations and shall not have intentional physical contact with MEC. The UXOSP will exceed the requirements of the DDESB-approved “UXO Personnel Training and Experience Hierarchy.”

UXO Safety Officer (UXOSO)

The UXOSO will implement the Site Safety and Health Plan (SSHP), inclusive of the MEC and HTRW components, and will verify compliance with applicable safety and health requirements. On the VNTR MEC sites, the UXOSO reports independently of project management to the contractor’s/subcontractor’s Program Certified Industrial Hygienist. The

UXOSO implements the approved explosives and UXO safety program in compliance with all DoD, federal, state, and local statutes and codes; analyzes UXO and explosives operational risks, hazards, and safety requirements; establishes and ensures compliance with all site-specific safety requirements for UXO and explosives operations; enforces personnel limits and safety Exclusion Zones (EZs) for UXO clearance operations, UXO and explosives transportation, storage, and destruction; conducts safety inspections to ensure compliance with UXO and explosives safety codes; and operates and maintains air monitoring equipment required at site for airborne contaminants. The UXOSO is authorized to temporarily stop work to correct an unsafe condition or procedure. The UXOSO will meet or exceed the requirements for that position as presented in the DDESB-approved "UXO Personnel Training and Experience Hierarchy" found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

UXO Quality Control Specialist (UXOQCS)

The UXOQCS implements the UXO-specific sections of the Quality Control (QC) Program for all MEC-related activities, conducts QC inspections of all UXO and explosives operations for compliance with established procedures, and directs and approves all corrective actions to ensure all MEC-related work complies with contractual requirements. The UXOQCS has the authority to temporarily stop work to correct an unsafe condition or procedure. On VNTR MEC sites, the UXOQCS reports independently of project management to the contractor's/subcontractor's Program QC Manager. The UXOQCS will meet or exceed the requirements for that position as presented in the DDESB-approved "UXO Personnel Training and Experience Hierarchy" found in Technical Paper Number 18 - Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, 2004.

2.3.14 Composition and Management of MEC Investigation/Removal Teams

Each UXO Team will consist of one UXOTIII and six or fewer team members. Teams will have a minimum of two UXO-qualified personnel, one of which will be the UXOTIII. Teams performing actual physical removal of MEC (as opposed to brush cutting teams, etc.) shall be composed entirely of UXO-qualified personnel.

Each field team will be directly supervised by an UXOTIII who will in turn report to the SUXOS. These may include brush clearing teams, UXOSP teams, and laborer teams.

The SUXOS will supervise no more than 10 UXOTIIIs.

The UXOSO and UXOQCS duties may be performed by the same person.

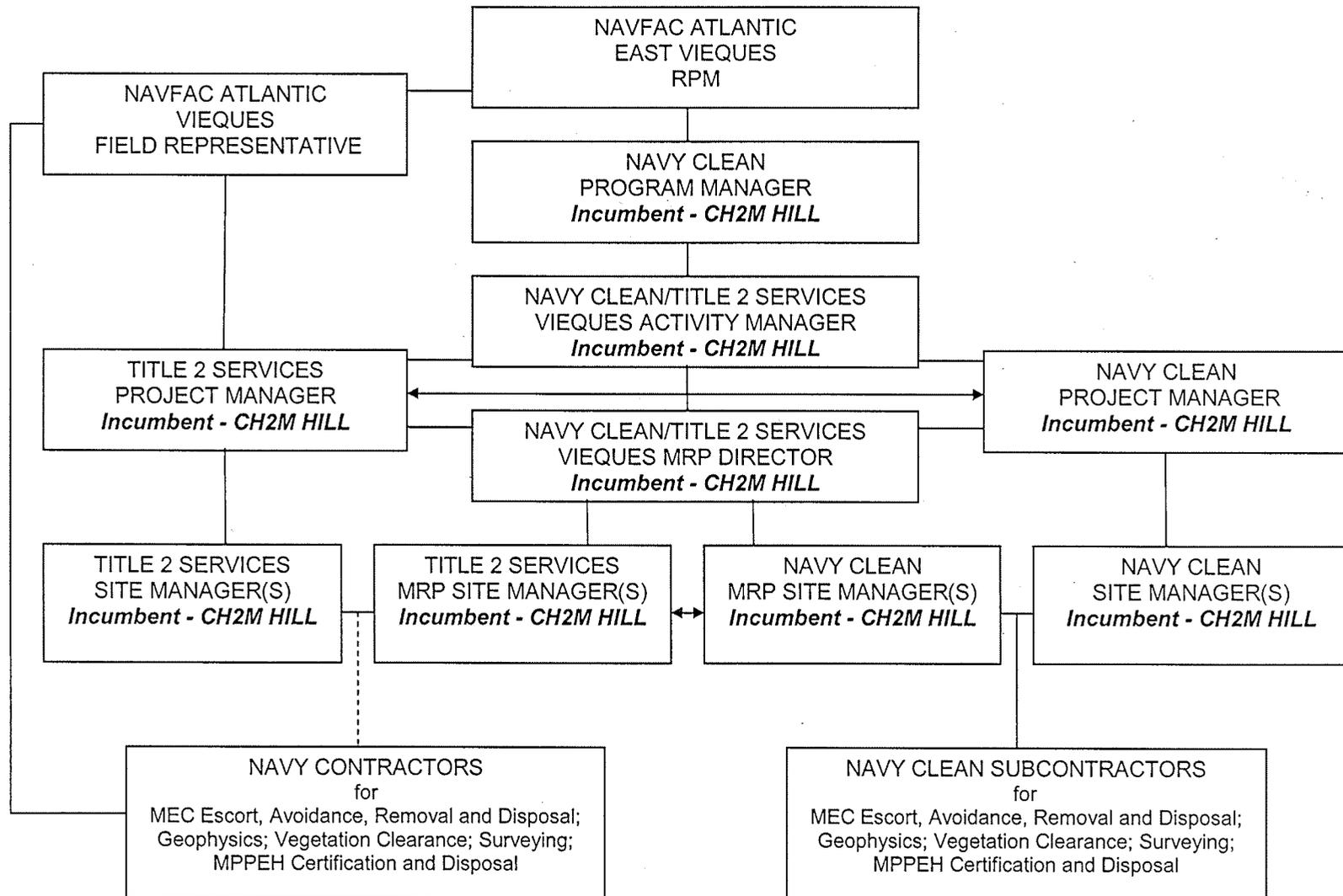
The UXOSO and UXOQCS will not be directly involved in any MEC removal or investigation tasks.

A UXOQCS may not be required full-time onsite. However, QC functions will be performed for all field activities. The UXOQCS will ensure a quality product in the field without compromising safety.

The UXO Technician I will not determine whether or not MEC is safe to move.

UXO Sweep Personnel will not excavate anomalies or handle MEC. If these personnel are performing required work, they may remain in the EZ during anomaly investigation.

Figure 2-1
Vieques MEC Project Team



2.4 Technical Approach

In addition to the instructions outlined in this Master Work Plan, SSWPs will be developed that will detail the methods and procedures for MEC investigation and removal at each site within the Former VNTR. The technical approach to work will vary depending upon the nature and complexity of each site, but will be designed to safely and efficiently complete the task.

To accomplish this objective, some or all of the following tasks will be performed:

- Project Planning
- Archive Records Search
- Mobilization
- Site Layout
- Site Safety and Communications
- Visitor Access and Control
- Field Documentation and Data Management
- Surface MEC Survey/Clearance
- Vegetation Removal
- Digital Geophysical Mapping
- Anomaly Excavation
- MEC Procedures
- Operations in Sensitive Areas
- MEC Disposal/Demolition Operations
- Statistical Sampling
- Demobilization
- Disposition of Material Potentially Presenting an Explosive Hazard (MPPEH)/Munitions Debris (MD)
- Community Relations
- MEC Investigation Report and After Action Report

2.4.1 Project Planning

The Vieques Activity Manager and Navy CLEAN/Title 2 Services Project Manager will provide project management for daily field oversight, track budget and schedule of field activities, provide weekly reports to the NAVFAC Atlantic RPM, review invoices, prepare monthly progress reports, provide technical review of major project deliverables, prepare project correspondence, and coordinate with NAVFAC, Navy contractors and Navy CLEAN subcontractors.

2.4.2 Archive Records Search

An archive records search for the Former VNTR was conducted in 2002 in conjunction with the preliminary range assessment. A summary of the search is in the *Preliminary Range Assessment Report* (NFEC and CH2M HILL April 2003). The summary will be consulted for MEC information for any given area within the Former VNTR prior to MEC-related activities. Tables documenting historical munitions use at the Former VNTR are contained in Appendix A.

2.4.3 Mobilization

This section presents the requirements for pre-mobilization, mobilization, and project setup.

Pre-Mobilization

Prior to mobilization, the following actions require advance planning in preparation for mobilization:

- Finalize procurement actions for items and services needed during the mobilization.
- Coordinate with the Federal Aviation Administration for the release of “Notice to Airmen” (NOTAM) if regular detonations are expected.
- Coordinate with U.S. Coast Guard for the release of a “Notice to Mariners” if regular detonations are expected.
- Notify local response agencies (police, fire department, hospital) of upcoming project activities.
- Coordinate with DoI personnel on Vieques Island to ensure compliance with all ARARs and identify in advance of mobilization specific areas in which operations will take place.
- Development of a site-specific work plan by the Remedial Action contractor containing all of the required site-specific information.

Mobilization

A mobilization period is necessary to mobilize, organize, and train the staff, and to mobilize, inventory, and test equipment. Mobilization activities will include:

- Transport and assembly of the work force.
- Conduct site-specific training on the work plan, SSHP, and MEC procedures and hazards.
- Ship and inventory project equipment including geophysical detection equipment, hand tools and supplies, portable toilets, backhoes, vegetation clearance equipment, etc.
- Coordinate with local agencies including police, hospital, and fire department as appropriate.
- Organize support facilities and test communication equipment.
- Test and inspect equipment.

Field Office

A field office will be established within Camp Garcia on Vieques. The field office is the central command location for MEC activities. Personnel will report to this location at the beginning of each work day for the daily health and safety briefing. The field office is the central point of communications for the project. The office will be equipped with one or more phones, and radio base station for radio communication with the field crew(s). Health and safety records will also be maintained in the field office.

Pre-Construction, Kick-off, and Safety Meeting

During mobilization and prior to initiating field activities, a pre-construction, kick-off, and safety meeting will be conducted with project personnel. This meeting will include a review of the work plan, as well as review and acknowledgment of the SSHP by all site personnel. Specific field efforts will be addressed through an agenda driven review of the master and site specific work plans.

Site Layout

The survey to establish the project site layout includes the actions performed to identify the operating area boundaries, install grid corner stakes, and develop a project base map.

Following an initial reconnaissance of the work area, the survey team will locate and mark the site boundaries with stakes and establish ground controls in accordance with the location, surveying, and mapping plan. The spatial coordinates collected during the establishment of the survey monuments, operating area boundary, and individual grids will be used to develop a project base map.

The final product of this operation is the generation of a spatially-referenced site drawing that accurately depicts the location operating area boundaries and grid boundaries. Throughout operations, this map will be continually updated to reflect project performance and contamination encountered. Upon project completion, the data contained on this map will be an integral part of the final report.

The locations of all stakes will be checked by a UXO Technician for the presence of MEC using an appropriate geophysical instrument prior to driving the stake.

The project sites addressed on a grid system will be divided into grids measuring 30 meters x 30 meters. This grid system will adhere to the current three tier Vieques grid system.

MEC Avoidance

MEC avoidance refers to techniques employed by UXO personnel to ensure the safety of project personnel working on sites known or suspected to be contaminated with MEC. These procedures can range from visual surface clearance of safe paths through contaminated areas to using magnetometers to clear environmental sampling sites.

In general, actual or suspected MEC found during MEC Avoidance operations will be conspicuously marked with surveyors tape or pin flags. Safe pathways will also be conspicuously marked. Safe pathways will be at least twice as wide as the widest vehicle to be driven on site.

Utility Clearance

If required, a utility clearance must be coordinated for underground service lines near excavation or demolition sites. Although many utilities will be evident from geophysical maps, some utilities, such as fiber optic cables, plastic gas lines, and plastic water pipes, may not be detected. If possible, utility clearance for the entire project areas will be coordinated once during the Site Layout process. Documentation of this clearance will be maintained in the Field Office.

2.4.4 Site Safety and Communications

Safety is the primary concern during MEC operations. All personnel engaged in these efforts will adhere to the SSHP and any additional safety requirements. Personnel will also comply with guidelines provided in DoD 4145.26-N, Contractor Explosive Safety for Ammunition and Explosives. The health and safety plan is included as Appendix B.

In the event that sealed drums, contaminated soils, or other suspect materials or conditions are encountered during site investigation and removal actions that would indicate a potential health or safety hazard, work efforts will temporarily cease pending an evaluation by the NAVFAC Field Representative, Navy CLEAN/Title 2 MRP Site Managers, and Contractor/Subcontractor SUXOS and UXOSO. Operations will continue only when it has been determined it is safe to proceed.

Hand-held radios will be used for any required communications between the UXO Teams and project command center/project office. The project office will relay all required communication with other station activities using established radio links or telephones (when available) as a secondary means of communication.

2.4.5 Visitor Access and Control

To ensure the safety of all personnel, both site workers and visitors, strict adherence to formal policies must be followed by personnel/organizations desiring access to project areas. Visitor Access Protocol is provided in Appendix C.

2.4.6 Field Documentation and Data Management

Data will be collected from the field utilizing the CH2M HILL developed Munitions Response Site Information Management System (MR-SIMS). Data will be processed, and used to generate project status reports and information that will be used for project reports and a subsequent risk assessments and feasibility studies, as required.

Field data collection will be conducted using a Global Positioning Satellite (GPS) -enabled handheld computer (e.g., Trimble Geo-XT) with GIS software installed (e.g., CartoPac). The handheld will be a mobile GIS and data collection system. Aerial photographs and geophysical maps will be pre-loaded on the units to facilitate data collection efforts. Using standardized collection forms and drop down selection lists, the field team(s) can easily document discovered MEC items, investigation, surface clearance, removal, and disposal actions. Data collected in the field on MEC consists of the following PDA fields: Item group (for example- UXO, MPPEH, non-MD), class (for example-projectile/mortar, rocket/guided missile, scrap), category (for example-20mm projectile, 5-inch rocket, scrap), filler type, fuzing, quantity, weight, if demo is required, date found, operation type (for example-visual surface clearance, vegetative clearance), grid cell, X coordinate, and Y coordinate. In some instances all of this information may not be available for an item. If that is the case as many of the parameters as can be determined will be recorded. The information gathered in the handheld unit is transferred each day into a desktop computer application. Once the information has been transferred to the desktop computer, the handheld will be pre-loaded with information for next-day field operations.

The desktop computer holds two separate software applications for use in the MR-SIMS system. First, a desktop version of the GIS software is used to synchronize the multiple handheld devices to a centralized application. The desktop version of the GIS will contain all of the MEC investigation/removal areas and is used as the centralized “nerve center” to assign daily tasks and receive the results of field operations at the end of each day. Every day, the collective field data from the desktop application are imported into the MR-SIMS software application. The MR-SIMS desktop is Microsoft Access-based and Quality Control steps required for data validation are integrated into the application workflow. The desktop system facilitates project management (queries and reports) and other digital geophysical mapping (DGM) and MEC operations. Validated data from the desktop application is transferred and loaded into the MR-SIMS web-GIS database.

Validated MEC field data are stored in a centralized Oracle database. The GIS software (e.g., ArcIMS, ArcSDE), allows the Vieques project team to analyze field data. Data visualization, analysis, progress tracking, queries and other data operations can be conducted from the web-GIS interface.

2.4.7 Surface MEC Survey/Clearance

UXO technicians will carefully inspect the site for evidence of partially or fully exposed MEC on the ground surface before vegetation removal or geophysical survey teams are allowed to work on the site. The surface sweep may be visual or magnetometer-assisted depending on the ground cover vegetation.

MEC items found during the initial surface clearance will be marked and identified. If MEC items are too hazardous to move or cannot be positively identified they will be disposed of using Blow-in-Place (BIP) techniques. If MEC items are safe to move they may be transported to a collection point for temporary storage or directly to a consolidated disposal site.

2.4.8 Vegetation Removal

To facilitate investigation and removal of MEC at the Former VNTR project sites, vegetation clearance may be necessary to allow access and thorough searching in a safe and efficient manner. The method of vegetation removal will be determined and presented in site-specific work plans. In determining which method of vegetation clearance is appropriate for the specific project and site, the following factors will be considered:

- Success of previous experience at project sites
- Health and Safety
- Types of MEC present at the site
- Site boundaries
- Site physical characteristics (e.g., topography)
- Weather conditions
- Site biological characteristics (e.g., species present, life cycle characteristics, ecological role)
- Potential impact to environment on and surrounding the site
- Anticipated site reuse
- Cost

Vegetation removal can be conducted manually or by mechanical means using mechanical brush clearing equipment or controlled burning. U.S. Fish and Wildlife Service (USFWS)

biologists will be notified in advance of the areas where vegetation clearance will be conducted and if necessary a site reconnaissance of the proposed work area prior to vegetation removal activities to identify and mark for avoidance any State or Federally listed flora. Cutting trees larger than 3 in. in diameter will be avoided, unless absolutely necessary. Trees will be felled into an area that has already been surface swept for MEC. A prescribed burning plan is currently being developed, and will be incorporated on approval as Appendix J.

As the first step prior to mechanical or manual vegetation clearance, the UXO Technicians will inspect all areas of the grid ahead of the vegetation removal crews with the aid of handheld magnetometers. The UXO Technicians will mark any MEC or other hazards by encircling the hazard with flagging tape.

The vegetation removal will be supervised by a UXOTIII and a UXOTII. The laborers will use hand tools that are appropriate for the vegetation being cut, such as chain saws, power string trimmers, and machetes to cut the vegetation.

When mechanized vegetation removal methods are selected an initial cut may be made prior to the surface sweep for MEC. Vegetation will be cut to height no lower than 24 in. above ground level. UXO Technicians will then perform a surface sweep with the aid of handheld magnetometers. If MEC debris is found and can be moved, it will be transferred to a consolidation point prior to further cutting to the 6-in. to 12-in. level. If it is determined that the MEC can not be moved without adversely affecting the ongoing clearance effort, the MEC will be marked and the vegetation removal and subsequent surface clearance will avoid that area and continue. The MEC or metallic debris will be addressed at a time when it does not adversely affect production of the vegetation removal and surface clearance. If no MEC or metallic debris is found, the vegetation can be cut to within 6 to 12 in. above ground level.

All cut vegetation will either be accumulated on-site and mulched or mulched in place. A typical method of vegetation disposal is chipping the vegetation into mulch, which is then spread over the cleared area. Brush clearance will be accomplished with gas-powered string trimmers with saw blade attachments, a tractor equipped with a bush hog mower, or other mechanical brush clearing equipment suitable for the vegetation type and potential explosive hazard. The brush will be cut to a height of no greater than 6 in. above ground surface to eliminate interference with MEC detection or survey activities.

Trees will be trimmed or removed on a case-by-case basis and only as required to accomplish the project tasks. If removal is required, the tree will be cut using chain saws or other mechanized equipment. The tree will be sectioned, if necessary, to remove it from the immediate area, so it does not interfere with MEC detection or survey activities.

2.4.9 Digital Geophysical Mapping

The primary objective of each geophysical investigation will be to locate all detectable MEC while developing a clear, defensible and complete Administrative Record containing all recorded and developed data. To locate and characterize all detectable MEC with maximum effectiveness and efficiency, the most appropriate geophysical equipment and survey methodologies will be evaluated and selected as identified in the Geophysical Survey Plan.

Section 5 provides procedures for performing digital geophysical mapping.

2.4.10 Anomaly Excavation

During anomaly excavation actions, the UXOTIII will assign UXO technicians one or more anomalies to investigate. Excavation of anomalies will be performed by a two-person team of UXO technicians using hand excavation tools.

Hand Excavation Tools

Small hand tools (such as shovels, spades, trowels, and pry bars) will be used to access potential MEC. Anomaly excavation will be accomplished using guidance provided in USACE EP 75-1-1, paragraph 6-7.g and safety considerations regarding excavation shafts in soil provided by EM 385-1-1, paragraph 26.F.01. Specifically, all excavation within 12-inches of the anomaly will be accomplished by hand. Hand tools will be used for the majority of items, which generally are found near the surface. The following basic technique will be used for anomaly excavation:

1. The UXO technician will relocate the anomaly with an appropriate geophysical instrument.
2. Until the anomaly is identified otherwise, it is assumed the anomaly is MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue down until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument, or until the maximum depth of excavation required by the work plan is reached.
3. Using progressively smaller and more delicate tools to carefully remove the soil, the excavation team will expand the sidewall to expose the metallic item in the wall of the excavation for inspection and identification without moving or disturbing the item.
4. Once the item is exposed for inspection, the excavation team will determine if it is MEC.
5. If the item is MEC, the procedures of MEC Identification will apply.
6. If the item is not MEC, it will be removed and the area will be rechecked with the appropriate geophysical instrument to ensure that a MEC is not hidden beneath it. The excavation team will then annotate the results of the excavation on the anomaly tracking sheet and move on to the next marked subsurface anomaly.
7. The hole will be backfilled only after the UXOQCS concurs that the excavation is complete.
8. Anomalies not unearthed during excavations completed to the maximum depth identified in the site specific work plan will be recorded in the project database, which will include at a minimum depth of excavation and coordinate location, and will be included in the appropriate investigation/removal action report.
9. Excavations will not be backfilled until the QA process has been completed and the designated NAVFAC QA personnel has indicated the excavation can be backfilled.

Earth Moving Machinery Excavation

A commercial backhoe or other heavy equipment may be used by the UXO team to carefully excavate anomalies if believed to be at a greater depth than can be efficiently excavated by hand. Earth Moving Machinery (EMM) will be used no closer than 1 ft to anomalies located during excavation. A team consisting of at least a UXO Technician and an equipment

operator will perform the anomaly excavation with EMM. The UXOTIII may assign additional workers to assist with the excavation if deemed necessary. The EMM excavation will be conducted similar to hand excavation.

- 1) Upon arrival at the anomaly site, the excavation team will reacquire the anomaly using an appropriate geophysical instrument, and the equipment operator will begin the excavation under the direction of the UXO technician. The equipment operator will excavate near the location, but not directly on top of the anomaly.
- 2) To prevent contacting the anomaly with the backhoe, the UXO technician will frequently monitor the excavation to ensure that the equipment operator does not dig directly over the anomaly. The objective of the direction by the UXO technician is to remove the soil from a selected area adjacent to the anomaly, while ensuring that the backhoe bucket does not disturb the anomaly.
- 3) The UXO technician will direct the equipment operator to stop excavation when the soil has been removed to within 1 ft of the anomaly, as estimated by the response from the magnetometer or the post-processed geophysical data.

The backhoe will then be shut down, and the excavation will be completed using hand tools as previously described for hand excavation.

2.4.11 MEC Procedures

This section discusses the procedures that will be performed by UXO-qualified personnel during MEC operations (e.g., investigation and removal actions). This section includes recommended procedures for validating anomalies, identification, transportation, and disposal of MEC. Navy contractors and Navy CLEAN subcontractors will provide relevant standard operating procedures (SOPs) in their SSWP.

MEC Safety Precautions

The general work practices outlined in *Basic Safety Concepts and Considerations for Ordnance and Explosives (OE) Operations, OE MCX, EP-385-1-95a*, will be followed. Some basic precautions to be followed also include:

- The work periods for field UXO personnel are limited to maximums of 10 hours per day and 50 hours per week. Exceptions to this requirement will only be made in the event that public safety is at imminent risk and with the concurrence of the Contracting Officer.
- Each work team will consist of a UXOTIII and six or fewer team members.
- Each work team will have at least two UXO-qualified personnel.
- The SUXOS will oversee no more than 10 UXOTIIIs.

MEC Identification

The UXO Technician will carefully remove enough soil, without disturbing the MEC, to facilitate positive identification or to obtain its identification features. UXO Technicians will make every effort to identify MEC through visual examination of the item for markings and other identifying features such as shape, size, and external fittings. Items will not be moved

during the inspection/identification until the fuze condition can be ascertained. If the condition is questionable, consider the fuze to be armed. The fuze is considered the most hazardous component of a UXO, regardless of type or condition. The SUXOS make final determination of identification of the item and the disposition of the item prior to implementing any disposal operations.

MEC Transportation

Transportation of MEC may be a consideration if safe to do and there is a compelling reason. Guidelines to determine whether to transport and procedures for transport are discussed below.

Determination to Transport MEC. Recovered military munitions or MEC will not be moved by personnel unless it is safe to do so. Movement of MEC by hand is authorized only after positive identification and a determination by the UXO Technician III and either the SUXOS or UXOSO that the MEC is safe to move. The on-site Navy field representative will make final determination on whether or not to move an MEC item. A conservative approach to MEC transportation will be taken and only considered when the item is positively identified as safe to move.

Procedures for Transportation of MEC. If onsite movement of MEC for disposal or venting is approved, move the MEC in the position found. Movement over short distances for onsite consolidation will be done by hand-carrying the MEC in the position found. Movement of greater distances (e.g., to another grid for disposal or venting) may be done in a specially-equipped vehicle. The vehicle must have the appropriate placards and a non-sparking liner and tie-down points. The MEC will be stabilized with sandbags or placed in a wooden box filled with sand and securely tied down. The driver of the transport vehicle will be followed by another similar vehicle and driver to assist him in loading and unloading the MEC, and in the event of mechanical trouble.

MEC Safe Holding Areas

Depending on condition and quantity of MEC encountered, one of the two courses of action will be taken:

- MEC left in place pending disposal.
- MEC transported to on-site consolidation point pending disposal.

MEC items left in place pending disposal will have geographic coordinates and item information gathered. The specific location of the item will be evaluated to determine any security or access concerns. Finally, the next planned demolition event for the site will be considered to determine if additional measures will be necessary to maintain control/security of the item. Additionally, activities that may result in increased trespassing or attempts to access the work areas will be evaluated to determine if additional measures should be taken to discourage access, prevent access, or minimize potential encounters with UXO. USFWS, USEPA, and the Puerto Rico Environmental Quality Board (PREQB) will be notified if the site personnel are made aware of the possibility of increased trespassing, so they can provide notification to the appropriate enforcement agencies for both waterway access and land access. In the event of actual trespassing incident, proper authorities will be

notified immediately along with the timely notification of USFWS, USEPA, and PREQB. A designated area will be established on-site for collection of MPPEH.

Recovered Chemical Warfare Materiel (RCWM)

RCWM is not expected to be encountered at the Former VNTR based on range usage archival searches and previous investigations. If suspected RCWM is encountered the following procedures will be followed:

- Person discovering suspected RCWM will immediately notify the SUXOS.
- SUXOS will immediately direct the work team to stop work and evacuate the site in an upwind direction. The initial EZ for RCWM is 450 ft upwind per Field Manual (FM)-9-15 (U.S. Army, 1996).
- SUXOS should note the location of the suspected RCWM to help with its identification and reacquisition.
- SUXOS will designate a minimum of two UXO-qualified individuals to position themselves upwind as far as possible to prevent unauthorized personnel from accidental exposure.
- SUXOS will immediately contact the NAVFAC RPM and local USFWS representatives to request military assistance.

Note: Assistance for RCWM will be requested through the US Army's 52d Ordnance Group at Fort Gillem, GA, (404) 469-3333. Should the 52nd Ordnance Group be non-responsive, the Chemical Warfare Design Center will be contacted (296) 895-1180.

- SUXOS will account for all personnel and notify the Title 2 Services Contractor Project Manager.
- SUXOS will ensure the area is secured until relieved by proper authorities. The SUXOS will direct Title 2 Services Contractor personnel to support response units as appropriate.
- USEPA Region II, PREQB, and NOSSA will be notified if RCWM is discovered during investigation/removal action operations. The contact information for these agencies is given in Appendix D.

Before work resumes, site plans will be reviewed for adequacy in consideration of this newly discovered hazard.

Hazardous, Toxic, and Radioactive Waste

There is documented use of 25mm depleted uranium (DU) projectiles at the Former VNTR during a one time event, where approximately 250 to 300 rounds were fired in the vicinity of the "convoy target" located east of the "mock runway." Of the rounds fired approximately one half were recovered. Daily safety briefs will include identification of DU and safety precautions to be used in the case DU rounds are identified. The primary procedure will be to evacuate the area by moving upwind greater than 100 meters, notifying the SUXOS and UXOSO immediately, and contacting the Radiological Affairs Support Office (RASO) Steven W. Doremus, Director, Environmental Radiation Programs NAVSEADET RASO, (757) 887-7745, DSN 953-7745, fax (757) 887-3235.

The following equipment and personal protective equipment (as per U.S. Army, Industrial Operations Command, Pamphlet 700-48) will be available on-site in the case that UXO personnel are directed to remove and secure the DU to maintain the work schedule: coveralls, leather gloves, nitrile gloves, protective goggles, eye wash, hand cleanser, plastic bags (4 mil), metal container (30 gal, 55 gal, or ammunition box), swabs, tape to seal bags, marking pens, labels, and Radiac meter AN VDR2 6665-01-222-1425 (or similar). Direct surface or swab measurements with the Radiac meter can be performed if directed by support center.

2.4.12 Operations in Sensitive Areas

MEC operations may be requested and/or required in areas that are sensitive due to population centers, cultural, ecological, political, or other reasons.

Populated Areas

The Former VNTR is considered remote and is not located near any populated areas. However, the range boundaries are frequently breached by trespassers. Additionally, the coastal waters surrounding the Former VNTR are off-limits, but commercial and recreational boats are frequently spotted just off shore. Project personnel will be reminded to stay alert for trespassers as part of their daily safety briefings. Intrusive operations will immediately stop if a trespasser is spotted within or approaching the Exclusion Zone established for the task being performed. Work will not resume until the situation is resolved.

Ecologically Sensitive Areas

All site-specific activities will be evaluated during the planning phase by the Project Manager, in consultation with USFWS personnel, to ensure that sites are evaluated to determine the presence of, or potential impacts to, state and federally listed flora and fauna.

2.4.13 MEC Disposal/Demolition Operations

MEC disposal / demolition operations will be conducted in accordance with TM 60A-1-1-31 and applicable/appropriate TM-60 Series publications. All Navy contractors and Navy CLEAN subcontractors conducting MEC removal or investigation operations will provide a detailed Demolition Operations SOP in their respective SSWP.

Notification Procedures

Prior to carrying out demolition operations, the U.S. Coast Guard and Federal Aviation Administration will be contacted and the appropriate notices/advisories made for watercraft and aircraft safety (e.g., notice to mariners and notice to airmen). Additionally the following will be notified prior to demolition activities; NAVFAC Atlantic RPM, NAVFAC Field Representative, Vieques Activity Manager, Navy CLEAN/Title 2 Project Manager, Navy CLEAN/Title 2 MRP Director, Navy CLEAN/Title 2 Site Managers, Department of Natural and Environmental Resources, Fuerza Unidad de Rapida Accion, PREQB, USFWS, USEPA Region II, and the Municipality of Vieques. The PREQB shall be notified 24 to 48 hours prior to demolition operations. The contact information for these agencies is given in Appendix D.

Responsibilities

During demolition activities, the Navy contractor/Navy CLEAN subcontractor SUXOS will have overall control of the Site. An EZ will be established around the demolition site according to the Explosive Operations Site Approval and Explosives Safety Submission. Only the SUXOS, UXO Team, and UXO-qualified safety personnel will be allowed within the EZ once the disposal operations have begun. The UXOSO will ensure safe work practices and procedures are observed,

General Procedures

The following general procedures will be followed for all disposals by detonation:

- The UXO Team, comprised of the UXOTIII and a UXOTII, will inspect the location, condition, and net explosive weight (NEW) of the MEC selected for disposal.
- The UXOTIII will ensure that permission to detonate explosives has been obtained from the SUXOS and coordinated with the appropriate outside agencies.
- It is the responsibility of the SUXOS to schedule the detonations and to ensure that all project personnel are accounted for before disposal operations begin.
- The UXO Team will prepare enough explosive charges to perform the planned detonations. The transportation vehicle will then be loaded with the properly containerized explosives and initiators, and other equipment required.
- Initiators will always be transported in a separate container from the main-charge explosives.
- A minimum separation distance of 25 ft will be observed for initiators and main-charge explosives while at the disposal site.
- If several MEC items are located in close proximity to each other, a mainline/branchline shot may be used to destroy these MEC simultaneously. Ensure the total NEW of the MEC to be destroyed does not increase the EZ minimum separation distance.
- Prior to initiation, the UXOTIII will ensure that guards are stationed at the roadblocks, scan the EZ for personnel, sound three distinct blasts on an air or vehicle horn, and then scan the area again and initiate the demolition charge if all is clear.
- In the event of a misfire, a 30-minute wait time for electric misfires or a 60-minute wait time for non-electric misfires will be observed.
- All waterways, roadways, and other access routes will be monitored for non-essential personnel during all phases of demolition operations.

Post-Demolition Procedures

After successful initiation of the demolition shot, the UXO Team will conduct an inspection of the shot to confirm that complete destruction of the MEC item(s) has occurred. Upon verification, an “all clear” announcement will be made. If multiple demolition shots are conducted, a systematic approach to dispose of MEC items scheduled for detonation will be

performed. Following the final scheduled demolition shot of the day, notification will be provided to all parties on the notification list.

Engineering Controls

Due to the remote location of the VNTR work sites, the requirement for engineering controls is not anticipated. Fragment or blast mitigation may be provided by an appropriate DDESB-approved engineering control. Typical engineering controls for intentional detonations include tamping and sandbags. The design of such an engineering control shall be based on the Munition with the Greatest Fragmentation Distance (MGFD). The NEW used for the design of the engineering control shall be the total NEW of all munitions plus the initiating explosives.

2.4.14 Statistical Sampling

Intrusive MEC sampling consists of: 1) locating potential subsurface MEC items by mapping or detecting geophysical anomalies, and 2) excavating a percentage of the anomalies or area to determine if MEC or MPPEH metal is present. If statistical sampling is to be performed at the Former VNTR, the sampling methodology will be selected and described in site-specific work plans.

Sampling Methodologies

Statistical sampling determines how much sampling is required to sufficiently characterize the site for MEC contamination. Statistical sampling has evolved over the years to generate the following techniques (not in any hierarchical order):

- *Full-Coverage Sampling.* With this method, 100 percent of a site is sampled. This method is expensive, slow, and can be devastating to the environment.
- *Fixed-Pattern Sampling.* With this method, sampling data are gathered from grids spaced evenly over the site. With fixed-pattern, typically 10 percent of the total site is sampled.
- *Hybrid-Grid Sampling.* This method addresses random-pattern deficiencies by adding biased grids to random grids to ensure that areas with known contamination are sampled. Biased grids can also fill large unsampled areas left between random grids.
- *Transect Sampling.* This method would involve sampling along regular transects. It is particularly suited to boundary location (i.e., for identifying where impact areas end). This method requires a 1 to 5 percent sample area.
- *Meandering Path.* This method involves collecting geophysical data at a site by walking a meandering path over the study area. Geophysical sensors and data loggers collect data as GPS determines and records location. The meandering path technique eliminates the need to cut vegetation because the survey team simply finds a path through or around it. A safety escort and a geophysicist follow a loosely planned path designed to reduce distances between sample areas and to cover areas suspected of containing MEC.

2.4.15 Demobilization

Demobilization may occur for a variety of reasons:

1. The project is completed with all work accomplished.
2. The project is incomplete, but the contractor has expended most of the contract funds.
3. Weather conditions may prompt a demobilization.
4. It may be determined that continuing in the present course of action is not in the best interest of the Government.

Whatever the reason, the Government, through its Contracting Officer, must convey officially to the contractor its decision to demobilize from the project site.

Demobilization upon Project Completion

Full demobilization will occur when the project is completed with appropriate QA and QC checks performed. During final demobilization, personnel will be retained only as long as necessary. All personnel no longer required will be demobilized. The following will occur prior to demobilization:

- All areas to be investigated or cleared will be verified as completed to the Government's satisfaction
- All areas that could not be investigated or cleared will be identified
- Site restoration will be verified as performed to an appropriate level

Unscheduled Demobilizations

If weather conditions threaten to force an unscheduled demobilization, the decision to demobilize will be based on an analysis of the cost to stay on the project until the weather clears versus cost to demobilize. If the number of predicted productive days during the poor weather conditions is sufficient enough to show a benefit by staying onsite, the work can continue.

2.4.16 Management of Material Potentially Presenting an Explosive Hazard (MPPEH)

The procedures for managing MPPEH and MD are provided in Appendix E.

2.4.17 Community Relations

The contractor or its subcontractors will only perform community relations when requested by the NAVFAC Atlantic Contracting Officer for a specific task or project. When approached by any person or entity requesting information about a project, site personnel will defer to the Navy onsite representative or installation representative as appropriate. The contractor will not make available or publicly disclose any data generated or reviewed under this contract or any subcontract unless specifically authorized by the Contracting Officer. Reports and data generated under this task order will become the property of the Government and distribution to any other source is prohibited unless authorized by the

Contracting Officer. During the implementation of actions under the CLEAN contract, the Navy will implement community relations activities based on the assessed level of community interest.

Additional activities may be necessary once the action begins and at completion. Activities for consideration during these key periods may include:

- Issuing a fact sheet to nearby residents and interested community members describing the remedial activities, the steps in implementing the action, the schedule for completion, and period of operation.
- Preparing and distributing periodic information updates describing developments at the site.
- Holding community workshops and small group meetings before the action begins, during its implementation, and at completion using presentation boards, displays, handouts, and other graphics to clearly present the plans and progress of site remediation.
- Providing briefings and press releases for the media.
- Updating the information repositories with appropriate documents, such as work plans, fact sheets, brochures, and media releases.
- Developing displays showing progress of work and its schedule to be placed where the information repository is located or other places where people gather, such as the town square, museum, and schools.
- Posting information and documents to the web site.
- Establishing a contact person at the site.
- Briefing community leaders, local agencies, and interested community members of key site activities before they occur, explaining how the action will proceed, the schedule, and other issues of interest (such as findings) in a timely manner.
- Responding to inquiries and concerns of community members promptly.
- Conducting a public ceremony and site tour to acknowledge completion of the action.

2.4.18 MEC Reporting

The contractor shall prepare and submit to the Navy for review a MEC Assessment reports and After Action reports as appropriate. Upon receipt of comments from the Navy, an reports shall be submitted to PREQB, NOSSA and EPA. Upon receipt of comments, the contractor shall submit a Final MEC Assessment Report. This report shall present the visual and geophysical data collected during the MEC investigation.

All boundaries shown between cleared and uncleared areas or between areas cleared to different depths will include sufficient survey information so that they can be determined in the field at any future date. The maps should be sufficiently detailed so that they will serve as a permanent record of the extent of all MEC cleared property in the event that existing buildings or other reference features are removed in the future.

Explosives Management Plan

3.1 General

This section provides details of the plan for management of explosives to support the MEC Investigation and Removal Actions at the Former VNTR. This plan was developed in accordance with NAVSEA OP 5 VOL I and NAVSEA 8020.14, OPNAVINST 5530.13, ATF P 5400.7, DoD 6055.9-STD, Department of Transportation (DOT) regulations, and local and state laws and regulations. An Explosives Operations Site Approval has been developed and approved for the former VNTR. Specific explosives that will be procured and the procedures to be used for storage and transportation will be included in the associated site-specific work plan.

3.2 Licenses and Permits

The Navy contractors and Navy CLEAN subcontractors providing MEC removal should be prepared to acquire commercial explosives from a local vendor who will deliver the materials to the project site. The contractor will maintain a valid ATF user of High Explosives Permit. Explosives vendors cannot supply explosives without the required valid dealer ATF license. A copy of the dealer's license will be maintained at the project office, and upon request, will be made available to any local, state, or federal authority. In addition, users and transporters of explosives over public transportation routes, as well as manufacturers, receivers, storers or possessors of explosives will be required to obtain a permit from the Superintendent of Police, as required by the Commonwealth of Puerto Rico law or as directed by the Superintendent of Police.

3.3 Procedures

3.3.1 Acquisition

The types and estimated quantities of explosives and their intended use during the project may be revised as work progresses, but typically the following explosives will be used during explosive disposal of MEC:

- Main charge high-explosive such as TNT, Tetryl, Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine (HMX), or binary explosives that detonate at high velocities will be used to detonate MEC.
- Jet Perforators, or similar prepackaged shaped charges are generally used to explosively vent hard-cased munitions to determine if they are inert filled.
- Detonating cord used to construct mainline-branch line shots, to link multiple shots together, or to transmit the explosive train to the main charge explosive when the main charge is buried (tamped), underwater, or otherwise inaccessible.

- Electric and/or non-electric blasting caps used as initiators.
- NONEL (shock-tube) used to transmit the explosive train from the igniter to the demolition devices. Shock-tube priming of explosives offers the instantaneous action of electric detonation without the risk of accidental initiation of the blasting cap (and the charge) by radio transmitters in the area, or by static electricity discharge. The explosion of the shock-tube is totally contained within the plastic tubing.

All explosives are expected to be purchased through commercial suppliers in Puerto Rico. Military explosives are not expected to be required for this project.

3.3.2 Initial Receipt

Explosive shipments will normally originate from the island of Puerto Rico. The mode of delivery to Vieques may vary based upon the DOT Hazard Classification of the explosives being delivered. Binary explosives, NONEL, and certain initiators may be delivered by commercial air carrier to the Vieques Airport. High explosive main charges, Jet Perforators, detonating cord, and certain initiators may be delivered by special chartered aircraft or delivered to Vieques Island via watercraft.

Regardless of delivery mode and location, all incoming shipments will be met by project personnel qualified and authorized to transport explosives and taken directly to explosive storage magazines near OP-1 (Buildings 4710A and 4710B).

Explosives in unsealed boxes containing partial lots will be opened, and the contents counted. 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 SUXOS of the discrepancy, who will in turn notify the NAVFAC Field Representative and the Title 2 Services/Navy CLEAN MRP Site Manager.

3.4 Explosive Storage

3.4.1 Magazines

The existing magazines near OP-1 will be used for the storage of explosives in support of MEC activities on the VNTR. These magazines, Building 4710A and 4710B were previously sited by NOSSA as Ready Service Magazines for Navy explosive ordnance disposal teams conducting range clearance and refurbishment operations on the VNTR. Explosives will be segregated in accordance with its Hazard Division (HD) and the storage compatibility group criteria listed in Chapter 3 of DoD 6055.9-STD.

3.4.2 Magazine Type

Buildings 4710A and 4710B are identical, concrete/masonry units with steel doors. The doors are equipped with security-type hardware (hinges, hasps, and hasp covers).

The existing fences and gates around 4710A and 4710B will be maintained in a good state of repair as required.

This explosives storage area will meet the requirements of:

- ATF P 5400.7 - Alcohol, Tobacco, and Firearms (ATF) Explosives Laws and Regulations
- DoD 6055.9-STD - DoD Ammunition and Explosives Safety Standards
- NAVSEA OP 5 Volume 1, Ammunition and Explosives Ashore

The storage magazines are approved as follows: Magazine 4701A is limited to a NEW of 100 lb of HD 1.4 materials. The inhabited building distance (IBD) is 75 ft based on the NEW for HD 1.4. Magazine 4701B is limited to a NEW of 2,000 lb of HD 1.1 materials. The IBD is 1,250 ft based on the NEW for HD 1.1.

3.4.3 Physical Security

Each explosive storage magazine is surrounded by a chain-link security fence with a lockable gate. The magazine doors are fitted with dual tamper-resistant hardware which accept a single high security padlock. The gate keys will be issued to an authorized individual and the magazine keys will be issued to another authorized individual. Keys will be secured in the project office when not in use.

If temporary magazines are required, locks will meet the standards for ATF Type 2 magazines, as specified in Section 55.208(a)(4), ATF P 5400.7. Each magazine will have two locks. An authorized individual will hold a key to one of the locks, and another authorized individual will hold the key to the other. Access to the explosives will require both individuals. Keys will be secured in the project office when not in use.

During non-working hours, a guard will be posted at OP-1 when explosives are stored in building 4710A and 4710B. The guard will verify the security of both facilities every two hours. The guard will have reliable communications to notify Puerto Rico State Police in case of emergency.

3.4.4 Placards

Explosive storage magazines will be clearly marked with DoD fire symbols and National Fire Protection Association 704 markers. Signs stating "EXPLOSIVES" and "NO SMOKING" will be posted on the outside of the magazines.

3.4.5 Lightning Protection System

Buildings 4710A and 4710B have installed lightning protection systems that comply with the specification given in the *Draft Final Explosives Operations Site Approval, Former VNTR, Vieques, Puerto Rico, October 2004*.

3.4.6 Fire Protection

Fire extinguishers of 10 lb and type BC will be located in the magazine area. Smoking, matches, open flames, spark producing devices, and firearms will not be permitted within 50 ft of the magazines. The area surrounding the magazines will be kept clear of all combustible materials for a distance of at least 50 ft.

3.4.7 Stocking Procedures

When explosives are stored onsite to meet project requirements, the containers of explosive materials are to be stored so that markings are visible. Stocks of explosive materials are to be stored so that they can easily be counted and checked upon inspection.

Except for fiberboard and other non-metal packages, containers of explosive materials are not to be unpacked or repacked inside a magazine or within 50 ft of a magazine, and must not be unpacked or repacked close to other explosive materials. Containers of explosive materials must be closed while in storage.

Tools used for opening and closing containers of explosive materials are to be of non-sparking materials, except that metal box-cutters may be used for opening fiberboard containers. A wood wedge and a fiber, rubber or wooden mallet is to be used for opening and closing wood containers of explosive materials. Metal tools other than non-sparking transfer conveyors are not to be stored in any magazine containing explosives.

If multiple Navy contractors/Navy CLEAN subcontractors are on site and require explosive storage, explosive storage containers will be conspicuously marked and physically separated to the extent possible. Total NEW will not exceed the limits specified in paragraph 3.4.2.

3.5 Transportation

This section presents the vehicle requirements and on-site transportation procedures of explosives.

3.5.1 Onsite Transportation Procedures

Explosives will be delivered to the magazines by a licensed and permitted commercial explosives transporter. When explosives are required at the work site, the UXO team will transport the explosives in an appropriately placarded vehicle following the procedures stated in this section.

Procedures for transporting explosives from the storage facility to the demolition site include the following rules:

- The driver of any explosive-laden vehicle will ensure that the load is properly braced and that the initiators are carried separately from main charge explosives.
- The UXO Technician in charge of the explosives movement will ensure the driver and any passengers are not carrying any smoking products or flame producing devices. Smoking is strictly forbidden by all personnel involved in the handling or transportation of explosives.
- Drivers transporting explosives on roads that are not controlled by the U.S. Government must possess a valid commercial driver's license with a hazardous materials endorsement.
- The amount of explosives issued and transported will be limited to the amount needed to perform the day's demolition operations and any quantity limitations imposed by transportation regulations.

3.5.2 Vehicle Requirements

Vehicles transporting explosives on the Site will comply with the following requirements:

- Vehicles transporting explosives will be properly placarded.
- All vehicles transporting explosives will be equipped with reliable communications, a first aid kit, and two 10-pound BC fire extinguishers.
- Vehicles transporting explosives will be inspected daily when in use and the inspections will be documented in a Motor Vehicle Inspection Form (Form 3-1).
- The vehicle used to transport the explosives will have a non-sparking bed liner.

3.6 Receipt Procedures

This section describes the procedures the Navy contractors and Navy CLEAN subcontractors will use to maintain records of explosives inventories.

3.6.1 Inventory Control and Records Management

An accurate running inventory of all explosives stored on site will be maintained on the magazine data card. One copy of the magazine data card, (Form 3-2) or equivalent, will be kept with the specific lot of explosives, and one copy will be kept in the field office.

At the time of explosives delivery, and at the time of explosives issuance, the authorized individual will ensure that all additions and subtractions from the inventory of a magazine are recorded on the magazine data card(s). If issued explosives are not used, they will be added back into the inventory and recorded on the magazine data card.

Explosives will be tracked by lot number on the magazine data cards. All explosive inventory records generated will be archived for a period of at least 5 years in accordance with ATF regulations.

3.6.2 Responsible Persons and Employee Possessors

A “Responsible Person” is defined as an individual who has the power to direct the management and policies of the company pertaining to explosive materials. This generally includes sole proprietors, partners, site managers, corporate officers and directors.

A “possessor of explosives” is someone who has actual physical possession or constructive possession, which means the person has dominion or control over explosives. Persons who are physically handling explosive materials are considered to possessors of explosives.

Navy contractors/Navy CLEAN subcontractors who hold an ATF User of High Explosives Permit will formally designate by name, those on-site personnel who are authorized to purchase, receive, access, and use explosives. This designation will be in writing, signed by a “Responsible Person,” referenced in SSHP’s, maintained at the site office and made available for audit. Only personnel designated in writing may conduct the receipt and initial inventory of explosives. Individuals authorized to receive explosives will be at least UXOTIII qualified.

3.6.3 End User Certification

The senior on-site authorized individual, as the end-user of explosives, will certify in writing that the explosives were used for their intended purpose.

3.6.4 Reconciling Discrepancies

In the event there is a discrepancy following daily deliveries or on-site storage between the explosives on hand and the explosives inventory recorded on the Magazine Data Card, the senior on-site authorized individual will be notified. The senior authorized individual, together with the contractor/subcontractor SUXOS, will review documentation to determine whether the discrepancy is a clerical error or whether explosives have been lost or stolen. If it is concluded explosives are lost or stolen, the procedures listed below will be followed.

3.6.5 Remote Firing Device Management and Control

The remote firing device maintained on site will be controlled and managed with accompanying documentation according to the SOP attached at the end of this section.

3.7 Inventory

If explosives are stored onsite, each Magazine Data Card will be audited at least weekly by project staff, such as the NAVFAC Field Representative, Title 2 MRP Site Manager, or Navy CLEAN MRP Site Manager on a rotating basis. The senior authorized individual(s) will ensure that the contents of each magazine are inventoried on a weekly basis and that the quantities of explosives on hand match the quantities listed in the Magazine Data Cards. During this inventory, the numbers of each item stored in the magazine will be determined by sight inspection and count. Sealed containers will be left unopened and counted as full. Discrepancies discovered at any time will be handled as described in the following section.

3.8 Lost, Stolen, or Unauthorized Use of Explosives

If explosives are discovered to be lost, stolen, or used without authorization, the incident will be immediately reported to the Navy contractor/Navy CLEAN subcontractor SUXOS, who in turn, will then inform respective Project Managers, NAVFAC Field Representative, and Navy CLEAN/Title 2 Services Site Managers and PM. The NAVFAC Field Representative or Navy CLEAN/Title 2 Services PM will immediately notify the NAVFAC RPM and provide updates as required. The NAVFAC RPM will notify EQB and the Puerto Rico Police.

As required by 27 CFR Part 555.30, any permittee is required to report the theft or loss of explosives to the ATF within 24 hours of discovery. In the event of such an occurrence, the following procedures will be followed:

- The magazine will be secured, and the area will be sealed until the appropriate authorities complete their investigation.
- Notify the nearest ATF office or by telephoning 888-283-2662 (nationwide toll-free number)

- Notify local law enforcement authority to report the theft or loss.
- Complete the report form (ATF Form 5400.5) (Form 3-3), and attach any additional sheets or invoices necessary to provide the required information.

3.9 Return of Explosives

Explosives that have been issued but not used during the course of the workday will be returned to the magazine prior to shift ending. All unused explosives will be returned to the magazine from which they came, and the magazine data card(s) will be annotated.

3.10 Disposal of Explosives

If explosives were being stored onsite and some quantity remains at the end of the project the Navy Contractor/Navy CLEAN Subcontractor Project Manager will consult with NAVFAC and contracting representative to determine the appropriate disposition. Consideration will be given to transfer the remaining explosives to another on-site UXO contractor/subcontractor holding a ATF permit or another project via a licensed and permitted commercial carrier. If economically advantageous transfer opportunities cannot be identified, the explosives will be detonated consistent with procedures contained in SSHPs.

Form 3-1

MOTOR VEHICLE INSPECTION
(TRANSPORTING HAZARDOUS MATERIAL)

GBL. NO.	ORIGIN	DESTINATION
NAME OF CARRIER		
NAME OF DRIVER		
DATE AND HOUR		
INSTALLATION/ACTIVITY		
DIVER=S STATE PERMIT NO.		
MEDICAL EXAMINER=S CERTIFICATE AND DATE		

VEHICLE

TYPE OF VEHICLE _ TRUCK Q TRUCK AND FULL TRAILER Q TRACTOR AND DOUBLE TRAILERS Q TRACTOR AND CLOSED SEMI-TRAILER Q TRACTOR AND FLAT-BED TRAILER	TRUCK NUMBER	TRAILER(S) NUMBER	SLEEPER CAB Q YES _ NO
	ORIGIN	ORIGIN	VALID LEASE _ YES Q NO
	DESTINATION	DESTINATION	I.C.C. NUMBER

*NOTE: All of the following items shall be checked on empty equipment prior to loading.
Items with an asterisk (*) shall be checked on incoming loaded equipment.*

ITEM NO.	CHECK APPROPRIATE COLUMN <i>(See reverse side for explanatory notes)</i>	ORIGIN		DESTINATION		REMARKS <i>(Explain unsatisfactory items; use reverse side if necessary)</i>
		SAT	UNSAT	SAT	UNSAT	
1.	ENGINE, BODY, CAB AND CHASSIS CLEAN					
2.	STEERING MECHANISM					
3.	HORN OPERATIVE					
4.	WINDSHIELD AND WIPERS					
5.	SPARE ELECTRIC FUSES AVAILABLE					
6.	REAR VIEW MIRRORS INSTALLED					
7.	HIGHWAY WARNING EQUIPMENT					
* 8.	FULL FIRE EXTINGUISHER INSTALLED (2)					
9.	LIGHTS AND REFLECTORS OPERATIVE					
10.	EXHAUST SYSTEM					
* 12.	FUEL TANK, LINE AND INLET					
* 14.	ALL BRAKES OPERATIVE					
16.	SPRINGS AND ASSOCIATED PARTS					
* 17.	TIRES					
18.	CARGO SPACE					
* 19.	ELECTRIC WIRING					
* 20.	TAIL GATE AND DOORS SECURED					
22.	ANY OTHER DEFECTS <i>(Specify)</i>					

Q APPROVED Q REJECTED	<i>(If rejected give reasons on reverse under ARemarks. @ Equipment shall be approved if deficiencies are corrected prior to loading.)</i>	SIGNATURE <i>(of Inspector)</i> ORIGIN	SIGNATURE <i>of Inspector)</i> DESTINATION
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ITEMS TO BE CHECKED PRIOR TO RELEASE OF LOADED VEHICLE		ORIGIN	DESTINATION
23.	MIXTURES OF MATERIAL PROHIBITED BY DOT REGS. ARE NOT LOADED ONTO THIS VEHICLE		
* 24.	LOAD IS SECURED TO PREVENT MOVEMENT		
25.	WEIGHT IS PROPERLY DISTRIBUTED AND VEHICLE IS NOT OVERWEIGHT		
* 27.	SPECIAL INSTRUCTIONS <i>(DD Form 836)</i> FURNISHED DRIVER		
* 28.	COPY OF VEHICLE INSPECTION <i>(DD Form 626)</i> FURNISHED DRIVER		
* 29.	PROPER PLACARDS APPLIED		
* 30.	SHIPMENT MADE UNDER DOT EXCEPTION 868		

SIGNATURE <i>(of Inspector)</i> ORIGIN	SIGNATURE <i>(of Driver)</i> ORIGIN
SIGNATURE <i>(of Inspector)</i> DESTINATION	SIGNATURE <i>(of Driver)</i> DESTINATION

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
REPORT OF THEFT OR LOSS-EXPLOSIVE MATERIALS

DATE _____

Upon discovery of any theft or loss of any of your explosive materials:

- First, contact ATF toll free at 1-800-461-8841 between 8:00 a.m. - 5:00 p.m. EST (or after-hours and weekends contact ATF collect at 1-888-283-2662) to report the theft or loss;
 - Second, contact your local law enforcement office to report the theft or loss to obtain a police report; and
 - Third, complete this form and attach any additional reports, sheets or invoices necessary to provide the required information, and fax then mail the form with additional material(s) to the nearest ATF office listed on the reverse. We suggest you retain a copy of the completed form. Please complete each item, as applicable, to the best of your ability.
- NOTE:** Section 842(k), 18 U.S.C., Chapter 40, states, "It shall be unlawful for any person who has knowledge of the theft or loss of any explosive materials from his stock to fail to report such theft or loss within twenty-four hours of discovery thereof to the Secretary and to appropriate local authorities." Codified at 27 C.F.R., Section 55.30.

1. NAME, ADDRESS AND TELEPHONE NUMBER OF PERSON MAKING REPORT <i>(Include corporate or business name, if applicable)</i>	2. LOCATION OF THEFT OR LOSS <i>(If different from item 1)</i>
--	--

3. THEFT OR LOSS a. DISCOVERED b. OCCURRED <i>(Show approximate if exact not known)</i> c. REPORTED TO ATF BY TELEPHONE d. REPORTED TO LOCAL AUTHORITIES	DATE 	TIME 	4. NAME AND ADDRESS OF LOCAL AUTHORITY TO WHOM REPORTED POLICE REPORT NUMBER: _____
--	----------------------	----------------------	--

5. EXPLOSIVE MATERIALS LOST OR STOLEN <i>(Attach invoices or additional sheets, if necessary)</i>		
a. MANUFACTURER OR BRAND NAME <i>(Include date and shift code)</i>	b. QUANTITY <i>(Pounds of Explosives, Number of Caps)</i>	c. TYPE AND DESCRIPTION <i>(Dynamite, Blasting Agents, Detonators, etc. Include for each type, size, MS delay or length of legwire, as applicable)</i>

6. THEFT OR LOSS OCCURRED FROM *(Check applicable box)*

PERMANENT MAGAZINE
 PORTABLE MAGAZINE
 TRUCK
 WORK SITE
 OTHER *(Explain)* _____

7. ENTRY TO MAGAZINE MADE THROUGH <i>(Complete if applicable)</i> <input type="checkbox"/> DOOR <input type="checkbox"/> ROOF <input type="checkbox"/> FLOOR <input type="checkbox"/> FOUNDATION <input type="checkbox"/> WALL <input type="checkbox"/> CEILING <input type="checkbox"/> VENTS <input type="checkbox"/> OTHER <i>(Explain)</i> _____	8. NUMBER AND TYPE OF LOCKS FORCED <i>(Complete if applicable)</i>
--	---

9. OTHER INFORMATION PERTINENT OT THE THEFT OR LOSS

10. SIGNATURE AND TITLE OF PERSON MAKING REPORT	11. FEDERAL EXPLOSIVES LICENSE OR PERMIT, IF ANY
---	--

FOR ATF USE ONLY		
DATE RECEIVED	TIME RECEIVED	UNIQUE IDENTIFIER

REPORTING INSTRUCTIONS

Forward or Fax this completed form to the ATF address listed below:

Bureau of Alcohol, Tobacco and Firearms
Arson and Explosives National Repository Branch (AENRB)
P.O. Box #50980
Washington, DC 20077-8001
Toll Free Fax: 1-866-927-4570

Questions regarding the completion of this form should be referred to the AENRB toll free at 1-800-461-8841.

PRIVACY ACT INFORMATION

The following information is provided pursuant to section 3 of the Privacy Act of 1974 (5 U.S.C. § 522a(e)(3)).

1. **Authority.** Solicitation of this information is made pursuant to Title XI of the Organized Crime Control Act of 1970 (18 U.S.C. Chapter 40). Disclosure of a theft or loss of explosive materials is mandatory pursuant to 18 U.S.C. § 842(k) for any person who has knowledge of such theft or loss from his stock.
2. **Purpose.** The purpose for the collection of this information is to give ATF notice of the theft or loss of explosive materials, and to furnish ATF with the pertinent facts surrounding such theft or loss. In addition, the information is used to confirm and verify prior notification of this theft or loss of explosive materials.
3. **Routine Uses.** The information will be used by ATF to aid in the administration of laws within its jurisdiction concerning the regulation of explosive materials and other related areas. In addition, the information may be disclosed to other Federal, State, foreign, and local law enforcement of laws within their jurisdiction.
4. **Effects of not supplying information requested.** 18 U.S.C. § 842(k) makes it unlawful for any person, who has knowledge of the theft or loss of explosive materials from his stock, to fail to report such theft or loss within twenty-four hours of discovery thereof, to the Secretary and to appropriate local authorities. The penalty for violation of this section is a fine of not more than \$1,000 or imprisonment for not more than one year, or both. 18 U.S.C. § 844(b).

PAPERWORK REDUCTION ACT NOTICE

This request in accordance with the Paperwork Reduction Act of 1995. The purpose of this information collection is to report the theft or loss of explosive materials. The information is used for investigative purposes by ATF officials. This information is mandatory by stature. (18 U.S.C. § 842)

The estimated average burden associated with this collection of information is 1 hour and 48 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be addressed to Reports Management Officer, Document Services Branch, Bureau of Alcohol, Tobacco and Firearms, Washington, D. C. 20226.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Remote Firing Device Management and Control

I. Purpose and Scope

This procedure presents the process managing and controlling remote firing devices (RFD) kept on-site. Proper management and control of this equipment is paramount because of potential liability issues and equipment cost. This procedure is intended to be a standard, but should be supplemented if site conditions/operations dictate.

II. Roles and Responsibilities for Management and Control of RFD

Below are the roles and responsibilities for those CH2M HILL individuals who have a role in the management and control of RFD(s)

CH2M HILL Contracts Administrator

- Maintain procurement information and documentation
- Provide government furnished equipment (GFE) tags for all components (if applicable)
- Enter equipment into GFE or log (if applicable)
- Include equipment status and information on periodic GFE deliverable (e.g., yearly accounting of equipment to government) to government contracts (if applicable)
- Prepare GFE transfer documentation at conclusion of project or upon request from government (if applicable)

CH2M HILL On-site UXO Technician

- Maintain control of RFD when not “checked-out” (e.g., insure RFD is in a locked cabinet or office)
- Maintain “check-in/check-out” log
- Check condition of all equipment when “checked-in”
- Coordinate any maintenance required (e.g., replace batteries)
- Notify the Contracts Administrator and Director of Munitions Response Operations CH2M HILL immediately if lost or stolen

CH2M HILL Site Manager

- Assume CH2M HILL on-site UXO Technician responsibilities if the UXO Technician is off-site

III. Specific Procedures and Guidelines

- It is assumed that a CH2M HILL representative will be on-site at all times. In the case there are no CH2M HILL representatives on-site the equipment should be shipped to the Virginia Beach Office of CH2M HILL. If the equipment is GFE and will be needed on-site during the time there are no CH2M HILL representatives, the equipment should be checked out to the on-site NAVFAC representative using the procedures below
- The CH2M HILL on-site UXO Technician will maintain control of the RFD by locking the equipment and any associated components in a secure cabinet or office on-site at Camp Garcia.
- Evaluate the secure location for storage of the RFD regularly to determine if it is adequate and if needed coordinate with the CH2M HILL Site Manager to determine a more appropriate storage location.
- All potential users of the RFD must make notification to the CH2M HILL on-site UXO Technician of their need to use the equipment 24 hours in advance. In the case of emergency needs the user should make notification as soon as possible.
- Prior to “check-out” the CH2M HILL on-site UXO Technician will check equipment operation according to manufacturer guidelines and instructions.
- Any deficiencies in operation or equipment maintenance will be entered on the on-site equipment maintenance log sheet and coordination with the CH2M HILL Site Manager will be made to have repairs/replacement made.
- At time of “check-out” the “check-in/check-out” log for the equipment must be completed to include signature of CH2M HILL on-site UXO Technician and user. If the equipment is being used by only CH2M HILL, the log must be signed by two separate CH2M HILL individuals.
- Immediately after use the equipment must be “checked-in” to the CH2M HILL on-site UXO Technician.
- The CH2M HILL on-site UXO Technician will test the equipment according to manufacturer instructions and will evaluate the condition of the equipment against the condition at “check-out” and note any differences on the “check-in/check-out” log. If maintenance or repairs are needed they will be entered on the on-site maintenance log.
- The CH2M HILL on-site UXO Technician will return the equipment to the designated secure storage location.
- If an RFD is lost or stolen immediate notification must be made to the Contracts Administrator and Director Munitions response Operations.

IV. Attachments

- RFD “check-in/check-out” log.

V. Key Checks and Items

- RFD is secured in a locked cabinet or office on-site when not in use
- RFD is maintained in good working order
- RFD “check-in/check-out” log is maintained
- If RFD is lost or stolen immediate notification to the Contracts Administrator and Director Munitions Response Operations is made

Explosives Siting Plan

4.1 General

This section describes safety criteria for planning and siting explosives operations. This criteria is intended to establish explosive safety quantity distance arcs around MR activities. Distances given are the minimum required. Specific MR Areas and MR activities are described in Sections 1 and 2 of this Master Work Plan. An Explosives Operations Site Approval has been developed and approved for the Former VNTR. Explosives Safety Submissions, revisions, and amendments will be developed and submitted for approval as necessary to carry out work in various areas within the Former VNTR. These documents will be maintained on-site.

4.2 MEC Areas

4.2.1 Restricted Area

The Restricted Area is defined as all lands beyond the warning signs, road barriers, and locked gates. Personnel access to and movement within the Restricted Area requires authorization from the Navy and USFWS. Only project personnel and authorized, escorted visitors are allowed within the Restricted Area. Appendix C provides Visitor Access Protocol.

4.2.2 Exclusion Zones (EZ)

An EZ is a safety arc established around MR activities. EZs are established within the Restricted Area to further limit access to sites of MEC intrusive operations or planned detonations.

EZs are 3-dimensional. A Notice-to-Airmen will be coordinated through local Federal Aviation Administration officials.

If an EZ extends beyond the land boundaries of the Restricted Area, institutional and engineering controls will be established and enforced to ensure public safety. These controls include public safety announcements, roadblocks, evacuations, tamping of disposal shots, and relocating munitions prior to disposal.

If an EZ extends into coastal waters, procedures will be implemented to prevent public exposure to the hazard. A Notice-to-Mariners will be coordinated through local Coast Guard officials. Project personnel will be posted at key vantage points on the beach to observe any encroachment into the exclusion zone. These sentries will be in radio/cell phone communication with the work site supervisor.

Unintentional Detonation EZ

Prior to start of any MEC operations an EZ for unintentional detonation will be established. This EZ is based upon the hazardous fragment distance for the NEW of the MGF.D.

EZ for Unintentional Detonation in the ECA and LIA. The unintentional detonation EZ during MEC operations is 1,250ft. Distance is based on NEW for the MGFDF of a MK 84 LDGP bomb (945 lb) and derived from NAVSEA OP 5 Vol. 1, Table 7-9.

EZ for Unintentional Detonation of MEC in the SIA. The unintentional detonation EZ during MEC intrusive operations is 600ft. Distance is based on NEW for the MGFDF of a M106 8-in. projectile (38 lb) and derived from NAVSEA OP 5 Vol. 1, Table 7-9.

EZ for Unintentional Detonation of MEC in the EMA. The unintentional detonation EZ during MEC intrusive operations is 400ft. Distance is based on NEW for the MGFDF of a M374 81-millimeter mortar (2.09 lb) and derived from NAVSEA OP 5 Vol. 1, Table 7-9.

TABLE 4-1
MGFDF Fragmentation and Over Pressure Safety Distances
VNTR, Vieques, Puerto Rico

VNTR Area	MGFDF ^a	Hazardous Fragment Distance ^b (ft)	Maximum Case Fragment Throw Distance ^c (ft)	K50 Over Pressure Distance ^d (ft)
LIA & ECA	MK 84 LDGP Bomb	925	3882	491
SIA	M106 8-In. Projectile	530	3287	167
EMA	M374 81mm Mortar	234	1233	64

^aFor Quantity-Distance (Q-D) siting purposes, the MGFDF and resulting EZ distances will be established, based on the greatest of the fragmentation or overpressure distances for the types of MEC expected to be encountered. Fragment hazard distances will be recalculated based on the NEW, in the event different MEC are found.

^bOP5, Volume 1 and DDESB TP-16, the distance at which fragments do not exceed a hazardous fragment density of one hazardous fragment per 600 ft², where a hazardous fragment is defined as a fragment having an impact energy of 58 ft-lb or greater.

^cOP5, Volume 1 and DDESB TP-16, the maximum distance at which a fragment may travel based on munition design specifications and maximum trajectories.

^dAs calculated in accordance with OP5, Volume 1 and DDESB TP-16, the distance at which blast overpressure exposure from Hazard Division 1.1 explosives is less than 0.90 psi—the lower end of the permissible exposure level for inhabited buildings and administrative and housing areas per Chapter 2, para. D.6 of DoD 6055.9-STD. Determined from the formula: $50 \times \text{NEW}^{1/3}$.

Intentional Detonation EZ

Prior to intentional detonation of any MEC item(s) an EZ will be established. Intentional detonation EZ is based on the Maximum Case Fragment Throw Range. Rogue fragments may travel farther.

MEC items should be arranged in the safest possible configuration. Lugs and strong-backs should point downward. Base-plates and noses should point in the safest possible direction. Counter-charges should be placed to prevent shaped charge jets from forming during disposal. If safe to do so, counter-charges should be placed underneath MEC items containing white phosphorous (WP) to prevent unconsumed WP from becoming mixed with the soil.

The SUXOS and UXOSO will closely monitor the type and quantity of MEC items in consolidation shots to ensure maximum NEW is not exceeded.

Manned roadblocks will be established on all access roads leading to intentional detonation site. Personnel at these roadblocks will be in radio or cell phone communication with each other, the SUXOS, and the UXOSO.

EZ for Intentional Detonations in the ECA and LIA. 4,000 ft based upon the MK 84 LDGP Bomb. For items with a diameter 5 in. or less, a 2,772-ft exclusion zone may be used. For items with a diameter less than 1.5 in., a 1,250-ft exclusion zone may be used. Intentional detonations in this area will not exceed a NEW limit of 1,000 lb (including demolition materials) for the 4,000-ft exclusion zone; a NEW limit of 600 lb for the 2,772-ft exclusion zone; and a NEW limit of 50 lb for the 1,250 exclusion zone.

EZ for Intentional Detonations in the SIA. 4,000 ft based on the M106 8-in. projectile. For items with a diameter 5 in. or less, a 2,772-ft exclusion zone may be used. For items with a diameter less than 1.5 in., a 1,250-ft exclusion zone may be used. Intentional detonations in this area will not exceed a NEW of 50 lb (including demolition materials).

EZ for Intentional Detonations in the EMA. 2,500 ft based on the 81mm mortar. For items with a diameter less than 1.5 in., 1,250-ft exclusion zone may be used. Intentional detonations in this area will not exceed NEW of 10 lb (including demolition materials).

4.3 Inhabited Building Distance (IBD) and Public Transportation Route (PTR) Distance

IBD is the minimum permissible distance between an inhabited building and a potential explosion site. The PTR is calculated at 60-percent of the IBD. The IBD and PTR for the proposed inspection/removal areas are given in Table 4-2 and based on the MGFD for each area.

TABLE 4-2
Inhabited Building (IB) and Public Transportation Route (PTR) Distances

MEC Area	MGFD	NEW (lb)	Hazardous Fragment Distance (ft)	IBD (ft)	PTR (ft)
ECA & LIA	MK 84 Bomb	945.00	925	1,250	750
SIA	M106 - 8-In.	38.00	530	530	318
EMA	M374 - 81mm	2.09	234	234	140

There are no inhabited buildings within these distances from known MR Sites, however, the coastal waters around the VNTR will be treated as a PTR during all MR Activities.

If PTR Distance extends into coastal waters procedures will be implemented to prevent public exposure to the hazard. A Notice-to-Mariners will be coordinated through local Coast Guard officials. Project personnel will be posted at key vantage points on the beach to observe any encroachment into the PTR Distance. These sentries will be in radio/cell phone communication with the work site supervisor. A small boat or personal watercraft will be available to relay a warning to boats encroaching within the PTR Distance.

4.4 Preliminary Site Work

Preliminary site work such as elevation surveys, geophysical surveying and detecting anomalies does not require an Exclusion Zone for Quantity-Distance (Q-D) purposes.

4.5 Team Separation Distances

Team separation distances provide a safety zone between work sites.

4.5.1 Team Separation Distances in the ECA and LIA

Teams working within the ECA and LIA will maintain a minimum of 500 ft of separation distance. This is based on the K50 over pressure distance of 491 ft for the Mk 84 LDGP Bomb, the MGF D for these MR Areas.

4.5.2 Team Separation Distance in the SIA

Teams working within the SIA will maintain a minimum of 200 ft of separation distance. The K50 over pressure distance of the MGF D for this MR Area, the M106 8-in. HE Projectile, is 167 ft.

4.5.3 Team Separation Distance in the EMA

Teams working within the EMA will maintain a minimum of 200 ft separation distance. The K50 over pressure distance of the MGF D for this MR Area, the M374 81mm HE Mortar, is 64 ft.

4.6 Planned or Established Treatment Sites

There are no planned/established treatment sites proposed for the VNTR. MEC items will be disposed of in-place or nearby where they are encountered.

4.7 Footprint Areas

There are three types of footprint areas: BIP, MEC collection points within a search grid, and consolidated shots within a search grid. Essential project personnel (UXO and Geophysical teams) may continue to work within these areas, but must stay at least 200 ft from the MEC item(s) for which the footprint was established.

4.7.1 Blow-in-Place (BIP)

BIP operations are conducted when an MEC item is too hazardous to move or cannot be positively identified. If there is no operational or safety requirement to move an MEC item it should be disposed of in-place.

BIP Operations in the ECA and LIA

A default, 4,000-ft footprint area will be established around BIP operations within the ECA and LIA. These operations will be limited to 1,000 lb NEW. The size of the footprint and

NEW limit will accommodate a Mk 84 LDGP Bomb, the largest MEC expected to be encountered in these MR Areas.

If the MEC item being disposed of has a diameter of less than 5 in. the BIP footprint may be reduced to 2,500ft.

If the MEC item being disposed of is considerably smaller than 5 in. in diameter a reduced BIP footprint may be calculated based on the item's explosive filler weight.

BIP Operations in the SIA

A default, 4,000-ft footprint area will be established around BIP operations within the SIA. These operations will be limited to 50 lb NEW. The size of the footprint and NEW limit will accommodate a M106 8-in. HE Projectile, the largest MEC expected to be encountered in this MR Area.

If the MEC item being disposed of has a diameter less than 5 in. the BIP footprint may be reduced to 2,500ft.

If the MEC item being disposed of is considerably smaller than 5 in. in diameter a reduced BIP footprint may be calculated based on the item's explosive filler weight.

BIP Operations in the EMA

A default, 2,500-ft footprint area will be established around BIP operations within the EMA. These operations will be limited to 10 lb NEW. The size of the footprint and NEW limit will accommodate a M374 81mm HE Mortar, the largest MEC expected to be encountered in this MR Area.

If the MEC item being disposed of is considerably smaller than a M374 81mm HE Mortar, a reduced BIP footprint may be calculated based on the item's explosive filler weight.

4.7.2 Collection Points

MEC items which can be safely moved may be consolidated onsite pending transport to another area for storage or disposal. The SUXOS and UXOSO will establish the exact location for collection points and closely monitor the MEC items placed there to ensure maximum NEW is not exceeded.

Collection Points in the ECA and LIA

The NEW of any single collection point will not exceed 1,000 lb. An IB distance of 1,250 ft and a PTR distance of 750 ft will be established and maintained around collection points in these MR Areas.

Collection Points in the SIA

The NEW of any single collection point will not exceed 50 lb. An IB distance of 530 ft and a PTR distance of 318 ft will be established and maintained around collection points in this MR Areas.

Collection Points in the EMA

The NEW of any single collection point will not exceed 10 lb. An IB distance of 234 ft and a PTR distance of 140 ft will be established and maintained around collection points in this MR Areas.

4.7.3 In-Grid Consolidation Shots

MEC items which are safe to move may be consolidated for final disposal. MEC items should be arranged in the safest possible configuration. Lugs and strong-backs should point downward. Base-plates and noses should point in the safest possible direction. Counter-charges should be placed to prevent shaped charge jets from forming during disposal. If safe to do so, counter-charges should be placed underneath MEC items containing WP to prevent unconsumed WP from becoming mixed with the soil.

The SUXOS and UXOSO will closely monitor the type and quantity of MEC items in consolidation shots to ensure maximum NEW is not exceeded.

Manned roadblocks will be established on all access roads leading to the site of the consolidation shot. Personnel at these roadblocks will be in radio or cell phone communication with each other, the SUXOS, and the UXOSO.

In-Grid Consolidation Shots in the ECA and LIA

A default, 4,000-ft footprint area will be established around consolidation shots in the ECA and LIA. These operations will be limited to 1,000 lb NEW. The size of the footprint and NEW limit will accommodate a Mk 84 LDGP Bomb, the largest MEC expected to be encountered in these MR Areas.

If all MEC items in the consolidation shot have a diameter of less than 5 in. the footprint may be reduced to 2,500ft.

If all MEC items in the consolidation shot are considerably smaller than 5 in. in diameter a reduced BIP footprint may be calculated based on the items' explosive filler weight.

In-Grid Consolidation Shots in the SIA

A default, 4,000-ft footprint area will be established around consolidation shots in the SIA. These operations will be limited to 50 lb NEW. The size of the footprint and NEW limit will accommodate a M106 8-in. HE projectile, the largest MEC expected to be encountered in this MR Area.

If all MEC items in the consolidation shot have a diameter of less than 5 in. the footprint may be reduced to 2,500ft.

If all MEC items in the consolidation shot are considerably smaller than 5 in. in diameter a reduced BIP footprint may be calculated based on the items' explosive filler weight.

In-Grid Consolidation Shots in the EMA

A default, 2,500-ft footprint area will be established around consolidation shots in the EMA. These operations will be limited to 10 lb NEW. The size of the footprint and NEW limit will

accommodate a M374 81mm HE Mortar, the largest MEC expected to be encountered in these MR Areas.

If all MEC items in the consolidation shot are considerably smaller than a M374 81mm HE Mortar, a reduced BIP footprint may be calculated based on the items' explosive filler weight.

Geophysical Plan

5.1 Introduction

The following sections present the general geophysical investigation plan in support of the DGM activities that will be implemented during investigation of MRSs at the Former VNTR. SSWPs will be developed prior to investigation of each MRS. Each SSWP will further define the geophysical investigation approach to be implemented at that site.

5.2 Personnel Qualifications

DGM operations will be conducted by personnel experienced in MEC geophysical operations led by a qualified MEC experienced geophysicist. All geophysical support personnel onsite will have documentation of 40-hour Occupational Safety and Health Administration (OSHA) certification, any necessary re-certification (8-hour refresher), and OSHA-compliant medical monitoring physical exams. Throughout DGM operations, geophysical support personnel will strictly adhere to the general practices given in this Master Work Plan and applicable SSWPs. Personnel conducting DGM operations will practice avoidance in the event that MEC is encountered.

5.3 Geophysical Investigation Objective and Flow Chart

The primary objective of the geophysical investigations at the Former VNTR is to accurately locate geophysical anomalies that could represent MEC in the subsurface while developing a clear, defensible, and complete Administrative Record containing all recorded and developed data. Tasks associated with this objective are listed below and are shown in the flow chart presented as Figure 5-1. Specifics related to each of the tasks will be addressed in the SSWPs developed for individual sites. Some of the resources used for development of this document and that should be consulted for development of the DGM related work plans in the SSWP include *USACE DID OE-005-05.01*, *USACE DID OE-005-05A.01*, the *Ordnance and Explosives Digital Geophysical Mapping Guidance -Operational Procedures and Quality Control Manual*, and the *ITRC Geophysical Prove-Outs for Munitions Response Projects Technical/Regulatory Guideline*.

Define Geophysical Investigation Area – the area(s) of investigation will be defined and the boundaries marked in the field. Based on results from the geophysical investigation the investigation area may be refined.

Select Geophysical Survey Approach – the geophysical survey approach will be determined based on the overall goals and DQOs of the investigation, types of munitions expected at the site, geology, terrain, and vegetation. Included will be the types of equipment, methods, and personnel needed to carry out the geophysical investigation.

Select Potential DGM Equipment – potential equipment will be selected while developing the geophysical survey approach and a geophysical prove-out (GPO) will be used to facilitate final equipment selection. Multiple types of potential equipment may be identified and the GPO may be helpful in selecting the equipment that will most effectively meet the investigation and site needs. In other cases the appropriate equipment may not be known and the GPO will help to test the effectiveness of various geophysical equipment for the site and the conditions.

Equipment Test – the proposed geophysical systems will be tested under site-specific conditions. The GPO will determine the capability of the selected equipment. During the GPO the equipment will be deployed over an area representative of the investigation area seeded with inert MEC items or (if necessary) surrogates. The GPO will test the entire survey process from data collection to anomaly reacquisition.

Site Preparation – the necessary site and safety preparations will be made, which will include a MEC surface clearance, removal of surface metallic items, vegetation clearance, establishing survey boundaries, and establishing control points.

Digital Geophysical Mapping – the survey is conducted by deploying the geophysical equipment according to the methods and procedures defined in the geophysical survey plan.

Data Processing and Interpretation – during mag and flag investigations the UXO technicians will mark anomalies with pin flags as they are detected in the field. For DGM surveys, the data will be processed and subsurface geophysical anomaly maps will be created. The anomalies will be evaluated and dig sheets will be created. The dig sheets will indicate the anomalies to be reacquired and subsequently investigated by UXO personnel.

Anomaly Reacquisition and Intrusive Investigations – anomaly locations selected during the processing and interpretation phase will be located in the field (reacquired). The locations will be presented as coordinates on the dig sheets and then located and marked in the field. UXO personnel will then investigate the anomalies intrusively within an established search radius. During the intrusive investigations appropriate hand held geophysical instruments will be used to locate the metallic item(s).

Conduct Quality Assurance/ Quality Control – QA/QC procedures will be performed to ensure that performed work meets contractual and quality standards. Daily functional checks will be conducted for the geophysical equipment.

Verify Results and Report – the results of the survey will be compiled and compared to the Data Quality Objectives (DQOs). A summary report as outlined in the SSWP will be prepared.

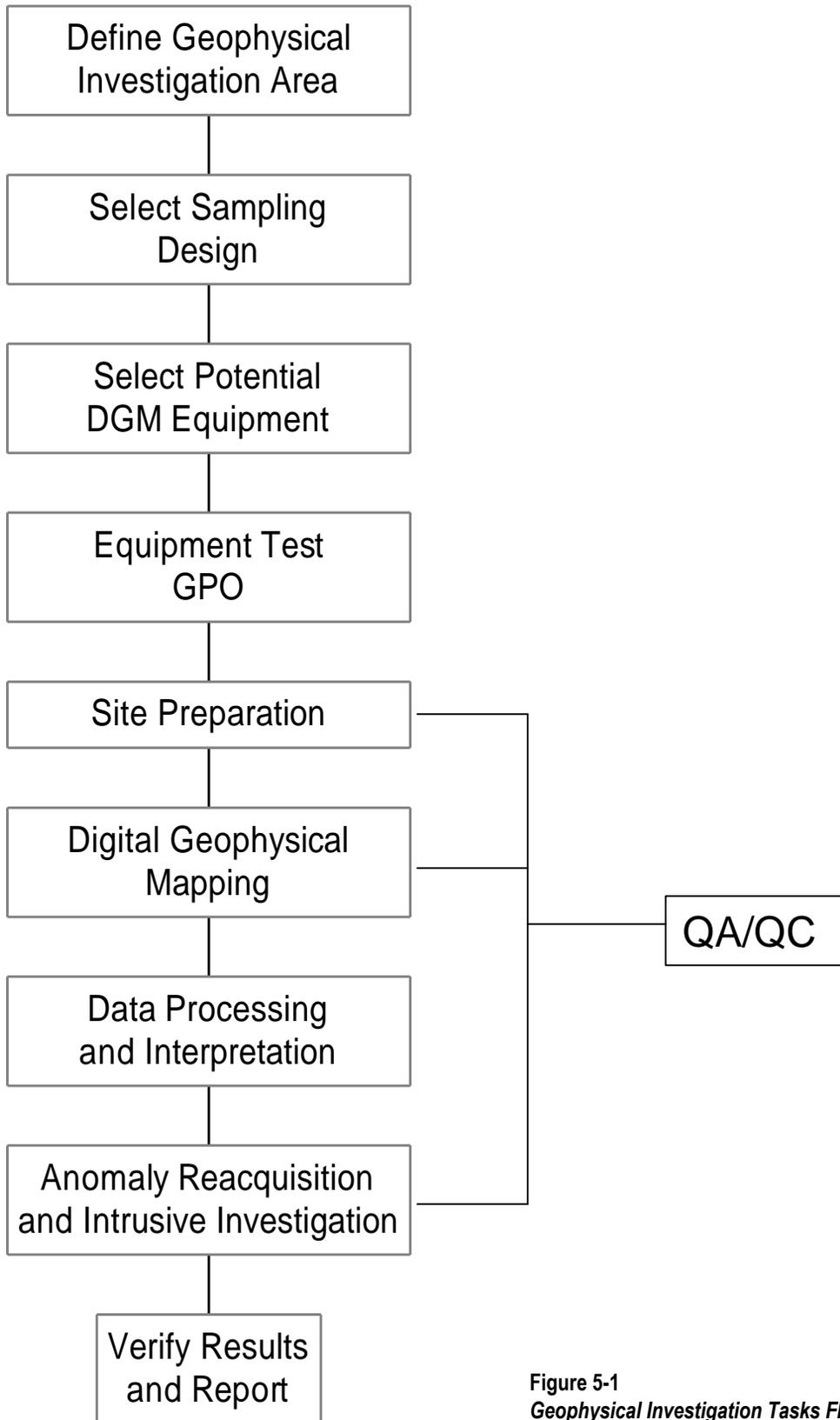


Figure 5-1
Geophysical Investigation Tasks Flow Chart
Former VNTR, Vieques, Puerto Rico

5.4 Geophysical Prove-Out

The initial phase of each investigation to locate MEC in the subsurface will be an evaluation of the proposed geophysical system through a GPO. A GPO may be performed for each VNTR site or the SSWP may refer to a GPO performed for a VNTR site of similar geology, terrain, vegetation and target MEC. The GPO Plan and procedures are given in Appendix F.

The purpose of the GPO is to demonstrate and document the site-specific capabilities of a DGM system to operate as an integrated system capable of meeting project DQOs. For the purposes of this work, a system is considered to include the survey platform, sensors, navigation equipment, data analysis and management, and associated equipment and personnel.

A GPO area consistent with the local site conditions (geologic, topographic, and vegetation), will be established and seeded with known items (similar to those suspected or discovered at the site) at various depths and orientations. The depths and orientations of the items will be varied to effectively evaluate the DGM systems. DGM systems will be evaluated across the entire GPO area using the same survey techniques determined to be suitable for the investigation. Specifics regarding each GPO will be given in the SSWP for each site.

Results of the GPO will be included in a GPO report prepared immediately after the GPO has been performed. The report will include a summary of all of the GPO operations, seed item specifics (actual burial locations, depths, etc.), an as-built map of the GPO plot and GPO results.

On-site DGM surveys will only commence once project team concurrence on the GPO results has been achieved.

5.5 Boundary Survey

A surveyor will perform a boundary survey, to include placement of colored flagging on stakes along the perimeter of the site, to establish work area limits for the vegetation removal crews. The survey team will consist of a surveyor party chief, a surveyor technician, and a UXO escort. The escort will be equipped with an appropriate geophysical instrument to perform anomaly avoidance.

5.6 Vegetation Removal

Many areas within the Former VNTR have a dense shrub canopy that must be removed prior to performing the DGM operations. Vegetation removal will consist of removal of sufficient subgrowth and small trees (less than a 3-in. diameter) where necessary to perform the DGM surveys. Personnel will use mechanical means where possible and manual means in other areas. Vegetation removal will be conducted by a vegetation removal subcontractor under the direction of UXO technicians, and activities will be conducted in conjunction with a visual UXO surface clearance by the technicians to protect personnel and equipment.

5.7 Grid/Transect Survey

In order to establish an operational grid system, a surveyor will emplace individual grids over the investigation area. The corners of the grids will be coincident with the UTM Grid Plane Coordinates in Easting (meters) and Northing (meters) and will be marked using labeled, non-metallic stakes.

Transects will be established by placing survey markers at the beginning and end of a transect. Periodic markers will be placed along the transect to provide accurate locations for use during DGM surveys. The number of markers will vary depending on site conditions and transect length. The markers will be coincident with UTM Grid Plane Coordinates in Easting (meters) and Northing (meters) and will be marked using labeled, non-metallic stakes.

5.8 Surface Clearance

Following the grid survey, the Navy Contractor/Navy CLEAN subcontractor will conduct a surface clearance to facilitate the DGM Survey. Only UXO qualified personnel will be used to locate, remove, and/or dispose of MEC/MPPEH. The surface MEC clearance will be performed using one (1) UXOTIII and up to five (5) UXOTII/UXOTI/UXOSP. Each UXO technician will be equipped with an appropriate geophysical instrument (e.g. Schonstedt Model GA-52Cx magnetometer, Minelabs Explorer or White's Metal Detector) to assist in locating MEC items and metal debris that are obscured by brush cuttings. The UXO III will organize his/her UXO Team in a line-abreast formation, with each UXO Technician spaced at approximately 5-ft intervals. The team will move forward in unison and will visually search the ground for metallic debris and/or MEC items. If this method is insufficient, individual 3- to 5-ft search lanes will be established.

5.9 QA/QC Seeding

Prior to performance of the DGM of each area, representative inert MEC items (QC and QA seeds) will be buried across the site. The QC seed items will be buried at depths not-to-exceed the maximum detection depths as determined from the GPO. These items will be used to validate both the DGM surveys and the intrusive operations at the site. Each SSWP will specify the approximate number of QC and QA seed items to be buried across each investigation area.

5.10 Digital Geophysical Mapping

5.10.1 Instrumentation

Based on site conditions and prior DGM surveys at the site, it is clear that there are several industry standard geophysical instruments that can successfully perform DGM surveys at VNTR. The actual DGM system for each specific site will be determined through the GPO process. Descriptions of the specific systems to be used for the DGM surveys and their SOPs will be provided in each SSWP.

5.10.2 DGM Survey

The DGM Contractor will perform a DGM survey over the entire site to locate metallic items related to military munitions. All DGM survey details, particularly lane spacing and sensor separation, will be selected to maximize coverage of the survey area.

DGM field teams will consist of personnel as specified in Section 5.2. All geophysical and positioning data will be digitally recorded and downloaded at the end of each day. Data archives will be maintained both onsite and offsite.

Digitally recorded field data sheets shall include the following, at a minimum:

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

5.11 Data Processing and Interpretation

5.11.1 Data Processing

Instrument specific software (e.g. DAT61MK2, MagMap2000) will be used for initial data processing and the output imported into Geosoft Oasis Montaj™ (or comparable software if available) for additional processing, graphical display, anomaly selections and QA/QC.

Types of processing will be system specific and will be defined through SOPs contained in SSWPs. The general processing steps that may be performed on the data include the following:

- Diurnal correction (magnetic data)
- Positional offset correction
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency Correction

- Heading error removal (magnetic data)
- Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)
- Contour level selection with background shading
- Analytic Signal calculation (magnetic data)
- Digital filtering and Enhancement (low pass, high pass, band pass, Convolution, Correlation, Non-linear, etc.)

5.11.2 Interpretation/Anomaly Selection

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

- The maximum amplitude of the response with respect to local background conditions
- The lateral extent (plan size) of the area of response
- The 3-dimensional shape of the response
- The location of the response with respect to the edge of the grid, unsurveyable areas, land features, cultural features, or utilities within or adjacent to the grid
- The shape and amplitude of the response with respect to the response of known targets buried in the GPO test plot
- The shape and amplitude of the response with respect to relevant anomalies encountered in previous MEC removal grids
- The apparent depth of the anomaly
- Potential distortions in the response due to interference from nearby cultural features
- Proven discrimination algorithms (if available)

5.11.3 Dig Sheets

The target analysis process culminates in the creation of “dig sheets,” which contain target information location, amplitude, and other distinguishing characteristics (e.g., depth and weight estimates) when possible. At a minimum, the following information will be provided on the dig sheets:

1. Project site
2. DGM Contractor
3. Responsible geophysicist
4. Grid identification
5. Unique anomaly identification numbers
6. Predicted location in UTM Grid Plane Coordinates in Easting (meters) and Northing (meters)
7. Instrument peak value (where applicable) at each anomaly location.

5.11.4 Grid Maps

The DGM Contractor will also provide, with each dig sheet, a grid map, which contains the following:

1. Client
2. Project
3. Contractor
4. Map creator
5. Map approver
6. Date map was created
7. Map file name (full path and file extension)
8. Scale
9. Grid identification
10. Grid corner locations
11. Contoured data
12. Anomaly locations with unique identification numbers
13. North arrow, legend, title block, etc.

5.12 Anomaly Reacquisition

The DGM Contractor who performed the initial DGM survey will reacquire target anomalies. Wherever possible, coordinate locations of each targeted anomaly will be uploaded into a Real-Time Kinematic (RTK) Differential Global Positioning System, which will be used to navigate or re-occupy the point where a temporary mark will be placed. Reacquisition of target locations where no GPS coverage exists will be conducted using laser positioning, robotic total station, conventional total station survey equipment or (as a last resort) tape measures pulled from corner stakes to locate the interpreted local x,y coordinate position listed for each target on the dig sheet. Each reacquired target location will be marked with a pin flag labeled with the anomaly's identifying number as specified on the dig sheet.

Using the same type of geophysical equipment as was used for the DGM survey, the reacquisition crew will then refine the location of the anomaly. This will be accomplished by observing the DGM instrument response in a continuous mode while slowly maneuvering the instrument over the anomaly. The pin flag will be moved (if necessary) to the refined location and any offset (direction and distance) will be documented.

The reacquired anomaly locations and anomaly amplitudes (where possible) will be recorded to compare to the initially selected locations as QC and for feedback to the processing geophysicists.

5.13 Data Quality Objectives

Data quality objectives particular to DGM surveys at VNTR are discussed below. Some sites may require modification of the DQOs based on site conditions or target MEC. Any modification to the DQOs will be discussed in the SSWPs.

Failure to meet any of the project DQOs requires a written response by the DGM Contractor explaining the reason for the failure and a Corrective Action Plan (CAP), if appropriate, shall be submitted to the Title 2 Services Contractor within 5 working days of identification of the situation. After review of the CAP, the Title 2 Services Contractor will determine whether the CAP should be implemented or may require re-work of the area performed on the day or particular area affected by the failure to meet the project DQO.

5.13.1 MEC Detection

The DQO for MEC detection is to detect all MEC to their maximum detectable depths. Although it is understood that actual detection depths may vary based on site-specific and munition-specific circumstances, such as:

(1) item orientation, (2) site background/noise levels, (3) masking effects from adjacent metallic items, (4) item shape, (5) magnetic conductivity of item materials, and (6) weathering effects on the magnetic conductivity of item materials, an equation has been developed based on empirical data that describes typical detection depths for most MEC items:

$$\text{Estimated Detection Depth (in meters)} = 11 * \text{diameter (in millimeters)} / 1,000$$

(Depth is to center of mass of the item.)
(COE DID OE-005-05.01)

This relationship reflects the fact that MEC detection capability is reduced with greater item depth and/or decreased item size. Figure 5-2 is a graphical representation of this equation in the form of a target objective performance box.

The GPO process should be used to validate this equation as an appropriate DQO for specific sites at VNTR sites.

5.13.2 Lane Spacing (Sensor Separation)

The DQO for lane spacing (sensor separation) is to achieve at least 98% coverage of contiguously surveyed areas. No greater than 2% of site may have data gaps, or “white space,” as reflected on the final contoured representation of the data. In order to calculate this, the effective “footprint” width of the sensor must be established (most likely through the GPO process) for the smallest MEC item of interest at the site. For example, an instrument being used to survey a site where a 20mm projectile is the smallest MEC item of interest may have an effective footprint of 2-ft, meaning that any location on the ground surface that is greater than 1 ft from the center of the instrument would be considered a data gap. Data gaps greater than 4 ft² are not considered to meet this DQO, i.e. the 2 percent allowable data gaps must be spread across the survey area so that no particular area has been significantly “under-surveyed.”

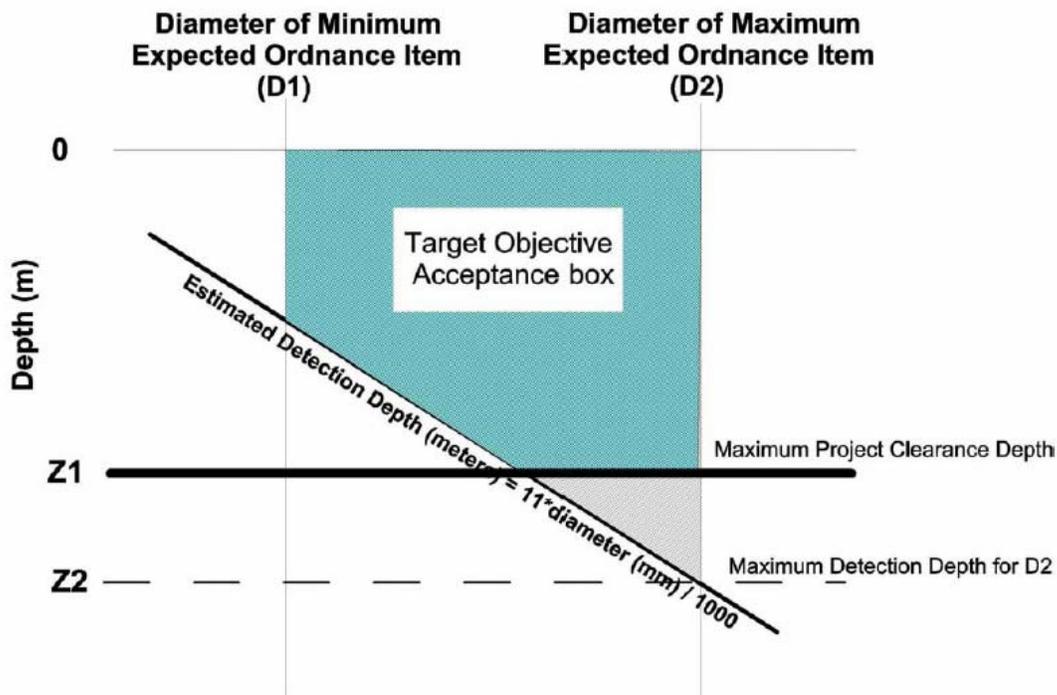


FIGURE 5-2
Target Objective Performance Box. (From USACE DID OE-005-05.01)

5.13.3 False Positives

The DQO for “false positives” (anomalies reacquired that result in no detectable metallic material recovered during excavations) is to have no greater than 15%. Achieving this DQO is highly dependent on the size and anticipated depth of the smallest MEC item of interest at the site. A revised DQO may be necessary for sites where small and/or deep MEC items are required to be found.

5.13.4 Positioning Accuracy

The DQO for horizontal positioning accuracy is 95% of all DGM Contractor selected anomaly locations (as shown on the dig sheets) must lie within a one (1) meter radius of a point on the ground surface directly above the source of the anomaly.

5.13.5 Reacquisition

The DQO for reacquisition is 95% of all reacquired anomaly locations (after “pinpointing” with DGM instrument) must lie within a 35 cm (1.15 ft) radius of a point on the ground surface directly above the source of the anomaly.

5.13.6 Data Handling

The DQO for data handling is that all data must be delivered in a timely manner and in a useable format. Data and digital field records (scanned or otherwise digitally captured) must be delivered in “raw” format to the Title 2 Services Contractor within 3 working days

of completion of the data collection of the area covered in that file. The data should not be delivered, however, until all data gaps have been filled in an area sufficient to meet the lane spacing DQO. Final dig sheets, processing summary sheets and data must be delivered within 5 working days of completion of the data collection of the area covered in that file.

5.14 Quality Control and Quality Assurance

QC and QA will be defined on a site-specific basis and be outlined in each SSWP. In general, QA/QC will be dictated by the sensors, navigation methods, and survey modes utilized to achieve the site-specific objectives.

5.14.1 Quality Control

The following general QC steps will be incorporated into all site investigations:

- Geophysical instruments will be field tested frequently by the DGM Contractor to ensure that they are operating properly. A description of each test, its acceptance criteria and frequency is provided below and summarized in Table 5-1.
 - Equipment Warm-up: This is an instrument specific activity (although a standard warm-up time is 5 minutes). Some geophysical systems require more warm-up time than others do. For example, the Geometrics G-858 system has an on-screen display that indicates when the sensors have warmed up sufficiently and are ready to be used for survey activities. A system specific SOP will be included into SSWPs to define the equipment warm-up time. Equipment warm-up is performed each time the instrument is first turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to “cool-down.”
1. Record Sensor Positions: Positioning accuracy of the final processed data is demonstrated by operating the equipment over one or more known points, usually in a “cross” or “star” pattern, and plotting the track on a map. It is important that the positioning system be tested in exactly the same manner in which it is to be used during the actual surveys. The accuracy of the data positioning is assessed by calculating the difference between the location where the track-plots cross each other on the map and the actual location of the known point(s). Presumably, the actual track-plots will cross exactly over the known point when the data was collected, and the difference, if any, observed on the final track-plot map is a direct measure of the positioning system’s accuracy. In some cases where absolute positioning errors need to be quantified, the DGM Contractor should “force” the sensors to cross over the known point(s) using guides or rails (wood 2 X 4’s or PVC pipe split in half) placed on the ground, which force the sensor to travel over an exact path while collecting data. The sensor position test is conducted at the beginning of the survey operations for each work day.
 2. Personnel Test: This test checks the response of instruments to the personnel and their clothing/proximity to the system. On a daily basis, instrument coils are checked for their response to the personnel operating the system, with response 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 is conducted at the beginning of the survey operations for each work day.

3. Vibration Test (Cable Shake): This test checks the response of instruments to vibration. On a daily basis, instrument coils are checked for their response to vibrations in the cables, with response 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 is conducted at the beginning of the survey operations for each work day.
 4. Static Background and Static Spike: Static tests are performed by positioning the survey equipment within or close to the survey boundaries in an area free of metallic contacts and collecting data for a specific period, while holding the instrument in a fixed position without a “spike” (known standard) and then with a “spike.” The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test are conducted at the beginning and end of each survey operation. This is the test that essentially “opens” and “closes” out a survey area (grid, grid block, set of transects, etc.). The more frequently this is performed, the less area would need to be resurveyed in the event there is a test failure.
 5. Azimuthal Test: This test is performed to ensure that a system’s sensors are oriented in such a way that they minimize data drop-outs and maximize instrument response. This test is typically only performed for magnetometer systems and should be done the first time the system is used at the site.
 6. Height Optimization: This test is performed to ensure that the sensors are at a height that optimizes the signal-to-noise ratio while still reliably detecting the smallest MEC item of interest at the site. This test should be done the first time the system is used at the site.
 7. Six Line Test: The “Six Line Test” is a standard response test consisting of a predetermined route (survey line) established on or near the site in an area free of metallic contacts. The beginning, midpoint, and end of the line are marked, and data is collected along the line. The line is traversed a total of six times as follows: 1) *normal* data collection speed *without* a “spike” at the centerpoint; 2) *normal* data collection speed *without* a “spike” at the centerpoint; 3) *normal* data collection speed *with* a “spike” at the centerpoint; 4) *normal* data collection speed *with* a “spike” at the centerpoint; 5) *fast* data collection speed *with* a “spike” at the centerpoint; 6) *slow* data collection speed *with* a “spike” at the centerpoint. This test is conducted the first time a system is used at the site.
 8. Octant Test (Heading Error Test): This test is done to document “heading” error associated with magnetometer systems so the error can be corrected during data processing. The test is conducted the first time a system is used at the site.
 9. Repeat Data: Repeat data is used to demonstrate consistency in instrument function and operation and the consistency of the survey team. At least 5% of the area surveyed should be resurveyed for comparison to the original data. The actual resurvey percentage and whether it will be performed prior to or post-excavation activities will be specified in SSWPs.
- Records management and review

- Comparative review of intrusive results. Excavation results reviewed by the DGM Contractor ensuring excavated anomalies correspond to the selected targets. The size, depth, and orientation of each target compared with digital data identifying possible mis-matches. All suspect intrusive results will be reinvestigated.
- Comprehensive digital documentation of site activities with in-place feedback procedures to capture lessons learned. Daily “lessons-learned” component of morning safety tailgate briefings.

TABLE 5-1
Geophysical Instrument Standardization Tests and Acceptance Criteria
Former VNTR, Vieques, Puerto Rico

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	1st Time Instr. Used	10% of Total Area Surveyed
1	Equipment Warm-up	Equipment specific (typically 5 min)	X				
2	Record Sensor Positions	+/- 1 in. (2.54 cm)		x			
3	Personnel Test	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response.		x			
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		x			
5	Static Background & Static Spike	+/- 20% of standard item response, after background correction			x		
6	Azimuthal Test *	Sensor orientation that minimizes drop-outs				x	
7	Height Optimization	Maximum S/N ratio that reliably detects smallest target objective				x	
8	Six Line Test	Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm				x	
9	Octant Test (Heading Error Test) *	Document heading error for post-processing correction				x	
10	Repeat Data	Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm					X

* Magnetometer Only
S/N = Signal to Noise

5.14.2 Quality Assurance

The following general QA steps will be incorporated into all site investigations:

- Independent review of raw and processed data, field notes, data processing parameters, maps and dig sheets via the Title 2 Services Contractor QA Geophysicist.
- Audits of field and data processing procedures as outlined in SOPs provided in the SSWPs.
- QA audits, to ensure that the overall quality procedures and objectives of the project are met.
- QA surveys (if performed) will have specific pass/fail criteria established in the SSWPs. Because detection capabilities of different technologies vary depending on the size, depth, and ferrous content of the target items and other site-specific parameters, DGM QA surveys should be performed with the same type of instrument used to perform the initial DGM surveys. The selection of a specific system for site surveys (from the GPO process) can be made for a variety of reasons and will not always be because it is the best at detecting all possible MEC items buried at the site. Thus, only DQOs established for that particular system can be evaluated during the QA process.

If other systems/instruments are used to QA DGM surveyed areas, only the appropriate DQOs will be considered. For example, if a grid is surveyed using an EM61-MK2 time domain metal detector and QA of the grid is performed using a Schonstedt metal detector, the grid can only be failed if an item is found at a depth, orientation and azimuth that was determined to be detectable during the GPO for the EM61-MK2. Alternatively, if the specific depth, orientation and azimuth of the item were not evaluated during the GPO, the 11 times diameter equation (see Attachment 5-1) should be used to determine pass or failure.

5.15 Records Management

All files will be available for QA/QC during the investigation to assure the field and data processing procedures are properly implemented. All raw data files, final processed data files, hard copies, and field notes will be maintained by the DGM Contractor for the duration of the project and then turned over to the Title 2 Services Contractor.

5.16 Feedback Process

The feedback of ground-truth excavation data is one of the most important ways to ensure efficient and effective MEC geophysical mapping. Excavation data collected during each intrusive activity will be captured to document the item location (distance and direction from the reacquired flag location), weight, shape, orientation, and depth. This data will be electronically entered into a ground-truth database and incorporated within the project GIS.

The feedback process will also populate the database developed for each target signature developed during the data processing and analysis steps. The DGM Contractor's Project Geophysicist will review the target signatures in conjunction with the integrated ground-

truth data to evaluate local geologic/geophysical effects on the target signatures. This information will be described in weekly reports to the Title 2 Services Contractor and be communicated to the staff processing and reviewing geophysical data.

Excavation results for each MEC removal grid will be posted on the project-provided internet web site within 3 working days of grid completion. The DGM Contractor's Project Geophysicist, or a designate, will review the excavation results with respect to the anomaly selection criteria, QC dig results, and actual MEC encountered and provide a weekly progress report with recommendations to the Title 2 Services Contractor.

5.17 Corrective Measures

Specific corrective measures are dependent of the type of geophysical system used during an operation and will be developed on a site-specific basis. However, the following are the basic corrective measures to be employed for DGM operations:

- Replacement of system components if they fail to meet daily testing requirements
- Re-survey of grids (or specific survey areas affected by the DQO failure) when DQOs are not met and the project team determines that the DQO is still appropriate
- Re-excavation at anomaly locations if it is determined by either the DGM Contractor Project Geophysicist or the Title 2 Services QA Geophysicist that the excavated items are not sufficient to have caused the initial anomaly

5.18 Interim Reporting

Access to interim data will be provided via a project internet web site or other project appropriate method. All digital data will be provided in formats compatible with the NAVFAC Atlantic's computer systems. Interim data will include:

- CADD base and topographic maps for all MEC removal grids, with grid control points.
- Draft and final geophysical data, as specified in Section 5.7, for all MEC removal grids.
- Grid data and QC reports for all MEC removal grids.
- Draft and final dig sheets for all MEC removal grids.
- Dig sheets and relocation coordinates for all MEC removal grids.
- Anomaly excavation reports for all MEC removal grids.
- QA dig sheets and excavation reports for all MEC removal grids.

5.19 Data Delivery

The following are the DGM data delivery requirements:

- All sensor data shall be correlated with navigational data based upon a local "third order" (1:5,000) monument or survey marker. If a suitable point is not available, the Title 2 Services Contractor shall have a Professional Land Surveyor establish a point.
- All sensor data shall be preprocessed for sensor offsets, diurnal magnetic variations, latency corrections, drift corrections, etc. and correlated with navigation data.

- Diurnal magnetic variations measured at a base-station must be collected at a minimum of once per minute.
- The geophysical mapping technology shall digitally capture the instrument readings into a file coincident with the grid coordinates.
- All raw and final processed data shall be delivered corrected and processed in ASCII files.
- Corrections such as for navigation, instrument bias, and diurnal magnetic shift shall be applied.
- All corrections shall be documented.
- Geophysical data files may be provided in grids of up to 400 ft. x 400 ft. square.
- Data shall be presented in delineated fields as $x, y, z, v1, v2$, etc., where x and y are UTM Grid Plane Coordinates in Easting (meters) and Northing (meters) directions, z (elevation is an optional field in meters), and $v1, v2, v3$, etc., are the instrument readings.
- The last data field should be a time stamp.
- Each data field shall be separated by a comma or tab.
- No individual file may be more than 100 megabytes in size and no more than 600,000 lines long.
- Each grid (or set) of data shall be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel.
- Within 3 working days after collection, the DGM Contractor shall furnish a file documenting the field activities associated with the data, the pre-processing performed, and each day's data to the Title 2 Services Contractor. Delivery should be via internet using FTP, E-mail attachment for small files under 5 Mb, digital compact disk (CD) or other approved method. Such data is considered to be in draft form. This data shall be corrected for sensor offsets, diurnal variations, latency, heading error, and drift.
- Within 5 working days after collection, the DGM Contractor shall furnish final data packages for each area (e.g. grid, grid block, set of transects, etc.) surveyed. Final data packages must include the following:
 - dig sheets in pdf and Microsoft Excel formats,
 - pdf file(s) of color contoured geophysical results with anomaly selections shown and labeled at a readable scale for dig team use,
 - final processed data files,
 - all quality control data files associated with the survey files, along with Adobe Acrobat Portable Document Format (PDF) showing graphical presentation of the QC data,
 - file documenting the field activities associated with the data, and the processing performed (see Table 5-2),

- digital planimetric map, in Geosoft, ArcView (or other approved) format, and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map.

TABLE 5-2
Processing Documentation Requirements

Information Type	Raw/Pre-processed Data Delivery	Final Data Delivery	Must be in File Headers
Site ID	X	X	X
Geophysical instrument type used	X	X	X
Positioning method used	X	X	X
Instrument serial numbers (geophysical and positioning)	X	X	
Coordinate system and unit of measure	X	X	X
Grid ID (or other identifier of surveyed area)	X	X	X
Date of data collection	X	X	X
Raw data file names associated with delivery	X	X	X
Processed data file names associated with delivery		X	X
Name of Project Geophysicist	X	X	
Name of Site Geophysicist	X	X	
Name of data processor	X	X	X
Data processing software used	X	X	
Despiking method and details		X	
Sensor drift removal and details	X	X	
Latency correction and details	X	X	
Heading correction and details	X	X	
Sensor bias, background leveling and/or standardization adjustment method and details		X	
Diurnal correction (magnetic data)	X	X	
Geophysical noise identification and removal (spatial, temporal, motional, terrain induced) and details		X	
Other filtering/processing performed and details		X	
Gridding method		X	
Anomaly selection and decision criteria details		X	
Other processing comments		X	
Date data processing is completed		X	
Data delivery date	X	X	
Scanned copy of field notes and field PDA notes (if applicable)	X	X	

SECTION 6

Site Safety and Health Plan

The Site Safety and Health Plan will be implemented for all MEC activities and operations is provided as Appendix B. All Navy contractor and Navy CLEAN subcontractor health and safety plans will meet or exceed the guidelines and procedures given in Appendix B and will be maintained in project files and on site during the performance of all MEC investigation and removal action activities.

Location Surveys and Mapping Plan

Survey and mapping tasks are key components of the MEC investigations for identifying the location of each MEC component in the field, reporting the locations of these components on maps and in spatial queries conducted in the GIS, and assisting with disposition of MEC components. This Location Surveys and Mapping Plan describes the methods, equipment, and accuracy requirements for location surveys and mapping for the removal actions, MEC surveys, and anomaly reacquisition described in this work plan.

7.1 Surveying

Surveying and anomaly reacquisition at the Former VNTR will be conducted by the geophysical subcontractor using GPS, ultrasonic ranging and data system, or other suitable navigation systems. Protocols for recording, documenting, and integrating MEC location and attributes with the MEC data management system are described in Sections 2, 5, and 12 of this work plan.

7.2 Mapping

All control points and their corresponding location, identification, coordinates, and elevations will be stored digitally and will be reproducible for accurate plotting on maps. Each map should include, but is not limited to, a north arrow, scale bar, legend, and standard border. The map size will be determined on a case-by-case basis, dependent on the scale and amount of data to be shown.

GPS technology will be used to locate MEC components. This technology is available on the project and protocols are in place for recording, documenting, and integrating the location and MEC attributes with the MEC data management system.

7.2.1 Digital Data

The survey information collected will be sufficient to accurately relocate the position of the target component in the field and accurately plot the position of each component in the GIS system, or for use in statistical applications and tabular reports.

Digital data will comply and be compatible with U.S. Navy requirements.

7.2.2 Digital Format

All data will conform to the Tri-Spatial Data Standards (TSDS) or CADD/GIS Technology Center Spatial Data Standards (SDS) and as outlined in the specific task order. Any and all deviations from these standards will be done only at the request of the U.S. Navy.

All location survey data and digital maps are transportable and can be copied to portable media for archiving or transfer to other team members. Available formats include CD (the

preferred method) or DVD. The media used is dictated in part by the size of the files. All survey coordinates will be stored as part of the site-wide relational database.

7.3 Deliverables

The following deliverable items and data will be obtained from the surveyor as part of this task order:

- Field Survey – Original copies of field books, layout sheets, computation sheets, and computer printouts. These items will be suitably bound, marked, and packaged for delivery.
- Location Survey Points – Tabulated list of all surveyed control points showing the adjusted coordinates and elevations that were established for the specific MEC project.
- MEC Inventory – Tabular list of all MEC components with associated location and descriptions.
- All survey coordinates and MEC-related digital information will be stored as part of the site-wide relational database. These digital data will be backed up on the same schedule as the site-wide database.
- All unique items created or used to generate the deliverables, as requested in each task order.
- Drawings and Data – All maps and associated data will be provided.

SECTION 8

Sampling and Analysis Plan

Sampling and analysis procedures for projects at the Former VNTR are documented in the *Final Master Work Plan Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico* (CH2M HILL, June 12, 2003). Environmental sampling at MRSs will be conducted in accordance with the June 2003 Master Work Plan, or the most current approved Environmental Response Program sampling plan as it is updated. The master field sampling plan is included as Appendix G.

Quality Control Plan

This Quality Control Plan (QCP) details the approach, methods, and operational procedures to be employed to perform quality control during MEC investigation and removal actions at the Former VNTR. This plan was developed in accordance with NOSSAINST 8020.15, NAVSEA OP 5 VOL I (Revision 7), DoD MIL-STD-1916, ANSI/ASQC Q10011-1994, ANSI 14010-1996, and OE MCX DID OE-005-11.01, and where applicable, USACE ER 1180-1-6: Construction Quality Management (1995); USACE ER 1110-1-12: Engineering and Design Quality Management (1993); and USACE ER 415-1-10: Contractor Submittal Procedures (1997). Additionally, local and state laws and regulations, ATF P 5400.7, DoD 6055.9-STD, DOT regulations, and OPNAVINST 5530.13: Dept. of Navy Physical Security Instructions for Sensitive Conventional Arms, Ammunition and Explosives.

9.1 Introduction

This QCP describes the QC organization and program for MEC-related projects at the Former VNTR. This QCP, and the requirements and systems established herein, are relevant and applicable to project work performed by the Navy contractors and Navy CLEAN subcontractors and suppliers.

The objectives of this QCP are to anticipate the specific operating requirements of the project, and to establish procedures to ensure that achieved quality meets technical design specifications and conforms to the requirements of the Task Order. Specifically, this plan:

- Identifies the project QC organization and defines each individual's respective authority, responsibilities, and qualifications.
- Defines project communication, documentation, and record keeping procedures.
- Establishes QC procedures, including the necessary supervision and tests, to ensure that work meets applicable specifications and drawings.

Revisions will be distributed according to Section 9.2 of this QCP. Quality Control forms are included at the end of this QCP.

9.1.1 Project Background

A detailed discussion of the project background is presented in Section 1. Additional detail for specific tasks will be included in SSWPs.

9.1.2 Project Scope of Work

The project scope of work and detailed approach for completion will be included in the individual SSWPs.

9.2 QC Personnel Organization and Responsibilities

Quality Control personnel, organization, qualifications, and responsibilities are addressed in more detail in this section.

9.2.1 QC Personnel Qualifications and Training

Project personnel will be qualified to perform their assigned jobs in accordance with terms outlined by the scope of work. Resumes for proposed key personnel will be included in Navy Contractor/Navy CLEAN Subcontractor SSWPs. All site personnel must have the training as outlined in Appendix B, which includes the OSHA 40-hour hazardous waste operators training and annual 8 hour refresher (29 CFR 1910.120).

9.2.2 Documentation of Qualification and Training

The review and verification of personnel qualifications are to be documented on Form 9-1, provided at the end of this section. The Navy Contractor/Navy CLEAN Subcontractor UXOQCS will maintain records documenting the required qualifications and training for each site worker. The UXOQCS will monitor expiration dates to provide advance warning to the Navy Contractor/Navy CLEAN Subcontractor Project Manager of when employees will require refresher training or other requirements. The UXOQCS will maintain records of site specific and routine training for personnel and visitors, as required. These records will be maintained onsite for audit purposes.

9.2.3 Navy Contractor/Navy CLEAN Subcontractor Project Manager

The primary responsibility of the PM is the overall direction of the project and accountability for work activities undertaken. As such, the PM will provide the managerial administrative skills to ensure that resource allocation, planning, execution, and reporting meet Contract requirements. The quality-related responsibilities of the PM may include, but are not limited to, the following:

- Organizing project staff and assigning responsibilities.
- Understanding the Contract and scope of work for the specific project.
- Ensuring that submittals are completed and submitted as required in the TO.
- Communicating to the project staff regarding client requirements and QC practices.
- Identifying, providing documentation, and notifying the client and project team of changes in the scope of work, project documentation, and activities.
- Supervising the preparation of project-specific procedures, work plans, and QC project plans.
- Approving project execution methodologies.
- Disseminating project-related information from the client.
- Deciding whether project documents require independent review.
- Investigating nonconformance and implementation of corrective actions.

- Evaluating the effect of nonconformance on the project and the appropriateness of reporting such items to the client.
- Providing appropriate documentation of nonconformance when reporting to the client.
- Serving as final reviewer prior to release of project information.
- Approving and signing outgoing correspondence.
- The PM may assign a portion of these responsibilities to the Site Manager and SUXOS, who will remain on site throughout the project field activities.

9.2.4 Navy Contractor/Navy CLEAN Subcontractor Site Manager

The Site Manager is responsible for efficiently applying the resources of the project team to execute the field phases of the project. The Site Manager will assist the PM in maintaining sufficient resource allocations to meet the project schedule and budget and will provide daily feedback to the PM on project progress, issues requiring resolution, and other project-specific issues, as required. The quality-related responsibilities of the Site Manager include, but are not limited to, the following:

- Notifying the PM if problems arise with the schedule.
- Providing scheduling and integration of subcontractor services in support of the SUXOS.
- Providing logistical support for field operations.
- Continuously monitoring work progress and adherence to authorized work scopes, budgets, and schedules.
- Aiding in the preparation of submittals.
- Attending weekly onsite status meetings.
- Reviewing the project work plans regularly.

9.2.5 Navy Contractor/Navy CLEAN Subcontractor UXO Quality Control Specialist

The designated UXOQCS will be specified in the contractor's SSHPs. The UXOQCS has authority to enforce the procedures defined in this QCP. In alignment with this authority, the UXOQCS has the authority to stop work in order to ensure that project activities comply with specifications of this QCP, the contract, and the Task Order. This authority applies equally to all project activities, whether performed by the contractor or its subcontractors and suppliers.

Specifically, the UXOQCS is responsible for:

- Developing, assessing the effectiveness of, and maintaining this QCP and related procedures.
- Reviewing and approving the qualifications of onsite technical staff and subcontractors.
- Planning and ensuring the performance of preparatory, initial, follow-up, and completion inspections for each definable feature of work.

- Identifying quality problems and verifying that appropriate corrective actions are implemented.
- Ensuring that the requisite QC records including submittals are generated and retained as prescribed in this QCP.
- Notifying the Title 2 Services Contractor 48 hours prior to beginning any required action of the preparatory and initial phases. At a minimum, the UXOQCS will use weekly QC Reports for the purposes of this notification.

The UXOQCS is to be physically onsite whenever project-related fieldwork is in progress. If the UXOQCS is to be absent from the site, with client approval, an alternative UXOQCS will be designated and will be given equivalent responsibilities and authority.

9.2.6 Navy Contractor/Navy CLEAN Subcontractor Program QC Manager

The Program QC Manager is responsible for developing, maintaining, and ensuring implementation of the quality program. This responsibility includes overseeing activities under the guidance of this QC plan, performing periodic reviews of the processes being implemented, evaluating any recommendations made by the project team over the course of the program regarding use of these processes, and implementing continuous improvement evaluations of the quality program. Specific responsibilities of the Program QC Manager include:

- Developing program-level QC program consistent with guidance and requirements for MR projects.
- Approving project-level QC plans.
- Performing reviews to ensure that sound professional engineering and other technical and regulatory capabilities are applied during planning and execution of MEC operations.
- Conducting project audits.
- Ensuring that corrective actions are implemented promptly and fully.
- Developing lessons-learned for team distribution.
- Conducting quality training for UXOQCS.

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

Quality control on the VNTR project will be monitored through all of 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.

9.3.1 Definable Features of Work

The DFOW for task orders are divided into activities related to planning, field operations and final project reports and close-out. **The following are some examples of DFOWs. A**

comprehensive list of DFOWs along with Work Audit Procedures can be found in Table 9-1.

Planning

- Pre-Mobilization Activities: System set-up for GIS, document management and control, data management and subcontracting
- Technical Project Planning: Technical and operational approach
- Contractor/Subcontractor SSWPs and SOPs: Preparation and obtaining approval.

Field Operations

- Site Preparation: Mobilization, survey, vegetation removal, surface clearance
- MEC investigation and removal
- MPPEH/MD management (inspection/ demilitarization/ certification/ verification/ disposition)
- Disposal/Demilitarization of MEC
- Site Restoration and Demobilization

Final Project Reports and Close-Out

- Site-Specific Final Report: Preparation and obtaining approval
- Proposed Plan and Decision Documents: Preparation and obtaining approval
- Obtain MEC Response Complete Acceptance
- Data Archiving and Project Closeout

9.3.2 Mobilization

This definable feature of work includes all required activities associated with mobilizing at the start of the project.

9.3.3 Location Surveying and Mapping

This definable feature of work includes all activities relating to grid layout activities.

9.3.4 Vegetation Removal

This definable feature of work includes all activities relating to the removal of vegetation. This feature may need to be subdivided as needed, especially if a more involved phased approach is used such as prescribed burning followed by manual/mechanical clearance.

9.3.5 MEC Surface Removal

This definable feature of work includes all activities relating to UXO sweeps to ensure that no surface MEC is present.

9.3.6 MEC Disposal

This definable feature of work includes all required activities associated with disposing of MEC or explosively venting items.

9.3.7 Scrap Disposal

This definable feature of work includes all required activities associated with managing and disposing of scrap metal recovered during MEC operations.

9.3.8 Site Restoration

This definable feature of work includes all required activities associated with restoring the site to acceptable condition.

9.3.9 Demobilization

This definable feature of work includes all required activities associated with demobilizing at the completion of the project.

9.3.10 Three Phases of Control

The UXOQCS is to ensure that the three-phase control process, including the Preparatory Phase, Initial Phase and Follow-Up Phase, is implemented for each DFOW listed in this QCP. Each control phase is important for obtaining a quality product and meeting the TO objectives, however the preparatory and initial audits are particularly valuable in preventing problems. Production work is not to be performed on a DFOW until a successful preparatory and initial phase has been completed.

Preparatory Phase

The preparatory phase (PP) culminates with the planning and design process leading up to actual field activities. Successful completion of the PP verifies that the TO delivery, QC, and safety plans have been completed and are ready to be implemented. 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 assure 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.
5. Confirm qualifications of personnel (Form 9-1) and that roles/responsibilities are well-defined and communicated.

6. Confirm with the UXOSO that the site health and safety plan and activity hazard analyses adequately address 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 plans and 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 UXOQCS and the team during the PP. The UXOQCS or designee must then 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 9-2) specific for the DFWO and summarized in the Weekly QC Report.

Initial Phase

The initial phase (IP) occurs at the startup of field activities that are associated with a specific DFWO. The initial phase confirms that the Project QCP, other applicable work plan sections, and procedures are being effectively implemented and the desired results are being achieved.

During the IP, the initial segment of the DFWO is observed and inspected to ensure that the work complies with contract and work plan requirements. The initial phase should be repeated when acceptable levels of specified quality are not being met.

The following shall be performed for each DFWO:

1. Establish the quality of work required to properly deliver the TO in accordance with contract requirements. The UXOQCS ensures that supervision has made the work crews aware of expectations associated with the field methods established under the preparatory phase.
2. Resolve conflicts. Should conflicts arise in establishing the baseline quality for the DFWO, the responsibility to resolve the conflict falls to the Project Manager. Should the conflict not be resolved in a manner that satisfies the project requirements, the UXOQCS must elevate the conflict to the program level (Program QC Manager) and issue a non-conformance report. The UXOQCS may direct a cessation of work activity, with the concurrence of the Program QC Manager, should the issue jeopardize the results of the DFWO, or put the TO at risk of non-compliant performance.
3. Verify with the UXOSO that the site health and safety plan and activity hazard analyses were developed to ensure that the identified hazards adequately addressed field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of the initial phase activities, results are to be documented in the Initial Phase Inspection Checklist (Form 9-3), 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 then leads directly into the follow-up phase (FP), which addresses the routine day-to-day activities on the field site. Inspection/audit activities associated with each DFOW are addressed in Section 9.4. Specific concerns associated with the follow-up include:

1. Inspection of the work activity to ensure work is in compliance with the contract and work plans.
2. Evaluation and confirmation that the quality of work is being maintained at a level no less than that established during the initial phase.
3. Evaluation and confirmation that required testing is being performed in accordance with procedures established during the preparatory phase and confirmed during the initial phase.
4. Confirmation that non-conforming work is being corrected promptly and in accordance with the direction provided by the UXOQCS.

To conduct and document these inspections, the UXOQCS is to generate the Follow-up Phase Inspection Checklist (Form 9-4). The follow-up phase inspections will be performed daily, or as otherwise identified in this QCP until the completion of each DFOW.

The UXOQCS is responsible for onsite monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, TO, and approved project plans and procedures. He is also responsible for verifying that a daily Health and Safety Inspection is performed and documented as prescribed in the project SSHP. Discrepancies between site practices and approved plans/procedures are to be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the UXOQCS or a designee prior to granting approval to continue work. Follow-up 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 definable feature of work may be required at the discretion of the Program QC Officer or the UXOQCS. Additional preparatory and initial audits are generally warranted under any of the following conditions: unsatisfactory work, changes in key personnel, resumption of work after a substantial period of inactivity (e.g., 2 weeks or more), or changes to the project scope of work/specifications.

Final Acceptance Audit

The Final Acceptance Inspection is performed, upon conclusion of the DFOW and prior to closeout, to verify that project requirements relevant to the work are satisfied. Outstanding

and nonconforming items are to be identified and documented on the Final Inspection Checklist (Form 9-5). As each item is resolved, it is to be noted on the checklist.

9.4 Inspection/Audit Procedures

The UXOQCS is responsible for verifying compliance with this QCP through audits and surveillance. The UXOQCS or a designee is to inspect/audit the quality of work being performed for the definable feature of work. The UXOQCS or a designee is to verify that procedures used conform to applicable specifications stated in this Work Plan or other applicable guidance. Identified deficiencies are to be communicated to the responsible individual and documented in the QC log and Weekly QC Report. Corrective actions are to be verified by the UXOQCS 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 9-1.

The Inspection Schedule and Tracking Form (Form 9-6) is to be used by the UXOQCS 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 UXOQCS for planning purposes. Audit records are to be maintained as part of the project QC file.

9.5 QC Testing

QC testing will be performed to ensure that MEC investigation and removal actions are being performed according to the project Definable Quality Objectives and prior to submitting to the NAVFAC Field Representative and/or Title 2 Services Contractor for QA testing.

9.5.1 Testing Procedures

The UXOQCS will inspect each grid/transect to determine whether or not the grid has been cleared in accordance with performance requirements presented in the QC Section of the Contractor's /Subcontractor's SSWP. The UXOQCS will utilize the same type geophysical instrument used by the investigation/removal team(s). The results of the QC inspections, both passing and failing, will be recorded in the MR- SIMS. For any grid/transect that fails a QC inspection, the grid will be completely reworked and re-QC'd before submitting the grid for QA inspection.

9.5.2 Level of QC Inspection

MIL-STD-1916 and MIL-HDBK-1916 will be utilized for grid, lot, or transect QC inspections during Site Inspection/Removal Action activities. Specifically:

- Type of sampling (attributes, variables, or continuous) will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSWPs.
- Initial Verification Level (VL) will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSWPs.

- Lot or production size will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSOWPs.
- The switching method will be used as given in the MIL-HDBK-1916 to determine decreases or increases in QC VL.

9.5.3 QC Pass/Fail Criteria

QC Pass/Fail criteria will be specified in Contractor SOWs and incorporated into SSOWPs.

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning	GIS Setup (<i>Pre-Mobilization Activities</i>)	X		Verify GIS system has been set up and is ready for site data	PP	Once	GIS system has been set up and is ready for site data	Do not proceed with field activities until criterion is passed
Planning	Document management and control (<i>Pre-Mobilization Activities</i>)	X	X	Verify appropriate measures are in place to manage and control project documents	PP	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
Planning	Data Management (<i>Pre-Mobilization Activities</i>)	X		Verify appropriate measures are in place to manage and control project data	PP	Once	Appropriate measures are in place to manage and control project data	Do not proceed with field activities until criterion is passed
Planning	Digital Geophysical Surveys (<i>Pre-Mobilization Activities</i>)	X		Verify that subcontractors digital geophysical survey plan has been reviewed and approved and is in accordance with (IAW) the master work plan geophysical plan.	PP/IP	Once	Survey plan has been approved	Do not proceed with field activities until criterion is passed
Planning	Subcontracting (<i>Pre-Mobilization Activities</i>)		X	Verify Subcontractor qualifications, training, licenses	PP/IP	Once	Subcontractors' qualifications, training, and licenses are up to date and acceptable	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor
Planning	Technical approach (<i>Technical Project Planning</i>)		X	Verify that technical approach has been agreed on by project team	PP/IP	Once	Technical approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Operational approach (<i>Technical Project Planning</i>)		X	Verify that operational approach has been agreed on by project team	PP/IP	Once	Operational approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Work Plan preparation and approval (<i>Technical Project Planning</i>)	X	X	Verify that Work Plan has been prepared and approved	PP/IP	Once	Work Plan has been prepared and approved	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	X	X	Verify all project plans are approved	PP/IP	Once	All project plans are approved	Do not proceed with field activities until criterion is passed

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Site preparation (including mobilization)	X		Verify local agencies are coordinated	PP/IP	Once	Local agencies are coordinated	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	X	X	Verify equipment and services are procured	PP/IP	Once	Equipment and services are procured	Proceed only with activities for which equipment has been procured Procure remaining equipment
Field Operations	Site preparation (including mobilization)	X	X	Verify communications and other logistical support are coordinated	PP/IP	Once	Communications and other logistical support are coordinated	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	X	X	Verify Emergency Services are coordinated	PP/IP	Once	Emergency Services are coordinated	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)		X	Verify operating schedules are finalized	PP/IP	Once	Operating schedules are finalized	Proceed only with those operations with finalized operating schedules
Field Operations	Site preparation (including mobilization)		X	Verify explosive storage and MEC debris/scrap storage areas are established	PP/IP	Once	Explosive storage and MEC debris/scrap storage areas are established	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)		X	Verify site-specific training is performed and acknowledged	PP/IP	Once	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)		X	Verify project plans are reviewed and acknowledged	PP/IP	Once	Project plans are reviewed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site survey	X		Verify Surveyor Qualifications	PP/IP	Once	Surveyor's qualifications are up to date and acceptable	Ensure surveyor provides the qualifications change surveyor

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Site survey	X		Verify Surveyor Licenses	PP/IP	Once	Surveyor's licenses are up to date and acceptable	Ensure surveyor provides the licenses or change surveyor
Field Operations	Site survey	X		Verify benchmarks for survey are established and documented	PP/IP	Once	Benchmarks for survey are established and documented	Ensure benchmarks for survey are established and documented prior to performing survey
Field Operations	Site survey	X	X	Verify site boundaries have been established	PP/IP	Once	Site boundaries have been established	Do not proceed with dependent field activities until criterion is passed
Field Operations	Site survey	X	X	Verify proper marker type, material and placement method	PP/IP	Once	Proper marker type, material and placement method were used	Replace markers as necessary to comply with requirement
Field Operations	Site survey	X	X	Verify Surveyor notes are legible, accurate and complete	IP	Once	Surveyor notes are legible, accurate and complete	Ensure surveyor replaces deficient notes with legible, accurate and complete notes
Field Operations	Site survey	X	X	Verify Stake Alignment and spacing intervals	IP	Once	Stake Alignment and spacing intervals are as specified in Work Plan	Replace stakes not aligned as specified
Field Operations	Vegetation removal		X	Verify personnel qualifications and training	PP/IP	Once	Personnel qualifications and training are appropriate	Ensure subcontractor provides appropriately trained and qualified personnel or replace subcontractor
Field Operations	Vegetation removal	X		Verify environmental controls are correct and functional	IP/FP	Once	Environmental controls are correct and functional	Ensure that appropriate environmental controls are in place prior to proceeding with vegetation removal

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Vegetation removal		X	Verify vegetation removal conducted in accordance with (IAW) WP Technical Management Plan	FP	Daily	Vegetation removal conducted IAW WP Technical Management 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
Field Operations	Surface Clearance		X	Verify equipment testing	IP/FP	Once/Daily	Equipment passes daily function test in equipment check area	Repair or replace instrument
Field Operations	Surface Clearance		X	Verify area/boundary	PP/IP	Once	Area/boundary is correct	Stop activities until area/boundary can be verified
Field Operations	Surface Clearance		X	Verify work methods	IP/FP	Daily	Work methods are being performed IAW the WP and SOPs	Stop activities until WP and SOPs are being followed and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface Clearance		X	Verify Team separation distance	IP/FP	Daily	Team separation distance is appropriate for work being performed	Stop activities until appropriate separation distance is being followed
Field Operations	Surface Clearance		X	Verify clearance conducted IAW WP Technical Management Plan	IP/FP	Daily	Clearance conducted IAW WP Technical Management Plan	Stop activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface Clearance			Check a portion of each grid/lot to insure Acceptance Criteria are met as defined in the SSWP.	FP	Each Occurrence	See Section 9.8	See Section 10.8

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Subsurface MEC Clearance	X		Verify subsurface MEC clearance IAW master work plan and any SSWP	IP	Once	Subsurface MEC clearance IAW master work plan and site specific work plan	Stop activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Geophysical Proveout construction	X		Verify that geophysical proveout construction is IAW the master work plan geophysical plan.	IP	During construction	Construction as written in master workplan geophysical plan	Re-construct to as written in master work plan geophysical plan.
Field Operations	Digital Geophysical Surveys	X		Verify that work is conducted IAW the digital geophysical survey plan	IP	Once	Work conducted IAW the digital geophysical survey plan	Stop activities until full compliance can be assured and re-collect any data not in compliance.
Field Operations	Inspection (MPPEH Management)	X	X	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel
Field Operations	Certification (MPPEH Management)	X	X	Verify Inspection conducted IAW MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Inspection being conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Certification (MPPEH Management)	X	X	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel
Field Operations	Certification (MPPEH Management)	X	X	Verify Certification is conducted IAW WP MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Certification is conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Disposal (MPPEH Management)	X	X	Verify Disposal is conducted IAW WP MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Disposal is conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Processing (MPPEH Management)	X	X	Verify processing is conducted IAW WP MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Processing is conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Demilitarization of UXO		X	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel
Field Operations	Demilitarization of UXO		X	Verify operations conducted IAW contractor SSWP/SOP	IP/FP	Each Occurrence	Operations conducted IAW Subcontractor SOP	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Demobilization		X	Verify that all equipment is inspected, packaged, and shipped to appropriate location.	FP	Once	All equipment is inspected, packaged, and shipped to appropriate location.	Ensure equipment is inspected, packaged, and shipped to appropriate location
Field Operations	Demobilization		X	Verify facilities-support infrastructures are dismantled and shipped to appropriate location.	FP	Once	Facilities-support infrastructures are dismantled and shipped to appropriate location.	Ensure facilities-support infrastructures are dismantled and shipped to appropriate location
Final Project Reports and Close-out	Site Specific Final Report preparation and approval		X	Verify field site is returned to original condition	FP	Once	Field site is returned to original condition	Ensure field site is returned to original condition

TABLE 9-1
Definable Features of Work Auditing Procedures

Activity	Definable Feature of Work with Auditable Function	NAVFAC/Title 2 Contractor	MEC SI/RA Contractors and Subcontractors	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Final Project Reports and Close-out	Site Specific Final Report preparation and approval	X	X	Verify tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete	IP	Once	Tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete	Ensure tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete
Final Project Reports and Close-out	Decision Document preparation and approval	X	X	Verify reviews performed by project, senior technical and program teams	FP	Once	Reviews performed by project, senior technical and program teams	Ensure reviews performed by project, senior technical and program teams
Final Project Reports and Close-out	MEC Response Completion Acceptance	X		Verify Final Report, Proposed Plan and Decision Document has been approved	IP	Once	Final Report, Proposed Plan and Decision Document has been approved	Take appropriate actions to ensure document get approved
Final Project Reports and Close-out	Archiving	X		Verify data back-up systems are in place	IP	Once	Data back-up systems are in place	Ensure data back-up systems are in place
Final Project Reports and Close-out	Project Closeout	X		Verify purchase orders have been closed out	IP	Once	Purchase orders have been closed out	Ensure purchase orders are closed out
Final Project Reports and Close-out	Project Closeout	X		Verify invoices completed and approved	IP	Once	Invoices completed and approved	Ensure invoices are completed and approved

9.5.4 Documentation of Testing

Test results are to be documented by the individual performing the test. Calibration and maintenance records associated with the measuring and testing equipment (M&TE) are to be generated by the individual performing the activity. Documentation for calibration and maintenance of M&TE will be available for audit.

The UXOQCS is responsible for ensuring that the tests are performed and that the results are summarized in and provided with the Weekly QC Report. Any failing test will be noted on the deficiency log (Form 9-11) so it can be tracked until such time as rework and re-testing can be performed and corrective action is verified.

9.6 Calibration and Maintenance

Calibration and maintenance of geophysical instruments, radios, cell phones, vehicles, machinery, air monitoring equipment (if present), etc., will be performed per manufacturer's specifications. Geophysical detection equipment will be tested daily. Records of these activities are to be generated by the individual performing the activity with copies provided to the UXOQCS for retention in the project QC file.

9.7 Government QA Activities

QA inspections will be performed in accordance with MIL-STD 1916 to document and verify the quality of the contractor's MEC investigation and removal activities. The Automated Quality Assessment Program System (AQAPS) will be utilized for the repository for data gathering of collective results.

9.7.1 QA Manager

The NAVFAC Field Representative is designated the QA Manager. Duties of the QA Manager include but are not limited to:

- Tailor AQAPS tool to site-specific/project specific requirement.
- Select associated DQOs
- Select associated Data Quality Elements
- Create Quality Assessment Project Plans
- Compile Work Instructions for targeted assessments.
- Schedule Quality Assessments and ensure adequate resources are available and trained to conduct the assessments.
- Validate Data.
- Monitor the assessment process.
- Manage the Correction Action Process
- Report assessment status to NAVFAC RPM on a regular basis.

- Alert management team to safety hazards and any major nonconformity.

9.7.2 Quality Assessor(s)

The Title 2 Contractor will provide Quality Assessor(s) and report to the QA Manager. Duties of the Quality Assessor include:

- Conduct Quality assessment activities in an ethical and professional manner.
- Conduct Quality assessments in accordance with the work instructions as directed by the QA Manager.
- Ensure assessment tools and instruments are available and operational.
- Report needed corrective actions to the QA Manager.
- Enter results of assessments into AQAPS.

9.7.3 QA Testing Procedures

The QA Manager and/or Quality Assessor will inspect each grid/lot/transect to determine whether or not the grid has been cleared in accordance with performance requirements presented in the QC Section of the Contractor's /Subcontractor's SSWP. The same type geophysical instrument used by the investigation/removal team(s) will be used. The results of the QA inspections, both passing and failing, will be recorded in the MR- SIMS and AQAPS. For any grid/lot/transect that fails a QA inspection, the grid/lot/transect will be completely reworked and re-QC'd before submitting the grid/lot/transect for QA re-inspection.

9.7.4 Level of QA Inspection

MIL-STD-1916 and MIL-HDBK-1916 will be utilized for grid, lot, or transect QA inspections during Site Inspection/Removal Action activities. Specifically:

- Type of sampling (attributes, variables, or continuous) will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSWPs.
- Initial VL will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSWPs.
- Lot or production size will be specified in Navy Contractor/Navy CLEAN Subcontractor SOW and SSWPs.
- The switching method will be used as given in the MIL-HDBK-1916 to determine decreases or increases in QA VL.

9.7.5 QA Pass/Fail Criteria

QC Pass/Fail criteria will be specified in individual SOWs and incorporated into SSWPs.

9.8 Deficiency Management

This section includes provisions for preventing quality problems and facilitating process improvements as well as for identifying, documenting, and tracking deficiencies until corrective action has been verified. Deficiency notices and corrective action requests will be provided to USEPA, PREQB, NOSSA, and USFWS during project status meetings or in project status documentation.

9.8.1 Deficiency Identification and Resolution

While deficiency identification and resolution occurs primarily at the operational level, QC and QA inspections provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Through implementation of the inspection programs, the QC and QA staffs are responsible for verifying that deficiencies are identified, documented, and corrected in a timely manner.

9.8.2 Corrective Action Request

A Corrective Action Request (CAR) (Form 9-7) can be issued by any member of the project staff, including Contractor and subcontractor employees. If the individual issuing the CAR is also responsible for correcting the problem, then he or she should do so and document the results on Part B of the CAR. Otherwise, the CAR should be forwarded to the QA Manager 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 UXOQCS for closure.

In addition to observing actual work operations, CARs are to be reviewed during follow-up QC inspections. The purposes of this review are: to ensure that established protocols are implemented properly; to verify that corrective action commitments are met; to ensure that corrective actions are effective in resolving problems; to identify trends within and among similar work units; and to facilitate system root cause analysis of larger problems.

The QA Manager will determine whether a written CAP (Form 9-8) is necessary. If any of the following conditions are met, a written CAP is required:

- the CAR priority is high. High priority indicates resolution of the deficiency requires expediting the corrective action plan and correction of the deficient conditions noted in the car; and that extraordinary resources may be required due to the deficiencies impact on continuing operations.
- The deficiency requires a rigorous corrective action planning process to identify similar work products or activities affected by the deficiency.
- The deficiency requires extensive resources and planning to correct the deficiency and to prevent recurrence.

The CAP is developed by a Project Manager designee and approved and signed by the Project Manager. The CAP is to indicate whether it is submitted for informational purposes

or for review and approval. In either event, operational staffs are encouraged to discuss the corrective action strategy with the QC and QA staffs throughout the process.

9.8.3 Deficiency and Corrective Action Tracking

Each CAR is to be given a unique identification number and tracked by the appropriate line manager until corrective actions have been taken and documented in Part B of the form, and the CAR is submitted to the QA Manager or a designee for verification and closure.

9.8.4 Documentation

The lessons learned through the deficiency management process are documented on CARs and CAPs. To share the lessons learned with the Title 2 Services Contractor and the Government, these documents are submitted through the Weekly QC Report (Form 9-9), or equivalent.

CARs should be cited in the Weekly QC Report. Minor deficiencies that are identified during a QC inspection but can be readily corrected and verified in the field are to be documented in the QC log and Weekly QC Report without initiating a CAR. Deficiencies identified in a QC inspection but 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. All CARs and CAPs will be maintained on site with the project files and will be subject to audit.

9.9 Reports

The Navy Contractor/Navy CLEAN subcontractors are responsible for the preparation and submittal of a Weekly QC Report to the NAVFAC Field Representative or the Title 2 Services Contractor as appropriate. All calendar days, including weekends and holidays, are to be accounted for throughout this project. As a minimum, one report is to be prepared and submitted for every continuous 7 days of no work.

In addition to the daily reporting requirement into MR-SIMS, the Weekly QC Report is to provide a summary of activities, including those performed by subcontractors and suppliers. The reports will present an accurate account of QC activities. They are to report both conforming and deficient conditions, and should be precise, factual, legible, and objective. Copies of supporting documentation, such as checklists and surveillance reports, will be attached. Copies of Weekly QC reports will be maintained on site with the project files and will be subject to audit.

9.10 Submittal Management

The Navy Contractor/Navy CLEAN Subcontractor Project Manager and UXOQCS are responsible for ensuring, through detailed review, that submittals as well as the materials and the work they represent, are in full compliance with applicable contract specifications. The Project Manager and UXOQCS are also responsible for ensuring that a project file is

established and maintained, and that accountable project documents are retained and controlled appropriately.

9.10.1 Project Records

The Navy Contractor/Navy CLEAN Subcontractor Project Manager will establish and maintain an onsite project file in accordance with contract requirements and NAVFAC Atlantic policies for document control. The Project Manager is responsible for controlling access to the project file to ensure that records are not lost or misplaced. The purpose of this file is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contract agreements, and project activities. The initial file will be structured to include a record copy of the following documents:

- Schedule and progress reports
- Technical specifications, including addenda and modifications thereof
- Change orders and other contract modifications
- Engineer Field Orders
- Manufacturer's certificates
- Survey Records
- Daily work activity summary reports, which may include:
 - Weekly QC Report
 - Daily Health and Safety Report
 - Reports on any emergency response actions
 - Test records
 - Records of site work
 - Chain-of-custody records
 - Reports on any spill incidents
 - Truck load tickets and shipping papers
- Other items as required by the Contracting Officer Representative:
 - Conversation logs
 - Meeting minutes and agenda
 - Inspection logs and schedules
 - Photo documentation
 - Site maps
 - As built drawings

As the project activities progress, the Contractor Project Manager will monitor usefulness of the project filing system for information retrieval. If additional file sections are needed, the initial filing structure will be expanded to include additional sections.

9.10.2 Transmittal to the Title 2 Services/Navy CLEAN Contractor

Submittals to the Title 2 Services/Navy CLEAN Contractor are to be accompanied by a completed submittal form (Form 9-10). This form is to be used for submittals requiring the Title 2 Services Contractor/Navy CLEAN response and for information-only submittals in accordance with the instructions on the reverse side of the form. This form is to be properly

completed by filling out the heading blank spaces and identifying each item submitted. Care is to be exercised to ensure proper listing of the Task Order, specification paragraph, and/or sheet number of the plans pertinent to the data submitted for each item.

FORM 9-1
PERSONNEL QUALIFICATION VERIFICATION FORM

NAME: _____ **POSITION** _____

CONTRACT: _____

REVIEW ITEMS		QUALIFICATIONS	VERIFIED BY/DATE
EXPERIENCE	REQUIRED:		
	ACTUAL:		
EDUCATION	REQUIRED:		
	ACTUAL:		
CERTIFICATIONS & QUALIFICATIONS	REQUIRED:		
	ACTUAL:		
TRAINING	REQUIRED:		
	ACTUAL:		
OTHER	REQUIRED:		
	ACTUAL:		

FORM 9-2
PREPARATORY INSPECTION CHECKLIST
(PART I)

Contract:

Date: _____

Title and No. of Technical Section: _____

A. Planned Attendees:

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

B. Submittals required to begin work:

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

FORM 9-2

**PREPARATORY INSPECTION CHECKLIST
(PART I)**

C. Equipment to be used in executing work:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

D. Work areas examined to ascertain that all preliminary work has been completed:

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

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

Contractor Quality Control Systems Manager

FORM 9-3
INITIAL PHASE CHECKLIST

Contract No.: _____

Date: _____

Title and No. of Technical Section: _____

Description and Location of Work Inspected: _____

A. Key Personnel Present:

	<u>Name</u>	<u>Position</u>	<u>Company</u>
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____
5)	_____	_____	_____

B. Materials being used are in strict compliance with the contract plans and specifications: Yes ___ No ___

If not, explain: _____

C. Procedures and/or work methods witnessed are in strict compliance with the contract specifications: Yes ___ No ___

If not, explain: _____

D. Workmanship is acceptable: Yes ___ No ___

State where improvement is needed: _____

E. Workmanship is free of safety violations: Yes ___ No ___

If no, corrective action taken: _____

**FORM 9-7
CORRECTIVE ACTION REQUEST**

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

PART A: NOTICE OF DEFICIENCY

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

PART B: CORRECTIVE ACTION

(17)PROPOSED CORRECTIVE ACTION/ACTION TAKEN:	
NOTE: SUPPORTING DOCUMENTATION MUST BE LISTED ON THE BACK OF THIS FORM AND ATTACHED.	
(18)PART B COMPLETED BY (NAME & TITLE):	(19)QC CONCURRENCE:
SIGNATURE:	DATE:

PART C: CORRECTIVE ACTION VERIFICATION

(20)CAR VERIFICATION AND CLOSE-OUT: (CHECK ONLY ONE & EXPLAIN STIPULATIONS, IF ANY)	
<input type="checkbox"/> APPROVED FOR CLOSURE WITHOUT STIPULATIONS	
<input type="checkbox"/> APPROVED FOR CLOSURE WITH FOLLOWING STIPULATIONS	
COMMENTS/STIPULATIONS:	
(21)CLOSED BY (PRINTED NAME & TITLE):	
SIGNATURE:	DATE:

- (1) **UXOQCS:** Verify that the total number of pages includes all attachments.
- (2) **UXOQCS:** Fill in CAR number from CAR log.
- (3) **UXOQCS:** Fill in appropriate priority category. **High** priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiency's impact on continuing operations. **Normal** priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.
- (4) **CAR Requestor:** Fill in date CAR is initiated.
- (5) **CAR Requestor:** Identify project name, number, CTO, and WAD.
- (6) **CAR Requestor:** Identify Project Manager
- (7) **CAR Requestor:** Identify CQC System Manager.
- (8) **CAR Requestor:** Identify project organization, group, or discrete work environment where deficiency was first discovered.
- (9) **CAR Requestor:** Identify line manager responsible for work unit where deficiency was discovered.
- (10) **UXOQCS:** Identify responsible manager designated to resolve deficiency (this may not be work unit manager).
- (11) **CAR Requestor:** Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.
- (12) **CAR Requestor:** Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.
- (13) **UXOQCS:** Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is **High**; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.
- (14) **UXOQCS:** Identify date by which proposed corrective action is due to QC for concurrence.
- (15) **UXOQCS:** Sign and date CAR and forward to responsible manager identified in (10) above.
- (16) **Responsible Manager:** Initial to acknowledge receipt of CAR.
- (17) **Responsible Manager:** Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.
- (18) **Responsible Manager:** Sign and date corrective action response.
- (19) **UXOQCS:** Initial to identify concurrence with corrective action response from responsible manager.
- (20) **UXOQCS:** Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.
- (21) **UXOQCS:** Indicate document closeout by signing and dating.

CORRECTIVE ACTION PLAN

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

PART A: TO BE COMPLETED BY PROJECT MANAGER OR DESIGNEE

(1) PROJECT:		
(2) PROJECT MANAGER:	(3) UXOQCS:	
(4) CAR NO(S) AND DATE(S) ISSUED:		
(5) DEFICIENCY DESCRIPTION AND LOCATION:		
(6) PLANNED ACTIONS	(7) ASSIGNED RESPONSIBILITY	(8) COMPLETION DUE DATE
(9) PROJECT MANAGER SIGNATURE:		DATE:

PART B: TO BE COMPLETED BY UXOQCS OR DESIGNEE

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

Form 9-9
Weekly Quality Control Report

Contract: _____

Date: _____
Report No: _____

LOCATION OF WORK: _____

DESCRIPTION: _____

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

TEMPERATURE: MIN ____ °F MAX ____ °F

1. Work performed today:

2. Work performed today by Removal Action subcontractor(s):

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

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

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

Form 9-9
Weekly Quality Control Report (Continued)

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

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

8. Non-conformances/ deficiencies reported:

9. Site safety monitoring activities performed today:

10. Remarks:

CERTIFICATION: I certify that the above report is complete and correct and that I, or my representative, have inspected all work identified on this report performed by _____ subcontractor(s) and have determined to the best of my knowledge and belief that noted work activities are in compliance with the plans and specifications, except as may be noted above.

UXOQCS (or designee) Signature: _____

FORM 9-10

DOCUMENT REVIEW AND RELEASE FORM

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

Approval:

_____ *Project Manager*

Approval:

_____ *UXOQCS*

FORM 9-11

DEFICIENCY NOTICE		DEFICIENCY NOTICE NO:	
PROJECT NAME		PROJECT NO:	
CLIENT		LOCATION:	
		DATE:	
		PROJECT MANAGER:	
RESPONSIBLE CONTRACTOR/COMPANY:			
REFERENCE/SPECIFICATION/DWG. NO.:			
DESCRIPTION OF DEFICIENCY:			
NAME & SIGNATURE		TITLE/COMPANY	DATE
RECOMMENDED CORRECTIVE ACTION:			
NAME & SIGNATURE		TITLE/COMPANY	DATE
PROJECT MANAGER ACCEPTANCE OF CORRECTIVE ACTION			
REMARKS:			
NAME & SIGNATURE		ESTIMATED DATE OF RESOLUTION	DATE SIGNED
CORRECTIVE ACTION COMPLETE			
REMARKS:			
NAME & SIGNATURE		TITLE/COMPANY	DATE CORRECTIVE ACTION COMPLETE
QC VERIFICATION CORRECTIVE ACTION COMPLETE			
REMARKS:			
NAME & SIGNATURE			DATE CORRECTIVE ACTION VERIFIED
PROJECT MANAGER ACKNOWLEDGEMENT OF CORRECTIVE ACTION COMPLETED/VERIFIED			
REMARKS:			
NAME & SIGNATURE			DATE

Environmental Protection Plan

10.1 Cultural and Archaeological Resources within the Project Site

Prior to initiating intrusive or other destructive investigation/removal techniques, surveys of the EMA, SIA and ECA will be conducted to identify potential archeological resources. The LIA has been subjected to significant bombing activities. Based on this the Puerto Rico State Historical Preservation Office has determined that any cultural or archeological resources in that area are no longer sufficiently in place or intact to be of scientific interest. Thus, archeological surveys won't be required in the LIA.

10.2 Surface Water and Groundwater Resources within the Project Site

Based on available aerial photography, surface water resources located within or adjacent to the project area, consist of several lagoons primarily along the coast. Ocean water resources within or adjacent to the project area consist of the Caribbean Sea to the north, south, and east. Two types of groundwater aquifers can be found within the project area; within the upper portion of the bedrock and sedimentary rocks in the EMA, and in the alluvial deposits found below the hills in the low flat valleys along the coast.

10.3 Coastal Zones within the Project Site

The entire northern, southern, and eastern sides of the project area are coastal zones (Caribbean Sea). No work is proposed seaward of the mean high tide boundary along the coastline. Because of the nature of the proposed work, the marine environment seaward of the shoreline are not expected to be impacted.

10.4 Protection and/or Mitigation of Ecological Resources

A Biological Assessment for the former VNTR is being conducted. In the interim, USFWS will be consulted on all MEC operations to ensure the appropriate measures are in place to protect ecological resources.. Such protective measures will include, but are not limited to, the following:

- Avoid any sea turtles or sea turtle nests that are encountered. All sea turtle nests that are located will be marked by flagging during the duration of the project to prevent potential impacts. All sea turtle tracks sighted within the project area will be reported to the project manager.

- Any MEC found within or near a wetland will be identified and removed, if deemed safe to do so, without impacts to wetland soil, vegetation, or hydrology.
- Any MEC found in the immediate vicinity of a water body will be identified and removed, if deemed safe to do so, without impacts to the water resource.
- Any MEC found near the coastal zone will be identified and removed, if deemed safe to do so, without impacts to the coastal environment.

Investigation-Derived Waste Management Plan

This IDW Management Plan describes the handling of materials during MEC investigation, removal and HTRW activities, and was developed in accordance with NAVSEA OP5, Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping and DoD 4160.21-M, Defense Reutilization and Marketing Manual. General IDW procedures for environmental investigations at Former VNTR were addressed in the *Final Master Work Plan Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico* (CH2M HILL, June 12, 2003). The Master IDW Management Plan (CH2M HILL, June 12, 2003) is included as Appendix H.

11.1 Objective

The primary objective of this plan is to identify when material removed from excavations requires special management as IDW.

11.2 Types of Potential IDW and Planned Disposition

During this removal action, media most likely encountered will be soil removed while excavating MPPEH, and non-hazardous scrap. No hazardous waste, liquid waste, or chemical warfare materiel is expected to be encountered.

IDW will be segregated, inventoried, demilitarized (if required) and disposed of. The following paragraphs outline the planned procedures for dealing with materials excavated or uncovered.

11.3 Non-Hazardous Debris Disposal

The following procedures apply to non-hazardous scrap or debris removed from the sites:

- Economically recyclable debris (such as scrap metal) will be collected and delivered to an appropriate local recycling facility. Recycling will be coordinated with the Navy.
- Non-MEC debris will be accounted for in estimated pounds recovered and type of material, and then shipped offsite.
- Vegetative debris will be mulched and left onsite as ground cover. This will reduce soil erosion from the brush clearing activities.
- Non-recyclable and other debris, such as concrete and asphalt rubble, tires, plastic, wood, personal protective equipment, and metal that is not considered recyclable will be placed at the Vieques Landfill as part of the general fill as required.

11.4 Disposition of Material that Presents a Potential Explosive Hazard (MPPEH)/Munitions Debris (MD)

Procedures for disposal of MPPEH/MD are addressed in Appendix E. MPPEH/MD materials will be evaluated as indicated below.

- **Prior to the treatment of any MPPEH/MD State and Federal regulatory agencies will be notified.**
- MPPEH/MD that have been in direct contact with energetic materials of the ordnance (e.g., expended rocket motors, shell casings, and warhead fragments) will be visually inspected by UXO personnel, and will be certified (3X) as described in Appendix E. MPPEH/MD that will be released for public use will be certified 5X.
- Certified-safe MEC wastes will be containerized on-site and sent to an authorized recycle facility that is on the qualified recycling program. The MMPEH/MD waste can be stored on-site for up to 270 days. Storage past this time period will require a RCRA Permit.
- MEC materials recovered in the remote areas will require inspection, demilitarization, certification, verification, and will be consolidated on-range if determined not to present any explosive safety hazards.
- Materials that cannot be certified as safe from explosive hazards will be handled, stored, transported, and disposed of as MPPEH by MRP Contractor.
- MPPEH/MD must be demilitarized to a point that they are not recognizable as hazardous ordnance.

11.5 Clearing and Grubbing

Vegetation that may interfere with the MEC or HTRW activity will be removed, as required, according to Section 2. Brush, grass, roots, and stumps, along with other debris that may be grubbed before implementing the activity, will be left onsite as mulched material.

11.6 Contaminated Soil and Hazardous Waste

If unexpected contaminated soil and/or hazardous waste is encountered during MEC activities, the Navy Contractor/Navy CLEAN Subcontractor will notify the NAVFAC Field Representative and Title 2 Services/Navy CLEAN Site Managers. All site activities will stop if necessary. The Title 2 Services/Navy CLEAN Project Manager, in coordination with the Navy and appropriate regulatory agencies, will develop appropriate removal and disposal procedures.

11.7 Transportation

Non-MEC related debris, vegetation, and contaminated soil will be transported to the Vieques Landfill or to the appropriate recycling facility for final disposition. A spill patrol

will be implemented to monitor the transport route and pick up spills that may occur from the haul trucks.

The vegetation, soil, and other non-recyclable debris will be placed in the general fill by spreading with a bulldozer in thin lifts. The soil may also be used as foundation for the landfill cover provided that it meets the following specification:

- Soil used in the upper 6-in. zone of the foundation layer will be, to the extent practicable, free of rocks greater than 0.5 in. The soil will not contain materials that could be deleterious to the geomembrane.

A UXO technician will observe the soil as it is being spread out. The location of the soil in the landfill will be surveyed.

Transport of encountered MEC-related material, including UXO, will be in accordance with Section 3.

Geographical Information System Plan

This GIS Plan describes the incorporation of GIS into the data management phases of MEC anomaly validation actions at the Former VNTR. This plan was developed in accordance with Military Munitions Response Program Mandatory Center of Expertise data item description (DID) OE-005-14.01.

The comprehensive MEC-GIS and associated database has been established to track and manage the data generated during the course of MEC investigation and removal actions. The hardware and software tools to be used have been specifically chosen to provide a flexible system that allows effective and timely data management, long-term storage and archival of data, and expansion of the database to include new information that can readily be integrated into the existing database as appropriate. The database and GIS are also designed to be transportable to existing project applications developed and maintained by other members of the Vieques project team. This will provide an efficient mechanism for retrieving MEC-related information for technical evaluation, removal efforts, reporting, and ultimately to assist in the efficient transfer and reuse of parcels at the Former VNTR.

The data is be managed using the CADD/GIS Technology Center SDS as outlined in SDS/Facility Management Standards release 2.4 where applicable. The intent of SDS is to provide data in an accessible and predictable format that can be used by standard, readily available GIS software applications.

12.1 Geographical Information System Incorporation

The purpose of this task is to leverage GIS technology to effectively manage and integrate MEC-related data collected at VNTR. GIS applications are used to integrate spatial data (maps) with tabulated data stored in databases (such as MEC type, location, and status) to facilitate visualization, querying and data, analysis and other knowledge management functions.

Significant amounts of background and location data collected during the various investigations that have been conducted or are currently being conducted are already integrated into a GIS for the site. The intent of this GIS is to leverage existing systems that have already been developed for the Navy so that the GIS can be integrated to meet the needs of MEC investigations and ultimately assist with making decisions regarding future reuse of parcels.

A comprehensive database, ArcSDE, ArcIMS, and ArcGIS has been developed to manage, evaluate, and report site information. The MEC-GIS system will be based on the current environmental system for Vieques and will incorporate additional data for MEC investigation, tracking, reporting, and decision support systems. Where applicable, additional data such as geology, hydrogeology, and infrastructure will be incorporated to assist in the investigation. Attribute data is stored in a relational database that is inherently linked to the spatial data through the GIS interface. Spatial data identifying elements such

as buildings are managed in Oracle ArcSDE. The ArcSDE and ArcGIS is integrated with the database and is used to perform spatial analyses of the various attribute and spatial data. All existing data is currently referenced to the 1983 North American Datum 83, UTM coordinate system.

Widely used, commercially available hardware and software is utilized in the development and maintenance of the MEC database and GIS. No proprietary software will be used to prepare these applications. Tools developed for interim analysis will be documented and may be evaluated by the Navy. This ensures that data will be readily accessible by all members of the project team authorized to use these data. This also ensures that the data is portable should it be necessary to transfer the GIS and associated database to other servers and workstations.

A computer system will be available onsite (at Vieques) for GIS data entry, management, and reporting. The Contractor will provide GIS and database support on an as-needed basis to assist with GIS system functionality and use.

The existing Vieques GIS has been developed in the ArcGIS environment. ArcGIS is the primary GIS software for all GIS data management and mapping. The Microsoft Office 2003 suite of programs (including Microsoft Access, Microsoft Word, Microsoft Project, and Microsoft Excel) will also be used on this project, where applicable.

Microsoft Access 2003 will be the primary database software used to manage MEC data. The database will include a database schema, electronic data entry functions, QC/QA reporting audits of the data, data management, and a link to the spatial data supporting the site-wide GIS. The site-wide relational database will be stored in Microsoft Access 2003. These database tables and relationships will be compatible for transfer of the data to an Oracle platform in the future if requested by the Navy.

All field data collected as part of the removal actions will be managed in and integrated with the site-wide relational database. The data fields in field forms and field data collection equipment will be formatted to be consistent with the data fields used in the database. Anomaly data will be collected using a real-time data collection process that will generate a raw data file consisting of values for easting, northing, and geophysical value. Naming conventions will be developed so that all field observations and measurements are consistent. Attributes specific to the MEC investigation will be stored and managed in tables separate from other database tables (such as environmental or endangered species related data). Several types of information that will be used to join tables include:

- Site name–Common name used to identify the study area.
- Munitions Response Site number assigned to each study area.
- Grid number–Unique number of sampling grid where MEC was observed.
- Identification number–Unique identification number assigned by the field team to each observation, MEC component, or explosion pit.

MEC spatial data will be entered into the database as point data identified by a unique northing and easting coordinate pair (a unique point designator will also be assigned). 30x30 meter grid systems will be used within the GIS system as a way to capture and

document the existence of multiple MEC items as well as documentation of vegetation removal, surface clearance, and surface removal work progress.

MEC item attribute data includes both qualitative and quantitative sample information such as ordnance type, quantity, and status. In addition, a munitions database can be linked to the MEC item table to provide physical and explosive data regarding each MEC or MEC item found in the field. This anomaly validation study will not require the use of various models for evaluation of buried explosives, trajectory, and other assessments related to the unintentional detonation of munitions. If required (as a result of field conditions), this analysis will be scoped in a separate task.

The workflow for transferring the field data to the database is summarized below:

1. Field observations are recorded on pre-defined field forms and electronically (MR-SIMS Geo XT). The MR-SIMS Geo XT units have predefined data dictionaries with drop-down boxes to simplify and standardize recording of field data.
2. Data from the geophysical survey will be processed by the field team leader daily, and the processed files will be submitted to the project data manager for QA and incorporation into the standard data management structure. Each file will be stored in original format and converted to the standard GIS or database format to be included in the system.
3. At the end of the field day, data on field forms are verified for completeness and accuracy (i.e., number of observations made match the number of observations recorded). Copies of the field forms are made and hard copies of the electronic forms are printed for the field office.
4. Data from field forms are entered into MEC database loading tables (either onsite or transmitted to a local office for data entry). These tables are then loaded into the MEC GIS and database. Electronic forms are processed onsite and loaded directly into the MEC database.
5. QC checks of the data will be based on a set of reports that will be generated from the database and provided to the project manager and field team leader for review. For example, the ordnance type information cannot be entered unless an ordnance sampling location has been properly defined.
6. After data tables are loaded, the database is ready for use at the site for data analysis and reporting, uploading to the onsite GIS, generation of field maps, or transfer and uploading to the Vieques site-wide database.

When required for field data collection, data entry fields on the paper and electronic forms will match the field names in the MEC database. This will allow the project team to track the flow of MEC information from data collection through processing, analysis, storage, and archival.

The MEC database will also be used to store and track inventory information related to the anomaly investigation. If MEC is moved and detonated onsite, this information will also be included in the GIS/database system.

Additional data will be incorporated as necessary into the onsite GIS as layers. These layers consist of pre-existing data, or other non-MEC data collected during the MEC investigation. Sources for such data include existing CAD files, published data, and output from other software applications. Examples of these layers include existing anomaly data, and spatial and attribute data collected and mapped by previous investigators, if available.

The GIS will not be used to store all raw data generated during the MEC investigations. For example, data points collected by geophysical instruments, gridded data used by modeling programs to generate contour maps, and similar types of backup data will likely be archived as separate tables in the database or as independent databases. An attribute field will be added to the GIS coverage that identifies a file location or similar reference to document these data. The interpreted results of analysis (such as interpreted geophysical results), however, will be included in the GIS.

12.2 Computer Files

All data, text, and digital maps will be available in standard file formats. Text will be delivered in either Microsoft Word 2003 or PDF, as requested in the specific project task order. The shareware PDF viewer will be provided along with the PDF documents.

All GIS and associated database and digitized aerial photographs are transportable and can be copied to portable media for archiving or transfer to other team members. Available formats include CD-ROM (the preferred method) or DVD-ROM. The media used is dictated in part by the sizes of the files. All survey coordinates will be stored as part of the site-wide relational database.

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Appendix A

Historical Munitions Use at the Former VNTR

APPENDIX A

Historical Munitions Use at the Former VNTR

Table A-1 presented in this appendix is taken from the *Final Expanded Range Assessment and Phase I Site Inspection Report for Former Vieques Naval Training Range (VNTR) Vieques, Puerto Rico*, CH2M HILL November 2006. The remainder of the tables and figure presented in this appendix are taken from the *Final Draft Preliminary Range Assessment Report, Vieques Naval Training Range, Vieques Island, Puerto Rico*, CH2M HILL April 2003.

TABLE A-1

Types of Ordnance Used on the Former VNTR, 1983 – 2003 (Information Provided from Historical Records Review)
Former VNTR, Vieques, Puerto Rico

Nomenclature	Bombs & Dispensers	Projectiles & Mortars	Rockets & Missiles	Submunitions	Grenades	Flares & Pyrotechnics	Demolition Explosives
3" (HE)		X					
4.5" (HE)		X					
5" (HE/TP)		X					
8" (HE/TP)		X					
16" (HE/TP)		X					
20mm (HE/TP)		X					
25mm (HE/TP/DU)		X					
27mm (HE/TP)		X					
30mm (HE/TP)		X					
37mm (HE/TP)		X					
40mm (HE/TP)		X					
40mm Projected Grenade (HE/HEDP/TP/Spot)					X		
60mm (HE/WP/Illumination)		X					
60mm candle (illumination)						X	
69mm (HE)		X					
76mm (HE)		X					
81mm (HE/WP/Illumination)		X					
81mm candle (illumination)						X	
90mm (HEAT)		X					
100mm (HE)		X					
105mm (HE/WP/Illumination)		X					
105mm candle (illumination)						X	
107mm Mortars (HE/WP)		X					
120mm (HE)		X					
155mm (HE/WP/Illumination)		X					

TABLE A-1

Types of Ordnance Used on the Former VNTR, 1983 – 2003 (Information Provided from Historical Records Review)
 Former VNTR, Vieques, Puerto Rico

Nomenclature	Bombs & Dispensers	Projectiles & Mortars	Rockets & Missiles	Submunitions	Grenades	Flares & Pyrotechnics	Demolition Explosives
155mm candle (illumination)						X	
175mm Projectiles (HE)		X					
Mk 20 (Dispenser)	X						
Mk 23 (spot)	X						
MK 76/BDU-33 (Spot)	X						
BDU-45 (500lb Spot/TP)	X						
BDU-48 (10lb Spot)	X						
BDU-50 (500 lb Inert)	X						
Mk 4 Signal Cart						X	
Mk 77 (WP Igniter w/thickened fuel) (Fire Bomb)	X						
Mk 81 (HE/Spot/Inert)	X						
Mk 82 (HE/Spot/Inert)	X						
Mk 83 (HE/Spot/Inert)	X						
Mk 84 (HE/Spot/Inert)	X						
Mk 106 (Spot)	X						
M117 (HE/Spot/Inert)	X						
AN-M65 (HE)	X						
SUU-30 (Dispenser)	X						
M39 (HE)				X			
BLU-63 (HE)				X			
BLU-77 (HE)				X			
BLU-86 (HE)				X			
BLU-97 (HEAT)				X			
Mk 118 (HE/TP)				X			
MK 118 VECP (HE/TP)				X			
M77 (HE-Dual Purpose (HEDP))				X			
No 1 Mk 1 (BL755, British)				X			
2.36" (HE)			X				
2.75" (HE/WP/Inert)			X				
3.5" (HE/Inert)			X				
5" ZUNI (HE/WP/Inert)			X				
83mm (HEAT)			X				
AGM-114 Hellfire (HEAT)			X				
AT-4 (HEAT)			X				
M72 LAW (HEAT)			X				

TABLE A-1

Types of Ordnance Used on the Former VNTR, 1983 – 2003 (Information Provided from Historical Records Review)
Former VNTR, Vieques, Puerto Rico

Nomenclature	Bombs & Dispensers	Projectiles & Mortars	Rockets & Missiles	Submunitions	Grenades	Flares & Pyrotechnics	Demolition Explosives
M47 Dragon (HEAT)			X				
SMAW (HE/HEAT)			X				
Hand Grenades (HE/WP/Spot)					X		
LUU-2 Aircraft Flare						X	
Mk 24 Aircraft Flare						X	
Mk 45 Aircraft Flare						X	
C-4 (Demolition HE)							X

Notes: HE-High explosive, TP-Target practice, DU-Depleted uranium, HEDP-High explosive dual purpose, SPOT-Spotting charge, WP-White phosphorus, HEAT-High explosive anti-tank, LAW-Light Anti-Armor/Anti-Tank Weapon, SMAW-Shoulder-launched Multipurpose Assault Weapon.

TABLE A-2
 NGFS Expended Annually by Type
VNTR, Vieques, Puerto Rico

Year	5"/54	5"/38	4.5"/38	3"/50	Total
1974	3,051	1,362	1,235	1,308	6,956
1975	3,498	3,289	324	691	7,802
1976	5,547	1,414	290	679	7,930
1977	6,591	1,667	530	1,066	9,854
1982	5869	721	41	106	6,737
1983	6938	491	0	1044	8,473
1984	5940	849	75	274	7,138
1985	7136	756	31	331	8,254
1986	5931	1209	104	42	7,286
1987	11596	2552	1143	563	15,854
1988	13012	1013	301	1246	15,572
1989	11938	1193	1041	862	15,034
1990	11121	920	243	563	12,847
1991	3902	0	131	196	4,229
1992	3873	0	397	413	4,683
1993	523	0	54	0	577
1994	774	0	15	0	789
1995	519	0	361	0	880
1996	3065	36	150	0	3,251
1997	4261	0	188	0	4,449
1998	7301	0	308	0	7,609
Total	122,386	17,472	6,962	9,384	156,204
Weight (lbs)	63	55	50	50	
Total Wt.	7,710,318	960,960	348,100	469,200	9,488,578
Average	5,828	832	332	447	7,438
Percent of Average Total	78.4	11.2	4.4	6	100

TABLE A-3
 ATG Ordnance Expended at Live Impact Area Annually by Type
VNTR, Vieques, Puerto Rico

Year	MK-81	MK-82	MK-83	MK-84	MK-77	MK-78	MK-16	Total
1974	12	612	0	0	24	8	8	656
1975	134	2,164	34	40	203	0	4	2,579
1976	186	1,281	127	0	0	0	0	1,594
1977	242	4,771	715	144	41	0	0	5,943
1982	0	762	14	0	0	0	0	776
1983	0	2547	92	64	0	0	0	2,703
1984	0	857	45	10	0	0	0	912
1985	0	575	72	20	0	0	0	667
1986	0	780	289	75	0	0	0	1,144
1987	0	1108	160	0	0	0	0	1,268
1988	12	1486	251	20	0	0	0	1,769
1989	27	1737	805	66	0	0	0	2,635
1990	23	1884	494	75	0	0	0	2,476
1991	106	2441	340	37	0	0	0	2,924
1992	8	1904	213	145	0	0	0	2,270
1993	0	1687	192	0	0	0	0	1,879
1994	0	1458	287	19	0	0	0	1,764
1995	0	939	246	14	0	0	0	1,199
1996	0	1899	393	14	0	0	0	2,306
1997	121	1865	329	3	0	0	0	2,318
1998	0	857	246	2	0	0	0	1,105
Total	871	33614	5344	748	268	8	12	40,865
Weight	250	500	1000	2000	509	650	463	
Total Wt.	217,750	16,807,000	5,344,000	1,496,000	136,412	5,200	5,556	24,011,918
Average	41	1601	254	36	13	0.38	0.57	1,947
Percent	2.1	82.2	13.1	1.9	0.66	0.02	0.02	100

TABLE A-4
 Marine Ordnance Expended Annually by Type
 VNTR, Vieques, Puerto Rico

Year	175mm	155mm	106mm	105mm	90mm	81mm	76mm	Total
1974	4,933	3,508	2,741	15,100	1,996	5,947	0	34,255
1975	0	2,388	305	8,162	440	1,422	78	12,795
1976	1,066	3,124	0	5,525	0	244	1,957	11,916
1977	0	0	0	212	0	16	3,928	4,156
1982	NA	100	NA	1,343	NA	2,599	12	4,054
1983	NA	177	NA	NA	NA	1,007	NA	1,184
1984	NA	146	NA	186	NA	1,049	223	1,604
1985	NA	311	NA	253	NA	288	44	896
1986	NA	165	NA	538	NA	855	70	1,628
1987	NA	817	NA	144	NA	869	139	1,969
1988	NA	1,336	NA	698	NA	2,342	891	5,267
1989	NA	667	NA	464	NA	1,333	442	2,906
1990	NA	1,505	NA	1,088	NA	620	306	3,519
1991	NA	515	NA	NA	NA	1,073	155	1,743
1992	NA	NA	NA	49	NA	471	470	990
1993	NA	156	NA	351	NA	1,002	625	2,134
1994	NA	NA	NA	NA	NA	639	355	994
1995	NA	517	NA	NA	NA	273	468	1,258
1996	NA	223	NA	397	NA	1,199	757	2,576
1997	NA	NA	NA	320	NA	625	700	1,645
1998	NA	816	NA	NA	NA	1,364	641	2,821
Total	5,999	16,471	3,046	34,830	2,436	25,237	12261	100,280
Weight (lbs)	130	95	41	33	23	10	28	
Total Wt.	779,870	1,564,745	124,886	1,149,390	56,028	252,370	343,308	4,270,597

Data was not available for the years 1978-1981
 NA - Data not available

TABLE A-5
 Small Arms Ammunition Fired at the EMA Ranges by Type
 VNTR, Vieques, Puerto Rico

Year	5.56 mm	7.62 mm	9 mm	.38 CAL	.50 CAL	12 Gage	Grenades	Total
1995	139,964	207,680	17,951	2,450	38,364	174	739	407,322
1996	99,424	147,692	3,480	2,592	50,846	2,000	292	306,326
1997	161,070	491,534	9,205	NA	54,605	200	240	53,048
1998	207,605	147,712	30,390	3,825	80,759	3,427	720	474,438

NA – Data not available

TABLE A-6
 Winter 1994 Refurbishment Ordnance Report, LIA, Department of the Navy
 VNTR, Vieques, Puerto Rico
 December 1994

Item	Quantity
Convoy Area	
BLU-77 Bomblet	10
MK-82 LDGP Bomb	9
MK-118 Bomblet	4
5" 54 Projectile	1
2.75" Warhead	1
Sam East	
MK-118 Bomblets	2,587
BLU-77 Bomblets	1,364
BLU-63/86 Bomblets	101
BLU-97 Bomblets	20
3" HE Projectile	3
5" HE Projectile	2
2.75" HE Warhead	1
2.75" WP Warhead	1
Runway	
MK-82 LDGP Bomb	5
5" HE Projectile	5
81mm HE Mortar	1
Sam West	
MK-82 LDGP Bomb	6
81mm HE Mortar	2
40mm HE Grenade	2
83mm Heat Warhead	1
MK-83 LDGP Bomb	1

TABLE A-6

Winter 1994 Refurbishment Ordnance Report, LIA, Department of the Navy
 VNTR, Vieques, Puerto Rico
 December 1994

Item	Quantity
60mm Illumination Round	1
Fuel Farm	
5" HE Projectile	5
MK-82 LDGP Bomb	2
2.75" HE Warhead	1
60mm Illumination Round	1
NGFT 1	
5" HE Projectile	1
60mm HE Mortar	1
NGFT 2	
MK-82 LDGP Bomb	2
81mm HE Mortar	2
MK-83 LDGP Bomb	1
69mm HE Mortar	1
NGFT 3	
MK-83 LDGP Bomb	3
NGFT 4	
MK-82 LDGP Bomb	1
40mm HE Grenade	1
NGFT 5	
MK-82 LDGP Bomb	2
40mm HE Grenade	1
NGFT 6	
Clear	0
NGFT 7	
MK-82 LDGP Bomb	1
40mm HE Grenade	1

TABLE A-7

Identification, Use, and Approved Ordnance Type (with Associated NEW) for PRA Areas at the AFWTF and EMA
VNTR, Vieques, Puerto Rico
November 2002

Area ID	Area Use with Ordnance Area Approval and Associated NEW
G-1	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-2	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-3	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-4	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-5	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-7	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
G-8	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
GP-1	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
GP-5	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
GP-7	ATG Target # 2 - MK-76 practice bombs with spotting charge; 20mm (amounts unknown)
GP-9	Gun Emplacement/Position – 300 rounds of 155mm per gun position per day
OP-5	Observation Post and former Gun Emplacement/Position - 300 rounds of 155mm per gun position per day
PI-9	Munitions loading/offloading and storage – No ordnance approval or NEW for this
Range 1	Small Arms Range [Battle Zero (BZO) Range] - 30,000 rounds 9mm or smaller per day or the NEW equivalent (30,000 lbs 1.3 or 1.4 hazard class)
Range 2	Small Arms Range (Squad Fire and Maneuver Range) - 30,000 rounds 9mm or smaller per day or the NEW equivalent (30,000 lbs 1.3 or 1.4 hazard class)
Range 3	Rifle Grenade Range (40mm) - 30,000 rounds 9mm or smaller; 500 40mm grenades per day or the NEW equivalent (30,000 lbs 1.3 or 1.4 hazard class)
Range 4	Anti-Fire/Antipersonnel Live Fire Tracking and Rocket Range - 30,000 rounds 9mm or smaller per day or the NEW equivalent; 500 40mm grenades; 100 LAWS per day
Range 5	Hand Grenade Range - 500 hand grenades per day of any type
Range 6	Open Detonation Training Range and Small Arms Range - 1,000 lbs C4 per day or the NEW equivalent

TABLE A-8
Summary Of MECs
VNTR, Vieques, Puerto Rico

ID On Figure 2-5	MEC Area Type	MEC Activities	Potential MEC	Potential Area of Impact	RAC Code	Comments
Live Impact Area						
LIA Bombing Range	Bombing Range	ATG bombing, naval gunfire, OB/OD	5"/54, 5"/38, 4.5"/38, 3"/50, MK16-MK-84 bombs, submunitions	900 acres	RAC 2	Established in 1964, since 1974 over 150,000 rounds and 4,700 tons of Naval gunfire; over 40,000 rounds (10,000 tons) of ATG bombing.
LIA OB/OD	OB/OD	OB/OD, possible burial	MK-16-MK-84 bombs, 3"-5" NGF, submunitions	1800 acres	RAC 2	Area is located within LIA, explosive safety quantity distance arc shows MEC impacts may cover an 1,800-acre area.
Surface Impact Area						
Surface Impact Target Area Includes PI-16, PI-17	Artillery/Bombing Targets	Artillery gunfire, strafing of ATG bombing of inert bombs	60mm, 81mm, 90mm, 105mm, 120mm, 155mm, 175mm, submunitions	2500 acres	RAC 3	Established in the 1950s for marine exercises, aerial photos indicate munitions craters covered over 1,800 acres; since 1974 over 100,000 rounds (over 2100 tons) of marine artillery fired at SIA.
GP-1	Gun Emplacement/Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	5500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position, was approved for firing of up to 300 rounds of 155mm per day.
GP-5	Gun Emplacement/Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	5500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position, was approved for firing of up to 300 rounds of 155mm per day.
OP-5	Observation Post/Gun Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	5500 acres	RAC 3	Field reconnaissance detected bomb fragments, projectile fragments, small arms; was approved for firing of up to 300 rounds of 155mm per day.
OP-11, OP-12, OP-13, PI-15	Photo-Identified Observation Posts	Potentially used for artillery fire	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	Unknown	IC	OP-12 was present prior to 1967; OP-13 was deteriorated in 1967, P-15 was identified in the EBS as a potential OP.
G-21,	Photo-identified Gun positions	Potentially used for mortar or artillery fire	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	Unknown	IC	Aerial photos identified mortar at G-21.

TABLE A-8
Summary Of MECs
VNTR, Vieques, Puerto Rico

ID On Figure 2-5	MEC Area Type	MEC Activities	Potential MEC	Potential Area of Impact	RAC Code	Comments
Eastern Maneuver Area						
G-1	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position; was approved for firing of up to 300 rounds of 155mm per day.
G-2	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance detect small arms MEC, was approved for firing of up to 300 rounds of 155mm per day.
G-3	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance detected small arms MEC, was approved for firing of up to 300 rounds of 155mm per day.
G-4	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance detected small arms MEC, was approved for firing of up to 300 rounds of 155mm per day.
G-5	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position; was approved for firing of up to 300 rounds of 155mm per day.
G-7	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position; was approved for firing of up to 300 rounds of 155mm per day.
G-8	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	5,500 acres	RAC 3	Field reconnaissance did not detect MEC within the open area of the gun position; was approved for firing of up to 300 rounds of 155mm per day.
GP-7	Target	Bombing target	MK-76, 20mm, submunitions	5,500 acres	RAC 3	Field reconnaissance detected MEC items including MK-76 inert bombs and 20mm, was approved for firing of up to 300 rounds of 155mm per day.
GP-9	Gun Emplacement/ Position	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	5,500 acres	RAC 3	Field reconnaissance detected bomb rack and bomb brace, was approved for firing of up to 300 rounds of 155mm per day.

TABLE A-8
Summary Of MECs
VNTR, Vieques, Puerto Rico

ID On Figure 2-5	MEC Area Type	MEC Activities	Potential MEC	Potential Area of Impact	RAC Code	Comments
OP-10,	Photo-Identified Observation Posts	Potentially used for artillery fire	60mm, 81mm, 105mm, 120mm, 155mm, 175mm, submunitions	Unknown	IC	Aerial photos identified OP-10 was a cleared area in 1962 but re-vegetated in 1967.
G-9 through G-19 G-22 through G-35, PI-13, PI-18, PAOC-FF	Photo-identified artillery Gun Positions or mortar	Artillery Gunfire towards SIA and LIA	60mm, 81mm, 105mm, 120mm, 155mm, 175mm	Unknown	IC	Aerial photo analysis identified the following number of revetted gun positions: 3 at G-9; 6 at G-10; 9 at G-12; 6 at G-13; 3 at G-14; 6 at G-15; 10 at G-16; 6 at G-17; 3 at G-18; 4 at G-19; 6 at G-20; mortar at G-22; 3 at G-24; 6 at G-25; 6 at G-26; 4 at G-27; 6 at G-28; 4 at G-29; 6 at G-30; 6 at G-31; 6 at G-32; 6 at G-33; 8 at G-34; 8 at G-35; PI-13, PI-18, PAOC-FF identified from interviews for EBS.
Range 1	Small Arms Range	Service rifle, M-16s, M-249 SAW, submachine guns, pistols, pyrotechnics	M-16, M-249 SAW, M-60, M240 G, practice hand grenades	1,330 acres	RAC 4	Field reconnaissance detected small arms MEC; was approved for firing of up to 30,000 rounds of 9mm per day.
Range 2	Small Arms Range	M-60 machine guns, service rifle, M-16s, submachine guns, pistols	9mm, M-60, M-16s	1,550 acres	RAC 4	Field reconnaissance detected small arms MEC; was approved for firing of up to 30,000 rounds of 9mm per day.
Range 3	Rifle Grenade Range	Rifle grenade fire	40mm Grenades	730 acres	RAC 3	Field reconnaissance detected small arms and 40 mm MEC; was approved for firing of up to 30,000 rounds of 9mm per day.
Range 4	Rocket Range	M-60 M-16 rifles, rocket fire, anti-tank weapons, anti-armor/ antipersonnel live fire tracking range, M-203 and M-79 grenade launchers	M-60s, M-16s, M-72, M-73 LAW, 40mm Grenades, 2.36" and 3.5" rockets, Dragon Missile	1,650 acres	RAC 3	Field reconnaissance detected expended rocket motors MEC and ORS; was approved for firing of up to 30,000 rounds of 9mm per day, 500 40mm grenades per day, 100 LAWS per day.
Range 5	Hand grenade Range	Hand grenade training area	Hand grenades	1.2 acres	RAC 3	Field reconnaissance did not detect MEC; was approved for firing of up to 500 hand grenades per day.
Range 6	Open Detonation range	OB/OD, small arms fire	9mm, M-60, M-16s, all surface infantry munitions and munitions formerly stored at NASD	1-2 acres	RAC 4	Field reconnaissance detected small arms MEC; was approved for use of up to 1,000 lbs. of C4 per day.

TABLE A-8
 Summary Of MECs
 VNTR, Vieques, Puerto Rico

ID On Figure 2-5	MEC Area Type	MEC Activities	Potential MEC	Potential Area of Impact	RAC Code	Comments
Photo-identified Ranges 7, 8, 9, PI-2, PI-3,	Small Arms Range	M-60 machine guns, service rifle, M-16s, submachine guns, pistols	9mm, M-60 M-16s	Unknown	IC	Aerial photo analysis identified Range 7 may have been used for longer-range weapons and had numerous targets/impact areas; Range 8 and Range 9 were visible in 1994.
PAOC- EE	Photo-Identified Munitions Storage	Munitions Storage within earthen berms	Unknown	Unknown	IC	Identified from interviews for EBS.
PI-9	Photo-Identified Munitions Storage	Munitions storage, loading/unloading, potential OB/OD	Unknown	Unknown	IC	Field reconnaissance identified artillery casings; Aerial photos identified Open storage of probable munitions in 1959 and 1962. Containers within bermed areas, disposal of white material in large trench at north end of EBS identified as a potential OB/OD.

Risk Assessment Code:
 1 High Risk - High Priority for Further Action
 2 Serious Risk - Priority For further Action
 3 Moderate Risk - Recommended further Action
 4 Low Risk - Recommended Further Action
 5 Negligible Risk - Indicates No further DoD Action Is Necessary

Appendix B

Site Safety and Health Plan

Site Safety and Health Plan

This site Safety and Health Plan is intended for reference by field personnel during implementation of MEC investigation and removal action activities at the former VNTR. The Navy Occupational Safety and Health Manual, OPNAVINST 5100.23E, will be referenced as necessary during field activities.

This Site Safety and Health Plan will be kept onsite 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. In addition, this plan adopts procedures in the project Work Plan. All on-site personnel are to be familiar with the procedures and the contents of this plan.

B.1 Project Information and Description

Client: U.S. Navy/Naval Facilities Engineering Command Atlantic

Project/Site Name: Former Vieques Naval Training Range

Site Address: Vieques, Puerto Rico

Date Health and Safety Plan Prepared: June 2005

Date(s) of Site Work: Refer to project specific documents (i.e., Work Plan) for detailed information

Site Access: All investigation sites are located in the Former Vieques Naval Training Range, in the eastern portion of Vieques Island, Puerto Rico. All Sites are accessed through the secure gate of the Former VNTR. All personnel will contact the Vieques Range Coordinator by radio, prior to entering or leaving each gate to let the Range Coordinator know where they will be working or to let the Range Coordinator know they are leaving. Prior to working on site, personnel must receive a safety briefing from a CH2M HILL UXO Representative.

Site Size: Refer to project specific documents (i.e., Work Plan) for detailed information

B.1.1 Site Topography

The topography of Vieques is characterized by gentle to steep rolling hills and valleys throughout the island, with the eastern side of the island exhibiting a more rugged terrain. The LIA is relatively flat with elevations ranging from 0 to approximately 50 feet above sea level. Cerro Matias, located within the SIA as OP-1, is the highest point on VNTR, at approximately 420 ft above MSL. The average elevation across Vieques is approximately 246 ft MSL. The coastal area is relatively narrow; however, the southern coast exhibits wider expanses of beach.

B.1.2 Prevailing Weather

The climate of Vieques is characterized as warm and humid (tropical-marine), with frequent showers occurring throughout the year. The temperature on Vieques is affected by the easterly trade winds blowing across the island year-round. This wind moderates the temperature throughout the year, causing an annual mean temperature of 79°F to 80°F, and a mean daily temperature range of 15°F to 25°F. The average annual rainfall on the island is approximately 36 inches, with extremes of 25 inches in the east and 45 to 50 inches in the west.

B.1.3 Site Description and History

Vieques is the largest offshore island of Puerto Rico, with a surface area of approximately 51 square miles. It is located approximately 7 miles east-southeast of the eastern end of the main island of Puerto Rico. The Navy owned portions of Vieques from 1941 until 2003. Although the Island of Culebra was the focal point for naval gunfire in the 1960s and early 1970s, AFWTF began developing facilities on the eastern end of Vieques in 1964 when it established a gunnery range in the LIA. In 1965, the Navy established a LIA, also known as the air impact area, and began construction activities at Observation Post (OP) 1 on Cerro Matias.

By the 1970s, the LIA maintained several targets for aerial bombing including old tanks and vehicles which were used as mock-ups, two bulls-eye targets and a strafing target. In addition, several point and area targets for ships to practice naval gunfire support were established in the LIA.

The Environmental Impact Statement (EIS) for Vieques (Tippetts, et al., 1979) provides a detailed discussion on the development of training facilities in the VNTR leading up to 1979. The AFWTF provided logistics support, scheduling assistance, and facilities for NGFS and ATG ordnance delivery training for Atlantic Fleet ships, NATO ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic (FMFLANT), conducted training for Marine amphibious units, battalion landing teams, and combat engineering units in the EMA. Occasionally, naval units of allied nations having a presence in the Caribbean and the Puerto Rican National Guard also utilized the EMA.

Adjacent to and west of the SIA, the 10,673-acre EMA provided maneuvering space and ranges for the training of marine amphibious units and battalion landing teams in exercises of amphibious landings, small arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. The EMA was first established in 1947. It is demarcated by the western property line east to the western front friendly fire line where the SIA begins.

Portions of the training areas within the VNTR were in continuous use from World War II, when the Navy acquired title to the land, until 2003. The Atlantic Fleet's ships, aircraft and marine forces carried out training in all aspects of NGFS, ATG ordnance delivery, air-to-surface mine delivery, amphibious landings, small arms fire, artillery and tank fire, and combat engineering. As part of normal operations, unexploded ordnance was cleared periodically from the LIA and destroyed. The Navy also operated a waste munitions open burn and open detonation (OB/OD) facility under an EPA permit within the LIA.

B.2 Tasks to be Performed Under this Plan

B.2.1 Description of Tasks

Refer to project documents (i.e., Work Plan) for detailed task information. A risk analysis (Section B.3) 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.

B.2.1.1 Hazwoper-Regulated Tasks

- Site Layout
- Surface geophysical surveys
 - Magnetic
 - Electromagnetic
- Vegetation removal
- MEC Removal

B.2.1.2 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.**

B.3 Activity Hazard Analysis for Unexploded Ordnance Operations

Table B-1 shows hazards analysis, and Table B-2 shows inspection requirements.

TABLE B-1
Hazards Analysis

Principal Steps	Potential Hazards	Recommended Controls
Transportation of explosive materials	Accidental detonation of explosives	<p>Explosives will be transported in accordance with the 49, CFR, Parts 100-199.</p> <p>Explosives will be transported in closed vehicles whenever possible.</p> <p>When using an open vehicle, explosives will be covered with a flame resistant tarpaulin.</p> <p>Motor vehicles will be shut off when loading/unloading explosives.</p> <p>Beds of vehicles will have either a nonconductive bed liner, dunnage, or sand bags to protect the explosives from contact with the metal bed and fittings.</p> <p>Initiating explosives, such as blasting caps, will remain separated at all times from bulk explosives.</p>

TABLE B-1
Hazards Analysis

Principal Steps	Potential Hazards	Recommended Controls
Transportation of explosive materials		<p>Each vehicle used for the transport of MEC will be outfitted with a fire extinguisher and first aid kit.</p> <p>Do not fuel trucks when loaded with MEC.</p>
	<p>Unqualified Drivers</p> <p>Vehicle operations</p>	<p>Drivers will be licensed in accordance with federal, state, and local regulations.</p> <p>Drivers will observe all posted speed limits while operating a motor vehicle on a public roadway.</p> <p>Vehicles transporting explosives offroad will not exceed 15 miles per hour (mph).</p> <p>Chock wheels when loading or unloading MEC-related materials.</p>
Storage of explosive materials	Accidental detonation of explosives	<p>Materials will be stored in accordance with federal, state and local regulations.</p> <p>Refer to the SOP for the Storage of Explosive Materials.</p>
Surveying and establishing boundaries and grids	Accidental detonation of explosives	<p>Personnel involved will attend a site-specific MEC recognition class prior to the commencement of any site activities.</p> <p>UXO personnel will escort non-UXO-qualified personnel at all times.</p> <p>Mark and avoid MEC. Only UXO personnel will handle MEC waste.</p> <p>Check location with magnetometer prior to driving stakes.</p>
	Wildlife, slips, trips, falls, insects, poisonous plants, use of hand tools	Refer to the Activity Hazard Analysis for section of this SSHP.
Clearing and grubbing	Accidental detonation of explosives	<p>Personnel involved will attend a site-specific MEC recognition class prior to the commencement of any site activities.</p> <p>Be alert and mark all MEC located.</p> <p>Only clear and grub to within 4 inches of the ground surface.</p> <p>UXO trained personnel will escort non-UXO-qualified personnel at all times.</p> <p>Surface sweeps will be conducted with magnetometers or other suitable geophysical instrumentation to identify potential MEC.</p>
Transportation of MEC waste	Accidental detonation of explosives	No personnel allowed in cargo compartment of vehicle transporting MEC.

TABLE B-1
Hazards Analysis

Principal Steps	Potential Hazards	Recommended Controls
	Accidental detonation of explosives	No MEC allowed in passenger compartment of vehicle. Block, brace, secure MEC. No smoking in vehicles used for transport of MEC waste.
	Vehicle operations	Placard vehicle in accordance with U.S. Department of Transportation (DOT) regulations. Vehicles transporting explosives offroad will not exceed 15 mph. Drivers will observe all posted speed limits while operating a motor vehicle on a public roadway.
MEC disposal operations	Accidental detonation of explosives	Observe procedures outlined in EODB 60A-1-1-31.
MPPEH demilitarization	Accidental detonation of explosives	Only UXO technicians will perform explosive demilitarization of MPPEH.
	Shredder Operations	Stay clear of moving mechanical parts. Ensure that only inspected scrap is fed into shredder.
Inspection/certification of MD	Accidental detonation of explosives	Only UXO technicians will inspect MPPEH. Personnel in the immediate vicinity of MPPEH inspections will be kept to the minimum necessary for safe operations but no less than two UXO technicians. Observe requirements of DoD 4160.21-M-1.
Anomaly reacquisition	Accidental detonation	Only UXO technicians will excavate or handle MEC. Personnel in the immediate vicinity of MEC operations will be kept to the minimum necessary for safe operations, but no less than two UXO technicians. Do not subject MEC to heat, shock, or friction. Only hand excavation permitted when within 1 ft of MEC. Magnetometers will be used frequently to pinpoint the location of MEC.
	Non-UXO technician personnel ^{1,2}	Establish exclusion zone (EZ); post warning signs, maintain site control. Stop all MEC operations when non-UXO-technician personnel are within the EZ ^{1,2} .
Clearing and Grubbing of vegetation	Cutting tools, chain saws, weed cutters	Eye, hand, foot, and hearing protection, (Level D). Face shield and chaps will be worn by chain saw operations. Personnel using chain saws, cutting tools, and weed cutters must provide safe distance between workers and be cautious of tools.

TABLE B-1
Hazards Analysis

Principal Steps	Potential Hazards	Recommended Controls
		Only the UXO subcontractor will transport MEC material and explosives.
		1) By US Army Corps of Engineers regulations, sweep personnel are not permitted within the EZ while "MEC operations" (intrusive and explosive operations such as demolition) are being performed; UXOT Is can only be in the EZ, under the same circumstances, if under the supervision of UXOT IIs or IIIs.
		2) Non-UXO Technician personnel can be designated as Essential Personnel to observe MEC operations if they have a letter authorizing them from the appropriate federal agency, a risk analysis has been performed, and they have been briefed on safety and are escorted by UXOT II or higher. No more than two authorized visitors, can enter the EZ at one time.

TABLE B-2
Inspection Requirements

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles	Daily preventive maintenance and operational checks	40-hour qualification per 29 CFR 1910.120
Fire extinguishers		8-hour refresher
First aid kits		UXO personnel EOD trained
Demolition materials	First aid kits	Tailgate safety meetings
Explosives	Calibration of geophysical instrumentation	Site-specific orientation
Blocking, bracing, and cushioning materials		Lead awareness training
Manual hand tools		Poison oak awareness training
Mechanized equipment		
EMM		
Geophysical instrumentation		
Global Positioning System instrumentation		
PPE		
Communications equipment		

B.4 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 the site or the particular hazard. Site Personnel must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. Site Personnel who do not understand any of these provisions should contact the Title 2 Services/Navy CLEAN MRP Site Manager for clarification. The main physical or safety hazards posed to site personnel during project activities are described below.

B.4.1 Munitions Response (Munitions Response Standards of Practice, SOP HSE&Q-610)

Munitions Response includes MEC, Chemical Warfare Material (CWM), MEC-contaminated soils and groundwater, range maintenance, ordnance demilitarization (Demil), and demining. MEC may be encountered during field activities. Sites potentially contaminated

with MEC will be screened by the UXO contractor with qualified UXO Technicians prior to and during field activities.

CH2M HILL employees who are potentially exposed to hazards associated with MEC activities shall follow the requirements described in this section regardless of the company performing the MEC operation. These requirements also pertain to UXO subcontractor personnel when CH2M HILL is providing oversight. Personnel knowledgeable of MEC safety precautions must observe these precautions at all times. They must also advise others in the vicinity of proper precautions for the protection of all personnel in an MEC danger area.

- Only qualified UXO Technicians will locate, identify, handle, remove, transport, store, or dispose of MEC items.
- The preferred and safest method for disposal of MEC is to destroy it in its original position by demolition (BIP) whenever circumstances permit. By this method, both the ordnance and the hazard it poses are eliminated in one operation.
- Munitions that have been determined to be “safe to move” by an authorized UXO Technician(s) can be transported to an approved holding area or disposal site.
- One person acting alone will never conduct operations involving contact with MEC.
- MEC must not be moved or disturbed in any way unless it has been determined to be safe to do so by qualified UXO technician(s). Operations in the vicinity of MEC should only be conducted after a complete work plan, including emergency procedures, has been established, reviewed and approved.
- Electronic equipment capable of emitting electromagnetic radiation (such as radios or cellular phones) shall not be activated in the vicinity of known or suspected electrically initiated ordnance.
- Munitions having no color-coding, incomplete color-coding, or improper color-coding are not uncommon, so color coding should not be relied on as a positive identification of ordnance.
- Inhalation of, and skin contact with, smoke, fumes, and vapors of explosives and related hazardous materials shall be avoided.
- MEC that has been exposed to fire or detonation must be considered extremely hazardous. Chemical and physical changes may have occurred to the contents, which render it more sensitive than when in its original state.
- When encountered, attempts should be made to positively identify MEC items. The item shall be carefully examined for markings and other identifying features such as shape, size, and external fittings. The item should not be moved prior to inspection.
- Ordnance shall be approached from the side because munitions may contain an ejection hazard, shaped charge explosive jet hazard, rocket motor, or fuzing sensitive to movement.
- Unnecessary personnel must not remain in the vicinity of MEC.

- Ordnance items must be considered armed and dangerous.
- Fired ammunition or ordnance should not be considered safe.
- Souvenirs shall not be collected.

B.4.2 Competent Person

UXO subcontractors are responsible for providing a competent person to oversee MEC operations. A competent person may be a SUXOS, UXOSO, UXO QC Specialist, or a UXO Technician III. Occupational Safety and Health Administration (OSHA) regulations describe a competent person as one who is capable of identifying existing and predictable hazards in the work surroundings and has the authorization to take prompt corrective measures to eliminate them.

The competent person must meet the following minimum qualification requirements:

- Be a graduate of either of one of the following: U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD; U.S. Naval EOD School, Indian Head, MD; U.S. Naval EOD School, Eglin Air Force Base, FL; EOD Assistants Course, Redstone Arsenal, AL; EOD Assistant Course at Eglin Air Force Base, FL; or a U.S. DoD-certified equivalent course.
- Have at least 10 years of combined active duty military EOD and contractor UXO experience.
- Have experience in UXO clearance operations and supervising personnel.

B.4.2.1 (Reference CH2M HILL SOP HSE&Q-307, Excavations)

- Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry.
- Follow all excavation entry requirements established by the competent person.
- Do not enter excavations where protective systems are damaged or unstable.
- Do not enter excavations where objects or structures above the work location may become unstable and fall into the excavation.
- Do not enter excavations that potentially contain a hazardous atmosphere until the air has been tested and found to be safe.
- Do not enter excavations with accumulated water unless precautions have been taken to prevent excavation cave-in.
- Use the Health and Safety Self-Assessment Checklist found in Attachment B-2 HSE&Q SOP 307 Excavations to evaluate excavations prior to entry.
- Prior to excavation crews entering any of the sites, conduct a reconnaissance and MEC avoidance activities to provide clear access routes to each site, according to the following procedures:

- Identify and clearly mark the boundaries of a clear approach path for the sampling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No one will be allowed outside any marked boundary.
- If MEC is encountered on the ground surface, clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- Conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC that may be in the subsurface. If a magnetic anomaly is encountered, assume it is MEC and divert the approach path around the anomaly. Only UXO technicians will operate the appropriate geophysical instrument and identify MEC.
- After preparing the site, employ the following approaches to excavation:
 - Remember that hand excavation is the most reliable method for uncovering MEC.
 - Consider earth-moving machinery (EMM) to excavate overburden from suspect MEC. EMM will not be used to excavate within 12 inches of suspected MEC.
 - Use a step-down or offset access method for hand or EMM excavation methods.

B.4.3 General Hazards

The general physical or safety hazards posed to personnel during project activities are:

- | | |
|--|--|
| • General hazards and housekeeping | • Utilities |
| • Hazard communications | • Working on water |
| • Shipping and transportation of chemical products | • Working near water |
| • Manual lifting | • Slips trips and falls |
| • Fire prevention | • IDW drum sampling |
| • Electrical | • Confined space entry |
| • Ladders | • Working around material handling equipment |
| • Thermal stress | • Biological hazards and controls |
| • Compressed gas cylinders | • Other hazards |

The health and safety control measures for these hazards are described below.

B.4.3.1 General Hazards and Housekeeping

- Site work must be performed during daylight hours whenever possible. Work conducted at night requires enough illumination intensity to read a newspaper without difficulty.
- Hearing protection must be worn in areas where shouting is necessary to hear someone within 3 ft.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel must be established and kept free from the accumulation of materials.

- Aisles, exits, ladders, stairways, scaffolding, and emergency equipment must be kept free from obstructions.
- Slip-resistant surfaces, ropes, and/or other devices must be provided.
- Stairs or ladders are generally required when there is a break in elevation of 19 inches or more.
- Specific areas shall 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 shall 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.

B.4.3.2 Hazard Communication SOP HSE&Q-107

In addition to complying with the above SOP 107 requirements, the Navy Contractor/Navy CLEAN Subcontractor UXOSO and the assigned MRP Site Manager will perform the following:

- Complete an inventory of chemicals brought onsite by CH2M HILL with the project-specific chemical product hazard communication form (Attachment B-4)
- Confirm that an inventory of chemicals brought onsite by contractors and subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from NAVFAC, contractors, and subcontractors for chemicals to which site personnel potentially are exposed.
- Before or as the chemicals arrive onsite, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment B-5.

B.4.3.3 Shipping and Transportation of Chemical Products

Chemicals are not expected to be needed as part of the field efforts. If chemicals are determined to be necessary, these chemicals might be defined as hazardous materials by DOT. All staff who ship the materials or transport them by road must receive 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.

B.4.3.4 Lifting HSE&Q SOP 112

These proper lifting techniques must be used when lifting any object:

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

B.4.3.5 Slips, Trips, and Falls

- Institute and maintain good housekeeping practices.
- Pick up tools and debris in the work area.
- Walk or climb only on equipment surfaces designed for personnel access.
- Be aware of poor footing and potential slipping and tripping hazards in the work area.

B.4.3.6 Fire Prevention and Control HSE&Q SOP 208

- Fire extinguishers must be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 ft. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 ft. Extinguishers must:
 - Be maintained in a fully charged and operable condition
 - Be visually inspected each month
 - Undergo a maintenance check each year
- The area in front of extinguishers must be kept clear.
- “Exit” signs must be posted over exiting doors, and “Fire Extinguisher” signs must be posted over extinguisher locations.
- Combustible materials stored outside should be at least 10 ft 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.

B.4.3.7 Electrical HSE&Q SOP 206

- All temporary wiring, including extension cords, 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
- Electrical power tools and equipment must be effectively grounded or double-insulated, UL-approved.

- Electrical power tools, equipment, and cords must be inspected for damage before use. If damaged, they shall be tagged and removed from service.
- Electrically powered equipment must be operated and maintained according to manufacturer's instructions.
- All electrical equipment, tools, switches, and outlets must be protected from elements.
- Only qualified personnel are to work on energized electrical circuits and equipment.
- Only authorized personnel are permitted to enter high-voltage areas.
- Switches, fuses, and breakers must be properly labeled.
- All 120-volt, single-phase 15 and 20 ampere receptacle outlets on construction sites, which are not part of the permanent building wiring, must be equipped with GFCIs for personnel protection.
- All portable electric generator receptacles must be effectively grounded by bonding the receptacle grounding wire to the generator frame.

B.4.3.8 Ladders (HSE&Q SOP 214, Stairways and Ladders)

- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Portable ladders must extend at least 3 ft above landing surface.
- The ladder must be faced when climbing with belt buckle between side rails.
- Both hands must be used to climb; ropes should be used to raise and lower equipment and materials.
- Straight and extension ladders must be tied off to prevent displacement.
- Ladders that may be displaced by work activities or traffic must be secured or barricaded.
- Fixed ladders greater than 20 ft in height must be provided with fall-protection devices.
- Stepladders must be used in the fully opened and locked position.
- The top two steps of a stepladder should not be used to sit or stand.
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder.

B.4.3.9 Heat Stress (HSE&Q SOP 211, Heat and Cold Stress)

B.4.3.10 Preventing and Treating Heat Stress

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, shaded area. 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 by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Provide adequate shelter or shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Monitor buddy for signs of heat stress. Persons who experience signs of heat rash or heat cramps should consult the UXOSO to avoid progression of heat-related illness.
- Cool down immediately if heat syncope (sudden fainting), heat exhaustion (hot, pale, clammy/moist skin), or heat stroke (red, hot, dry skin; loss of consciousness) is experienced and consume cool water or sports drink. Persons who experience heat syncope or heat exhaustion should also seek medical attention as soon as possible. Persons who experience heat stroke must get immediate medical attention.

B.4.3.10.1 Monitoring Heat Stress

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

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

B.4.3.11 Procedures for Locating Buried Utilities

Local Utility Mark-Out Service

Name: Caleb Romero, NAPR, Puerto Rico

Phone: (787) 865-4152, Ext. 423

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.

- Where necessary (e.g., uncertainty about utility locations), perform excavation or drilling of the upper depth interval manually.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon).
- When NAVFAC or another onsite party is responsible for determining the presence and locations of buried utilities, the NAVFAC Field Representative should confirm that arrangement.

B.4.3.12 Working Near Water

When working near water, and there is a risk of drowning, the following precautions should be taken:

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

B.4.3.13 Working on Water

- Safe means of boarding or leaving a boat or a platform must be provided to prevent slipping and falling.
- The boat/barge must be equipped with an adequate railing.
- Employees should be instructed on safe use.
- Work requiring the use of a boat must 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 must be shut off before refueling; do not smoke while refueling.

B.4.3.14 IDW Drum Sampling (HSE&Q SOP 408, Waste Management: Analysis and Characterization)

Personnel are permitted to handle or sample drums containing only investigation derived waste (IDW); handling or sampling other drums requires a plan revision or amendment approved by the HSM. The following control measures will be taken when sampling drums containing IDW:

- Minimize transportation of drums.
- Sample only labeled drums or drums known to contain IDW.

- Use caution when sampling bulging or swollen drums. Relieve pressure slowly.
- If drums contain, or potentially contain, flammable materials, use non-sparking tools to open.
- Do not use picks, chisels, and firearms to open drums.
- Reseal bung holes or plugs whenever possible.
- Avoid mixing incompatible drum contents.
- Sample drums without leaning over the drum opening.
- Transfer the content of drums using a method that minimizes contact with material.
- PPE and air monitoring requirements specified in Sections B.6 and B.7 must address IDW drum sampling.
- Spill containment procedures specified in Section B.9 must be appropriate for the material to be handled.

B.4.3.15 Confined Space Entry (HSE&Q SOP 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, the HSM must be contacted to develop the required entry permit.

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

B.4.3.16 Working Around Material Handling Equipment (HSE&Q SOP 306, Earthmoving Equipment)

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.
- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Because heavy equipment may not be equipped with properly functioning reverse signal alarms, never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers, and is equipped with a firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.

- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.

B.4.3.17 Biological Hazards and Controls

B.4.3.17.1 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 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.

B.4.3.17.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

B.4.3.17.3 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 length. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permethrin and spray skin only with DEET. 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). Indicators of Lyme disease: a rash might appear that looks like a bullseye with a small welt in the center. Indicators of RMSF: a rash of red spots might appear 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.

B.4.3.17.4 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 UXOSO and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

B.4.3.17.5 Bloodborne Pathogens

Exposure to bloodborne pathogens may occur when rendering first aid or cardio-pulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams con-

taining potentially infectious material. Exposure controls and PPE are. Hepatitis B vaccination must be offered where exposure is a possibility.

B.4.3.17.6 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, especially during surface water and sediment sampling activities; 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.

Toxic native plants include manchineel, castor bean, *Comocladia*, *Tragia volubilis*, *Malpighia fucata*, *Cordia ruplicola*, *Pictetia aculeate* and *Croton*. Manchineel (*Hippomane 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*) also has sap that can cause skin lesions and is found in previously disturbed coastal areas. *Comocladia* is a small shrub found in limestone soils such as the eastern part of the LIA, it has toxic sap and can cause allergic reactions. Another invasive shrub is *Croton discolor*. This small shrub rapidly invades cleared or disturbed areas and can cause respiratory allergies.

Several plants on Vieques are known to be skin irritating (Attachment B-9). They include:

- *Comocladia dodonaea* - Commonly known as Christmas-bush, this 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.
- *Croton discolor* - This plant 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 leaves. The leaves have a tendency to stick to your clothing because of the hairs of the leaves.
- *Tragia volubilis* - This plant 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.



Comocladia dodonaea



Croton discolor



Tragia volubilis

- *Malpighia fucata* – Commonly known as palo bronco, this evergreen shrub (or small tree) is identified by its opposite, blunt-pointed leaves. Upper leaf surfaces are green and lower surfaces are a paler green with many yellowish, needle-like hairs. Flowers have white/pink petals.
- *Cordia rupicola* – This is a small shrub with red fruit. Previously thought to be endemic to Puerto Rico and known only from one area, it has recently been reported from the island of Anegada's wooded hills among low dense brush.
- *Pictetia aculeate* – Commonly known as tachuelo, gumbo limbo, or turpentine tree, this tree has a reddish, peeling bark and produces an intensely aromatic resin not unlike the pine tree resins that are used to produce true turpentine.

*Malpighia fucata**Cordia rupicola**Pictetia aculeate*

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.

Hazardous Fauna. Mosquitoes and sand flies 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.

No poisonous snakes are indigenous to Puerto Rico, only non-poisonous snakes such as the Boa Constrictor. Feral (wild) dogs and cats have been observed.

Mongoose, 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. Please note that personnel performing water sampling should refrain from using DEET because the breakdown products can show up as false positive results in lab analysis. 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 prescription 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°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.

Fire Ant Bites. Fire ants 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. It is possible, however, 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.

B.4.3.18 Radiological Hazards and Controls

The Navy acknowledged inadvertently firing 263 rounds of depleted uranium (DU) ammunition in 1999. An intensive range sweep was initiated at that time and many of the DU rounds were recovered. The 25mm PGU-20 projectiles contain a small DU core about the size of a .50 caliber bullet. DU oxidizes rapidly when exposed to air. Oxidized DU is a greenish-yellow, powdery substance.

If a suspected DU projectile is encountered during MEC operations work will stop. UXO personnel will scan the suspected item with a radiation detection instrument. If the item is benign work will continue. If the item is radioactive the FS will refer to the contractors Health and Safety Program, Program and Training Manual, and Health and Safety Program Radiation Protection Manual for SOPs in contaminated areas.

If DU is suspected notify the SUXOS, UXOSO and MRP Site Manager immediately, and contact the **Radiological Affairs Support Office (RASO)**. **The contact information is: Steven W. Doremus, Ph.D. Director, Environmental Radiation Programs NAVSEADET RASO, (757) 887-7745, DSN 953-7745, fax (757) 887-3235.**

The following equipment and personal protective equipment (as per U.S. Army, Industrial Operations Command, Pamphlet 700-48) will be available on-site in the case that UXO personnel are directed to remove and secure the DU to maintain the work schedule: coveralls, leather gloves, nitrile gloves, protective goggles, eye wash, hand cleanser, plastic bags (4 mil), metal container (30 gal, 55 gal, or ammunition box, swabs, tape to seal bags, marking pens, labels, and Radiac meter AN VDR2 6665-01-222-1425 (or similar). Direct surface or swab measurements with the Radiac meter can be performed if directed by support center.

B.4.3.19 Chemical Warfare Materials

CWM is not expected at these work sites. If, at any time during the fieldwork, suspected CWM is encountered, the UXO team must stop all work activities immediately. Field sampling teams must withdraw from the site along the cleared approach paths, away from the area where the suspected CWM is found. The UXO team will immediately report the chemical event to the FS, who will in turn notify the NAVFAC RPM.

The NAVFAC RPM in coordination with the DoI will request assistance through the US Army's 52d Ordnance Group at Fort Gillem, GA (404) 469-3333. Should the 52nd Ordnance group be non-responsive, the Chemical Warfare Design Center (296-895-1180) will be contacted.

A team of at least two UXO-qualified personnel will secure the suspected CWM site and standby in an upwind location until relieved by a government representative. The initial exclusion zone for chemical weapons is 450 meters in all directions per US Army FM 9-15, Explosive Ordnance Disposal Service and Unit Operations.

B.4.3.20 Contaminants of Concern

VNTR: Previous investigations included the collection of soil and groundwater samples for VOCs, SVOCs, PCBs, and metals analysis. Parameters exceeding conservative long-term exposure risk based screening criteria in surface soils included aluminum, arsenic, iron,

lead, thallium, vanadium, 2,4-dinitrotoluene, 2,4,6-trinitrotoluene, and hexahydro-1,3,5-trinitro-1,3,5,7-tetrazocine. In subsurface soils, the metals arsenic and barium exceeded screening criteria. Parameters exceeding screening criteria in groundwater included aluminum, barium, cadmium, chromium, iron, manganese, nickel, selenium, vanadium, and zinc. In addition, various small MEC and spent munitions were discovered at the site. The metals detected at the site were detected at concentrations indicative of background concentrations for the island. Table B-3 shows potential exposure routes.

TABLE B-3
Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section B.6.	Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections B.6 and B.7, 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).
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B.5 Project Organization and Personnel

B.5.1 Medical Surveillance and Training HSE&Q SOP 113, Medical Monitoring)

Site personnel must 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 Hazard Communication and Safety Awareness, a 10 hour Construction Safety Awareness class, the 40 hour hazardous Waste Worker training, Initial Safety coordinator training, Safety coordinator – Construction training, Safety Coordinator – Hazardous Waste training, Dangerous Goods Shipping, the Waste Management Course, Bloodborne Pathogens training, Fire Extinguisher, CPR & 1st Aid and have documented requisite field experience. Employees designated “FA-CPR” are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least two (2) FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Note: Lead awareness training is provided in Attachment B-7 of this plan. The quiz must be completed successfully by project personnel exposed to lead during MEC operations.

Pregnant employees are to be informed of and are to follow the procedures in the contractor’s SOP, Reproduction Protection, including obtaining a physician’s statement of the employee’s ability to perform hazardous activities before being assigned field work.

B.5.2 Field Team Chain of Command and Communication Procedures

Client

Contact Name: Chris Penny, RPM

Phone: (757) 322-4815

Facility Contact Name: Oscar Diaz, Manager, Vieques National Wildlife Refuge (DoI)

Phone: (787) 741-2138

Title 2 Services/Navy CLEAN Contractor

Vieques Activity Manager: CH2M HILL, John Tomik

Project Manager: CH2M HILL, Stacin Martin

Health and Safety Manager: Michael Goldman

MRP Director: CH2M HILL, Tim Garretson

MRP Site Manager: CH2M HILL, Cliff Walden

Investigation/Removal Action Contractors

Project Manager:

UXOSO:

Phone:

All site personnel (contractors and subcontractors) listed above are covered by this plan and must be provided a copy of it. This plan does not, however, address hazards associated with the tasks and equipment in which the subcontractor has expertise (e.g., MEC clearance).

Contractors and subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to the Title 2 Services Contractor for review before the start of field work. Subcontractors must comply with the established Health and Safety Plan(s). The NAVFAC Field Representative or Title 2 Services/Navy CLEAN MRP Site Manager will verify that contractor and subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). The Title 2 Services/Navy CLEAN Contractor's oversight does not relieve contractors and subcontractors of their responsibility for effective implementation and compliance with the established plan(s). The CH2M HILL UXOSO or 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). HSE&Q SOP 215, Contracts, Subcontracts and HSE&Q Management Practices will be followed.

The Title 2 Services/Navy CLEAN Contractor will continuously endeavor to observe contractor and subcontractors' safety performance. This endeavor should be reasonable, and should include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. The Title 2 Services/Navy CLEAN Contractor is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the NAVFAC Field Representative or MRP Site Manager is responsible for confirming contractor and subcontractor performance against both contractor and subcontractor's Site-Specific Health Plan.

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

- Brief personnel on the provisions of this plan, and require them to sign the Employee Signoff Sheet included in Attachment B-1.
- Ask personnel 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 contractor/subcontractor safety representative and require corrective action; the

contractor/subcontractor is responsible for determining and implementing necessary controls and corrective actions.

- When repeat non-compliance/unsafe conditions are observed, notify the contractor/subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected site personnel, notify the 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 the project field logbook, daily reports, or other records.

Contractors

The Title 2 Services Contractor is not responsible for the health and safety or means and methods of Contractors who contracted directly to NAVFAC, and must never assume such responsibility through actions (e.g., advising on safety and health issues). In addition to this plan, the Title 2 Services Contractor staff should review contractor safety plans so staff remain aware of appropriate precautions that apply to the Title 2 Services Contractor. Except in unusual situations when conducted by the HSM, the Title 2 Services Contractor must never comment on or approve contractor safety procedures.

Safety and health-related communications with contractors should be conducted as follows:

- Ask the contractor to brief the Title 2 Services Contractor employees and subcontractors on the precautions related to the contractor's work.
- When an apparent contractor non-compliance/unsafe condition or practice poses a risk to the Title 2 Services Contractor employees or subcontractors:
 - Notify the contractor safety representative.
 - Request that the contractor determine and implement corrective actions.
 - If needed, stop affected work until contractor corrects the condition or practice. Notify NAVFAC, Project Manager, and HSM as appropriate.
- If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative. The Title 2 Services Contractor's obligation is limited strictly to informing the contractor of our observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative. The Title 2 Services Contractor's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of our observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- Document all oral health and safety related communications in the project field logbook, daily reports, or other records.

B.6 Personal Protective Equipment (PPE) (HSE&Q SOP 117, Personal Protective Equipment)

Table B-5 details the protective equipment necessary for various site tasks.

TABLE B-5
Personal Protective Equipment

PPE SPECIFICATIONS ^a				
Task	Level	Body	Head	Respirator ^b
General site entry Surveying MEC surveys and removals Observation of material loading for offsite disposal Oversight of remediation and construction	D	Work clothes; leather work boots ^g ; work glove.	Hardhat ^c Safety glasses Ear protection ^d	None required
Tasks requiring MEC anomaly reacquisition in contamination area	Modified D	Work clothes or cotton coveralls Boots: chemical-resistant boots ^g OR steel-toed, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile and outer chemical- resistant nitrile gloves.	Hardhat ^c Safety glasses Ear protection ^d	None required
Tasks requiring upgrade or downgrade for reasons presented below	C	Coveralls: Polycoated Tyvek® Boots: chemical-resistant boots ^g OR leather work boots ^g with outer rubber boot covers Gloves: Inner surgical-style nitrile and outer chemical- resistant nitrile gloves.	Hardhat ^c Splash shield ^c Ear protection ^d Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent.
Reasons for Upgrading or Downgrading Level of Protection				
Upgrade ^f		Downgrade		
<ul style="list-style-type: none"> Request from individual performing tasks Change in work tasks that will increase contact or potential contact with hazardous materials Occurrence or likely occurrence of gas or vapor emission Known or suspected presence of dermal hazards Instrument action levels (Section A.7) exceeded 		<ul style="list-style-type: none"> New information indicating that situation is less hazardous than originally thought Change in site conditions that decreases the hazard Change in work task that will reduce contact with hazardous materials 		

^a Modifications are as indicated.

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

^c Hardhat and splash-shield areas are to be determined by the UXOSO. UXO technicians are required to wear hard hats except when investigating suspect MEC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 ft 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 percent, or if organic vapor measurements are > midpoint of Level C range (refer to Section A.7)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

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

^g Steel-toed boots are not required during surface geophysical mapping.

B.7 Air Monitoring/Sampling

B.7.1 Air Monitoring Specifications

Table B-6 shows relevant air monitoring specifications.

TABLE B-6
Air Monitoring Specifications

Instrument	Tasks	Action Levels ^a		Frequency ^b	Calibration
PID: Organic Vapor Monitor (OVM) with 10.6eV lamp or equivalent	MEC anomaly reacquisition in contaminated areas	0 – 1 parts per million (ppm) >1 – 5 ppm > 5 ppm	Level D Level C Stop Work	Initially and periodically during task	Daily

^a Action levels apply to sustained breathing-zone measurements (2 minute duration) above background.

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

B.7.2 Calibration Specifications

Table B-7 shows calibration specifications.

TABLE B-7
Calibration Specifications

PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing

B.7.3 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 VOCs. Contact the HSM immediately if these contaminants are encountered.

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

B.8 Decontamination

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

B.8.1 Decontamination Specifications

Table B-8 shows the general decontamination specifications.

TABLE B-8
Decontamination Specifications

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

B.8.2 Diagram of Personnel Decontamination Line

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

Figure B-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the UXOSO or MRP Site Manager to accommodate task-specific requirements.

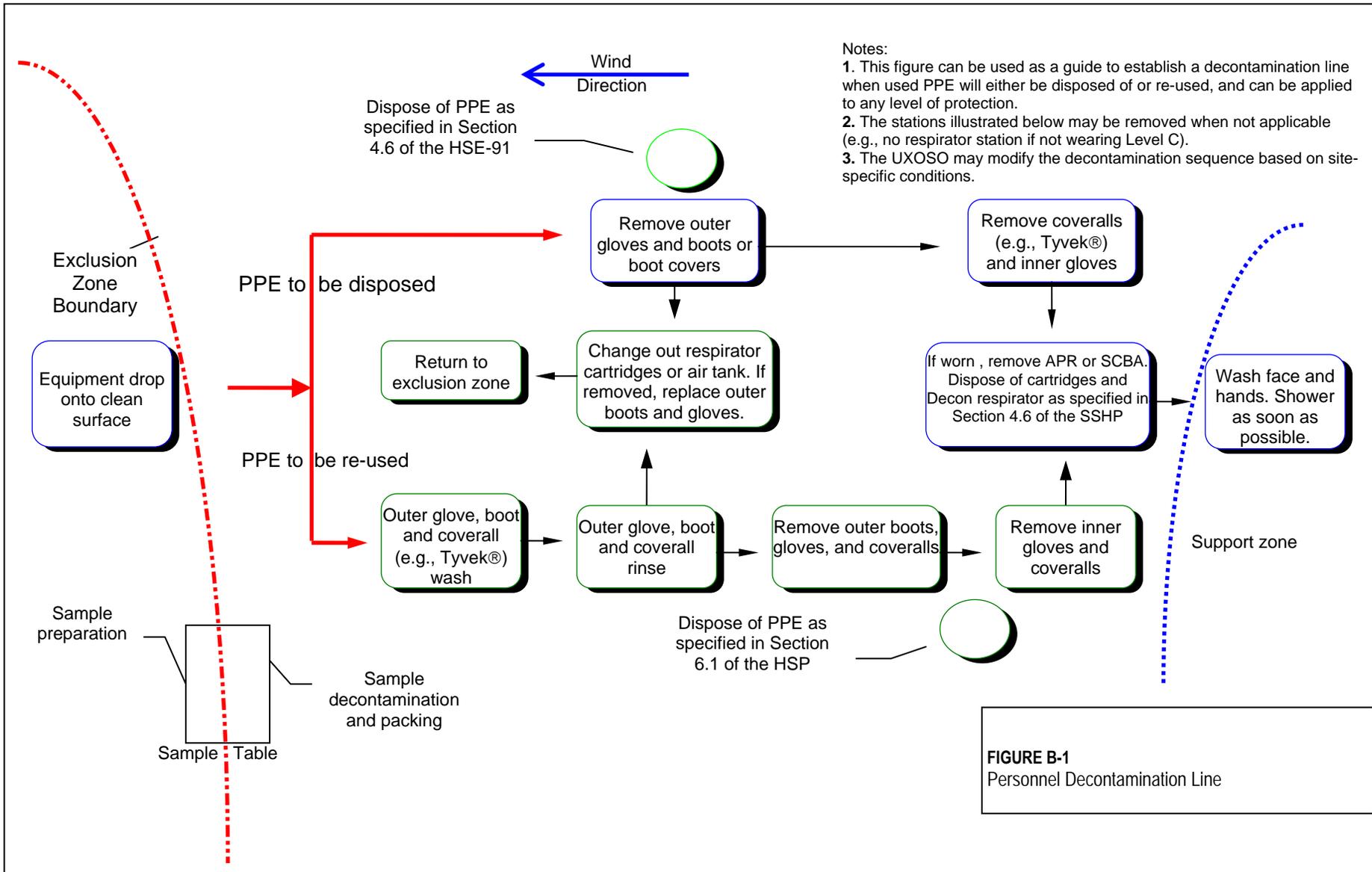


FIGURE B-1
Personnel Decontamination Line

B.9 Spill Prevention and Containment Procedures

This section establishes minimum site requirements. Navy Contractors and Navy CLEAN Subcontractors are responsible for spill prevention and control related to their operations. Contractors' written spill prevention and control procedures must be consistent with this plan. All spills must be reported to the SUXOS, UXOSO, site managers, and PM.

B.9.1 Spill Prevention

All fuel and chemical storage areas will be properly protected from onsite and offsite vehicle traffic. Fuel storage tanks must be equipped with secondary containment. Fuel tanks must be inspected daily for signs of leaks. Accumulated water must be inspected for signs of product before discharge.

Incidental chemical products must be properly stored, transferred, and used in a safe manner. If chemical product use occurs outside areas equipped with spill control materials, adequate spill control materials must be maintained.

B.9.2 Spill Containment and Control

Spill control materials will be maintained in the support zone and at fuel storage and dispensing locations. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include taking the following actions:

- Immediately warn any nearby personnel and notify the work supervisor.
- Assess the spill area to ensure that it is safe to approach. Activate site evacuation signal if the spill presents an emergency.
- Ensure that any nearby ignition sources are immediately eliminated.
- If it can be done safely, stop the source of the spill.
- Establish site control for the spill area.
- Use proper PPE in responding to the spill.
- Contain and control spilled material through the use of sorbent booms, pads, or other materials.

B.9.3 Spill Clean-up and Removal

All spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be drummed, labeled, and properly stored until material is disposed of. Contaminated material will be disposed of according to applicable federal, state, and local requirements. Contact the regulatory compliance person for the project or the program for assistance.

B.10 Site Control Plan

B.10.1 Site Control Procedures

- The Contractor UXOSO will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for onsite safety briefing include a general discussion of this section, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, and emergencies.
- The UXOSO 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 contractor's SOP, 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 UXOSO in appropriate level of protection.
- The UXOSO is to conduct periodic inspections of work practices to determine the effectiveness of this plan: refer to Sections B.2 and B.3. Deficiencies are to be noted, reported to the HSM, and corrected.

B.10.2 Hazwoper Compliance Plan

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 B.2.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section B.2.1.2 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 onsite, or while non-Hazwoper-trained staff are working near Hazwoper activities. Other data (e.g., soil) also must document that no potential exists for exposure. The HSM must approve the interpretation of these data. Subsections 6.4.20 and 6.7 address contaminant data and air sampling requirements, respectively.

- When non-Hazwoper-trained personnel are at risk of exposure, the NAVFAC Field Representative or MRP Site Manager must post the exclusion zone and inform non-Hazwoper-trained personnel of the following:
 - 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 a potential for exposure to health and safety hazards no longer exists.
- 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.

B.11 Emergency Response Plan

B.11.1 Pre-Emergency Planning

The UXOSO and MRP Site Manager will perform the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with all onsite parties, the facility, and local emergency service providers as appropriate. These tasks include:

- 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 NAVFAC, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.

- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The UXOSO and MRP Site Manager will evaluate emergency response actions and initiate appropriate follow-up actions.

B.11.2 Emergency Equipment and Supplies

The UXOSO should mark the locations of emergency equipment on the site map and post the map, as illustrated in Table B-9.

TABLE B-9
Sample Supply List and Locations

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

B.11.3 Incident Response

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

- Shut down 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.
- **No attempts will be made to extinguish fires located within the impact areas.**
- The UXOSO cognizant of the fire's location will assess the affect on egress routes, immediately notify all other contractors and subcontractors and make recommendations to their respective UXOSO's as to the safest route to follow, or in the case that no safe route exists, an alternate plan of evacuation.

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

B.11.4 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 medical consultant. The UXOSO will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room. During non-emergencies, follow these procedures, as appropriate:

- Notify appropriate emergency response authorities listed in Section B.11.8 (e.g., 911).
- 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.
- Report incident as outlined in Section B.11.7.

B.11.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the UXOSO and MRP Manager before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The UXOSO or MRP Site Manager and a “buddy” will remain onsite after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The UXOSO or MRP Site Manager will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- If the need of rapid evacuation in case of severe trauma exists, the currently approved helicopter evacuation plan will be followed. This plan includes primary contact communications via satellite phone (maintained and tested weekly by the three (3) primary contractor UXOSO’s) and secondary communications through 2-way radios with Aeromed (primary) helicopter evacuation agency. Cell phones may be used as a supplementary method if all other communications fail.

B.11.6 Evacuation Signals

Table B-10 provides examples of possible evacuation signals.

TABLE B-10
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.

B.12 Incident Notification and Reporting/Injury Management

- In the event of an emergency, immediately call..... **911**.
 - Severe Bleeding
 - Loss of consciousness
 - Chest Pain
 - Broken bones
- All other injuries or illness' (even those that are minor and may only require First Aid) which occur at work, while on business travel or commute must be reported to your supervisor and the Vieques MRP PM immediately.
- After informing their supervisor and the PM, the injured employee calls CH2M HILL's contracted Occupational Nurse.

24-hour CH2M HILL Emergency Nurse Assistance

800/756-1130

- The Occupational Injury Nurse listens to the injured employee to understand the injury/illness.
- Employee is provided guidance on appropriate treatment options (triage).
- If instructed to visit a medical facility by the Occupational Nurse, the Supervisor is responsible for instructing the injured employee to take a copy of the **CH2M HILL Initial Medical Treatment Form (Attachment # 15)** with them to the physician, clinic or hospital.
- Appropriate treatment details are handled by the Occupational Injury Nurse, and Workers Compensation Groups.
- Nurse communicates and troubleshoots with and for employee through full recovery.
- 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.

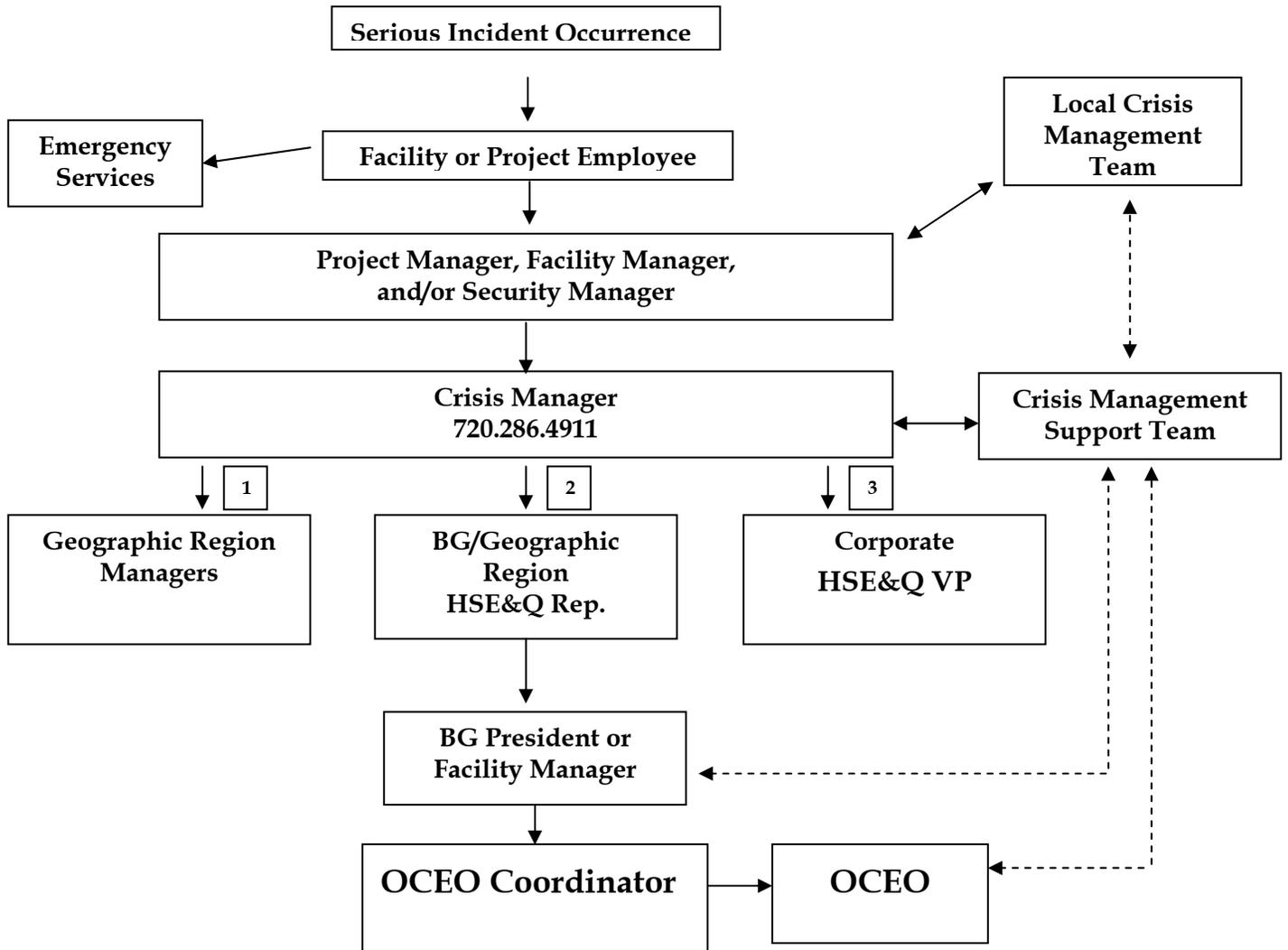
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to NAVFAC as required in contract.

HSE&Q-111 Incident Reporting and Investigation, is incorporated in this plan as Attachment B-13 HSE&Q-601 Serious Incident Reporting Process, is incorporated in this plan as Attachment B-14. HSE&Q-124 Injury Management/Return-to-Work, is incorporated as Attachment B-15.

B.13 Serious Incident Reporting

- Serious Incidents must be reported in accordance with CH2M HILL Standard of Practice HSE-601, *Serious Incident Reporting Process* (Attachment B-14 to this plan), immediately. Serious incidents are those that involve any of the following:
 - Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
 - Kidnap/missing person
 - Acts or threats of terrorism
 - Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage.
 - Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment

B.14 Serious Incident Notification Chart



Legend:

- > Direct line of communication
- ←----- Indirect line of communication

B.14.1 Emergency Contacts

24-hour CH2M HILL Occupational Nurse: (800) 756-1130	
Medical Emergency - 911 <i>911 Operators on Vieques DO speak English</i> Local Ambulance #: - 911 Hospital (Non-Emergency)#: (787) 741-2151	CH2M HILL Medical Consultant Health Resources Dr. Jerry H. Berke, M.D., M.P.H. 600 West Cummings Park, Suite 3400 Woburn, MA 01801-6350 1-781-938-4653 After hours:1-800-350-4551 (After hours calls will be returned within 20 minutes)
Fire/Spill Emergency - 911 Local Fire Dept (Non-Emergency)#: (787) 741-2111	Injury Management Administrator/Occupational Medical Consultant 1-800-756-1130
Security & Police - 911 FWS Law Enforcement # (787) 457-0082 (Bill Wolfrum) Local Police (Non-Emergency)#: (787) 741-2020	Chief Health, Safety, Environment & Quality Officer and Senior VP: Keith Christopher Phone: (703) 471-1441
Utilities Emergency Water: Gas: Electric:	Regional Health and Safety Program Manager (RHSPM) Mike Goldman: Office 770/604-9182 x 396 Cell: 770 331- 3127, Home: (404) 872-6081 Pager: (888) 856-9114
Title II Services MRP Site Manager Name: Cliff Walden Cell: 334-462-3946 Removal Action Contractor Site Safety Coordinator Name: Phone:	Emergency Response Coordinators Cliff Walden-Cell: 334-462-3946 Dennis Ballam-Cell: 757-270-0812
Title II Services Contractor Project Manager Name: Stacin Martin Phone: (757) 967-8710/(757) 671-8311 Ext. 435, Cell (571) 215-4198 Investigation/Removal Action Contractor Project Manager Name: Phone:	Regional Human Resources Department Rosemary Duvall: 561/515-6698 Corporate Human Resources Department John Monark/COR Phone (303) 771-0900
Federal Express Dangerous Goods Shipping Phone: (800) 238-5355	Worker's Compensation and Auto Claims Zurich Insurance Company: (800) 382-2150. Report fatalities and report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

NAVFAC RPM: Chris Penny

NAVFAC Field Rep: Carlton Finley

Phone: (787) 509-3071

Federal Agency/Contact Name: USFWS/Mr. Oscar Diaz

Phone: (787) 741-2138

Federal Agency/Contact Name: USEPA-CERCLA/Mr. Daniel Rodriguez

Phone: (787) 741-5201

Federal Agency/Contact Name: USEPA-RCRA/Mr. Tim Gordon

Phone: (212) 637-4167

State Agency/Contact Name: PREQB/Ms. Yariisa Martinez

Phone: (787) 365-8573

Local Agency/Contact Name:

Phone:

Naval Ordnance Safety and Security Activity (NOSSA)

Phone: (301) 744-4450

NAVEODTECHDIV

Phone: (301) 744-4069 or
(877) 363-4636

Radiological Affairs Support Office (RASO)

Phone: (757) 887-7745

USACE Military Munitions Center of Excellence

Phone: (256) 895-1200

AEROMED Medical Evacuation

Phone: (787) 756-3480

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

Facility Alarms: N/A

Evacuation Assembly Area(s):

Facility/Site Evacuation Route(s):

Hospital Name: Centro de Salud Familiar Susana Centeno

Hospital Phone #: (787) 741-2151

Address: Carr. 997 Kilometer 1 Ht. 0

Bo. Destino

Vieques Puerto Rico

Directions to Hospital

Exit the VNTR via the main road passing Camp Garcia on the right. At the intersection of Hwy 997 turn right. Head north on Hwy 997 for approximately 2 miles. The hospital is on the right.

If you reach the intersection of Hwy 997 and Hwy 200 you have driven too far north.

Important Notes on Medical Emergencies

1. Always call for an ambulance, but keep in mind access to the range is limited by gates and terrain. It may be necessary for the field team to transport the patient to the hospital, or possibly send someone to meet the ambulance and guide them to the site of the emergency.
 2. **The hospital is open 24hrs, however the ability to treat traumatic injuries is limited. Serious cases are flown to San Juan's Centro Medico Hospital via AEROMED helicopter. The entire AEROMED process (evaluation, notification, and transport) will take at least 1 hour. See attached map for Landing Zones (LZs). When contacting AEROMED identify appropriate LZ by appropriate designation and use road flare to mark pick-up point.**
-

B.15 Behavior Based Loss Prevention System

A Behavior Based Loss Prevention System (BBLPS) has been implemented on this project. 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 to implement the BBLPS on this project include:

- Job Hazard Analysis (JHA)

- Pre-Task Safety Plans (PTSP)
- Safe Work Observations (SWO)
- Loss and Near Loss Investigations (NLI)

The MRP Site Manager serves as the Safety Coordinator (SC) and is responsible for implementing the BBLPS on the project site. When a separate individual is assigned as the SC, the SC is delegated authority from the MRP Site Manager to implement the BBLPS on the project site, but the MRP Site Manager remains accountable for its implementation. The MRP Site Manager/Safety Coordinator shall only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

B.15.1 Job Hazard Analysis

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

Job Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the JHA form provided in Attachment B-10. The JHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

An JHA shall be prepared for all field activities performed by CH2MHILL and subcontractor during the course of the project by the MRP Site Manager/SSC. Hazard Controls (Section B-4) of the HSP, the Hazard Analysis Table (Table B-1), and applicable CH2M HILL Standards of Practice (SOPs) should be used as a basis for preparing these JHAs.

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

B.15.2 Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/JHAs, that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in Attachment B-11, 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 JHA. 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.

B.15.3 Safe Work Observations

Safe Work Loss-Prevention Observations (SWO's) shall be conducted by MRP Site Managers/SCs for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. SWO's are a tool to be used by supervisors 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. MRP Site Managers/SCs shall perform at least one SWO each week for a tasks/operations addressed in the project-specific HSP or JHA. The MRP Site Managers/SCs shall complete the SWO form in Attachment B-12 for the task/operation being observed.

B.15.4 Loss/Near Loss Investigations

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

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

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

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

MRP Site Managers/SSCs shall perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations shall be performed using the following incident investigation forms provided in Attachment B-13:

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

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

B.16 Approval

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

B.16.1 Original Plan

Written By: Stacin Martin

Date: September 2005

Approved By: _____

Date: _____

B.16.2 Revisions

Revisions Made By: Stephen Brand Date: October 2006

Revisions to Plan: Added BBLPS and modified emergency contact requirements.

Revisions Approved By: Michael Goldman CIH, CSP, CHMM Date: November 13, 2006

Attachments

- Attachment B-1: Employee Signoff Form – Site Safety and Health Plan
- Attachment B-2: CH2M HILL HSE&Q-307 Excavations
- Attachment B-3: CH2M HILL HSE&Q-610 Explosives Usage and Munitions Response (MR)
- Attachment B-4: Project Specific Chemical Product Hazard Communication Form
- Attachment B-5: Chemical Specific Training Form
- Attachment B-6: Applicable Material Safety Data Sheets
- Attachment B-7: Lead Awareness Training
- Attachment B-8: Landing Zone Map for Medical Evacuation Helicopter
- Attachment B-9: Toxic Flora
- Attachment B-10: Job Hazard Analysis
- Attachment B-11: Pre-Task Safety Plan
- Attachment B-12: Safe Work Observations
- Attachment B-13: HSE-111 Incident Reporting and Investigation
- Attachment B-14: HSE-106 Serious Incident Reporting Process
- Attachment B-15: HSE-124 Injury Management

ATTACHMENT B-2: CH2M HILL HSE&Q-307 Excavations

CH2MHILL

Excavation and Trenching Safety Enterprise Standard Operating Procedure HSE&Q-307

1.0 Purpose

This Enterprise Standard Operating Procedure (SOP) outlines the requirements that CH2M HILL legal entities and business groups (BGs) must comply with when performing excavation and trenching activities.

This SOP provides information about the spectrum of hazards and issues to be addressed during each phase of a project associated with excavation operations. Excavation hazards addressed in this SOP include exposure to cave-ins, falls, falling objects, hazardous atmospheres, unstable structures, and excavating into underground utilities.

2.0 Scope and Application

This SOP applies enterprise-wide to all CH2M HILL legal entities and BGs, their employees, subcontractors, and their lower-tier subcontractors that operate in the United States (U.S.) and internationally.

Some state's Occupational Safety and Health Administration (OSHA) plans may have more stringent requirements. Contact the appropriate Responsible BG health and safety manager (RHSM) to address these specific requirements. This SOP should be used as a starting point for international operations, but country-specific health and safety (H&S) regulations (that is, Canada or Australia) shall prevail, and a country-specific SOP should be developed to comply with these specific H&S regulations.

This Enterprise SOP applies when:

- CH2M HILL employees enter excavations, regardless of the company responsible for excavation safety (CH2M HILL, subcontractor, or third party contractor)
- CH2M HILL self-performs excavation activities; and/or,
- CH2M HILL provides oversight of subcontractor's excavation activities

This SOP does not apply to excavation activities in areas with known or potential ordnance explosives (OE)/unexploded ordnance (UXO) hazards. These requirements are addressed in the OE Enterprise SOP.

2.1 Applicable Enterprise SOPs

Other Enterprise SOPs that may be applicable to excavation activities include the following:

- The requirements for operating and/or exposure to earthmoving equipment are contained in the “Earthmoving Equipment” SOP.
- Excavation activities that are performed on sites with known or potential OE/UXO hazards must implement additional excavation precautions found in the OE Enterprise SOP.
- Soil suspected to be contaminated should be sampled and analyzed for characterization prior to excavation under procedures described in the “Waste Analysis and Characterization” SOP.
- A Stockpile Management Plan should be prepared as discussed in the “Stockpiles” SOP to address country, state, and local stockpiling requirements.
- A Storm Water Pollution Prevention Plan (SWPPP) or an Erosion and Sediment Control Plan may be required, as discussed in the “Wastewater/Storm Water” SOP, where construction activities cover greater than a threshold area. Consult your Environmental Manager (EM)
- Stockpiles may require liners and covers and excavations may require silt fences, covering, or other best management practices (BMPs) to control erosion or runoff.
- Fugitive dust and noise must be monitored and suppressed where necessary.
- All wastes generated shall be characterized prior to excavation.
- Hazardous waste shall be managed and disposed in accordance with the “Onsite Waste Management” SOP, and the “Offsite Waste Management” SOP.
- If excavation involves hazardous wastes, the “Decontamination” SOP shall be followed. No potentially contaminated equipment shall be permitted to leave the work site.

3.0 Definitions

The following definitions are used in this excavation and trenching SOP.

3.1 Benching

Benching is a method of protecting personnel from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

3.2 Company Responsible for Excavation Safety

The party that has direct control over the excavation operations is responsible for excavation safety. This could be CH2M HILL, a subcontractor, or an independent third party. When CH2M HILL self-performs excavation operations, CH2M HILL assumes responsibility for excavation safety. When CH2M HILL hires a subcontractor to perform an excavation operation, the subcontractor assumes responsibility for excavation safety. When

CH2M HILL employees must enter excavations on projects controlled by an independent third party contractor, the third party contractor assumes responsibility for excavation safety.

3.3 Competent Person

A competent person is one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The company responsible for excavation safety designates the excavation-specific competent person.

3.4 Excavation

An excavation is any man-made cut, cavity, trench, or depression in an earth surface that is formed by earth removal.

3.5 Hazardous Atmosphere

A hazardous atmosphere is one that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful, may cause death, illness, or injury. Specific examples of hazardous atmospheres are provided below.

- Oxygen-deficient atmospheres contain less than 19.5 percent oxygen and can result in a range of symptoms, from dizziness to unconsciousness, and even death at extremely low levels.
- Oxygen-enriched atmospheres contain greater than 23.5 percent oxygen and can increase the flammability of combustible materials.
- Explosive atmospheres contain flammable gases that exceed 10 percent of the lower explosive limit (LEL).
- Carbon monoxide from the exhausts of earthmoving equipment can collect in excavations. Carbon monoxide causes oxygen starvation and can be fatal at a concentration of 1 percent [10,000 parts per million (ppm)] after a 1-minute exposure. Ventilation or respiratory protection is required when carbon monoxide levels exceed 35 ppm.
- Toxic atmospheres may develop depending on the level of contamination in the soil. Refer to the site-specific health, safety and environment (HS&E) plan or field safety instructions for more details.

3.6 Independent Third Party Contractor

An independent third party contractor has no contractual relationship with CH2M HILL and is contracted directly to the owner.

3.7 Protective Systems

Protective systems provide a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems and other systems that provide the necessary protection.

3.8 Shielding

Shielding is a structure that is able to withstand the forces imposed on it by a cave-in, thereby protecting personnel within the structure. Shields can be permanent structures or they can be designed to be portable and moved as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with local regulatory agency requirements. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

3.9 Shoring

A structure such as a metal hydraulic, mechanical, or timber shoring system supports the sides of an excavation and is designed to prevent cave-ins.

3.10 Sloping

Sloping is a method of excavating in which the sides of an excavation are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies depending on such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

3.11 Stable Rock

Stable rock is natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

3.12 Trench

A trench is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters). An excavation is also considered to be a trench if forms or other structures are installed or constructed in the excavation that reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 meters) or less (measured at the bottom of the excavation).

3.13 Type A Soil

Type A soils are cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (14,629 kilograms per square meter) or greater. Type A soils include clay, silty clay, sandy clay, clay loam, caliche, hardpan, and sometimes silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; if it is subject to vibration from heavy traffic, pile driving, or similar activities; if it was previously disturbed; or if it is part of a sloped, layered system in which the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

3.14 Type B Soil

Type B soils are cohesive soils with an unconfined compressive strength greater than 0.5-ton per square foot (4,876 kilograms per square meter) but less than 1.5 tons per square foot (14,629 kilograms per square meter). Type B soils include granular cohesionless soils such as angular gravel, silt, silt loam, sandy loam, and sometimes silty clay loam and sandy clay loam; previously disturbed soils that are not Type C; fissured soils and soils subject to vibration that would otherwise be classified as Type A; dry rock that is not stable; and material that is part of a sloped, layered system in which the layers dip on a slope less steep than four horizontal to one vertical (4H:1V).

3.15 Type C Soil

Type C soils are cohesive soils with an unconfined compressive strength of 0.5-ton per square foot (4,876 kilograms per square meter) or less. Type C soils include granular soils such as gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system in which the layers dip into the excavation at a slope of four horizontal to one vertical (4H:1V) or steeper.

4.0 Roles and Responsibilities

The following sections outline the roles and responsibilities for individuals when using this procedure.

4.1 Business Group Health and Safety Leads

The BG H&S Leads are responsible for implementing this Enterprise H&S SOP for all projects in their BG. The BG HSE&Q Lead also has the authority to approve deviation from this standard to accommodate local requirements.

4.2 Project Manager

The CH2M HILL Project Manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the H&S management process. The PM has overall H&S management responsibility, but may delegate specific tasks to other project staff. The PM retains ultimate H&S responsibility for the project.

4.3 Site Manager

The CH2M HILL Site Manager (SM) is responsible for all field operations onsite and is typically the Construction Manager (CM), Site Superintendent, Site Supervisor or Field Team Leader. The SM is directly responsible for implementing all aspects of the project H&S plan, as assigned by the PM.

4.4 Responsible Business Group Health and Safety Manager

The Responsible BG HSM (RHSM) is the HSM assigned by the BG H&S Lead to provide health and safety technical guidance and support to the project. The RHSM prepares and/or approves the CH2M HILL project H&S plan, reviews subcontractor H&S plans and submittals, conducts project H&S audits, and provides H&S support and guidance to the project.

4.5 Site Safety Coordinator

The Site Safety Coordinator (SSC) is either the SM, or is designated by the SM to implement the project H&S Plan. He or she has successfully completed all required SSC training. The SSC ensures that the party responsible for excavation safety provides an excavation-competent person to inspect and oversee all excavation activities.

4.6 Excavation-competent Person

The company responsible for excavation safety shall provide an excavation-competent person to inspect and oversee all excavation activities. The competent person shall have training in and knowledge of soil classification, the use of protective systems, and the requirements of local regulatory agency excavation standards. The competent person shall be capable of identifying excavation hazards and have the authority to take corrective actions to eliminate the hazards. The excavation-competent person shall be onsite during excavation activities and during entry into excavations.

4.7 CH2M HILL Employees

All employees are responsible for following safe work practices and complying with this SOP and project H&S requirements.

All employees are responsible for following the requirements established by the excavation-competent person, ensuring that the excavation-competent person has completed the daily inspection prior to entry and informing the competent person of any unsafe conditions associated with the excavation.

5.0 Requirements

The following excavation and trenching safety requirements outlined in this Enterprise SOP must be implemented.

5.1 General Requirements

CH2M HILL employees who enter excavations must take precautions to avoid excavation hazards by following the excavation entry requirements provided in Section 5.4 of this standard. CH2M HILL employees who provide oversight of subcontractor excavation activities must also follow the excavation safety requirements provided in Sections 5.5 and 5.6 of this standard. CH2M HILL employees who self-perform excavation activities must follow the excavation safety requirements provided in Sections 5.3, 5.4, 5.5 and 5.6 of this standard.

5.2 Subcontractor Management

Subcontractor H&S responsibilities are expressly defined through the subcontract terms and conditions. Subcontractors must determine how to conduct their operations, in compliance with applicable H&S regulations and industry standards, and how to correct deficiencies. CH2M HILL employees shall not direct the means and methods of subcontractor operations.

Subcontractors are responsible and accountable for implementing these requirements and any additional requirements established in their own safety procedures. Subcontractors retain control over their practices, and CH2M HILL's oversight does not relieve them of their own responsibility for effective implementation and enforcement of HS&E requirements.

The "Subcontractor Safety Procedure Criteria – Excavations" presented in Attachment 1 provides the minimum criteria for excavation safety procedures. These criteria may be used by the HS&E staff to review submitted subcontractor safety procedures when CH2M HILL is performing oversight of the subcontractor's operations.

The "HS&E Self-Assessment Checklist – Excavations" in Attachment 2 may be used to verify the subcontractor's compliance with established safe work practices, regulations, and industry standards.

5.3 CH2M HILL Self-performed Excavation Activities

The CH2M HILL Excavation Permit (Attachment 3) is required to be completed by the CH2M HILL excavation-competent person when CH2M HILL self-performs excavation activities. The Permit is completed and signed by the CH2M HILL excavation-competent person prior to each day's excavation activities for each excavation on the project.

The physical features of each excavation are documented in the Permit, including the length, depth, and location of the excavation. The Permit also confirms that adequate excavation protective systems have been instituted to protect workers from cave-ins, and that protective measures have been taken to control the hazards posed by surface encumbrances, underground installations, potential hazardous atmospheres, water accumulations, and stability of adjacent structures for each excavation.

An excavation permit may be extended for the same excavation for more than one day, provided there are no changes in the excavation physical features, protective systems to prevent cave-ins, or other protective measures to control the hazards posed by surface encumbrances, underground installations, potential hazardous atmospheres, water accumulations, or stability of adjacent structures.

Excavations and their adjacent areas and protective systems shall be inspected by an excavation-competent person prior to the start of each day's excavation activities, as needed throughout the work shift, and after every rainfall or other event that could increase the potential for excavation cave-in. Excavation inspections are conducted to identify evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres or other hazardous conditions.

The CH2M HILL Daily Excavation Inspection Checklist (Attachment 4) is required to be completed by the CH2M HILL excavation-competent person when CH2M HILL self-performs excavation activities. The Inspection Checklist is completed and signed by the CH2M HILL excavation-competent person each day prior to entering the excavation.

5.4 Excavation Entry Requirements

The requirements of this subsection are to be followed by CH2M HILL employees and subcontractor personnel who enter excavations, regardless of the company responsible for excavation safety (CH2M HILL, subcontractor, or third party contractor).

The party responsible for excavation safety shall provide an excavation-competent person to inspect and oversee all excavation activities. CH2M HILL personnel entering an excavation controlled by a third party contractor or subcontractor must comply with the written procedures or permits governing the third party contractor's or subcontractor's excavation activities, and must document the name of the third party or subcontractor excavation-competent person in their daily log.

All personnel entering the excavation shall verify that an excavation permit has been completed prior to entry.

- Personnel shall not enter excavations until the competent person has completed the daily inspection and has authorized entry.
- Personnel entering excavations shall be aware of and follow all requirements established by the excavation-competent person.
- Personnel shall not enter excavations where protective systems are damaged or unstable unless they are responsible for excavation safety and entry must be made to repair the systems. Entry shall be made only after additional precautions have been taken to ensure safe entry, as determined by the excavation-competent person.
- Personnel shall not enter excavations where objects (including machinery) or structures above the work location might become unstable and fall into the excavation.
- Personnel shall not enter excavations where there is the potential for a hazardous atmosphere until the air has been tested and found to be at safe levels, as determined by the excavation-competent person. It is important to remember that some chemical vapors are heavier than air and can accumulate at the bottom of excavations.
- Personnel shall not enter excavations that contain accumulated water unless precautions have been taken to prevent excavation cave-in, as determined by the excavation-competent person.

5.5 Excavation Safety Requirements

The requirements of the following subsections are to be followed by CH2M HILL personnel when self-performing excavation activities, and by subcontractors when performing excavation activities while CH2M HILL provides oversight of subcontractors activities.

5.5.1 General

- A daily safety briefing/meeting shall be conducted with all excavation personnel to discuss the work planned for the day and the HS&E requirements to be followed.

- Excavations that are to be entered shall be inspected each day, as needed throughout the work shift, and after every rainfall or other event that could increase the potential for excavation cave-in. This inspection shall be conducted by the excavation-competent person and shall include, at a minimum, indications of possible cave-in, water accumulation, failure of any component of protective systems, stability of spoil piles and adjacent structures, and indications of hazardous atmosphere. Subcontractors shall document their daily excavation inspections using their excavation inspection checklist.
- If the excavation-competent person observes any deficiency or unsafe condition, excavation entry will not be permitted and all exposed personnel shall be removed from the excavation until adequate precautions have been taken to ensure safe entry.
- Walkways shall be provided where personnel are required or permitted to cross over excavations. Walkways 6 feet (1.8 m) or more above lower levels shall be equipped with standard guardrails.
- Guardrails, fences, or barricades shall be installed at excavations 6 feet (1.8 m) or deeper when the excavations are not readily visible because of plant growth or other visual obstruction.
- Wells, pits, shafts and similar excavations 6 feet (1.8 m) or deeper shall be provided with guardrails, fences, barricades or covers.
- Earthmoving equipment shall be operated in compliance with local regulatory agency requirements.

5.5.2 Prior to Excavating

- A Dig Permit may be required at certain client facilities.
- The location of underground utilities such as electric, gas, fuel, water, cable, telephone, and sewer, either in service or abandoned, and underground installations such as foundations, underground storage tanks, and any other structures shall be identified before excavating is permitted. Utility companies and/or installation owners shall be contacted for exact locations of their equipment. When the exact location cannot be determined, detection equipment or other acceptable means of locating the underground installations shall be used before excavation.

5.5.3 Excavating Activities

- All rocks, trees, and other surface encumbrances that are undermined or could become unstable as a result of excavating activities shall be removed or supported to prevent them from falling into the excavation.
- Support systems such as shoring, bracing, or underpinning shall be used to support exposed underground utilities that may become unstable as a result of excavating operations.
- Excavating below the base of a foundation, wall, sidewalk or other surface structure shall not be permitted unless: 1) a support system is provided to ensure the stability of

the structure, 2) the excavation is in stable rock, or 3) a registered professional engineer has determined that the structure is far enough away that it will not be affected by the excavating activity.

- When mobile equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge, warning systems such as barricades, hand and/or mechanical signals, or stop logs shall be in place to remind the operator of the location of the edge.

5.5.4 Excavation Entry

- Trenches greater than 4 feet (1.2 meters) deep shall be provided with a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet (7.6 meters).
- Structural ramps used solely by personnel shall be designed by a competent person. Structural ramps used by equipment shall be designed by a competent person qualified in structural design (generally a registered professional engineer).
- The atmosphere of excavations greater than 4 feet (1.2 meters) deep shall be tested prior to entry when a hazardous atmosphere exists or could reasonably be expected to exist, such as excavating landfills, hazardous waste dumps; or areas containing sewer or gas utility systems, petroleum distillates, or areas where hazardous substances are stored nearby.
- When atmospheric testing indicates a hazardous atmosphere exists or could reasonably be expected to exist, emergency rescue equipment such as safety harnesses and lifelines and emergency self-contained breathing apparatus (SCBA) shall be readily available.
- When atmospheric testing indicates that a hazardous atmosphere is present, ventilation or appropriate respiratory protection shall be used to eliminate or reduce exposure to safe levels. If ventilation is used, atmospheric testing shall be conducted as often as necessary to ensure safe levels are maintained.
- Excavations that contain accumulated water shall not be entered unless precautions have been taken to prevent excavation undermining and cave-ins. Precautions may include special support systems or shield systems, water removal equipment that is monitored by the excavation-competent person to ensure proper operation, or safety harnesses and lifelines.
- Adequate precautions such as diversion ditches or dikes shall be used to prevent surface water from entering the excavation, and to provide adequate drainage of the area adjacent to the excavation when the natural drainage of surface water is interrupted.
- Personnel shall be protected from materials falling or rolling from the face of the excavation by scaling to remove loose material, or by installing protective barricades.

- Spoil piles, material, and equipment must be kept at least 2 feet (61 centimeters) from the edge of the excavation, or a retaining device must be used to prevent the material from falling into the excavation.

5.5.5 Protective Systems

The excavation-competent person is responsible for determining the appropriate protective system to be used to prevent excavation cave-in. This determination may be based on the soil classification, space limitations, available materials, type of work to be performed in the excavation, and availability of tabulated data or a registered professional engineer.

CH2M HILL must rely on the expertise of the excavation-competent person with regard to excavation protective systems. The following information provides a general understanding of the common minimum protective system requirements. For the U.S., refer to “OSHA Protective System Requirements Summary” in Attachment 5. For other countries, refer to the country-specific SOP or local regulatory agency requirements.

- Sloping, benching, shoring, shielding, or other protective systems are required to protect personnel from cave-ins except when the excavation is made entirely in stable rock or is less than 5 feet (1.5 meters) deep and there is no indication of possible cave-in, as determined by the excavation-competent person.
- Excavations that are less than 5 feet in depth where examination of the ground by a competent person provides any indication of a potential cave-in shall be sloped to 34 degrees.
- Protective systems for excavations deeper than 20 feet (6.1 meters) must be designed or approved by a registered professional engineer.
- If the excavation soil is not classified by the excavation-competent person, the maximum allowable slope shall be 34 degrees measured from the horizontal. Refer to 5.7 for details about the actual slope and configurations allowed.
- Protective system materials shall be free from damage that might impair their proper function. Damaged components shall be inspected by the competent person to evaluate their suitability for continued use.
- Protective system materials shall be used in a manner consistent with manufacturers’ recommendations and shall not be subjected to loads exceeding their design limits.
- Protective system materials shall be securely connected together to prevent sliding, falling, kickouts or other predictable failures.
- Personnel shall be protected from cave-ins while entering and exiting shielding systems.
- Personnel shall not work in shielding systems during installation, removal, or vertical movement. Personnel may remain inside the shield during horizontal movement as long as the shield is not lifted.

5.5.6 Protective Systems Removal and Backfilling

- Precautions shall be taken when removing protective system components. Removal shall start at, and progress from, the bottom of the excavation. Components shall be released slowly so that it is possible to detect indications of possible failure of the remaining components. Temporary structural members may be required to carry the loads imposed on the protective system.
- Backfilling shall take place immediately after removal of the protective system.

6.0 Training Requirements

CH2M HILL employees who enter excavations, regardless of the company responsible for excavation safety, are required to complete either the CH2M HILL 10-Hour Construction Safety Awareness training course or the Excavation computer-based training module found on the HS&E web page.

CH2M HILL may choose to supplement internal construction training courses with courses provided by local regulatory agencies.

When CH2M HILL self-performs excavation activities, the CH2M HILL excavation-competent person is required to complete a separate excavation-competent person course.

Excavation subcontractors are responsible for complying with all applicable HS&E training requirements and for providing the training necessary to complete their tasks safely.

7.0 Assessment Requirements

The “HS&E Self-Assessment Checklist – Excavations” in Attachment 2 is provided as a method for verifying compliance with this SOP. The RHSM may use this checklist when performing H&S audits at CH2M HILL projects, including subcontractor’s activities.

8.0 Recordkeeping

9.0 Revision Log

Revision	Date	Description	File Name

10.0 Attachments

Attachment 1 [Subcontractor Safety Procedure Criteria – Excavations](#)

Attachment 2 [HS&E Self-Assessment Checklist – Excavations](#)

Attachment 3 [CH2M HILL Excavation Permit](#)

Attachment 4 **CH2M HILL Daily Excavation Inspection Checklist**

Attachment 5: **OSHA Protective System Requirements Summary**

Attachment 1: Subcontractor Safety Procedure Criteria— Excavations

The following criteria are not intended to be all-inclusive, but are provided as a tool to facilitate development and review of subcontractor safety procedures. Subcontractors are expected to address the following items in their safety procedures:

Minimum Acceptable Criteria for Subcontractor Excavation Safety Procedures:

1. Provide name and qualifications of the “competent person” responsible for excavation activities (for example, years and type of experience, training background):
2. Describe excavation and protective system inspection criteria or procedures (for example, frequency of inspections – daily, as needed throughout day, after rain; visual versus written inspections, items that are inspected):
3. Describe methods of identifying underground utilities (for example, contacting utility companies, detection equipment):
4. Describe specific method(s) of cave-in protection to be used on project (for example, sloping, benching, shoring, shielding):
5. Describe option(s) that will be used for protective systems determination (for example, soil classification, tabulated data, other data, registered professional engineer design):
6. Describe methods used to identify hazardous atmospheres and controls (for example, detection equipment, ventilation, respiratory protection, rescue equipment):
7. Describe methods used to prevent water accumulation (for example, water removal equipment, special support systems, harnesses and lifelines):
8. Describe methods used to protect workers from material falling into the excavation (for example, remove or support objects, keep material 2 feet (61 cm) back from edge of excavation, or keep workers off slopes):
9. Describe methods used to support adjacent structures near excavations (for example, shoring, bracing, or underpinning):
10. Describe safe work practices for other activities to be performed during this project [for example, use of ladders, fall protection, personal protective equipment (PPE)]:
11. Provide summary of equipment that will be needed to perform excavation safely and verify that equipment is in good operational condition (for example, excavation digging equipment, shoring and shielding materials):

Attachment 2: HS&E Self-Assessment Checklist—Excavations

This checklist shall be used by CH2M HILL personnel only and shall be completed at the frequency specified in the project’s Health and Safety Plan/Field Safety Instruction (HSP/FSI).

This checklist is to be used at locations where: 1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

The SSC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must rely on their expertise. Conditions considered imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazardous area until the situation is corrected.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposures to excavation hazards
 Evaluate a CH2M HILL subcontractor’s compliance with excavation HS&E requirements
 Subcontractor Name: _____

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

<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
EXCAVATION ENTRY REQUIREMENTS (4.1)				
1. Personnel have completed excavation safety training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Competent person has completed daily inspection and has authorized entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Personnel are aware of entry requirements established by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Protective systems are free from damage and in stable condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Surface objects/structures secured from falling into excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Potential hazardous atmospheres have been tested and found to be at safe levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Precautions have been taken to prevent cave-in from water accumulation in the excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Personnel wearing appropriate, PPE per HSP/SI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
GENERAL (4.2.1)				
9. Daily safety briefing/meeting conducted with personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Excavation and protective systems adequately inspected by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Defective protective systems or other unsafe conditions corrected before entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Guardrails provided on walkways over excavation 6 ft (1.8m) or deeper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Barriers provided at excavations 6 ft or deeper when excavation not readily visible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Barriers or covers provided for wells, pits, shafts, or similar excavation 6 ft (1.8 m) or deeper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Earthmoving equipment operated safely (use earthmoving equipment checklist in HSE-306)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PRIOR TO EXCAVATING (4.2.2)				
16. Dig Permit obtained where required by client/facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Location of underground utilities and installations identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXCAVATING ACTIVITIES (4.2.3)				
26. Rocks, trees, and other unstable surface objects removed or supported	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Exposed underground utility lines supported	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Undermined surface structures supported or determined to be in safe condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Warning system used to remind equipment operators of excavation edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXCAVATION ENTRY (4.2.4)				
32. Trenches > 4 ft (1.2 m) deep provided with safe means of egress within 25 ft (7.6 m)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Structure ramps designed and approved by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Potential hazardous atmospheres tested prior to entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Rescue equipment provided where potential for hazardous atmosphere exists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Ventilation used to control hazardous atmosphere and air tested frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Appropriate respiratory protection used when ventilation does not control hazards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Precautions taken to prevent cave-in resulting from water accumulation in excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Precautions taken to prevent surface water from entering excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Protection provided from falling/rolling material originating from excavation face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Spoil piles, equipment, materials restrained or kept at least 2 ft (61 cm) from excavation edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXCAVATION PROTECTIVE SYSTEMS (4.2.5)				
42. Protective systems used for excavations 5 ft (1.5 m) or deeper, unless in stable rock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Protective systems for excavation deeper than 20 ft (6.1 m) designed by registered PE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. If soil unclassified, maximum allowable slope is 34 degrees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Protective systems free from damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Protective system used according to manufacturer's recommendations and not subjected to loads exceeding design limits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Protective system components securely connected to prevent movement or failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Cave-in protection provided while entering/exiting shielding systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Personnel removed from shielding systems when installed, removed, or if vertical movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
PROTECTIVE SYSTEM REMOVAL AND BACKFILLING (4.2.6)				
50. Protective system removal starts and progresses from excavation bottom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Protective systems removed slowly and cautiously	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Temporary structure supports used if failure of remaining components observed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Backfilling takes place immediately after protective system removal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Attachment 3: CH2M HILL Excavation Permit

CH2MHILL

EXCAVATION PERMIT

This Permit is required to be completed by the CH2M HILL excavation-competent person when CH2M HILL self-performs excavation activities. The Permit is completed and signed by the CH2M HILL excavation-competent person prior to each day's planned excavation activities for each excavation on the project.

This Permit may be extended for the same excavation for more than one day, provided there are no changes in the excavation's physical features, protective systems to prevent cave-ins, or other protective measures to control the hazards posed by surface encumbrances, underground installations, potential hazardous atmospheres, water accumulations, or stability of adjacent structures.

GENERAL INFORMATION

Date: _____ Time: _____ Date Expires: _____

Project/Site Name: _____ Project Number: _____

Location of Excavation: _____

Scope of Work Description: _____

Size of Excavation: Depth: _____ Width: _____ Length: _____

PRIOR TO EXCAVATING

- Dig Permit obtained, where required by client/facility
- Client, installation owners, and utility companies contacted for location of underground utilities
- Detection equipment used when exact location of underground utilities is unknown
- Underground utilities located **within 5 feet** of excavations are hand-excavated to determine their exact location

The above data have been checked with drawing on file. When underground utilities are located within 5 feet of excavations, hand-excavation must be used to determine the exact location of buried utilities. Existing lines and interferences in the vicinity of work must be marked by stakes indicating the location and depth before excavating.

LINES IN THE VICINITY OF WORK

Electrical _____ Sewer _____ Drain _____ Other _____

Telephone _____ Steam _____ Process _____ (Specify) _____

Water _____ Alarm _____ Fiber Optic _____ Gas _____

PRECAUTIONS TAKEN

De-Energize Line _____ Insulate Operator _____

Ground Tools _____ Hand-excavate _____

ACCESS AND EGRESS

Ladder(s) _____ Ramp _____ Stairs _____

SOIL CLASSIFICATION

- Soils to be excavated have been classified: Stable Rock Type A Type B Type C
 Combination, describe: _____

NOTE: If soils unclassified, assume to be Type C

Soil Classification Basis (one visual and one manual test required):

- Visual Test Manual Test Pocket Penetrometer

EXCAVATING

- Rocks, trees, and other unstable surface encumbrances located that present a hazard to employees are removed or supported when required
 Underground utilities protected, supported, or removed to safeguard employees
 Undermined surface structures supported or determined to be in safe condition
 Warning system used to remind equipment operators of excavation edge

HAZARDOUS ATMOSPHERES

Is there a concern for developing a hazardous atmosphere? Yes _____ No _____

WATER ACCUMULATIONS

Is protection from the hazards associated with water accumulation required? Yes _____ No _____
Excavation interrupts drainage from surface water? Yes _____ No _____

PROTECTIVE SYSTEMS

- Protective systems used for excavations 5 ft (1.5 m) or deeper, unless stable rock
 Protective systems for excavation deeper than 20 ft (6.1 m) designed by registered PE
 Protective systems used: Sloping/Benching Shoring Trench Box Combination
Describe: _____

NOTE: No Benching allowed for Type C soil.

- Sloping cut to appropriate angle of incline for soil classification (if unclassified, assume Type C soil)
 Shoring/trench boxes used according to manufacturer recommendations and not subjected to loads exceeding design limits
 Protective system components securely connected to prevent movement or failure
 Protective systems inspected before installed
 Defective protective systems replaced or corrected

CH2M HILL Excavation-competent Person Name: _____

CH2M HILL Excavation-competent Person Signature: _____

Attachment 4: CH2M HILL Daily Excavation Inspection Checklist

CH2MHILL **DAILY EXCAVATION INSPECTION CHECKLIST**

Excavations, their adjacent areas, and their protective systems shall be inspected by an excavation-competent person prior to the start of each day's excavation activities, as needed throughout the work shift, and after every rainfall or other event that could increase the potential for excavation cave-in. This Inspection Checklist is required to be completed by the CH2M HILL excavation-competent person when CH2M HILL self-performs excavation activities. The Inspection Checklist is completed and signed by the CH2M HILL excavation-competent person prior to each day's entry into the excavation.

GENERAL INFORMATION

Date: _____ Time: _____ Weather
Conditions: _____
Project/Site Name: _____ Project Number: _____
Name/Location of Excavation: _____
Scope of Work Description: _____

INSPECTION CHECKLIST

- Excavation effectively barricaded to prevent unauthorized entry
 - Barriers provided at excavations 6 ft or deeper when not readily visible
 - Guardrails provided on walkways over excavations 6 ft or deeper
 - Underground utilities protected, supported, or removed to safeguard employees
 - Adjacent structures are adequately supported
 - No tension cracks/fractures or evidence of caving, sloughing, or weak zones observed in soil
 - Precautions taken to prevent surface water from entering excavation
 - Water is not accumulating in excavation
 - When water removal equipment used, it is monitored for proper operation
 - Air monitoring conducted for excavations with hazardous atmosphere potential
 - If hazardous atmosphere, ventilation used to bring conditions to safe level and tested frequently
 - If ventilation unable to bring conditions to safe level, appropriate respiratory protection used
 - Rescue equipment provided where potential for hazardous atmosphere exists
 - Protective systems provided to prevent excavation cave-in
 - Protective systems used: Benching Sloping Shoring Trench Box Combination
- Describe: _____
- Protective systems inspected and are free from damage and in stable condition
 - Protective system components securely connected to prevent movement or failure
 - Sloping cut to appropriate angle of incline for soil classification
 - Shoring installed according to design and secured from movement
 - Hydraulic shores maintained at designed pressure
 - Trench boxes not subjected to loads exceeding design limits
 - Vehicular traffic diverted an adequate distance from excavation
 - Spoil piles, equipment, and materials restrained or kept at least 2 ft (61 cm) from excavation edge
 - Protection provided to prevent material from falling/rolling into excavation

- Safe means of egress provided every 25 ft (7.6 m) inside excavation
- Personnel entering excavation briefed and understand planned work and safety precautions
- Additional precautions taken when entering excavation to repair damaged or unstable protective systems

CH2M HILL Excavation-competent Person Name:

CH2M HILL Excavation-competent Person Signature:

Attachment 5: OSHA Protective System Requirements Summary

Sloping and Benching Systems

Sloping and benching systems must be designed by a registered professional engineer for excavations deeper than 20 feet (6.1 meters). System design for excavations 20 feet (6.1 meters) or less in depth must be selected and constructed by using one or more of the following options:

Option 1: Soil classification not required. Maximum allowable slope = 1-½ horizontal (H) to 1 vertical (V) or 34 degrees measured from the horizontal. Acceptable configurations are determined in accordance with Appendix B, Figure B-1.3 of OSHA 29 CFR 1926 Subpart P.

Option 2: Maximum allowable slope based on the soil classification type. A competent person must classify the soil as Stable Rock, Type A, Type B, or Type C soil based on at least one visual and at least one manual analysis. Acceptable test methods are outlined in Appendix A of CFR 1926 Subpart P. Acceptable configurations are determined in accordance with Appendix B, Figure B-1 of CFR 1926 Subpart P. The following table provides the maximum allowable slope based on soil classification.

Soil Type	Maximum Allowable Slope (H:V)
Stable Rock	Vertical (90 degrees)
Type A	¾ : 1 (53 degrees)
Type A – open less than 24 hours and 12' (3.7 m) or less deep	½ : 1 (63 degrees)
Type B	1 : 1 (45 degrees)
Type C	1-½ : 1 (34 degrees)

Option 3: Maximum allowable slope based on other tabulated data, such as tables and charts. The identity of the approving registered professional engineer must be stamped on the data. The tabulated data must be in written form, describing detailed information on its use and limitations, and must be at the job site during construction of the protective system.

Option 4: Sloping or benching designs prepared and approved by a registered professional engineer. The identity of the registered professional engineer who approved the data must be stamped on the design. The design must identify the project and the configurations must be determined safe for the project. The design documents must be at the job site during construction of the protective system.

Notes: Options 1 and 2:

- The actual slope shall not be steeper than the maximum allowable slope.
- When the excavation shows signs of distress, the actual slope shall be reduced from the maximum allowable slope by $\frac{1}{2}$ horizontal and 1 vertical ($\frac{1}{2}$ H:1V).
- When surcharge loads from operating equipment, traffic, stored material, and equipment are present, the competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope.

Shoring, Shielding, and Other Protective Systems

Shoring, shielding, and other protective systems must be selected and constructed by using one of the following options. Soil classification using Appendix A of OSHA 29 CFR 1926 Subpart P is required for each option.

Option 1: Timber shoring design determined in accordance with the conditions and requirements of Appendix C of OSHA 29 CFR 1926 Subpart P. Aluminum hydraulic shoring design determined in accordance with Option 2, unless the manufacturer's tabulated data cannot be used. In such cases, Appendix D of OSHA 29 CFR 1926 Subpart P shall be followed. This option may be used only for excavations 20 feet or less in depth.

Option 2: Designs for protective systems determined in accordance with the specifications, recommendations, and limitations of the manufacturer's tabulated data. The manufacturer must issue written approval to deviate from these requirements and the approval must be available at the job site.

Option 3: Protective system designs determined using other tabulated data, such as tables and charts. The identity of the approving registered professional engineer must be stamped on the data. The tabulated data must be in written form, describing detailed information on its use and limitations, and must be at the job site during construction of the protective system.

Option 4: Protective system designs prepared and approved by a registered professional engineer. The identity of the registered professional engineer who approved the data must be stamped on the design. The design must identify the project and the configurations must be determined safe for the project. The design must be in written form, describing detailed information on its use and limitations, and must be at the job site during construction of the protective system.

**ATTACHMENT B-3: CH2M HILL HSE&Q-610 EXPLOSIVES USAGE
AND MUNITIONS RESPONSE (MR)**

CH2MHILL

Explosives Usage and Munitions Response (MR) Standard of Practice HSE&Q-610

1.0 Applicability and Scope

1.1 Applicability

This Standard of Practice (SOP) applies to:

- (1) CH2M HILL employees who enter areas known or suspected of having munitions,
- (2) Areas where explosives are used for construction or demolition purposes, and
- (3) Managers who may be responsible for oversight of a subcontractor's explosives usage, MR operations, or Controlled Detonation Chamber (CDC) operations.

Explosives usage or MR operations may be conducted on active, inactive, closed, transferring, or transferred ranges; former battlefields; disposal sites; munitions manufacturing and storage sites; and construction sites.

1.2 Scope

This SOP provides information regarding the spectrum of hazards and issues to be addressed during each phase of a project associated with operations involving the use of explosives. Hazardous situations addressed in this SOP include exposure to explosives used for construction or demolition work; munitions and explosives of concern (MEC), which include unexploded ordnance (UXO), discarded military munitions (DMM), and material that presents a potential explosive hazard (MPPEH); chemical warfare materiel (CWM), or munitions constituents (MC) contaminated soil and groundwater; munitions demilitarization operations; Controlled Detonation Chamber (CDC) operations; and operations to locate, identify, remove, and dispose of munitions.

CH2M HILL employees who enter areas where explosives may be encountered or used must take precautions to avoid these hazards and be aware of associated safe work practices.

As described in SOP [HSE&Q-215](#), Contracts, Subcontracts, & HSE&Q Management Practices, responsibilities for health, safety, and environmental (HS&E) protection are expressly defined through subcontract terms and conditions. CH2M HILL's HS&E practices in the field are determined on the basis of these defined responsibilities. Consistent with [HSE&Q-215](#), the subcontractor must determine how to operate safely, comply with applicable HS&E regulations and industry standards, and correct any deficiencies.

1.3 Regulatory Review

Projects involving the use of explosives are often complex (may require the acquisition, receipt, storage, and use of explosives to include insurance, permits/license, public safety, etc.) and have a myriad of regulatory requirements to ensure safety. A brief description of the major requirements follows:

U.S. Department of Defense (DOD) Ammunition and Explosives Safety Standards, DOD 6055.9-STD, establishes uniform safety standards that apply to ammunition and explosives, to associated personnel and property, and to unrelated personnel and property exposed to the potential damaging effects of an accident involving ammunition and explosives during their development, manufacturing, testing, transportation, handling, storage, maintenance, demilitarization, and disposal. Additional regulatory requirements are: Title 18 U. S. Code, 842, Safe Explosives Act, 27 CFR Part 555.1 Explosives, 29 CFR 1910.109 Explosives and Blasting Agents, National Fire Protection Association 495 Explosive Materials Code, 49 CFR Parts 100–199, Hazardous Materials Transportation.

The U.S. Environmental Protection Agency (EPA) regulates the disposal of military munitions, and of waste that contains military munitions, through the Military Munitions Rule (MMR) (62 Federal Register [Fed. Reg.] 6621, February 12, 1997; 40 Code of Federal Regulations [CFR] Part 260 et seq.) under authority of the Resource Conservation and Recovery Act (RCRA). The rule has two functions: (1) it identifies when conventional and chemical military munitions become a solid waste, and (2) it provides criteria for storing and transporting such waste, including a conditional exemption if the munitions are managed under DOD rules.

This SOP incorporates by reference the guidelines and requirements for MR operations that are published by the U.S. Army Corps of Engineers (USACE) Engineering Support Center, Huntsville, Alabama. These are generally accepted industry standards, similar to voluntary consensus standards published by such organizations as the National Fire Protection Association (NFPA) and the American National Standards Institute (ANSI).

2.0 Project Planning

2.1 Planning Requirements

Compliance with the applicable governing laws and regulations is the responsibility of the Project Manager. The Project Manager will contact the MR Operations Manager, or in his absence the MR Safety Officer or the Munitions Response Market Segment Director, prior to and post MR ORE approval and subsequent GO/NO GO decision for determination of applicable governing laws and regulations and to assist with planning and executing support for such activities as blasting operations, hazardous toxic radiological waste (HTRW) support, construction support, MR actions, handling of CWM or explosive-contaminated soils, and munitions demilitarization. The following types of support may be needed for MR operations:

- For on-site visits with known or suspected MEC, an Abbreviated Site Safety and Health Plan (ASSHP) (See **Attachment 1**) must be prepared. This ASSHP is to be used only for non-intrusive site visits, and it must be approved by the MR Safety Officer, or in his absence either the MR Operations Manager or MR Market Segment Director, before the field visit starts. All team members must read and comply with the ASSHP and attend the safety briefings. The UXO Safety Officer (UXOSO) shall ensure that the Safety Briefing Checklist and the Plan Acceptance forms are filled out before the site visit begins.
- On an HTRW site with known or suspected MEC, MEC support involves implementing anomaly avoidance techniques to avoid any potential surface MEC and any subsurface

anomalies. A Site Safety & Health Plan (SSHP) must be prepared. This SSHP is to be used only for non-intrusive anomaly avoidance activities, and it must be approved by the MR Safety Officer, or in his absence the MR Operations Manager or the MR Market Segment Director prior to the start of fieldwork. All team members must read and comply with the SSHP and attend the safety briefings. The UXOSO shall ensure that the Safety Briefing Checklist and Plan Acceptance Form are filled out prior to the start of the site work.

- On a construction site with known or suspected MEC, support must be provided by qualified UXO personnel during construction activities. The level of MEC support required depends on the probability of encountering MEC, determined on a project-by-project basis. This will be identified during the MR ORE.
- MR actions in which the intent is to locate, identify, excavate, remove, and dispose of MEC may require a Senior UXO Supervisor, UXO Safety Officer, and UXO Quality Control Specialist, to oversee UXO Teams performing operations.
- On an MR site that has MC contamination of soil or groundwater, MEC support may include both anomaly avoidance techniques and MEC construction support for excavating and/or treating MC-contaminated soil and groundwater.
- On ordnance demilitarization projects, MEC support is required to identify, handle, disassemble, process, certify, transport, and treat or dispose of munitions components.
- On projects where explosives waste is transported or disposed of off range, the MR Operations Manager and the BG Environmental Compliance Coordinator (ECC) may assist in identifying the applicable regulations and permits required.
- On projects where munitions debris (MD), material presenting a potential explosive hazard (MPPEH), or inert ordnance is recovered and processed for disposal as scrap, the MR Operations Manager and the BG ECC may determine whether treatment and certification is required, along with any permitting requirements.
- For drilling activities at project sites suspected of MEC contamination, the UXO team shall conduct a reconnaissance and MEC avoidance to provide clear access routes to each site before drilling crews enter the area. The procedures listed in [HSE&Q-204, Drilling](#), apply and shall be implemented.
- For excavation activities at project sites suspected of MEC contamination, the UXO team shall conduct a reconnaissance and MEC avoidance to provide clear access routes to each site before excavation crews enter the area. The procedures listed in [HSE&Q-307, Excavations](#), apply and shall be implemented.
- Safety and quality control (QC) audits shall be included in developing cost estimates for any MR or explosives usage project that will last more than two weeks.
- On projects that include intrusive activities to investigate MEC or use of explosives (blasting), an Explosive Safety Submission (ESS), an Explosive Siting Plan (ESP), and an Explosive Management Plan (EMP) may be required. The MR Operations Manager, or in his absence the MR Safety Officer or MR Market Segment Director, shall assist in evaluating project requirements and coordinate with others as appropriate.

The MR Operations Manager, or in his absence the MR Quality Control Manager, shall verify subcontractor training, personnel qualifications, and current medical examinations prior to the start of field operations. Any identified shortfalls in qualifications should be reported to the MR Operations Manager or in his absence to the MR Safety Officer or the Market Segment Director for resolution.

2.2 Opportunity and Risk Evaluation (ORE)

Every project or task involving the usage of explosives or a Munitions Response (MR) requires completion of paragraph 17 of the ORE form in **Attachment 2**. The most current form and assistance in filling out the form can be obtained from the MR Safety Officer, MR Operations Manager, or MR Market Segment Director. This document is a living form and should be updated as a project is developed and executed or upon change of scope of work (SOW), identification of previously unknown hazards, etc. Final acceptance of the MR portion (paragraph 17) of the ORE is done by the MR Safety Officer.

2.3 Alcohol, Tobacco, Firearms, and Explosives (ATF&E) Background Investigation

The "Safe Explosives Act of 2002" requires the employer (CH2M HILL) to submit to ATF&E identifying information, fingerprints, and photographs for all "Responsible Persons" and "Possessors of Explosives."

All personnel designated as Responsible Persons or Possessors of Explosives involved in explosives usage and MR projects must provide a 2-inch by 2-inch color picture and an ATF Form 5400.28 filled out for submission by the ATF&E License Holder (contact MR Operations for assistance) who will forward them to ATF&E so that a background investigation can be conducted to establish eligibility to work with explosives.

Under the "Safe Explosives Act," a "Responsible Person" and a "Possessor of Explosives" are defined as follows:

Responsible Person: An individual who has the power to direct the management and policies of the applicant pertaining to explosive materials. Generally the term includes partners, sole proprietors, project managers, site managers, corporate officers and directors, and majority shareholders.

Possessor of Explosives: An individual who has actual physical possession or constructive possession, which means the person has dominion or control over explosives. For example, persons who are physically handling explosive materials would be considered to be possessors of explosives. This would include employees who handle explosive materials in order to ship, transport, or sell them; and employees, such as blasters, who actually use explosive materials. Other examples of possessors include a supervisor at a construction site who keeps keys for magazines in which explosives are stored, or who directs the use of explosive materials by other employees; and an employee of a licensee or permittee transporting explosive materials from a licensed distributor to a purchaser.

Assistance in filling out required forms can be obtained from the MR Operations Manager, or in his absence the MR Safety Officer or the MR Market Segment Director. Submission of completed forms to ATF&E is the responsibility of the ATF&E License Holder. Upon

submission of the required forms “responsible persons and possessors of explosives” may execute their duties pending completion of the background investigation.

ATF&E will notify employers in writing or electronically of the result of each background check and will supply the “responsible person” or “possessor of explosives” with a “Letter of Clearance” where appropriate.

2.4 Training Requirements

2.4.1 MR Projects

CH2M HILL employees and subcontractors who work on projects that involve MR must complete the following training:

- A one-time, 40-hour Hazardous Waste Operations and Emergency Response course, and a minimum of three days’ actual field experience under the direct supervision of a trained supervisor as specified in 29 CFR §1910.120(e).
- An annual 8-hour hazardous waste refresher course, as specified in 29 CFR §1910.120(e)(8).
- Hazardous waste supervisory training (required for managers and supervisors only) as specified in 29 CFR §1910.120(e)(4).

All UXO technicians must be graduates of one of the following:

- U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD;
- U.S. Naval Explosive Ordnance Disposal (EOD) School, Indian Head, MD;
- U.S. Naval EOD School, Eglin Air Force Base (AFB), FL;
- EOD Assistants Course, Redstone Arsenal, AL;
- EOD Assistant Course, Eglin AFB; or
- An equivalent course as identified in Department of Defense Explosives Safety Board (DDESB) Technical Publication (TP) 18

The MR Operations Manager, or in his absence the MR Safety Officer or the MR Market Segment Director, must review subcontractor personnel qualifications.

2.4.2 Commercial Blaster Requirements

Commercial blasting is most often done in support of construction projects to remove or reduce obstacles that interfere with the construction of new roads, bridges, tunnels, harbors, or other facilities.

In order to be qualified as a “Blaster,” the individual shall be able to understand and give written and oral orders; be in good physical condition and not be addicted to narcotics, intoxicants, or similar types of drugs; and be qualified by reason of training, knowledge, or experience in the field of transporting, storing, handling, and use of explosives, and have a working knowledge of state and local laws and regulations that pertain to explosives. A “Blaster” will be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required. A

Blaster must also be knowledgeable and competent in the use of each type of blasting method used.

Depending on the type and location of work performed, personnel that transport explosives may need to have a commercial driver's license (CDL) with a hazardous material endorsement in accordance with Department of Transportation Requirements specified in 49 CFR.

The following definitions provide an overview the types of explosives which may be used in commercial blasting:

Explosives -- any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified by the U.S. Department of Transportation; see 49 CFR Chapter I. The term "explosives" shall include all material which is classified as Class A, Class B, and Class C explosives by the U.S. Department of Transportation, and includes, but is not limited to dynamite, black powder, pellet powders, initiating explosives, blasting caps, electric blasting caps, safety fuse, fuse lighters, fuse igniters, squibs, cordeau detonant fuse, instantaneous fuse, igniter cord, igniters, small arms ammunition, small arms ammunition primers, smokeless propellant, cartridges for propellant-actuated power devices, and cartridges for industrial guns. Commercial explosives are those explosives which are intended to be used in commercial or industrial operations.

(i) **Class A explosives.** Possessing, detonating, or otherwise having maximum hazard, such as dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder, blasting caps, and detonating primers.

(ii) **Class B explosives.** Possessing flammable hazard, such as propellant explosives (including some smokeless propellants), photographic flash powders, and some special fireworks.

(iii) **Class C explosives.** Includes certain types of manufactured articles which contain Class A or Class B explosives, or both, as components but in restricted quantities.

2.5 Medical Surveillance Requirements

All CH2M HILL employees who perform field work on MR sites must participate in a medical monitoring program in accordance with 29 CFR 1910.120 and HSE&Q 113, *Medical Monitoring*.

Employees who terminate employment and who have performed field work at MR project sites may be required to undergo an exit examination.

Subcontractors are responsible for ensuring that their employees are enrolled in a medical surveillance or monitoring program that meets the requirements of 29 CFR 1910.120.

2.6 Drug Free Workplace Requirements

CH2M HILL employees who perform or oversee MR operations are subject to the provisions of [HSE&Q-105, Drug-Free Workplace](#).

Subcontractors are responsible for ensuring that their employees who perform MR operations on CH2M HILL projects are on a drug abuse surveillance program that meets the requirements of [HSE&Q-105](#).

2.7 Competent Person Requirements

2.7.1 Munitions Response

MR subcontractors are responsible for providing a competent person to oversee MR operations. A competent person may be a Senior UXO Supervisor, UXO Safety Officer, UXO Quality Control Specialist, or UXO Technician III. The competent person must meet the following minimum qualifications:

- Be a graduate of one of the schools and courses listed for all UXO technicians in Section 2.4.1 above,
- Have at least 8 years of combined active-duty military EOD experience and contractor UXO experience, and
- Have experience in MR operations and supervision of personnel.

CH2M HILL-competent person requirements are the same as for a subcontractor.

The MR Operations Manager, the MR Market Segment Director, and the MR Safety Officer will compose the Ammunition & Explosive Personnel Qualification and Certification Board for employees of CH2M HILL. This Board will review individual qualifications and experiences for determining who will be allowed to perform those duties and assignments associated with SUXOS, UXOQC, UXOSO, and CDC Chamber Operator.

2.7.2 Blasting

Blasting subcontractors are responsible for providing a competent person to oversee blasting operations. A competent person may be a state licensed blaster. The competent person must be qualified through a license or permit issued by a state or local jurisdiction based on testing, extensive knowledge, training, and experience with an ability to solve or resolve problems related to blasting, and must meet the following requirements:

- Able to understand and give written and oral orders.
- In good physical condition and not be addicted to narcotics, intoxicants, or similar types of drugs.
- Required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.
- Knowledgeable and competent in the use of each type of blasting method used.

2.8 Safety Equipment

Subcontractors are responsible for providing all necessary personal protective equipment (PPE) for their employees. CH2M HILL will provide PPE only for its own employees. Other safety equipment will be provided as delineated in the subcontract and documents referenced by the subcontract. The MR Safety Officer, or in his absence the MR Operations Manager or the MR Market Segment Director, must review subcontractor work plans and site-specific HS&E plans to ensure that appropriate safety equipment has been included to meet the requirements of the scope of work (SOW).

Personnel who will be handling explosives will not wear outer or inner garments having static electricity-generating characteristics. These include clothing made of 100 percent polyester, nylon, silk, and wool, which are all highly static producing.

Protective shoes worn by personnel performing explosives operations should be constructed of nonferrous materials (e.g., fiberglass) to prevent interference with sensitive geophysical instruments.

UXO Technicians are required to wear hard hats when an overhead hazard exists or when specified in the site-specific HS&E plan. Hard hats should *not* be worn, however, when investigating suspect MEC. A hard hat can create an unsafe condition by falling off the technician's head at a critical moment. Also, if a MEC is accidentally detonated (the worst-case accident scenario), the hard hat will not protect the technician from fragments and may worsen the injury by reflecting fragments into the head of the technician. This is consistent with safety guidance from the Corps of Engineers, Huntsville Center, Military Munitions Center of Expertise (MM-CX).

2.9 Subcontractor Selection

Subcontractors are selected based on their past performance in working for CH2M HILL, safety record, experience, and compliance with federal, state, and local jurisdiction licensing and permitting.

Additional criteria may be developed, depending upon the specific SOW requirements for the subcontractor. When oversight is required by [HSE&Q-215](#), the CH2M HILL MR Safety Officer, or in his absence the MR Operations Manager or MR Market Segment Director, shall use these developed criteria to review the explosives procedures submitted by the subcontractor.

3.0 Definitions

Please see **Attachment 3** for definitions.

4.0 Project Execution

4.1 Safe Work Practices

Management is responsible to control and eliminate unsafe work conditions through training and engineering out the hazard. The requirements of this section are to be followed by all personnel where explosives are used, regardless of the company performing the operations. These requirements also pertain to subcontractor personnel.

4.2 MR Operations

On MR project sites, the MR Operations Manager will be contacted to establish requirements.

4.3 Regulations and Industry Standards

As described in [HSE&Q-215](#), the MR Safety Officer or MR Quality Control Manager may be required to oversee a subcontractor's field activities. Subcontractors retain control over their practices, and CH2M HILL's oversight does not relieve them of their own responsibility for effective implementation and enforcement of HS&E requirements. The following subsections provide the minimum regulatory and industry standards for operations.

The Military Munitions Response Program (MMRP) is a maturing program with different levels of regulatory oversight within each service component. Unless a service component has issued written regulations/guidance for execution of MR actions, then the default regulations/guidance followed will be those issued by the Department of Defense Explosive Safety Board (DDESB) and the U.S. Army Corps of Engineers. For commercial blasting operations, the following guidelines shall apply: ATF&E federal explosive laws and regulations (ATF P5400.7); ANSI A10.7, Safety Requirements for Transportation, Storage, Handling and Use of Explosives; and NFPA 495, Explosive Material Code.

4.3.1 General Safety Concerns and Procedures

Operations, including site visits, shall not be conducted until a complete plan for the site is prepared and approval for use is given by the CH2M HILL MR Safety Officer, MR Operations Manager, or MR Market Segment Director. These plans will be based upon the cardinal rule of explosive safety which is to limit exposure to the minimum number of personnel, for the minimum amount of time, to the least amount of explosives hazards consistent with safe and efficient operations.

Only UXO-qualified personnel shall perform MEC procedures. Non-UXO personnel may be used to perform MEC-related procedures when supervised by a UXO Technician III. All personnel engaged in field operations shall be thoroughly trained and capable of recognizing the specific hazards of the procedures being performed. To ensure that these procedures are performed to standards, all field personnel shall be under the direct supervision of a UXO Technician III or a Senior UXO Supervisor (SUXOS).

4.3.2 Explosives Safety Precautions

Comply with the cardinal rule for explosives safety: expose the minimum number of people to the minimum amount of explosives for the minimum amount of time. Project-specific explosives safety precautions shall be developed prior to field activities and included in Work Plans and Health & Safety Plans that must be reviewed and approved by the MR Safety Officer, or in his absence the MR Operations Manager or MR Market Segment Director.

4.3.3 Recognize, Retreat, and Report MEC

Any CH2M HILL project located on a present or former Department of Defense (DOD) facility, even if it is now under the control of a city, state, or private owner, should plan on the potential to encounter MEC/MPPEH. A contingency plan developed during pre-mobilization that addresses the three Rs of MEC/MPPEH (recognize the potential hazard, retreat upwind a safe distance, and report in accordance with approved plans) will lesson

the impact to the project and enhance employee safety if MEC/MPPEH is encountered. Assistance in developing this contingency plan should be obtained from the MR Safety Officer, or in his absence the MR Operations Manager or the MR Market Segment Director.

4.3.4 Explosives Management

Management of explosives material under the “Safe Explosives Act of 2002” implements stringent requirements that must be followed. Management of explosives is a process that, if in compliance with federal, state, and local jurisdiction, will reduce, control, or eliminate civil and criminal penalties, disciplinary actions, and potential risk to personnel, the public, and the environment. Details of explosives management are developed on a site-specific basis and included in a site-specific explosives management plan. These details are based on federal, state, and local jurisdiction requirements and on contractual specifications by the client.

4.3.5 Explosives Security

Security of explosives will conform to the requirements set forth by federal, state, and local jurisdictions. Provisions for explosives security during interstate or intrastate shipment will be performed by transportation vendors. Project site and overnight explosives security will conform to 49 CFR 171-173, transportation security requirements. Details of explosives security requirements are included in the explosives management plan for each project.

4.3.6 Controlled Detonation Chamber Operations

A Controlled Detonation Chamber (CDC) is capable of repeated controlled detonations of a suite of energetic materials that are currently demilitarized by open burn/open detonation (OB/OD). On CDC projects, the MR Operations Manager will be contacted to establish requirements.

4.3.7 Explosive Waste Disposal

When used or fired munitions are managed off range (i.e., transported off range and stored, reclaimed, treated, or disposed) or disposed of on range (i.e., buried without treatment), it is subject to regulation as a solid waste under RCRA. This means it may also be subject to regulation as a hazardous waste. Also, munitions that land off range and are not promptly retrieved are solid wastes. Table 4-1 describes how solid wastes may be characterized as hazardous in these situations. All characterization must be based on field observations by qualified MR personnel who are trained to properly identify waste munitions items and meet the requirements for an emergency response expert under RCRA. In the event that the explosive waste is regulated as hazardous waste, refer to SOP [HSE&Q-409](#), Waste Handling: Hazardous Waste for RCRA hazardous waste management requirements.

TABLE 4-1
Waste Characterization

Item	Characterization	Waste Code
Uncontaminated metal debris	If visual inspection determines that the item does not contain waste residue, then waste is non-hazardous scrap metal excluded from RCRA regulation under 40 CFR §261.6(a)(3). Waste may be subject to further incineration and certification requirements.	None

TABLE 4-1
Waste Characterization

Item	Characterization	Waste Code
Contaminated metal debris	If visual inspection determines that the item contains hazardous waste residue, then manage it as potential hazardous waste.	Potential D003 and/or D008
Ordnance items less than 0.50 caliber	Small-arms ammunition is not considered reactive hazardous waste in accordance with EPA policy (November 30, 1984 Memorandum, John Skinner, OSWER Director).	None
Ordnance items greater than 0.50 caliber	Untreated MEC is presumed to be reactive hazardous waste using generator knowledge under 40 CFR §261.23.	D003

4.3.8 Forms and Permits

(1) **Type-20 Manufacturer of High Explosives License/Permit** issued by the ATF&E is required to purchase, store, and use high explosives including on-site use of binary explosives in support of MR operations, construction projects, and demolition and deactivation (D&D) projects. The following must be done prior to execution of field activities:

- Explosives will not be ordered, shipped, stored, or used without the review and approval of the ATF&E License Holder.
- The ATF&E License Holder must review and approve all Explosive Siting Plans (ESPs) and Explosives Management Plans (EMPs) to ensure compliance with ATF&E regulations.
- Following compliance with the above, the ATF&E License Holder will provide procurement/contracting with a certified copy of our Type 20 license and the authorization letter (responsible persons & possessors of explosives) to procure explosives.
- Written authorization designating the “Responsible Persons” and “Possessors of Explosives” who can order, receive, store, and use explosives must be provided by the ATF&E License Holder to explosives supplier.
- A copy of the CH2M HILL ATF&E Type 20 Manufacturer of High Explosives license must be posted on the project site.
- A copy of the ESP must be provided through the ATF&E License Holder to the ATF&E Office that inspects the CH2M HILL records and to the nearest ATF&E Office to the project site.

Additional details are provided in **Attachment 4**, Explosives Management Check List, including required records that must be forwarded to the CH2M HILL ATF&E Type 20 License Holder upon completion of work.

(2) State and local explosives permits may be required for CH2M HILL and individuals to purchase, store, and use explosives in support of MR operations, CDC operations, construction projects, and D&D projects. In addition there may be local requirements to notify law enforcement or fire department agencies when establishing explosives storage.

5.0 Attachments

The following attachments are included with this SOP:

Attachment 1 [Abbreviated Site Safety and Health Plan \(ASSHP\)](#)

Attachment 2 [Opportunity Risk Evaluation \(ORE\)](#)

Attachment 3 [Glossary, Acronyms, and Abbreviations](#)

Attachment 4 [Explosives Management Check List](#)

CH2MHILL

Explosives Usage and Munitions Response (MR)
Standard of Practice HSE&Q-610

Attachment 1: Abbreviated Site Health, Safety, and Environmental Protection Plan (ASSHP)

For

Site name _____

Site location _____

Purpose of visit _____

ASSHP prepared by _____

Office _____

Address _____

Telephone _____

Date prepared _____

Signature and date _____

ASSHP reviewed and approved by:

Safety office: _____ Date: _____

Date: _____

NOTE: This ASSHP is to be used only for non-intrusive site visits and must be approved by the MR Safety Office, or in his absence the MR Operations Manager or the MR Market Segment Director, prior to the start of the field visit. All team members must read and comply with the ASSHP and attend the safety briefings. The UXOSO shall ensure that the Safety Briefing Checklist and Plan Acceptance Form are filled out prior to the start of the site visit.

I. Site Description and Previous Investigation

A. Site Description

. Size ____ + acres

. Present usage

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Military | <input type="checkbox"/> Recreational | <input type="checkbox"/> Other (wildlife refuge) |
| <input type="checkbox"/> Residential | <input type="checkbox"/> Commercial | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Natural area | <input type="checkbox"/> Industrial | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Agricultural | <input type="checkbox"/> Landfill | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Secured | <input type="checkbox"/> Active | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Unsecured | <input type="checkbox"/> Inactive | |

B. Past Uses

All members of the site visit team have been provided with a copy of the ASR.

Yes

No

C. Surrounding Population

- | | | |
|--------------------------------|--------------------------------------|--|
| <input type="checkbox"/> Rural | <input type="checkbox"/> Residential | <input type="checkbox"/> Other (specify) |
| <input type="checkbox"/> Urban | <input type="checkbox"/> Industrial | <input type="checkbox"/> _____ |
| | <input type="checkbox"/> Commercial | <input type="checkbox"/> _____ |

D. Previous Sampling and Investigation Results

1. MEC Encountered

Location	Description
----------	-------------

2. Samples (air, water, soil, and/or vegetation)

Chemical	Concentration	Medium	Location
----------	---------------	--------	----------

II. Description of On-Site Activities

- | | | |
|---------------------------------------|--|--------------------------------|
| <input type="checkbox"/> Walk-through | <input type="checkbox"/> Drive-through | <input type="checkbox"/> Other |
| <input type="checkbox"/> On-road | <input type="checkbox"/> Off-road | <input type="checkbox"/> _____ |
| <input type="checkbox"/> On-path | <input type="checkbox"/> Off-path | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Other | <input type="checkbox"/> Other | <input type="checkbox"/> _____ |

Activities and/or tasks to be performed: _____

III. Site Personnel and Responsibilities

Project Manager

Office _____

Address _____

Phone _____

Responsibilities _____

MEC Safety

Office _____

Address _____

Phone _____

Responsibility _____

Safety Office

Address _____

Phone _____

Responsibility _____

Team Leader

Office _____

Address _____

Phone _____

Responsibilities _____

UXOSO

Office _____

Address _____

Phone _____

Responsibilities _____

First Aid and CPR

Certified _____

Office _____

Address _____

Phone _____

Responsibilities _____

IV. Hazard Analysis

A. Safety and Health Hazards Anticipated

- Chemical (be specific and include warning signs and symptoms of overexposure)
- Ordnance (specify)
- Heat stress
- Noise
- Foot hazard
- Radiological
- Explosive
- Flammable
- Cold stress
- Electrical
- Biological
- Confined space
- Climbing hazard
- Other
- Tripping hazard
- Falling objects
- Overhead hazard
- Water hazard
- Sunburn

B. Overall Hazard Evaluation

- High
- Moderate
- Low
- Unknown

Justification _____

V. Accident Prevention

A. General Precautions

Before the on-site visit, all team members are required to read this ASSHP and sign the form acknowledging that they have read and will comply with it. In addition, the UXOSO shall hold a brief tailgate meeting in which site-specific topics regarding the day's activities are discussed. The buddy system shall be enforced at all times. If unanticipated hazardous conditions arise, team members are to stop work, leave the immediate area, and notify the SSHO.

VI. Standard Operation Safety Procedures, Engineering Controls, and Work Practices

A. Site Rules and Prohibitions

At any sign of unanticipated hazardous conditions, stop tasks, leave the immediate area, and notify the UXOSO. Smoking, eating, and drinking are allowed in designated areas only.

B. Material-Handling Procedures

Do not handle.

C. Drum-Handling Procedures

Do not handle.

D. Confined Space Entry

Do not enter.

E. Ignition Source and Electrical Protection

Smoke in designated areas only.

F. Spill Containment

N/A

G. Excavation Safety

Do not enter trenches and excavations.

H. Illumination

Work during daylight hours only.

I. Sanitation

Use existing sanitary facilities.

J. Buddy System

Two persons shall be on-site maintaining constant contact with each other; this shall be adhered to at all times.

K. Engineering Controls

N/A

L. Heat Stress and Cold Stress

Dress appropriately, take sufficient breaks, and drink plenty of fluids. Watch for signs and symptoms of cold or heat stress. Monitoring may be applicable depending on site weather conditions and type of PPE worn.

M. Ordnance

1. General Information

- a. The cardinal principle to be observed involving explosives, ammunition, severe fire hazards, or toxic materials is to limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material, consistent with a safe and efficient operation.
- b. The age or condition of an ordnance item does not decrease its effectiveness. Ordnance that has been exposed to the elements for extended periods of time becomes more sensitive to shock, movement, and friction because the stabilizing agent in the explosive may be degraded.
- c. When chemical agents may be present, further precautions are necessary. If the munitions item has green markings, leave the area immediately, since it may contain a chemical filler.
- d. Consider ordnance that has been exposed to fire as extremely hazardous. Chemical and physical changes may have occurred to the contents which render it more sensitive than it was in its original state.

2. On-Site Instructions

- a. DO NOT touch or move any ordnance item regardless of the marking or apparent condition.
- b. DO NOT visit an ordnance site if an electrical storm is occurring or approaching. If a storm approaches during a site visit, leave the site immediately and seek shelter.
- c. DO NOT use radio or cellular phones in the vicinity of suspected ordnance items.
- d. DO NOT walk across an area where the ground cannot be seen. If dead vegetation or animals are observed, leave the area immediately due to the potential of contamination by a chemical agent.
- e. DO NOT drive a vehicle into a suspected MR area; use clearly marked lanes.
- f. DO NOT carry matches, cigarettes, lighters, or other flame-producing devices into an MR site.

- g. DO NOT rely on color code for positive identification of ordnance items or their contents.
- h. Approach ordnance items from the side. Avoid approaching the front and rear areas.
- i. Always assume that an ordnance item contains a live charge until it can be determined otherwise.

3. Specific Actions upon Locating MEC

- a. DO NOT touch, move, or jar any ordnance item regardless of its apparent condition.
- b. Approach the item cautiously; take photographs and a full description. Take notes of the markings or any other identifiers.
- c. DO NOT be misled by markings on the ordnance item stating “practice bomb,” “dummy,” or “inert.” Even practice bombs have explosive charges that are used to mark or spot the point of impact; or the item could be mismarked.
- d. DO NOT roll the item over or scrape the item to identify the markings.
- e. The location of any ordnance items found during site investigation should be clearly marked so they can be easily located and avoided.
- f. Notify CEHND upon location of any ordnance. See Section VIII for phone number.

N. Other

Specify: _____

VII. Site Control and Communications

A. Site Map

Attach copy

B. Site Work Zones

N/A

C. Buddy System

To be adhered to at all times.

D. Communications

1. On Site

Use verbal communications among team members to communicate to each other on-site. If this communication is not possible, develop and use hand signals. Here are some examples:

Hand gripping throat:	“Breathing problems, can’t breathe.”
Thumbs up:	“OK, I’m all right, I understand.”
Thumbs down:	“No, negative.”
Hand(s) on top of head:	“Need assistance.”
Grab buddy’s wrist:	“Evacuate site now, no questions.”
One long airhorn blast:	“Evacuate site to assembly point.”
Two short airhorn blasts:	“Condition under control, return to site.”

2. Off Site

Off-site communications shall be established on every site. Communications may be established by using an on-site cellular phone or by locating the nearest public or private phone that may be readily accessed. Mark the appropriate box:

- Cellular phone
- Public or private phone
- Other: _____

3. Emergency Signals

In the case of small groups, a verbal signal for emergencies shall suffice. The emergency signal for large groups (i.e., airhorn) should be incorporated at the discretion of the UXOSO. Mark the appropriate box:

- Verbal
- Nonverbal (specify) _____

VIII. Emergency Response

A. Alert Procedures

Team members are to be alert to the dangers associated with the site at all times. If an unanticipated hazardous condition arises, stop work, evacuate the immediate area, and notify the UXOSO. Practice MEC avoidance. If a suspected MEC is encountered during field activities, the appropriate person will contact local authorities and government Project Manager. The local authorities will

contact military EOD. The suspected item will be marked with colored tape by on-site UXO specialist as applicable.

B. First Aid

A first aid kit and emergency eyewash (as applicable) will be located in the UXOSO’s field car. If qualified persons (i.e., a fire department, medical facility, or physician) are not accessible within five minutes of the site, at least one team member shall be qualified to administer first aid and cardiopulmonary resuscitation (CPR).

C. Emergency Telephone Numbers

1. Medical Facility

2. Fire Department

3. Police Department

4. Poison Control Center (NJ): (800) 962-1253

5. Government Safety Office:
For emergencies involving the discovery of MEC, contact the appropriate government Safety Office. If there is no answer at the appropriate government Safety Office, contact the local law enforcement office.

6. Local EOD

7. Project Manager

8. Others (list)

D. Hospital and Medical Facility Information

Route to hospital: Attach a map with the route to the hospital marked; if a map is not available, then provide clear, written instructions.

IX. Monitoring Equipment and Procedures

A. Exposure Monitoring

For non-intrusive on-site activities such as site visits, air monitoring is typically not required. However, if the site situation dictates the need for monitoring, then complete the following information on a separate page and attach the page to the ASSHP.

- Monitoring equipment to be utilized
- Documentation of equipment calibration and results
- Action levels

B. Heat and Cold Stress Monitoring

If heat stress monitoring is necessary, the monitoring criteria published in Chapter 8 of *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH/OSHA/USCG/EPA, October 1985) shall be followed. If cold stress monitoring is necessary, it shall be conducted in accordance with the most current American Conference of Governmental Industrial Hygienists (ACGIH) cold stress standard.

X. Personal Protective Equipment

A. General

Typically, for non-intrusive site visits, Level D PPE is required. Hard hats shall be worn if an overhead hazard exists, safety shoes if a foot hazard exists, and safety glasses if an eye hazard exists. If a higher level of protection is to be used initially or as a contingency, attach a brief discussion.

B. Non-intrusive Site Visit

Level of Protection

- | | | | |
|--------------|----------------------------|----------------------------|---|
| Initial: | <input type="checkbox"/> C | <input type="checkbox"/> D | <input type="checkbox"/> Modified (specify) |
| Contingency: | <input type="checkbox"/> C | <input type="checkbox"/> D | <input type="checkbox"/> Modified (specify) |
- Evacuate site if higher level of protection is needed.

XI. Decontamination Procedures

If decontamination is required, attach an additional sheet with the requirements.

Decontamination procedures are not anticipated for this site investigation. Team members are cautioned not to walk, kneel, or sit on any surface with potential leaks, spills, or contamination.

XII. Training

All site personnel shall have completed the training required by EM 385-1-1 and 29 CFR §1910.120 (e). The Project Manager shall ensure, and the UXOSO shall verify, that all on-site persons have completed appropriate training prior to submitting the plan to the safety office for review. Additionally, the UXOSO shall inform personnel, before they enter the site, of any potential site-specific hazards and procedures.

XIII. Medical Surveillance Program

The Project Manager shall ensure, and the UXOSO shall verify, that all on-site personnel are in the Medical Surveillance Program meeting the requirements of 29 CFR §1910.120 (NAVMED P-117 or equivalent) and ANSI Z-88.2, as appropriate, depending on the PPE and site-specific tasks.

Provide the following information on training and medical surveillance:

Name:

Course Date:

Medical Exam:

40-Hour/8-Hour

Date

XIV. Logs, Reports, and Recordkeeping

Site logs are maintained by the team leader. These are to include historical data, personnel authorized to visit the site, all records, standard operating procedures, any air monitoring logs, SOPs, and attachments to plans.

XV. General

The number of persons visiting the site shall be held to a minimum. No more than 8 people per UXOSO shall be allowed on-site. The more persons on-site, the greater the potential for an accident. The UXOSO may modify this ASSHP if site conditions warrant it and if it does not risk the safety and health of the team members. This modification shall be coordinated with the team members, and the UXOSO shall notify CEHND PM-SO of the change as the situation allows.

XVI. Natural Resources

The following is a list of threatened and endangered species:

Safety Briefing Checklist

(Check subjects discussed)

Location: _____ Date: _____

General Information

Purpose of visit: _____

Identification of key site personnel: _____

Training and medical requirements: _____

Specific Information

Site description and past uses: _____

Results of previous studies: _____

Potential site hazards: _____

MEC safety procedures: _____

Site SOPs: _____

Site control and communications: _____

Emergency Hand Signals

Emergency Response: _____

Location of First Aid Kit

Emergency Phone Numbers and Location

Location of Nearest Medical Facility and Location of Map to Facility

PPE and Decontamination: _____

Note: Stress the following during the briefings: If an unanticipated hazardous condition arises, stop work, evacuate the immediate area, and notify the UXOSO.

Plan Acceptance Form: Abbreviated Site Safety and Health Plan

For:

I have read and agree to abide by the contents of this Abbreviated Site Safety and Health Plan and I have attended the Safety Briefing for the aforementioned site.

Name (printed)	Office	Signature	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Person presenting the safety briefing:

Signature	Date
-----------	------

Equipment List

(The following items may be necessary to support the non-intrusive site visit)

CH2MHILL

Explosives Usage and Munitions Response (MR)
Standard of Practice HSE&Q-610

Attachment 2: Opportunity Risk Assessment (ORE)

17.0 PROJECTS INVOLVING OR POTENTIALLY INVOLVING THE USE OF EXPLOSIVES, MATERIALS POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD (MPPEH), MUNITIONS AND EXPLOSIVES OF CONCERN (MEC), AND RELATED ACTIVITY.

Administrative Information: (Fill in or highlight appropriate information)

Project Name:
Project Number:
Project Location: (Address, City, State, Zip Code, Country)
Address
City:
State:
Zip Code:
Country:
Contracting Organization:
Client Organization:
Department of Defense
Department of State
Department of Energy
Department of Interior
Other
Client Organization Name:
Contract:
U.S. Army Corps of Engineers
Navy
Air Force
Marine Corps
Other

PART A:

Common questions for Explosives Usage, Munitions Response (MR), and Controlled Detonation Chamber (CDC) projects. (Highlight Appropriate Number)

Scoring criteria

0 = none, 1 - 2 = Low Risk 3 Moderate Risk 4 - 5 High Risk

17.A1 Client Scope of Work E&MR Risk Factor	
Project Risk Category?	Check Correct Item
Military Munitions	
Military Explosives	
Commercial Explosives	
Commercial Ammunition	
Commercial Pyrotechnics	
HTRW	

17.A2 Client – END LAND USE	
Which factor best describes the project end land use?	Point Value
Like Use –	0
Not Yet Determined –	1
Limited Public Access – livestock grazing/wildlife preserve/historic area	2
Public Access – Farming/Agriculture	3
Unrestricted – Commercial	4
Unrestricted – Residential	5

17.A3 Chemical Warfare Materiel (CWM)	
Which factor best describes this risk factor?	Point Value
None	0
No-specific reference - but possible	3
CWM Known or Suspected	5

17.A4 Are Munitions and Explosives of Concern (MEC) Suspected?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A5 Does Owner acknowledge that it will retain ownership of, and responsibility for MEC & wastes?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.A6 Does Client indemnify CH2M HILL from third party claims for: Liability, Workers Comp, Pollution, etc.	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know?	3
No	5

17.A7 Is Owner responsible for obtaining necessary permits?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.A8 Will CH2M HILL write site-specific work/safety plan for this project?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17. A9 Will CH2M HILL subcontract MR or Explosive operational actions?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A10 Will CH2M HILL be responsible for MPPEH to include scrap?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A11 Is CH2M HILL HILL responsible for the disposal of Solid Waste and Hazwaste?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A12 Are commercial explosives required?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A13 Is Explosives storage required on site?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A14 Are there adjacent facilities/operations?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A15 Are there inhabited buildings in close proximity to the site?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A16 Are there public transportation routes in close proximity to the site or airport operations?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A17 Will explosive safety procedures adversely affect schedule?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

17.A18 Are there emergency response services in close proximity to site (e.g., fire, hospital)?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.A19 Are there sensitive environments that need to be considered?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
Don't Know	3
Yes	5

PART B:
Explosives Usage Project Questions

17.B1 Source of Explosives	
Which factor best describes the source?	Check (x)
Vendor - Authorized ATF&E Dealer	
Government Furnished	
Client Furnished	
Local Manufactured (Binary Explosives)	
Subcontractor Provided	
Transferred from another CH2M HILL project	

17.B2 Explosive Operations General RISK Requirements/Concerns	
Which factors apply to regulatory conformance risk factor?	Check (x)
State Blasting License (Individual)	
State Blasting License (Corporation)	
State Explosive Storage Permit (Fire Marshal Inspection)	
Vehicle Inspection (state of registration) for hazard materials transportation	
Hazard Materials License (federal and/or state)	
Operator – Commercial Drivers License with Hazmat Endorsement	
Miss Utilities Permit – underground gas lines, pipelines, alarms, internet, fiber optics, cable crossings, communications, sewer lines – Ground Shock/vibrations	
Airport/flight paths – Notice to Airmen (NOTAM) – Airspace	
Navigable Waterways – Notice to Mariners (NOTM)	
Power lines/ Radar/ Microwave tower/Antenna – Electro Magnetic Radiation Hazards	
Military - training corridor/area/test area/research and development area	
Need to establish a Temporary Open Detonation Area	
Need to establish an Explosive Holding Area	
Need to establish an Explosive Inspection Area for MPPEH/MD	
Need to establish a storage area for MEC	
Need to establish a storage area for MPPEH	

17.B3 Explosive Storage Risk Factors	
Which factor best describes this risk factor Magazine Condition?	Point Value
Not Applicable	0
Fire Inspector Permit/ground tests documents/ventilator and doors and locks and hasps IAW NFPA Code 495	1
	2
Do Not Know	3
	4
Surplus excess	5

17.B4 Explosive Transportation	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Within project area – private roads	1
	2
Public Roads	3
	4
Federal Roads (interstate)	5

17.B5 Explosive Security	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Provided by Military	1
	2
Don't Know	3
	4
Not Provided by Others	5

17.B6 Is underwater work required?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
	2
Don't Know	3
	4
Yes	5

PART C:
Munitions Response Project Questions

17.C1 Type of Munitions Response (MR) project	
Which factor best describes this risk factor?	Point Value
Environmental Records Search and Confirmation Study – Non-intrusive actions	0
Escort and/or Avoidance Activities – (site visit, reconnaissance, sediment sampling, develop wells, perform O&M, land survey, area preparation, design work, etc.)	1
Construction Support Trenching, Excavation, Soil Sifting, In Situ Treatment, Demolition, Land Clearing/grubbing etc.)	2
Demilitarization/ MPPEH/ Blasting/	3
Removal Action	4
Demining, IEDs	5

17.C2 What is Potential Land Use?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Same Use	1
Wildlife Preserve	2
Commercial	3
Industrial	4
Residential	5

17.C3 Type of Munitions Constituent (MC) Contaminated Soil and/or Groundwater	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Low concentrations of explosives measured in ppb/ppm	1
High concentrations of explosives measured in ppb/ppm	2
High concentrations of explosives measured in ppb/ppm - No explosive hazard	3
Soil with 5% to 10% energetic material by weight - initiation hazard	4
Soil with >10% energetic material by weight - explosive hazard	5

17.C4 Type of MEC Disposal	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Discarded Military Munitions (DMM)	1
MEC Unfused	2
MEC Fused but safe for movement	3
Munitions requiring disassembly prior to demilitarization	4
Unknown deteriorated material	5

17.C5 Is an explosive safety submission (ESS) anticipated by the Client?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
	2
Don't Know	3
	4
Yes	5

17.C6 Is underwater work required?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
No	1
	2
Don't Know	3
	4
Yes	5

PART D:

Controlled Detonation Chamber (CDC) Project Questions

17.D1 Type of MEC Hazard	
Which factor best describes this risk factor?	Point Value
Small arms ammunition up to and including 0.50-caliber	0
Demilitarization	1
MPPEH	3
Fireworks	4
CWM	5

17.D2 Quality and Completeness of Inventory	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Subject to Direct Inspection and Verification by CH2M HILL	1
Inspection/Verification by Others	3
Client Statement	5

17.D3 Condition of MEC	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Unserviceable ammunition (Code H)	1
MEC Unfused	2
MEC Fused but safe for movement	3
Munitions requiring disassembly prior to demilitarization	4
Unknown deteriorated material	5

17.D4 Will CH2M HILL provide CDC operator services?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.D5 If CDC leased to Owner, will CH2M HILL train Owner's operators?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.D6 Will Owner accept CH2M HILL rejection of MEC deemed unsuitable for CDC destruction?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17.D7 Are all MEC items of type, size and condition previously destroyed in CDC?	
Which factor best describes this risk factor?	Point Value
Not Applicable	0
Yes	1
Don't Know	3
No	5

17. __	
Risk Management Strategy	

17. __	
Risk Management Strategy	

17. __	
Risk Management Strategy	

17. __	
Risk Management Strategy	

17. __	
Risk Management Strategy	

17.____	
Risk Management Strategy	

17.____	
Risk Management Strategy	

17.____	
Risk Management Strategy	

17.____	
Risk Management Strategy	

CH2MHILL

Explosives Usage and Munitions Response (MR) Standard of Practice HSE&Q-610

Attachment 3: Glossary, Acronyms, and Abbreviations

Active munitions inventory (or stockpile): The supply of chemical and conventional military munitions that is available for issue and use for combat, training, demonstrations, research, development, testing, or evaluation. (See **munitions stockpile** and **demilitarization inventory**.)

Active range: An operational military range that is currently in service and being regularly used for training, demonstrations, research, development, testing, or evaluation.

AEDA: ammunition, explosives, and dangerous articles.

Anomaly avoidance: Techniques employed by EOD or UXO personnel at sites with known or suspected MEC to avoid any potential surface MEC or subsurface anomalies. This usually occurs at mixed-hazard sites when HTRW investigations must occur before an MEC removal action is executed. Intrusive anomaly investigations are not authorized during ordnance avoidance operations.

Anomaly: Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and nonferrous material at a site.

AP: armor piercing: Munitions that may or may not contain HE and are designed to penetrate hard targets.

APERS: antipersonnel munitions: May be loaded with high explosives or incendiary fillers and are designed to kill, wound, or obstruct personnel.

APT: armor-piercing tracer: Munitions, designed to penetrate hard targets, that contain a pyrotechnic element that produces bright light and/or smoke to aid in visual tracking of the munitions in flight.

ATV: all-terrain vehicle.

BD: base detonating: Impact fuse designed to function when the projectile comes in contact with the surface of the target. The fuse is located in the base or tail of the munitions.

bgs: below ground surface.

BRAC: Base Realignment and Closure.

CAD: cartridge-actuated device: An explosive device designed to produce gas pressure to expel or eject an item.

Cal: caliber: The diameter of a projectile or the bore of a weapon (i.e., .50-cal, 3-inch, 90-millimeter).

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act.

Chemical warfare materiel (CWM): An item configured as ammunition, containing a chemical substance intended to kill, seriously injure, or incapacitate a person through its physiological effects. Also includes V- and G-series nerve agents, H-series blister agent, and lewisite in other-than-munitions configurations. Due to their hazards, prevalence, and military-unique application, chemical agent identification sets (CAIS) are also considered CWM. CWM does not include riot control agents, chemical herbicides, smoke- and flame-producing items, or soil, water, debris, or other media contaminated with a chemical agent.

Closed range: A military range that has either been taken out of service as a range and has been put to new uses that are incompatible with range activities, or that is no longer considered to be a potential range area. A closed range is still under the control of a DOD component.

Construction support: Support provided by qualified UXO personnel during construction activities at potential MR sites to ensure the safety of construction personnel from the harmful effects of MEC. When it is determined that the probability of encountering MEC is low (current or previous land use leads to a determination that MEC may be present), a two-person UXO team will stand by in case the construction contractor encounters a suspected MEC. When it is determined that the probability of encountering a MEC is moderate to high (current or previous land use leads to a determination that MEC was employed or disposed of in the parcel of concern, e.g., open burn and open detonation areas), UXO teams are required to conduct subsurface MEC clearance for the known construction footprint, either in conjunction with the construction contractor or before construction.

Controlled detonation chamber (CDC): Also known as the Donovan Blast Chamber (DBC), the CDC is a system for controlled detonation of MEC and MEC-related materials. It is capable of repeated controlled detonations of a suite of energetic materials that are currently demilitarized by OB/OD. This offers the DOD an alternative to OB/OD while at the same time increasing throughput, efficiency, and safety and controlling air, soil, water, and noise pollution. The CDC system meets all state and federal air discharge regulations.

CQC: Contractor Quality Control.

CTT: closed, transferring, and transferred (refers to a subset of military ranges).

DAC: Defense Ammunition Center.

DDESB: Department of Defense Explosives Safety Board.

DERP: Defense Environmental Restoration Program.

Demilitarization (“demil”): The process that removes the military characteristics from unused munitions that are either unsuitable for continued storage, excess to DOD needs, or about to be released from DOD control. Demilitarization applies equally to munitions in unserviceable or serviceable condition. Used (i.e., fired) munitions items also sometimes undergo demilitarization. There are many demilitarization methods, such as recovery, recycling, remanufacture, disassembly, reclamation, mutilation, alteration, melting, burning, detonating, destruction, treatment, and disposal. Methods involving R3 currently constitute approximately two-thirds of the DOD demilitarization programs.

Demilitarization (demil) inventory: The demilitarization inventory consists of excess, obsolete, and unserviceable munitions. Munitions are moved from the active inventory to the demilitarization inventory after it is determined that they are not economically repairable, they are obsolete, or they are excess to DOD needs and cannot be sold under the Foreign Military Sales program. (Also see **active munitions inventory** and **munitions stockpile**.)

DENIX: Defense Environmental Network and Information Exchange.

Department of Defense Components: The Office of the Secretary of Defense, the Military Departments and Services, the Joint Staff, the Unified and Specified Combatant Commands, the Defense Agencies, the DOD Field Activities, and the National Guard.

Department of Defense Explosives Safety Board (DDESB): A Joint Service board comprising a chairperson, voting representatives from each of the Armed Services, and a permanent military and civilian secretariat to perform operational and administrative functions. The DDESB provides impartial and objective advice to the Secretary of Defense and DOD components on explosives safety matters. (See DOD 6055.9-STD for a detailed assignment of DDESB functions.)

DGPS: differential global positioning system.

Discarded military munitions (DMM): Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

DLA: Defense Logistics Agency.

DMM: discarded military munitions.

DOD: U.S. Department of Defense.

DODD: Department of Defense Directive.

DODIG: Department of Defense Inspector General.

DOI: U.S. Department of Interior.

DRMO: Defense Reutilization and Marketing Office.

DRMS: Defense Reutilization and Marketing Service.

EBS: environmental baseline survey.

Emergency response (to munitions- or explosives-related or UXO emergencies): An immediate response by explosives and munitions emergency response personnel (i.e., DOD EOD personnel) to control, mitigate, or eliminate the actual or potential threat encountered during an explosives or munitions emergency. The response action may include in-place or on-site render-safe procedures, treatment, or destruction of the explosives or munitions or

their transport to another location where these operations may be conducted. (See 40 CFR Part 260 et seq., the Military Munitions Rule.)

Energetic material: A component or item of ammunition that is designed to produce the necessary energy required for ignition, propulsion, detonation, fire, or smoke, thus enabling the item to function. Also a material (e.g., corrosive or oxidizer) that is inherently dangerous and capable of causing serious damage and that requires regulated handling to avoid accidents in connection with its existence and use.

EOD: explosive ordnance disposal.

EPA: U.S. Environmental Protection Agency.

EPCRA: Emergency Planning and Community Right-to-Know Act.

ERGM: extended-range guided munitions.

ESOH: Environmental, Safety, and Occupational Health.

ESOHPB: Environmental, Safety, and Occupational Health Policy Board.

Essential personnel. Personnel whose duties require them to remain within an ESQD arc for one or more of the following reasons:

- a. Direct involvement in an ammunition and explosives handling operation.
- b. Provision of mission-required services.
- c. Provision of mission-related repairs and/or tests.

ESTCP: Environmental Security Technology Certification Program.

Exclusion zone (EZ): A safety zone established around an MR work area. Only project personnel and authorized, escorted visitors are allowed within the EZ. Examples of EZs are safety zones around MEC-intrusive activities and safety zones where MEC is intentionally detonated. (See DDESB-KO, 27 January 1990.)

Explosive Equivalent. The amount of a standard explosive which, when detonated, will produce a blast effect comparable to that which results at the same distance from the detonation or explosion of a given amount of the material for which performance is being evaluated. It is usually expressed as a percentage of the total net weight of all reactive materials contained in the item or system. For the purpose of this manual, TNT is used for comparison.

Explosive Ordnance Disposal (EOD): Includes detecting, identifying, field evaluating, rendering safe, and final disposing of MEC.

Explosive Ordnance Disposal (EOD) Personnel: Military members who have graduated from the Naval School, EOD. They have received highly specialized training to provide time-critical MEC hazard mitigation services during both peacetime and wartime. EOD personnel are trained and equipped to perform render-safe procedures (RSP) on nuclear, biological, chemical, conventional, and improvised explosive devices. (Note that EOD personnel are distinguished from UXO Technicians, who are civilian contractor or

government personnel with specialized training and qualifications in the long-term remediation of MEC.)

Explosive Safety Quantity Distance (ESQD): The prescribed minimum distance between sites storing or handling hazard Class 1 explosive material and specified exposures (i.e., inhabited buildings, public highways, public railways, other storage or handling facilities, or ships, aircraft, etc.) to afford an acceptable degree of protection and safety to the specified exposure. The size of the ESQD arc is proportional to the NEW present.

Explosive Safety Submission (ESS): The document that serves as the specifications for conducting work activities at the project. The ESS details the scope of the project, the planned work activities, potential hazards, and the methods for their control.

Explosive Siting Plan (ESP): The document that serves as a DDESB Permit approving the site-specific storage locations, quantities, and safe distances for explosive operations.

Explosive soil: Mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself is explosive. The following also defines an explosive soil: The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether an explosive is classified as “primary” or “secondary.” Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. They are easily detonated by heat, sparks, impact, or friction. Examples of primary explosives include lead azide, lead styphnate, and mercury fulminate. Secondary explosives are bursting and boosting explosives (i.e., they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. Soil containing 10 percent or more by weight of any mixture of secondary explosives is considered “explosive soil.” Soil containing propellants (as opposed to primary or secondary high explosives) may also present explosion hazards.

°F: degrees Fahrenheit.

FAR: Federal Acquisition Regulations.

FFA: Federal Facilities Agreement.

FFCA: Federal Facilities Compliance Act.

FOST: finding of suitability to transfer.

Frag: fragment or fragmentation: Munitions material projected away from the point of detonation at a high velocity.

Free from explosive hazard: Material that has been inspected for explosives and determined not to present a danger of explosion or combustion from explosive or energetic material.

FUDS: formerly used defense sites.

GIS: geographic information system.

GPS: global positioning system.

Hazardous waste: A solid waste that meets the following criteria: (1) is or contains a hazardous waste listed in 40 CFR Part 261, or (2) exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. (Refer to 40 CFR § 261.3 for further explanation.)

HE: high explosive: Explosive that normally detonates rather than burns.

HEAT: high-explosive antitank: Ordnance designed to defeat armor by the use of a shaped charge.

HEI: high-explosive incendiary: High-explosive-filled ordnance with additional ingredients to give a fire-producing effect.

HQMC: Headquarters, U.S. Marine Corps.

ICM: improved conventional munition.

Impact area: The identified area within a range intended to capture or contain ammunition, munitions, or explosives and resulting debris, fragments, and components from various weapon system employments. In simple terms, normally the target area where live-fire rounds or bombs impact the earth.

Improved conventional munition (ICM): ICMs or submunitions, cluster bombs, and cargo rounds are considered sensitive-fused munitions and require special authority to enter contaminated areas.

Inactive range: An operational military range that is not currently being used but is still under military control, and which the military both considers to be a potential range area and has not put to a new use that is incompatible with range activities. A potential range area is defined as meeting one of three criteria:

- (1) Mobilization and force projection: ranges that are held by a DOD component for the purpose of preparing individuals and units for worldwide deployment, redeployments, or demobilization in response to war, stability, and support operations or projected training requirements that would exceed current active range capabilities;
- (2) Force structure: ranges held as inactive during realignment, reorganization, stationing, or reequipping of units projected to use these ranges under new training requirements; or
- (3) Future: ranges that are held by DOD components for future use in support of National Security Policy or DOD component doctrine that ensures the capability to produce, establish, and maintain conditions needed for operational success.

Inhabited Building Distance (IBD): The minimum distance permitted between an inhabited building and an ammunition or explosives location for the protection of administration, quarters, industrial, and other similar areas within a naval shore establishment. Inhabited building distances shall be provided between ammunition or explosives locations and the boundary of a shore establishment of the nearest point beyond the boundary where such inhabited structures could be erected.

Integrated Training Area Management (ITAM): A U.S. Army program designed to improve range conditions by inventorying and monitoring land conditions, determining

carrying capacity of the land in terms of the training requirements, and providing for land rehabilitation and maintenance measures.

Intentional detonation: An intentional detonation is a planned, controlled detonation.

Intrusive activity: An activity that involves or results in the penetration of the ground surface at an area known or suspected to contain MEC. Intrusive activities can be of an investigative or removal action nature.

IR: Installation Restoration.

ITAM: Integrated Training Area Management (a U.S. Army program).

JOCG: Joint Ordnance Commanders Group.

JUXOCO: Joint UXO Coordination Office.

Material that presents a potential explosive hazard (MPPEH): Military munitions, including: their components; munitions packaging material; residues from research, development, testing, and evaluation (RDT&E), production, use (to include range scrap), operational and quality testing, or demilitarization of munitions; or any other materials, equipment, or facilities potentially contaminated with explosives. MPPEH includes both end items and residues derived from processing end-items within United Nations Organization (UNO) Hazard Class (HC). It also includes munitions-related items, pieces, models, training aids, etc., that are suspected but not confirmed to be wholly inert.

Maximum credible event (MCE): The worst single event that could occur at any time with maximum release of a chemical agent from a munition, container, or process as a result of an unintended, unplanned, or accidental occurrence.

MEC: munitions and explosives of concern.

MIL SPECS/STDS: military specifications and standards.

Military munitions: All ammunition products and components produced or used by or for the DOD or the U.S. Armed Services for national defense and security, including military munitions under the control of the DOD, the U.S. Coast Guard, the U.S. DOE, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries used by DOD components, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. It does not include: wholly inert items; improvised explosive devices; and nuclear weapons, devices, and components thereof. However, it does include nonnuclear components of nuclear devices, managed under DOE's nuclear weapons program after all required sanitation operations under the Atomic Energy Act of 1954, as amended, have been completed.

Military range: A designated land or water area set aside, managed, and used to conduct research on, develop, test, and evaluate military munitions and explosives, other ordnance, or weapon systems, or to train military personnel in their use and handling. Ranges include

firing lines and positions, maneuver areas, test pads, detonation pads, impact areas, and buffer zones with restricted access and exclusionary areas.

MLLW: mean lower low water.

Most probable event (MPE): The most likely event, as a result of an accidental, unplanned, or unintended detonation of an item of ordnance, that could occur during MR activities. The event must be realistic, with reasonable probability of occurrence.

MPPEH: munitions that present a potential explosive hazard.

MT: mech time or mechanical time: fuses designed usually for airburst. MT fuses are located in the nose of the munition.

Munitions and explosives of concern (MEC): Military munitions that are UXO or have been abandoned, as defined in the EPA Munitions Rule. Also includes soil, facilities, equipment, or other materials contaminated with a high enough concentration of explosives that it presents an explosive hazard.

Munitions constituents (MC): Any materials originating from military munitions, including explosive and/or non-explosive materials, and emission, degradation, or breakdown products. [The following additional explanation is offered for purposes of this SOP: Munitions constituents are the substances or chemical residues that result from the proper functioning or use of munitions (e.g., residues created and remaining in the soil, water, or air from the burning or explosion of energetic material) or that are present in MEC. Such constituents may or may not present an immediate risk of acute physical injury from fire or explosion resulting from accidental or unintentional detonation or ignition of MEC or energetic materials. Similarly, such constituents may or may not result in environmental contamination requiring a response (i.e., response action).]

Munitions Debris (MD): Metal fragments resulting from the intended use of munitions or detonations.

Munition with the Greatest Fragmentation Distance (MGFD): The munition with the greatest fragment distance that is reasonably expected (based on research or characterization) to be encountered in any particular munition response area (MRA) or munitions response site (MRS).

Munitions Response Area (MRA): Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.

Munitions Response Site (MRS): A discrete location within a MRA that is known to require a munitions response.

Munitions Rule Implementation Policy: Detailed guidance and procedures issued by the Services that explains how DOD will implement and comply with the EPA Military Munitions Rule.

Munitions stockpile: Munitions in the active and demilitarization inventories as well as unused waste munitions as defined in the EPA's Military Munitions Rule (MMR). (See **active munitions inventory** and **demilitarization inventory**.)

Munitions: see **military munitions**.

Net Explosive Weight (NEW): The actual weight of explosive mixture or compound including the TNT equivalent of other energetic material which is used in the determination of explosive limits and ESQD arcs.

Non-stockpile chemical warfare materiel: CWM (defined above) that is not included in the chemical stockpile. Non-stockpile CWM is divided into five categories: (1) buried CWM; (2) recovered chemical weapons (items recovered during range clearing operations, from chemical burial sites, and from research and development testing); (3) former chemical weapon production facilities; (4) binary chemical weapons; and (5) miscellaneous CWM (unfilled munitions and devices and equipment specially designed for use directly in connection with employment of chemical weapons).

OB: open burn.

OCR: Office(s) of Collateral Responsibility.

OD: open detonation.

ODEP: Office of Defense Environmental Programs.

ODUSD (I&E): Office of the Deputy Under Secretary of Defense (Installations and Environment).

OE Safety Specialist: a USACE employee involved in the execution, supervision, or oversight of ordnance-related activities inside the exclusion zone who has graduated from the U.S. Naval EOD School, Indian Head, MD. An OE Safety Specialist shall be on-site each day during intrusive and MEC destruction activities. The OE Safety Specialist is on-site to ensure that the contractor establishes the appropriate daily safety routines at the beginning of UXO field operations, to perform quality assurance oversight, to verify contractor employee UXO qualifications, to advise the contractor on UXO procedures, to coordinate with the PM, and to facilitate EOD response when needed.

OEESCM: Operational and Environmental Executive Steering Committee for Munitions.

Open burn (OB): A controlled open-air process by which excess, unserviceable, and obsolete munitions are destroyed to eliminate their inherent explosives safety hazards. DOD OB units contain the munitions with pans or pads to minimize environmental contamination. DOD OB units are permitted as "miscellaneous units" in EPA's environmental permitting process.

Open detonation (OD): A process used for the treatment of unserviceable, obsolete, and/or waste munitions whereby an explosive donor charge initiates the munitions to be detonated. Although surface detonations can be performed under certain circumstances, most munitions are treated in 4- to 6-foot-deep pits for safety purposes. Most OD sites are permitted as miscellaneous units as part of the EPA environmental permitting process. DOD's units are generally permitted as combined OB/OD facilities.

Operational range: A military range that is currently under military control and management; includes both active ranges (currently in service or use) and inactive ranges (not in current use or service).

OPR: Office(s) of Primary Responsibility.

OSD: Office of the Secretary of Defense.

OU: Operable Unit.

OUSD (AT&L): Office of the Under Secretary of Defense (Acquisition, Technology, and Logistics).

PD: point detonating: impact fuse, designed to function when the projectile comes in contact with the surface of a target; located in the nose of the munition.

Potential Explosion Site (PES): The location of a quantity of explosives that will create a blast, fragment, thermal, and/or debris hazard in event of an accidental explosion of its contents. Quantity limits for ammunition/explosives at a PES are determined by the distance to an exposed site.

POL: petroleum, oil, and lubricants.

PPE: personal protective equipment.

Primer: Small, sensitive explosive component used as the first element in the explosive train.

Proj: projo or projectile: A weapon that is projected through a tube or barrel into the air toward a target.

PSE: preliminary source evaluation.

PTT: powder train time fuse: Fuses designed usually for airburst, normally used with illumination rounds to light up the battlefield.

QA: quality assurance.

QC: quality control.

Quantity-distance (Q-D): the quantity of explosives material and distance separations that provide defined types of protection. These relationships are based on levels of risk considered acceptable for the stipulated exposures and are tabulated in the appropriate Q-D tables provided in DOD 6055.9-STD. Separation distances are not absolute safe distances but are relative protective safe distances. Greater distances than those shown in the Q-D tables shall be used whenever possible.

R&D: research and development.

RAB: Restoration Advisory Board.

RAC: Remedial Action Contract.

Range clearance: An operation or procedure conducted to remove and properly dispose of munitions or munitions fragments. (e.g., MEC, "duds," etc.). Several types or degrees of clearance may be conducted (e.g., surface clearance based on visual inspection of the surface; shallow clearance where an area is systematically swept with detectors – normally to a depth of 20-24 inches; etc.) Range clearance, though technically applicable to any range category (closed, transferred, active, etc.) is often considered as occurring only at active,

operational ranges. Clearance operations at these active ranges are normally conducted as part of range maintenance activities to maintain or enhance operational safety conditions at the range facility. Even though it is possible for MEC to cause environmental contamination (pollution of soil, surface water, groundwater, etc., from the chemical constituents present in munitions), range clearance is focused on removing and safely disposing of munitions/ordnance items or fragments – not the removal or treatment of any chemical residues or constituents from the munitions or associated environmental contamination. Cleanup of environmental contamination or pollution is normally achieved by removal or remedial actions.

Range: see **military range**.

RCRA: Resource Conservation and Recovery Act.

RCWM: recovered chemical warfare material.

RDT&E: research, development, test, and evaluation.

Regional Environmental Coordinator (REC): A senior military officer or DOD civilian assigned to one of ten EPA regions who is responsible for the dissemination of information and coordination of environmental matters and public affairs among military installations and environmental regulatory organizations within their respective region. RECs have a liaison role and fully adhere to the Services' chain of command.

Remedial actions/remediation/remedial action process: Longer-term activities that complete the cleanup of contamination (or a contaminated site or location) if a removal action has not achieved or cannot achieve the required degree of cleanup for the contamination problem. A distinction is sometimes made between the control or cleanup measures to be implemented, which are called "remedial actions," and the identification, evaluation, decision-making, and design and construction steps required to implement the control measures. These steps collectively are called the "remedial action process."

Removals/removal action(s): Relatively quick actions designed to address imminent threats to human health and the environment posed by releases or spills of hazardous substances. Removals should satisfy one or more of the following tests:

- (1) **Imminent threat:** the site or situation poses an imminent threat to public health.
- (2) **Source control:** the removal action either removes the source of contamination off-site or effectively contains it on-site so that continuing releases to the environment are prevented or reduced.
- (3) **Access limitation:** the removal action substantially reduces the possibility of human exposure to hazardous substances. The EPA has categorized removal actions as emergency, time-critical, and non-time-critical. Each of these categories possesses its own criteria and procedural requirements.

Resource recovery and recycling (R3): Technologies and processes used by DOD to demilitarize military munitions. These include reuse, sale "as is" (e.g., Foreign Military Sales), conversion to a commercial product for sale or industrial use, or disassembly, modification, and partial or whole use for a military application.

Response(s) or response action(s): Responses or response actions are broadly defined in environmental law and regulations as any scientific or engineering investigation, evaluation, decision-making, design, or implementation step taken in response to (i.e., to clean up) a release or spill of hazardous substances. Removals and remedial actions (or remedial action processes) are subcategories of response actions. Procedural requirements (established in environmental regulations) for these two types of actions differ substantially, but their definitions are almost as broad as for “responses,” allowing the terms to be used almost interchangeably. The various terms are best defined by the procedural requirements imposed on them by the applicable environmental regulations.

RI/FS: remedial investigation/feasibility study.

ROD: Record of Decision.

Senior UXO Supervisor (SUXOS): Supervises all contractor on-site UXO activities. This individual must be a graduate of the U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD, or the U.S. Naval EOD School, Indian Head, MD. Must have at least 15 years of combined active-duty military EOD and contractor UXO experience, to include at least 10 years in supervisory positions.

SERDP: Strategic Environmental Research and Development Program.

SHPO: State Historic Preservation Officer.

Single Manager for Conventional Ammunition (SMCA): A DOD executive agent responsibility performed by the U.S. Army Operations Support Command. The Secretary of the Army is DOD’s SMCA. The U.S. Army OSC is the day-to-day operator of the SMCA and serves as the central program manager for the execution of most of DOD’s demilitarization requirements. The objectives and responsibilities of the SMCA can be found in DOD Directive 5160.65.

Sustainable range management: Management of a military range in a manner that supports national security objectives and maintains the operational readiness of the Armed Forces and ensures the long-term viability of the range while protecting human health and the environment. [The following additional explanation is offered for purposes of this SOP: A comprehensive DOD approach that develops and implements the policies, plans, practices, and procedures necessary to achieve sustainable ranges. Sustainable ranges are managed and operated in a manner that supports their long-term viability and utility to meet the national defense mission. Sustainable ranges will implement the planning, management, coordination, and public outreach necessary to ensure viable continuity of test and training operations and long-term coexistence with neighboring communities and natural ecosystems.]

Sustainable use: Actions taken to ensure that ranges maintain the ability to conduct training, research, development, testing, and evaluation of munitions in support of the national defense mission while minimizing adverse effects to human health and the environment.

SUXOS: Senior UXO Supervisor.

SWMU: solid waste management unit.

TNT equivalent: Considering the peak overpressure produced by detonation of a given weight of TNT as 100 percent, the TNT equivalency of an explosive is the amount of overpressure produced by detonation of an identical quantity of propellant under comparable conditions, expressed as a percentage.

Transferred range: A military range that is no longer under the control of a DOD component and has been leased, transferred, or returned to another entity (including other federal, non-DOD entities) for use.

Transferring range: A military range that is proposed to be leased or transferred from DOD to another entity or disposed of by conveying title to a non-federal entity. An active range will not be considered a “transferring range” until the transfer is imminent.

TRI: Toxic Release Inventory (required by the EPCRA).

Unexploded ordnance (UXO): Military munitions that have been primed, fused, armed, or otherwise prepared for use and that have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or materiel and that remain unexploded by malfunction, design, or any other cause. UXO presents an immediate risk of acute physical injury from fire or explosion resulting from accidental or unintentional detonation.

Unintentional detonation: A detonation not planned in advance.

USACE: U.S. Army Corps of Engineers.

Used or fired military munitions: Those military munitions that meet the following criteria: (1) have been primed, fused, armed, or otherwise prepared for use, and have been fired, dropped, launched, projected, placed, or otherwise used; (2) munitions fragments, (e.g., shrapnel, casings, fins, and other components, to include arming wires and pins) that result from the use of military munitions; or (3) malfunctions or misfires (e.g., fail to properly fire or detonate).

USFWS: U.S. Fish and Wildlife Service.

USGS: U.S. Geological Survey.

UST: underground storage tank.

UTM: Universal Transverse Mercator.

UXO: unexploded ordnance.

UXO personnel: Contractor personnel who have completed specialized military training in EOD methods and have satisfactorily performed the EOD function while serving in the military. Various grades and contract positions are established based on skills and experience.

UXO Quality Control Specialist (UXOQCS): Contractor personnel with the responsibility of enforcing the contractor’s Quality Control Program for all MR-related evolutions; conducting quality control inspections of all UXO and explosives operations for compliance with established procedures; and directing and approving all corrective actions to ensure that all MR-related work complies with contractual requirements.

UXO Safety Officer (UXOSO): Contractor personnel with the responsibility of enforcing the contractor's SSHP. This individual must, therefore, be in the field whenever possible to observe operations. Must have the same minimum qualifications as the UXO Technician III. In addition, must have the specific training, knowledge, and experience necessary to implement the SSHP and verify compliance with applicable safety and health requirements.

UXO Technician II: must be a graduate of the U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD; the U.S. Naval EOD School, Indian Head, MD; U.S. Naval EOD School, Eglin AFB, FL; or a DOD-equivalent certified course. Must have a minimum of five years of military EOD or contractor UXO experience.

UXO Technician III: supervises a UXO team. Must be a graduate of the U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD; the U.S. Naval EOD School, Indian Head, MD; U.S. Naval EOD School, Eglin AFB, FL; or a DOD-equivalent certified course. This individual must have a minimum of ten years of military EOD or contractor UXO experience.

UXO: unexploded ordnance.

UXOQCS: UXO Quality Control Specialist.

UXOSO: UXO Safety Officer.

Waste military munitions: A military munition that is a solid waste per 40 CFR §266.202. Such a waste military munition may also be a hazardous waste if it meets the definition found in 40 CFR §261.3. Waste munitions are hazardous wastes when they exhibit the hazardous waste characteristic of ignitability, corrosivity, reactivity, or toxicity, or are listed as hazardous wastes.

WP: white phosphorus: A screening smoke that burns on contact with air and can be used as an incendiary.

CH2MHILL

Explosives Usage and Munitions Response (MR) Standard of Practice HSE&Q-610

Attachment 4: Explosives Management Check List

N/A	Check List Item	PM Date Completed	MR Review Date	MR QC NTP Date
	Identify Contract and SOW Requirements			
	Complete Corporate Opportunity Risk Evaluation (ORE), Paragraph 17 Explosives Usage and MR Projects			
	Complete Project Site Specific Work Plans: (Explosive Management Plan, & Explosive Siting Plan*)			
	Obtain State/local (if required) Explosive Permit* for CH2M HILL to use high explosives within the state and or local jurisdiction.			
	Obtain State/local (if required) Permit* for CH2M HILL to site explosives magazine within the state and or local jurisdiction.			
	Identify CH2M HILL licensed Blaster* (if self-performing)			
	Complete CH2M HILL ATF&E "Explosives Procurement Work Sheet" for Review and obtain approval from MR Operations Manager			
	Request copy with original signature of ATF&E Type 20 Explosives Manufacture License* from CH2M HILL License Holder			
	Request "Authorization Letter*" identifying "Responsible Persons" and "Possessor of Explosives" that are authorized to order, receive, store, and use explosives under the CH2M HILL ATF&E Type 20 Explosives Manufacturer License from the License Holder			
	Complete "Materials Purchase Requisition Form*" for Contracting (Must be in corporate name of CH2M HILL, Inc & authorized by the CH2M HILL ATF&E License Holder or MR Market Segment Director)			
	Vender Identified by contracting (If sole source - justification is required)			
	Vender required to provide a copy of their ATF&E License* to CH2M HILL for evaluation and certification by CH2M HILL ATF&E License Holder			
	Purchase Order* is provided to the vender with a copy of our ATF&E Type 20 Manufacturer of High Explosives License and Authorization Letter for Responsible Persons and Possessor of Explosives			
	Award the purchase order to the selected vender and			

N/A	Check List Item	PM Date Completed	MR Review Date	MR QC NTP Date
	identify Possessor of Explosives authorized to receive explosives at the project site, telephone number and address of receiving location			
	Vender accepts purchase order and holds for contracting release of shipment			
	Vender identifies carrier and provides a shipment schedule with copy of manifest* to CH2M HILL contracting and contracting notifies the Project Manager			
	Establish Explosives Storage Area (Security, Lightning Protection, Grounding)			
	Schedule State and or local jurisdiction site inspection for "Explosive Storage" (Magazines) if required.			
	Magazine storage area inspected and approved* for storage by local jurisdictions.			
	CH2M HILL contracting notifies vender to release shipment			
	Notify ATF&E servicing office for CH2M HILL ATF&E License*, local ATF&E office*, and local jurisdictions* of storage of explosives and provide an Explosives Siting Plan that includes ATF Form 5400.13/5400.16, Explosives Storage Magazine Description Worksheet*.			
	Post CH2M HILL ATF&E Type 20 License on the project site			
	CH2M HILL "Responsible Person" or Possessor of Explosives" person receives shipment (presents identification to transporter, verifies manifest, and inventories shipment to ensure accuracy between purchase order and manifest. Discrepancies should be resolved IAW the project Explosive Management Plan)			
	Explosive materials are properly inventoried (date shift codes, acquisition dealer, (permit address), POC), and stored IAW project Explosives Management Plan			
	Material Safety Data Sheets (MSDS) for explosives materials are on-site			
	Magazine Data Cards (Daily Summary of Magazine Transactions*) are completed and maintained IAW project Explosives Management Plan			
	Magazine has two mortise type 5 pin high security locks			
	Security Checks conducted a minimum of every 72 hours and documented*			
	Responsible person or possessor of explosives has control of keys			
	Daily Usage (Shot) Log maintained for expenditure of explosive materials including target materials			
	Weekly inventories of all explosives materials conducted and documented*			
	Notify local jurisdictions and ATF&E offices when			

N/A	Check List Item	PM Date Completed	MR Review Date	MR QC NTP Date
	explosives materials are no longer being stored*			
	*Project Manager to provide to the ATF&E License Holder completed purchase orders, manifest documents, inventories, magazine data cards, usage logs, and any other associated information for ordering, storage and use of explosives material along with an end user certification that all explosives materials have been accounted for.			
	MR Safety Officer shall conduct a quality control audit of the project explosives management plan and checklist compliance with ATF&E requirements and report on the conformance of the Project Manager & License Holder.			
	* Indicates documents that upon completion of project will be forwarded to the License Holder			

**Attachment B-4 - Project Specific Chemical Product Hazard
Communication Form**

Attachment B-5 - Chemical Specific Training Form

ATTACHMENT B-5: CHEMICAL-SPECIFIC TRAINING FORM

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 B-6: APPLICABLE MATERIAL SAFETY DATA SHEETS

To be inserted at project start up.

Attachment B-7 - Lead Awareness Training

ATTACHMENT B-7: LEAD AWARENESS

Lead Exposure Training Instructions

This module was designed for employees who work in areas with percent levels of inorganic lead or areas where there is a potential lead exposure above the action level of 30 $\mu\text{g}/\text{m}^3$.

Lead Exposure Training Program

The OSHA lead standard (29 CFR 1910.1025) requires employers to provide lead training for those employees who may be exposed to inorganic lead above the action level of 30 $\mu\text{g}/\text{m}^3$. This training program satisfies this OSHA requirement and is provided to assist employees in recognizing lead exposure hazards and understanding the procedures to be followed to minimize exposure.

Objectives

- Inform employees of the possible adverse health effects of lead exposure
- Inform employees of the regulatory requirements when working with or around lead
- Identify how lead exposures could occur on project

How to complete this training

Employees are required to read the training materials that follow and complete a short quiz. The training materials must be read thoroughly and understood before completing the quiz; you will have only one chance at answering each question.

Quiz scores will automatically be sent to the Health and Safety Training Administrator. A minimum score of 70 percent must be obtained to receive credit for this training. If a passing score is obtained, the H&S Training Administrator will issue you a certificate of completion. If a passing score is not obtained, you are required to contact your regional health and safety program manager to discuss the training material directly.

Lead Exposure Training

1. Uses And Occurrences

Lead is a well-known naturally-occurring metal found in the earth's crust, often associated with silver and zinc. It has had a variety of uses since antiquity, but its greatest use today is in car batteries. It was formerly used in gasoline, water pipes, pottery glazes, paint, solder, and as metal alloy. It currently has a variety of other uses such as radiation shielding, as vibration dampening material, in explosives, bullets, magnets, and in electronic equipment. It is also a common contaminant at hazardous waste sites.

2. Physical Characteristics

Lead exist as the familiar soft, dull gray metal, as a white or red solid as lead oxide, a gray or black solid as lead sulfide (galena), a white solid as lead sulfate, all which are insoluble in water. There are numerous other forms of inorganic lead. The organic forms, tetraethyl lead and tetramethyl lead, used in the past in fuels, are flammable colorless liquids also insoluble in water.

3. Toxicity and Hazards

Lead is a highly toxic substance that has a variety of adverse health effects from both chronic and acute exposure. An acute exposure to high levels of lead can cause a brain condition known as encephalopathy which can lead to death in a few days. The more common chronic exposure can also cause brain damage, blood disorders (anemia), kidney damage, damage to the reproductive system of both men and women and toxic effects to fetuses. Lead is stored in the bones and eliminated from the body very slowly. Consequently, exposures to low levels over many years can cause these adverse health effects. Lead is toxic by inhalation and ingestion, but is not absorbed through the skin. Some common symptoms of chronic overexposure include loss of appetite, metallic taste in mouth, anxiety, insomnia and muscle and joint pain or soreness.

4. Regulations

Inorganic lead has been specifically regulated in general industry by OSHA since 1981 (29 CFR 1910.1025) and in construction (29 CFR 1926.62) since 1994. The 8-hour permissible exposure limit is 50 $\mu\text{g}/\text{m}^3$. There is no short-term exposure limit. OSHA also specifies an action level of 30 $\mu\text{g}/\text{m}^3$. These limits apply to both general industry and construction. Initial air monitoring must be done whenever there are indications of lead exposure above the action level. If the action level is not exceeded, air monitoring can cease. If the action level is exceeded, initial blood lead level monitoring must be made available. If exposed above the action level for more than 30 days in a year, medical surveillance must be provided which includes further blood lead level monitoring and a medical examination. If specified blood levels are exceeded, the employee must be removed from the job or task where lead exposure occurs. Training must also be provided. If the PEL is exceeded, engineering controls must be implemented to reduce exposure. If engineering controls are not feasible or ineffective, respirators must be provided and worn. Air-purifying respirators with high-efficiency (HEPA) filters can be worn when airborne levels are as high as 500 $\mu\text{g}/\text{m}^3$. If levels exceed this amount, supplied air respirators must be worn. In addition, if the PEL is

exceeded, OSHA requires the establishment of regulated areas, showers, change rooms, separate clean lunchrooms and warning signs. Regulated areas are demarcated from the rest of the workplace to limit access to authorized personnel who have received lead training. To enter a regulated area you must also wear protective clothing. Tetraethyl and tetramethyl lead each have separate PELs of 100 $\mu\text{g}/\text{m}^3$ and 150 $\mu\text{g}/\text{m}^3$ respectively, and are not covered under the inorganic lead regulation.

5. How Exposures Can Occur At Projects

Exposure to lead can occur at hazardous waste sites where lead is found in soil or groundwater and at old mining sites or former smelter sites. Exposure to lead-containing dust could occur during drilling, heavy equipment movement or other soil-disturbing activities. Dust formation can be minimized by wetting soils. Exposure could also occur during lead paint removal activities, during welding on metal surfaces with lead-containing paint, or in project work in smelters, battery recycling or manufacturing plants or at some mines.

6. Additional Information

Persons working at hazardous waste sites with known high amounts in soils (3 percent or 30,000 ppm) should have blood lead draws taken before and after site work. Air sampling should be done during soil disturbing activities at the site. Person working at non-hazardous waste site who have information or suspect they have been exposed to lead above the action level should contact a health and safety manager to determine if medical monitoring is needed or other regulatory requirements apply.

Lead Quiz

1. Which of the following is not a mode of entry of lead?
 - A. Inhalation
 - B. Ingestion
 - C. Skin absorption
 - D. All of the above are modes of entry
2. Which of the following is not a common symptom of lead exposure?
 - A. Loss of appetite
 - B. Metallic taste in mouth
 - C. Muscle and joint pain or soreness
 - D. All are common symptoms of lead exposure
3. What are the OSHA exposure limits for lead (PEL and action level)?
 - A. 50 $\mu\text{g}/\text{m}^3$ and 25 $\mu\text{g} / \text{m}^3$ respectively
 - B. 50 ppm and 25 ppm respectively
 - C. 50 ppm and 30 ppm respectively
 - D. 50 $\mu\text{g}/\text{m}^3$ and 30 $\mu\text{g} / \text{m}^3$ respectively
4. When is air monitoring required for lead exposures?
 - A. When exposed to lead for 30 days or more in a year
 - B. Anytime lead is present in the workplace
 - C. When there are indications of lead exposure above the action level
 - D. When the PEL is exceeded
5. When must medical surveillance be made available for lead exposures?
 - A. When the action level is exceeded
 - B. When the action level is exceeded for 30 days in a year
 - C. When the PEL is exceeded
 - D. When the PEL is exceeded for 30 days in a year

6. When is respiratory protection required for lead exposures?
 - A. When the action level is exceeded
 - B. When the action level is exceeded for 30 days in a year
 - C. When engineering controls do not reduce exposure below the PEL
 - D. When the PEL is exceeded for 30 days in a year

7. What respiratory protection is considered acceptable for protection against lead exposures?
 - A. Air-purifying with organic vapor cartridge
 - B. Air-purifying with HEPA cartridge
 - C. Air-purifying with lead cartridge
 - D. Supplied-air respirator is the only acceptable respiratory protection

8. What are the requirements for entering a lead-regulated area?
 - A. Must be an authorized person
 - B. Must complete lead training
 - C. Must wear protective clothing
 - D. All of the above

9. What control measure should be used to minimize dust formation when disturbing lead-containing soil?
 - A. Training
 - B. Wetting the soil
 - C. Air purifying respirators
 - D. None of the above

10. What level of lead in the soil might require a lead blood test?
 - A. 1% or 10,000 ppm
 - B. 3% or 30,000 ppm
 - C. 5% or 50,000 ppm
 - D. None of the above

ATTACHMENT B-8: Landing Zone Map for Medical Evacuation Helicopter.



**Turn-a-Round
Landing Zone - Charlie
Emergency Evacuation Only
Lat - 18.1438253
Long - 65.3104913**

**OP-1
Landing Zone - Alpha
Lat - 18.1317586
Long - 65.3172952**

**Run In
Landing Zone - Bravo
Emergency Evacuation Only
Lat - 18.1361807
Long - 65.3067286**



0 200 400 Meters

Medical Evacuation Landing Zones

ATTACHMENT B-9: Toxic Flora

Poison Oak



Poison Ivy



Poison Sumac



Manchineel



Castor Bean



Comocladia



Croton



Tragia Volubilis (commonly known as pica-pica or cowitch)



Malpighia fucata (commonly known as palo bronco)



Malpighia fucata

Malpighia fucata

Cordia rupicola



Pictetia aculeate (commonly known as tachuelo, gumbo limbo, or turpentine tree)



Attachment B-10 - Job Hazard Analysis

ATTACHMENT B-10: Job Hazard Analysis

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

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

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

PRINT NAME

SIGNATURE

Supervisor Name: _____

Date/Time: _____

Safety Officer Name: _____

Date/Time: _____

Employee Name(s): _____

Date/Time: _____

ATTACHMENT B-11: Pre-Task Safety Plan

CH2MHILL

Pre-Task Safety Plan (PTSP)

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

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Hazard Control Measures (Check All That Apply):

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

Field Notes: _____

Name (Print): _____

Signature: _____

Date: _____

ATTACHMENT B-12: Safe Work Observations

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

ATTACHMENT B-13: HSE-111 Incident Reporting and Investigation

CH2MHILL

Incident Reporting and Investigation Standard of Practice HSE-111

1.0 Introduction

This Standard of Practice (SOP) provides procedures for reporting and investigating incidents. Emergency response procedures are included in the Emergency Response Plan (ERP), as discussed in [HSE-106](#), *Emergency Planning*.

An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. An incident includes:

- Injury or illness
- Spill or release
- Damage to property
- Permit issue (e.g., permit violation)
- A “near-miss”
- Other (e.g., fire, explosion, bomb threat, workplace violence)

This SOP provides specific guidelines for immediate internal notification of all but the most serious incidents. It also describes procedures for accessing, creating, updating and reviewing the CH2M HILL Incident Report Form (IRF). Finally this SOP provides guidelines for conducting prompt incident investigations to determine the root causes and corrective actions to prevent recurrence.

If the severity of the incident meets any of the following criteria, implement HSE-601 “Serious Incident Notification Process”, which ensures timely notification of Business Group Presidents and allows for positive control over flow of information so that the incident is handled in conjunction with the senior management team.

- Work related death of employee or CH2M HILL subcontractor
- Life threatening injury or illness of employee or CH2M HILL subcontractor
- Kidnap/missing person (employee or CH2M HILL subcontractor)
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$50,000 in property damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.
- Event that may not have any significant real impact but will attract media attention.
- Significant near miss or negative trend that will likely require work suspension or significant company resources to resolve

2.0 Regulatory Review

Attachment 1 has a list, by country, of the regulations related to incident reporting and investigation. Compliance with the regulations listed in this attachment will be met if this SOP is followed. Contact the Regional Health and Safety Program Manager (RHSPM) for information on countries not listed in Attachment 1.

3.0 Responsibilities

3.1 Employee

The employee is responsible for:

- Providing immediate verbal notification of all incidents to the Emergency Response Coordinator (ERC) and immediate supervisor (e.g., Group Leader).
- Providing detailed information to the Human Resources Representative (HRR), upon request, for all work-related injury and illness incidents.
- Providing additional or updated information to the HRR (for injury/illness incidents) or the Regional Health and Safety Program Manager (RHSPM)/Environmental Compliance Coordinator (ECC) (for all other incidents) after the initial IRF has been submitted

3.2 Emergency Response Coordinator

The ERC is responsible for:

- Implementing emergency response procedures as directed in the ERP for all emergencies (see [HSE-106](#), *Emergency Planning*).
- Notifying the RHSPM of all incidents.
- Creating and submitting an IRF for all non-injury incidents.
- Creating and submitting an IRF for a work-related injury/illness of a CH2M HILL subcontractor.
- Providing additional or updated information about the incident to the RHSPM/ECC after the initial IRF has been submitted.
- Conducting incident investigations as directed by the RHSPM or ECC.

3.3 Regional Health and Safety Program Manager

The RHSPM is responsible for:

- Being available (or appointing a designee, if unavailable) to receive notification of all incidents.
- Providing incident verbal notification as directed in Section 6.2 of this SOP.
- Reviewing submitted Injury/Illness, Property Damage, Near-Miss, and Other IRFs for completeness and accuracy and completing the “RHSPM Injury Evaluation” and “RHSPM/ECC Evaluation” sections of the IRF.

- Updating the “RHSPM Injury Evaluation” and “RHSPM/ECC Evaluation” sections when additional or updated information becomes available.
- Determining the level of and directing incident investigations for Injury/Illness, Property Damage, Near-Miss, and Other incidents.

3.4 Environmental Compliance Coordinator

The ECC is responsible for:

- Being available (or appointing a designee if unavailable) to receive notification of environmental incidents and analyzing incidents for reportability and seriousness.
- Providing incident verbal notification as directed in Section 6.2 of this SOP.
- Reviewing submitted Spill/Release and Environmental/Permit Issue IRFs for completeness and accuracy and completing the “RHSPM/ECC Evaluation” section of the IRF.
- Updating the “RHSPM/ECC Evaluation” section when additional or updated information becomes available.
- Determining the level and directing incident investigations for Spill/Release and Environmental/Permit Issue incidents.

3.5 Legal and Insurance Department (LID)

The LID is responsible for:

- Assigning workers compensation case management.
- Granting approval for communication with external parties regarding incidents.
- Directing internal and external communication, reporting, and investigation of serious incidents.
- Addressing insurance issues associated with the incident.

3.6 Human Resources Representative (HRR)

The HRR is responsible for:

- Completing and submitting an IRF for CH2M HILL employee injury-related incidents.
- Updating CH2M HILL employee injury-related IRFs when additional or updated information about the incident becomes available.
- Completing and submitting necessary workers compensation forms.

3.7 Regional Human Resources Representative (RHRM)

The RHRM is responsible for:

- Ensuring that an IRF is completed for all CH2M HILL employee injury-related incidents.

- Sharing responsibility with LID for determining appropriate workers compensation issues.

3.8 Project Manager (PM)

Project Managers are responsible for:

- Reporting incidents to the client, if necessary, after discussing with the RHSPM.
- Ensuring that unnecessary communication of serious incidents is kept to a minimum, as outlined in Section 6.2.3 of this SOP.

3.9 Area Office Manager (AOM)

Area Office Managers are responsible for:

- Reporting incidents to the building owner, if necessary, after discussing with the RHSPM.
- Ensuring that unnecessary communication of serious incidents is kept to a minimum, as outlined in Section 6.2.3 of this SOP.

3.10 Corporate Director, Health, Safety, and Environmental Protection (CDHS&E)

The CDHS&E or designee is responsible for:

- Maintaining a log of all incidents and investigations.
- Distributing summaries of incidents with periodic management reports.
- Analyzing all incidents.
- Modifying the Health, Safety, and Environmental Protection (HS&E) program as necessary to prevent future incidents.

3.11 Corporate Health, Safety, and Environmental Protection (HS&E)

The Corporate HS&E unit is responsible for maintaining all submitted IRFs and Investigation Reports.

3.12 Environmental Program Manager (EPM)

The EPM is responsible for reviewing Spill/Release and Environmental/Permit Issue IRFs and Investigation Reports to verify accuracy, consistency, and compliance with applicable federal, state, and local environmental requirements.

3.13 Health and Safety Program Manager (HSPM)

The HSPM is responsible for reviewing Injury/Illness IRFs to verify that reports are being completed in a consistent manner and in compliance with occupational safety and health recordkeeping requirements.

4.0 CH2M HILL Policy

It is the policy of CH2M HILL to maintain an IRF for all work-related injuries and illnesses sustained by its employees in accordance with occupational safety and health recordkeeping and various state workers compensation requirements. An IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation or permit exceedance, and near-misses) as part of CH2M HILL's loss prevention and risk reduction initiative.

5.0 Definitions

5.1 Employee

The term "Employee" includes all CH2M HILL full-time, part-time, and temporary-duty employees, as well as contracted employment agency and temporary employees for which CH2M HILL is responsible for day-to-day direction. "Employee" does not include subcontractor employees who are supervised by subcontractor management. Questions regarding whether someone should be considered an employee should be directed to the RHSPM.

5.2 Work-Related Injury or Illness

Work-related injury or illness includes all injuries and illnesses that result from an event or exposure in the work environment. "Work environment" includes CH2M HILL premises and other locations where employees are engaged in work-related activities or are present as a condition of employment.

5.3 Incident

An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

- Injury or illness
- Hazardous substance exposure
- Damage to property
- Fire or explosion
- Spill, release, potential violation, or permit exceedance
- A "near-miss"

5.4 Near-Miss

A near-miss occurs when an intervening factor prevented an incident from occurring. Examples of near-miss situations include: a hard hat or other personal protective equipment (PPE) prevented an injury; secondary containment or emergency shutoff prevented a spill; or an alert co-worker prevented an accident.

5.5 Serious Incidents

The following are general criteria for determining whether an incident should be considered a serious one. Consultation with the RHSPM, CDHS&E, and LID will make the determination. The general criteria for serious incidents include:

- Intervention by external emergency response organizations
- Hospitalization
- Spills and releases of hazardous substances exceeding the reportable quantity (RQ)
- Potential violations of law or regulation
- Estimated property damage in excess of \$10,000

6.0 Incident Notification and Reporting

6.1 Emergency Reporting

Procedures for the immediate reporting of emergencies must be included in the ERP as discussed in SOP [HSE-106](#), *Emergency Planning*. All incidents must be reported to the ERC immediately. If required, the ERC must immediately report emergency situations to the appropriate response authorities as indicated in the ERP.

6.2 Incident Verbal Notification

The following notification procedures apply to all incidents, including after an ERP (and [HSE-106](#), *Emergency Planning*) has been implemented for emergencies.

6.2.1 Incidents

Incidents must be communicated verbally immediately, as shown in Attachment 2 (Incident Notification and Reporting Flowchart) and described as follows:

- All employees and subcontractors must immediately notify the ERC and their direct supervisor (e.g., Group Leader) of all incidents.
- The ERC must notify the RHSPM of all incidents.
- The RHSPM must notify the ECC of spills/releases and environmental/permit incidents.
- The RHSPM (or ECC for environmental incidents) refers serious incidents to the Legal and Insurance Department, which directs remaining procedures (non-serious incidents follow remaining procedures).
- The RHSPM/ECC consults with Corporate HS&E staff to determine reportability and notifies the appropriate occupational safety and health and/or environmental authorities and agencies of reportable incidents.
- The RHSPM must immediately notify the CDHS&E and the LID of any fatality or any incident that results in in-patient hospitalization of three or more employees.
- The RHSPM notifies the Project Manager (field) or Area Office Manager (office) of the incident.
- The Project Manager notifies the client of the incident, if necessary
- The Area Office Manager notifies the building owner of the incident, if necessary.
- The RHSPM/ECC directs the HRR to create an IRF for work-related injury/illness incidents.

6.2.2 Serious Incidents

The RHSPM/ECC must refer all incidents that meet the serious incident criteria (as defined in Section 5.5) to the LID, whose representative will direct all internal and external communications, including IRF creation, agency reporting, client or building owner notification, and incident investigation (unless infeasible because of differences in time zones).

Post-emergency incident communications regarding serious incidents at a CH2M HILL office or project (regardless of the party involved) shall be considered sensitive in nature and must be controlled in a confidential manner. Internal communications regarding a serious incident may be conducted with affected project, regional, and Business Group staff but must be kept to a minimum. Communication should be oral whenever possible. If e-mail communications are necessary, the following procedures must be used:

- Address the e-mail to Peggi Spencer/COR (or Dan Smith/COR in her absence).
- Send as "Confidential" e-mail (select under "Message Options").
- Include phrase "Confidential – Attorney/Client Privileged Communication" in the title and body of the e-mail.
- Include the following as the first paragraph of the e-mail:

This e-mail contains information pertaining to a project site accident and must be handled with confidentiality. Do not forward this e-mail without approval of Peggi Spencer/COR or Dan Smith/COR. All e-mails pertaining to this incident must be addressed to Peggi Spencer/COR (or Dan Smith/COR in her absence). All e-mail on this issue must contain, in both subject and content, the phrase "Confidential - Attorney/Client Privileged Communication." These practices are required to maintain attorney/client privilege. All other communication regarding this incident should remain verbal unless approved by Peggi Spencer/COR or Dan Smith/COR.

6.3 Incident Report Form Completion Process

The HRR is responsible for completing the IRF for incidents where injuries to CH2M HILL employees are involved. The ERC is responsible for completing the IRF for all other incidents including property damage, spills/releases, environmental/permit issues, near-misses, and injuries to subcontractors. ***The IRF must be completed within 24 hours of the incident.*** Responsibilities for initial IRF creation are shown in Attachment 3, IRF Completion Flowchart. Refer to Appendix A for specific guidelines for accessing and completing the IRF. Any problems encountered with the electronic IRF should be referred to the regional Information Technology (IT) staff. For serious incidents, the IRF is completed only as directed by the LID.

6.4 Incident Report Form Review Process

When an initial IRF is submitted, it generates a report that is automatically sent to various staff for review and evaluation as shown in Attachment 3, IRF Completion Flowchart. CH2M HILL employee injury-related IRFs are sent to the LID and the RHSPM. The review process is as follows:

- The LID shall review the IRF and determine, with assistance from the appropriate RHRM, the appropriate workers compensation issues.
- In the United States, the RHSPM shall review the IRF for completeness and complete the “RHSPM Injury Evaluation” and “RHSPM/ECC Evaluation” sections to determine if the incident is an OSHA-recordable injury or illness. In other countries, the RHSPM/ECC determines off-line whether the incident is recordable to the local agencies. See Attachment 1 for guidelines for Australia.
- Property Damage, Near-Miss, and Other IRFs are sent to the RHSPM. The RHSPM shall review the IRF for completeness and complete the “RHSPM/ECC Evaluation” section.
- Spill/Release and Environmental/Permit Issue IRFs are sent to the ECC. The ECC shall review the IRF for completeness and complete the “RHSPM/ECC Evaluation” section to determine if the incident is a reportable spill or violation.
- The HSPM shall review an Injury/Illness IRF for accuracy and verify that the incident is categorized consistent with local occupational safety and health recordkeeping requirements.
- The EPM shall review a Spill/Release and Environmental/Permit Issue IRF to verify accuracy, consistency, and compliance with applicable federal, state, and local environmental requirements.
- Corporate HS&E shall maintain all submitted IRFs.

6.5 Incident Report Form Updating Process

When additional or updated information becomes available, the HRR (for CH2M HILL injury-related incidents), the RHSPM (for incidents involving property damage, near-miss, or other), or the ECC (for incidents involving spills/release or environmental or permit issues) shall update the existing IRF and re-submit the form as shown in Attachment 4, IRF Updating Flowchart. The updated IRF will replace the original IRF in the system and will be routed and reviewed following the same process as described above. Refer to Appendix A, Section 4.0, for specific guidelines for updating the IRF.

7.0 Incident Investigation

The purpose of an incident investigation is to understand how the incident happened, analyze the root causes, and prevent recurrence by implementing corrective actions. To conduct an effective investigation, all information must be as detailed and comprehensive as possible. The investigation must be based on facts that clearly identify the sequence of events and the factors that contributed to the incident. The investigation team should not be involved with any punitive actions resulting from the investigation. Fairness and impartiality are essential.

Serious incidents are investigated as directed by the LID.

7.1 Non-Serious Incident Investigation Procedure

Incident investigations are to be initiated and completed as soon as possible, but no later than 72 hours after the incident has occurred. Except for serious incidents, the RHSPM or

ECC (depending on the type of incident) shall be responsible for determining the level of the investigation. The RHSPM/ECC may conduct the investigation directly or may delegate this function to the ERC or other party, depending on the extent of the incident and staff availability. The Investigation Guidelines in Appendix B must be followed when conducting incident investigations. Typically, non-serious investigations will be documented by updating the IRF and describing the investigation facts in the Comments section. A supplemental report may be required for more extensive investigations. The RHSPM/ECC shall ensure that the Project Manager (field) or Area Office Manager (office) is made aware of investigation findings and all corrective actions, and shall verify that corrective actions are implemented to prevent further incidents.

8.0 Attachments

Attachment 1	Regulatory Requirements and Standards
Attachment 2	Incident Notification and Reporting Flowchart
Attachment 3	IRF Completion Flowchart
Attachment 4	IRF Updating Flowchart
Appendix A	Incident Report Form Completion Guideline
Appendix B	Incident Investigation Guidelines

CH2MHILL

Incident Reporting and Investigation Standard of Practice HSE-111

Attachment 1: Regulatory Requirements and Standards

Australia

NSW – Regulation 2001

VIC – OHS (Incident Notification) Regulations 1996

TAS – Section 61 Workplace Health & Safety Regulations 1998

WA – Work Safety & Health Act – Notification of Accidents

QLD – OHS – Incident Record/Report

NT – Section 46 – Work Health Regulations

ACT – OHS Act

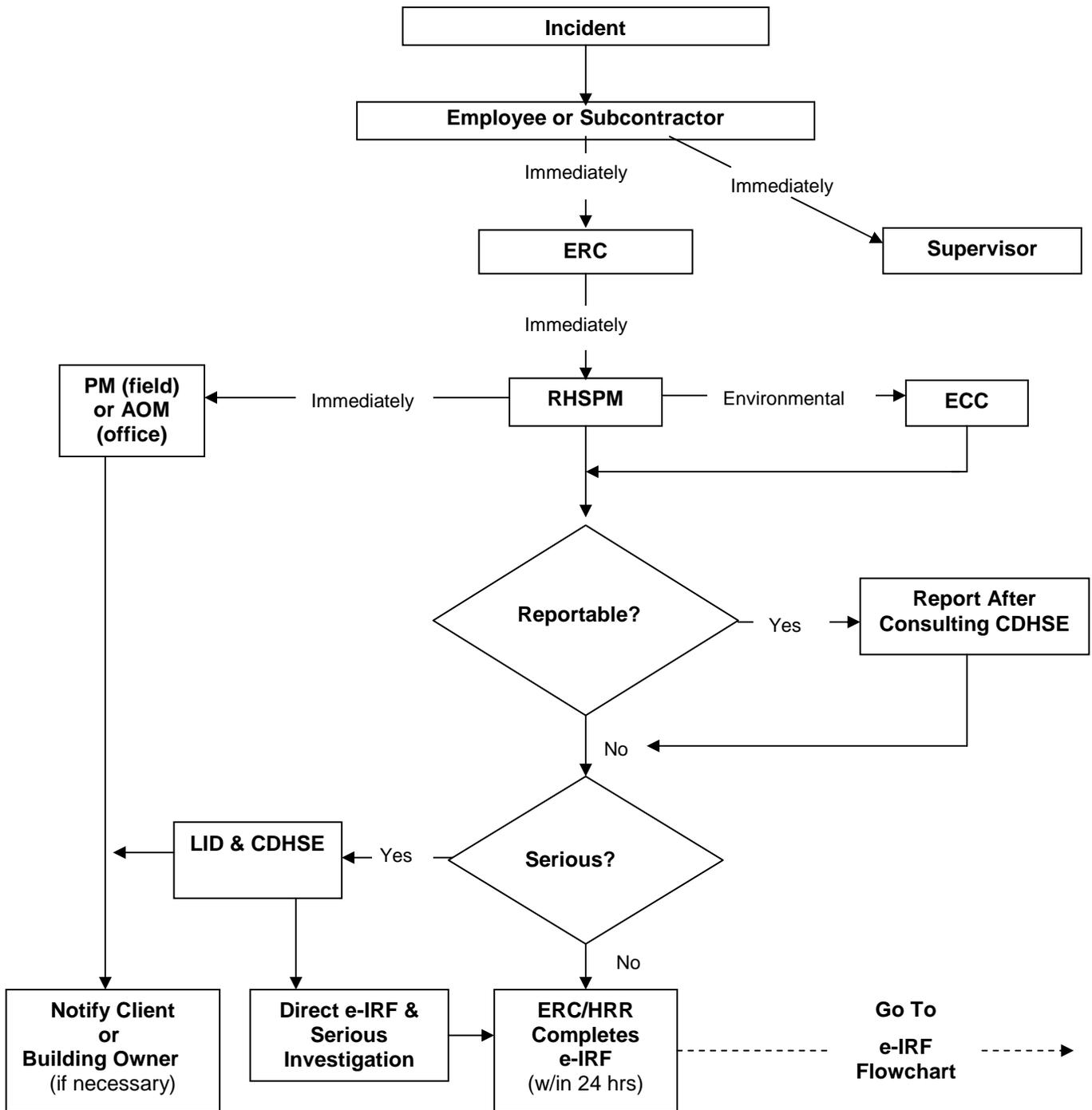
SA – OHS Act

United States

OSHA (29 CFR §1904.4) and various state workers compensation laws require employers to complete an injury/illness report after receiving information that a work-related injury or illness has occurred. CH2M HILL satisfies these requirements by using an IRF.

Investigations falling within the scope of the OSHA Process Safety Management Standard must meet the requirements of 29 CFR §1910.119(m).

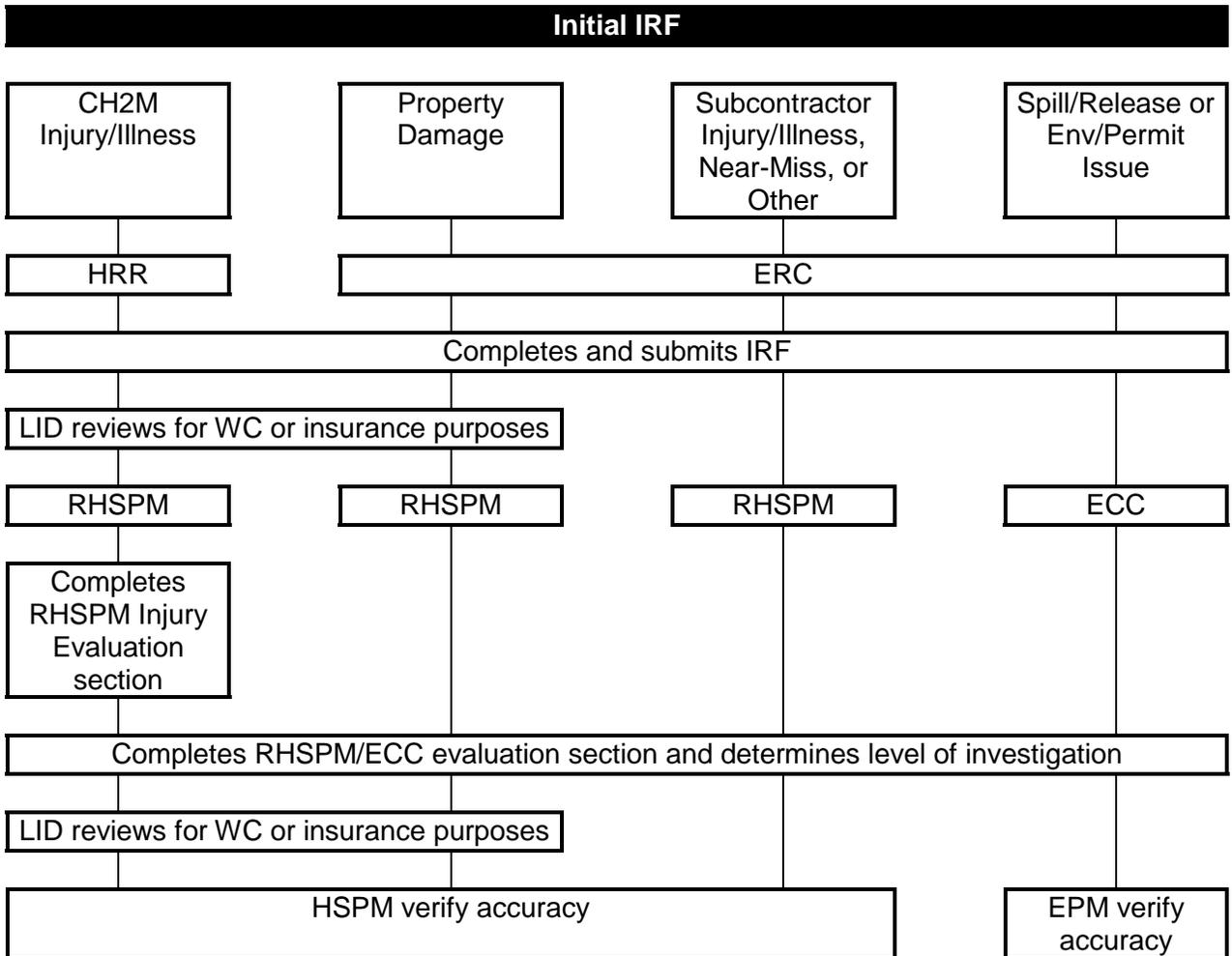
Attachment 2: Incident Notification and Reporting Flowchart



CH2MHILL

Incident Reporting and Investigation Standard of Practice HSE-111

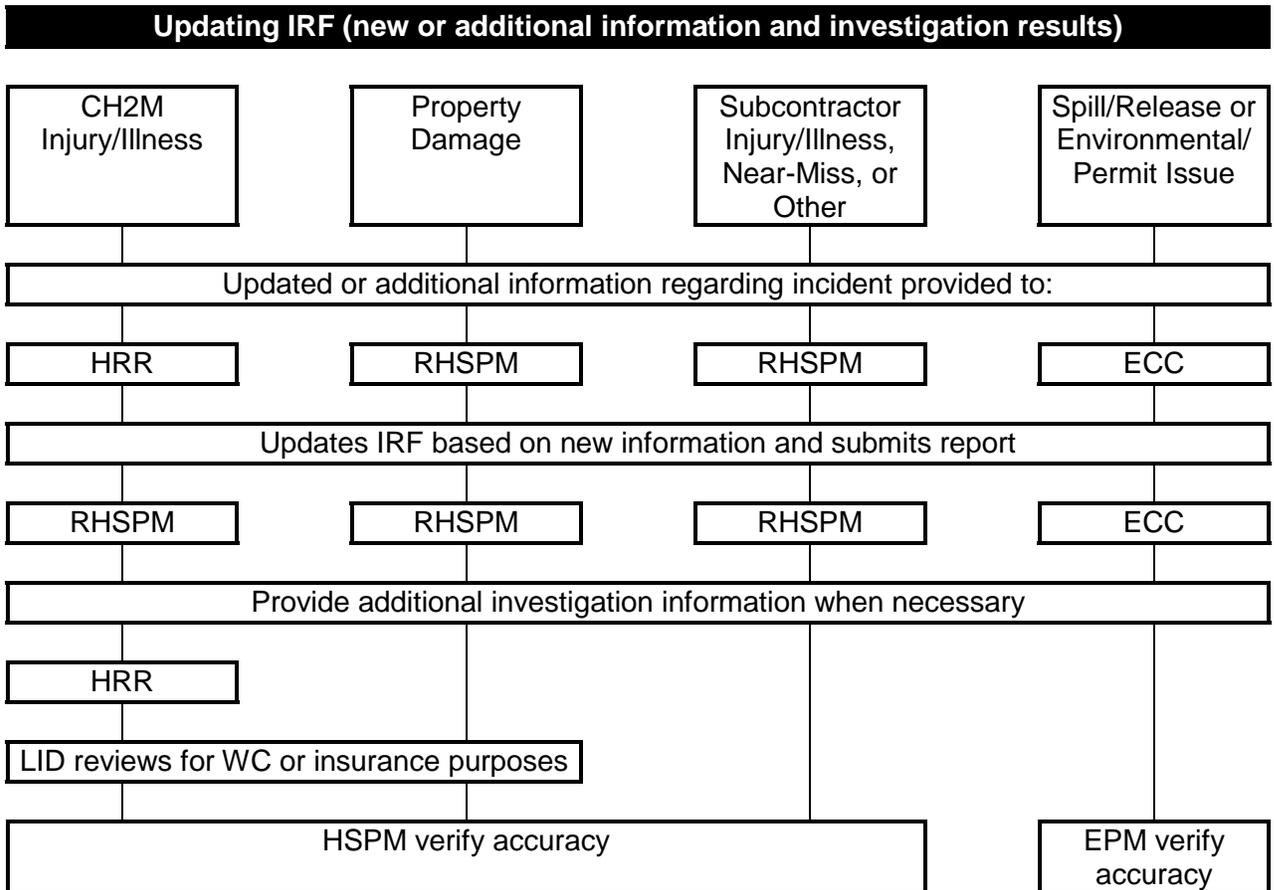
Attachment 3: IRF Completion Flowchart



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Incident Reporting and Investigation Standard of Practice HSE-111

Attachment 4: IRF Updating Flowchart



CH2MHILL

Incident Reporting and Investigation Standard of Practice HSE-111

Appendix A: Incident Report Form Completion Guideline

1.0 Introduction

This guideline is provided to assist in accessing, creating, reviewing, and updating the Incident Report Form (IRF).

2.0 Access to IRF

The preferred method of submitting an IRF is by using the electronic IRF (e-IRF). The e-IRF may be accessed at the HS&E Home Page under Forms & Reports. If the e-IRF cannot be accessed, a hard copy of the form may be printed from Attachment 1. All fields on the hard copy must be completed and faxed to the Corporate HS&E Department for entry into the system. Faxed IRFs must be received within 24 hours of the incident. Problems encountered with the e-IRF should be referred to regional IT staff.

3.0 IRF Initial Entry

Human Resources Representatives (HRRs) are responsible for creating the IRF for CH2M HILL employee injury and illness incidents. The ERC is responsible for completing the IRF for all other types of incidents. An e-IRF may be created from the IRF Welcome Page by selecting the "Create" tab and then "Incident." All incidents require completion of the "Type of Incident" and "General Information" sections. Depending upon the type of incident, additional sections may require completion.

After completing the necessary information, hit the "Submit" button to generate an IRF report. If the information has been entered correctly, a separate window will momentarily appear stating that the IRF has been successfully submitted. Select the "OK" button; the completed report will open for review. Changes cannot be made to this screen; see section 4.0 to update e-IRF reports. Only HRR and HS&E staff have authority to edit existing reports. Submitted reports will be sent to the appropriate RHSPM and ECC for additional evaluation. If information has been entered incorrectly, the system will prompt the user to reenter the information. To clear the fields and reenter information, hit the "Reset" button. (Note: The "Reset" button will reset all fields on the current screen; therefore, all information on the current screen will require reentry.)

To make timely notifications to appropriate authorities, IRFs must be submitted within 24 hours of the incident occurrence.

3.1 General Sections for All Incident Types

Type of Incident Section

Select at least one of the incident types provided on the form. More than one incident type may be selected. The “Other” option may be used for incident types not provided on the form (e.g., fires, explosions, bomb threats, workplace violence).

General Information Section

Date of Incident – Provide the date the incident occurred. If the exact date is unknown, provide an approximate date. Enter date in the “mm/dd/yyyy” format. The system will prompt the user to reenter incorrect date entries.

Time of Incident – Provide the time the incident occurred. If the exact time is unknown, provide an approximate time. Enter time in military time or the “hh:mm am or pm” format. The system will prompt the user to reenter incorrect time entries.

Type of Activity – Select the activity being performed that resulted in the incident from the pick list. If activity is not listed, select “other” and provide a brief description. Only use “other” if no other option is appropriate.

Location of Incident – Select the location where the incident occurred from the pick list. If “Company Premises” is selected, provide the CH2M HILL office location. If “Field” is selected, provide the project number, project/site name, and client name. If “In Transit” is selected, provide traveling from and traveling to.

Geographic Location of Incident – Select the CH2M HILL region where the incident occurred from the pick list.

Subcontractor Involved – If a CH2M HILL subcontractor was involved in the incident, provide the subcontractor’s company name and telephone number.

Describe the Incident – Provide a brief description of the events that led to (caused) the incident. Be as specific as possible.

Verbal Notification Section

CH2M HILL Personnel Notified – Provide names, dates, and times of all CH2M HILL personnel notified in accordance with HSE-111.

Client Notified – Indicate if the Project Manager has notified the client in accordance with procedures in HSE-111, Section 6.2.

Witnesses Section

Witness information – Provide name, address, and telephone number of any witnesses to the incident.

Comments Section

Additional Comments/Changes – Provide any additional information that was not covered that will help clarify the reasons for the incident.

3.2 Injured Employee Data Section (Complete for Injury/Illness Incidents only)

Injured Employee General Information – If a CH2M HILL employee was injured, select the “Find” button and enter the first three letters of the employee’s last name. Allow the system a few seconds to search the global database. Select the injured employee from the pick list in option 2 and select “OK” in option 3. The system will automatically populate the general information fields. If the system could not locate the injured employee, select “Click to enter a subcontractor” and provide the information manually. If a CH2M HILL subcontractor was injured, select “Click to enter a subcontractor” and provide the information manually.

Injury Type – Select the injury type from the pick list. If injury type is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate. If more than one injury type, select “Multiple” and provide a brief description.

Part of Body Injured – Select the body part injured from the pick list. If the body part injured is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate. If more than one body part was injured, select “Multiple” and provide a brief description.

Nature of Injury – Select nature of injury from the pick list. If nature of injury is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate. If more than one nature of injury, select “Multiple” and provide a brief description.

Initial Diagnosis/Treatment Date – Provide the initial date when the injury/illness was diagnosed or treated. Enter date in the “mm/dd/yyyy” format. The system will prompt the user to reenter incorrect date entries.

Type of Treatment – Select treatment from the pick list. If treatment is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate. If more than one treatment, select “Multiple” and provide a brief description.

Required Days Off – Provide the number of days the doctor required the employee to be away from work. Do not count days in which the employee chooses to stay away from work without the doctor’s instruction. Do not count initial day of injury or onset of illness. Do not count days on which the employee would not have worked even if the employee had been able to work (e.g., holidays, vacations, weekends). This number may need to be updated if the doctor changes initial instructions.

Restricted Days of Work Activity – Provide the number of days the doctor restricted the employee’s work activity. Restricted days include: (1) days employee was assigned to another job on a temporary basis, (2) days employee worked at a permanent job less than full time, and (3) days employee worked at his/her permanent job but could not perform all the duties normally conducted. Do not count initial day of injury or onset of illness. Do not count days on which employee would not have worked even if the employee had been able to work (e.g., holidays, vacations, weekends). This number may need to be updated if the doctor changes initial instructions.

Equipment Malfunction – Select “Yes” if equipment malfunction caused or led to the incident.

Routine Task – Select “Yes” if incident occurred during a routine task.

Describe How You May Have Prevented This Accident – Provide a brief description of how this incident could have been avoided or prevented.

Physician Information – Provide name, address, and telephone number of physician visited.

Hospital Information – Provide name, address, and telephone number of hospital visited.

Emergency Room Information – Provide name, address, and telephone number of emergency room visited.

3.3 Property Damage Section (Complete for Property Damage incidents only)

Property Damaged – Provide a brief description of the property, including all vehicles, equipment, structures, etc.

Property Owner – Indicate if the property is owned by CH2M HILL or, if not, who owns the damaged property.

Damage Description – Provide a brief description of the physical damage on each damaged item.

Estimated Amount – Provide the estimated dollar value of damage or cost to repair.

3.4 Spill or Release (Complete for Spill/Release incidents only)

Substance – Provide the type of substance spilled or released to the environment.

Estimated Quantity – Provide the estimated quantity of the substance spilled/released.

Facility – Provide the name, address, and telephone number of the facility where the incident occurred.

Movement Off Property – Select “Yes” if the substance that was spilled/released moved off the property where the work was being performed.

Spill/Release From – Select from the pick list the type of container the substance was in prior to the spill/release. If the container type is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate.

Spill/Release To – Select from the pick list where the substance ended up after the spill/release. If area is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate.

3.5 Environmental/Permit Issue Section (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue – Where a federal, state, or local law or regulation may have been violated, describe the requirement and how it was violated.

Permit Type – Select the type of permit that was exceeded from the pick list. If the permit type is not listed, select “Other” and provide a brief description. Use “Other” only if no other option is appropriate.

Permitted Level or Criteria – Provide the level or criteria exceeded (e.g., 5.0 ppm lead or surface water quality criteria).

Permit Name and Number – Provide name and number of permit exceeded (e.g., NPDES No. ST1234).

Substance and Estimated Quantity – Provide substance name and estimate the quantity of the exceedance.

Duration of Permit Exceedance – Provide an estimate of how long the exceedance lasted.

4.0 IRF Updating

The HRR (for incidents involving CH2M HILL injuries) or the ERC (for all other incidents) must update the IRF when additional or updated information becomes available. New or additional treatment, diagnosis, lost workdays, or restricted days may change nonrecordable cases to recordable cases, or more accurate calculations may result in a reportable spill. Therefore, IRFs shall be updated when additional or updated information is obtained. The RHSPM and ECCs must update the “RHSPM/ECC Evaluation” section when appropriate. The following steps must be used when updating existing IRFs. (Note: Any changes will overwrite the previous field information. It is recommended that the existing report be printed prior to updating. Lost information can then be reentered by reviewing the printed copy.)

1. Access the IRF system.
2. At the welcome page, select “Reports” tab, then “Query.”
3. Reports may be queried on almost any IRF field. If the IRF number is known, query by General Information>Incident-number. If the employee name is known, query by Injury>Injured employee. Several parameters may be selected to narrow the search.
4. Once query parameters are selected, click the “Search” button. In a few seconds the IRFs that match the parameters will be displayed.
5. Click the IRF number to view and edit the IRF.
6. Any field may be edited; however, you are required to provide your name, date, and brief summary of the edits made under “Additional comments/changes.”
7. After all the changes have been made, click the “Submit” button. Edits will be saved and sent to the appropriate RHSPM and ECC.

5.0 RHSPM/ECC Evaluation

The RHSPM and ECC are responsible for reviewing IRF reports for accuracy and completeness, and for completing additional evaluation sections. RHSPMs are required to complete the RHSPM Injury Evaluation and RHSPM/ECC Evaluation sections for Injury/Illness Reports, Property Damage, Near-Miss, and Other reports. ECCs are required to complete the RHSPM/ECC Evaluation and ECC Evaluation sections for Spill/Release and Environmental/Permit Issue reports.

Questions regarding Injury/Illness, Property Damage, Near-Miss, and Other reports should be directed to the HSPM. Questions regarding Spill/Release and Environmental/Permit Issue reports should be directed to the EPM.

5.1 RHSPM Injury Evaluation Section

Work Related – In general, an incident is considered work related when it results from an event or exposure in the work environment. The work environment includes CH2M HILL premises and other locations where employees are engaged in work-related activities or are present as a condition of employment. CH2M HILL premises include company restrooms, hallways, and lunchrooms, but exclude parking and recreational facilities. Incidents occurring on CH2M HILL premises are typically work related. Incidents occurring off CH2M HILL premises are also considered work related if: (1) the employee was engaged in a work-related activity, (2) the employee was present at the location as a condition of employment, or (3) the employee was in travel status and was engaged in work or travel function. If the employee was engaged in an activity for personal use or enjoyment while off CH2M HILL premises, the incident would not be considered work related. Determining work relationships can be difficult. For complex cases, call the HSPM for clarification.

Incident Status – Distinguishing between injuries and illnesses is determined by the original event or exposure that caused the incident, not by the resulting condition. Injuries are caused by instantaneous events and exposures; anything other than instantaneous is classified as an illness. Animal, insect, and snake bites are classified as injuries. Back injuries are classified as injuries. Repetitive motion disorders are classified as illnesses.

Fatality Date – This field is to be used only for an injury or illness that is fatal. The OSHA 200 log requires a fatality date, and this may be different from the date of injury or illness. Enter date in the “mm/dd/yyyy” format.

Illness Category – This field is to be used only for recordable illnesses. The OSHA 200 log requires that recordable illnesses be categorized within one of the seven categories provided on the IRF. Choose only one category. The seven illness categories, with examples of each, are listed below:

- Occupational skin diseases or disorders – Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations.
- Dust diseases of the lungs (pneumoconioses) – Silicosis, asbestosis, and other asbestos-related diseases, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconioses.
- Respiratory conditions due to toxic agents – Pneumonitis, pharyngitis, rhinitis, or acute congestion due to chemicals, dusts, gases, or fumes: farmer's lung.
- Poisoning (systemic effects of toxic materials) – Poisoning by lead, mercury, cadmium, arsenic, or other metals; by carbon monoxide, hydrogen sulfide, or other gases; by benzol, carbon tetrachloride, or other organic solvents; by insecticide sprays such as parathion or lead arsenate; by other chemicals such as formaldehyde, plastics, and resins.

- Disorders due to physical agents (other than toxic materials) – Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, x-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves).
- Disorders associated with repeated trauma – Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud’s phenomenon; and other conditions due to repeated motion, vibration, or pressure.
- All other occupational illnesses – Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, or coccidioidomycosis.

Illness Diagnosed or Recognized – All commonly recognized and diagnosed illnesses are recordable. Commonly recognized illnesses are those that are simple to detect and can be identified without specialized medical training, such as poison ivy. Commonly recognized illnesses are recordable on the date the signs/symptoms are present. Complex illnesses (e.g., silicosis, asbestosis, and carpal tunnel syndrome) can be identified (diagnosed) only by properly trained medical personnel and become recordable only after they have been diagnosed. An individual who reports wrist pain should not be reported as recordable until a diagnosis has been made of a work-related illness. For injuries, select “Not diagnosed nor recognized.”

Medical Treatment – A guideline is provided in Attachment 2 for distinguishing between first aid and medical treatment. Distinguishing between first aid and medical treatment can be difficult; for complex cases call the HSPM for clarification.

Loss of Consciousness – Self-explanatory.

Restricted Work or Motion – The number of restricted days is provided in the “Incident Information” section that is completed by the HRR. This number may need to be updated if the doctor changes initial instructions. The HRR is responsible for updating the restricted workdays; the RHSPM should verify that this is being done.

Transfer to Another Job – Self-explanatory.

Lost Workdays – The number of lost workdays is provided in the “Incident Information” section that the HRR completes. This number may need to be updated if the doctor changes initial instructions. The HRR is responsible for updating the lost workdays; the RHSPM should verify that this is being done.

OSHA Recordable – A flowchart is provided in Attachment 3 for determining OSHA recordability. Recordability for incidents occurring outside the United States is not recorded in this section. Such determinations must be documented in the “Comment” section of the IRF. A flowchart is provided in Attachment 4 for determining recordability in Australia. Questions regarding recordability should be directed to the HSPM.

OSHA Log Date – This field is to be used only for recordable incidents in the United States. For recordable injuries, this is the date of the injury. For recordable illnesses, this is the date the illness was diagnosed or recognized. Illnesses are recordable only after they have been diagnosed or recognized. This field, along with the “OSHA Recordable” field, is used to

determine the recordable cases for the H&S quarterly report. Enter date in the “mm/dd/yyyy” format.

OSHA Log Location – This field is to be used only for recordable incidents in the United States. OSHA requires that each establishment maintain an OSHA 200 log and that recordable cases occurring at the establishment be entered onto the establishment log, regardless of where the employee normally reports for work. An establishment is defined as any operation with a continuous duration of 1 year or more. That means projects lasting more than 1 year are required to maintain their own OSHA 200 log.

From the pick list, choose the appropriate OSHA log location code. This should be the same as the region identified under the geographic location field. If a code is not available for an establishment project, one must be created. The code used, as well as the project’s name and location, must be provided to the HSPM.

5.2 RHSPM/ECC Evaluation Section

Comments – Provide any additional information that was not included in the responses to other questions that will help clarify and update the case. This may include doctor’s instructions from specific visits to assist in updating lost and restricted workdays and may include the specific reasons why this case is recordable or not.

Initial Determination of Cause(s) – Provide the root cause(s) of the incident to prevent recurrence. The form in Attachment 1 will be used to determine the cause of the incident. This form will be kept in project and/or regional HS&E files.

Corrective Actions/Lessons Learned – Indicate corrective actions required to address the situation and prevent recurrence. Provide lessons learned/suggestions that might have prevented the specific case or that may prevent future incidents of the same nature.

5.3 ECC Evaluation Section

Hazardous Substances and RQs – Indicate the status of the substance involved (CERCLA hazardous substance or extremely hazardous substance) in the spill or release and the applicable Reportable Quantity (RQ) by referring to the *BNA Spill Reporting Procedures Guide*.

Reportable to Agency – Indicate if the spill, release, or environmental issue is required to be reported to the regulatory agency. For example, “The exceedance is reportable to the State Water Quality Board because it was considered a bypass event under the terms of the NPDES permit.” This determination should have already been made when the incident was verbally communicated. Research applicable regulations to determine reportability. The agency should *not* be contacted to assist in making a determination. The incident should be reported after a determination is made. Note that most spills/releases must be reported within 24 hours.

State Reason – Provide the rationale behind the decision of whether or not to report the incident. For example, “The 0.03 ppm concentration of benzene in the mixture contained in the 50 gallons spilled did not exceed the federal or state RQ.”

6.0 Attachments

Attachment A-1	Incident Report (Hard Copy)
Attachment A-2	Treatment Classification Table
Attachment A-3	OSHA Recordability Flowchart
Attachment A-4	Australia Reportable Injury/Illness Guidelines

CH2MHILL

Attachment A-1: Incident Report Form (Hard Copy)

Fax completed form to:

425.462.5957

CH2M HILL Seattle Office

Attention: Corporate HS&E Department

Type of Incident (Select at least one)

- | | | |
|---|--|--|
| <input type="checkbox"/> Injury/Illness | <input type="checkbox"/> Property Damage | <input type="checkbox"/> Spill/Release |
| <input type="checkbox"/> Environmental/Permit Issue | <input type="checkbox"/> Near-Miss | <input type="checkbox"/> Other |

General Information (Complete for all incident types)

Preparer's Name: _____ Preparer's Employee Number: _____
Date of Report: _____ Date of Incident: _____ Time of Incident: _____ am/pm

Type of Activity (Provide activity being performed that resulted in the incident)

- | | | |
|--|--|--|
| <input type="checkbox"/> Asbestos Work | <input type="checkbox"/> Excavation Trench – Haz Waste | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Confined Space Entry | <input type="checkbox"/> Excavation Trench – Non Haz | <input type="checkbox"/> Process Safety Management |
| <input type="checkbox"/> Construction Mgmt – Haz Waste | <input type="checkbox"/> Facility Walkthrough | <input type="checkbox"/> Tunneling |
| <input type="checkbox"/> Construction Mgmt – Non-Haz Waste | <input type="checkbox"/> General Office Work | <input type="checkbox"/> Welding |
| <input type="checkbox"/> Demolition | <input type="checkbox"/> Keyboard Work | <input type="checkbox"/> Wetlands Survey |
| <input type="checkbox"/> Drilling – Haz Waste | <input type="checkbox"/> Laboratory | <input type="checkbox"/> Working from Heights |
| <input type="checkbox"/> Drilling – Non-Haz Waste | <input type="checkbox"/> Lead Abatement | <input type="checkbox"/> Working in Roadways |
| <input type="checkbox"/> Drum Handling | <input type="checkbox"/> Motor Vehicle Operation | <input type="checkbox"/> WWTP Operation |
| <input type="checkbox"/> Electrical Work | <input type="checkbox"/> Moving Heavy Object | |

Location of Incident (Select one)

- Company Premises (CH2M HILL Office: _____)
- Field (Project #: _____ Project/Site Name: _____ Client: _____)
- In Transit (Traveling from: _____ Traveling to: _____)
- At Home

Geographic Location of Incident (Select region where the incident occurred)

- | | | |
|------------------------------------|---|--|
| <input type="checkbox"/> Northeast | <input type="checkbox"/> Corporate | <input type="checkbox"/> Latin America |
| <input type="checkbox"/> Southeast | <input type="checkbox"/> Canadian | |
| <input type="checkbox"/> Northwest | <input type="checkbox"/> Asia Pacific | |
| <input type="checkbox"/> Southwest | <input type="checkbox"/> Europe Middle East | |

If a CH2M HILL subcontractor was involved in the incident, provide their company name and phone number: _____

Describe the Incident (Provide a brief description of the incident): _____

Injured Employee Data (Complete for Injury/Illness incidents only)

If CH2M HILL employee injured

Employee Name: _____ Employee Number: _____

If CH2M HILL Subcontractor employee injured

Employee Name: _____ Company: _____

Injury Type

- | | | |
|--|--|---|
| <input type="checkbox"/> Allergic Reaction | <input type="checkbox"/> Electric Shock | <input type="checkbox"/> Multiple (Specify) _____ |
| <input type="checkbox"/> Amputation | <input type="checkbox"/> Foreign Body in Eye | <input type="checkbox"/> Muscle Spasms |
| <input type="checkbox"/> Asphyxia | <input type="checkbox"/> Fracture | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Bruise/Contusion/Abrasion | <input type="checkbox"/> Freezing/Frostbite | <input type="checkbox"/> Poisoning (Systemic) |
| <input type="checkbox"/> Burn (Chemical) | <input type="checkbox"/> Headache | <input type="checkbox"/> Puncture |
| <input type="checkbox"/> Burn/Scald (Heat) | <input type="checkbox"/> Hearing Loss | <input type="checkbox"/> Radiation Effects |
| <input type="checkbox"/> Cancer | <input type="checkbox"/> Heat Exhaustion | <input type="checkbox"/> Strain/Sprain |
| <input type="checkbox"/> Carpal Tunnel | <input type="checkbox"/> Hernia | <input type="checkbox"/> Tendonitis |
| <input type="checkbox"/> Concussion | <input type="checkbox"/> Infection | <input type="checkbox"/> Wrist Pain |
| <input type="checkbox"/> Cut/Laceration | <input type="checkbox"/> Irritation to Eye | |
| <input type="checkbox"/> Dermatitis | <input type="checkbox"/> Ligament Damage | |
| <input type="checkbox"/> Dislocation | | |

Part of Body Injured

- | | | |
|--|---|--|
| <input type="checkbox"/> Abdomen | <input type="checkbox"/> Hand(s) | <input type="checkbox"/> Neck |
| <input type="checkbox"/> Ankle(s) | <input type="checkbox"/> Head | <input type="checkbox"/> Nervous System |
| <input type="checkbox"/> Arms (Multiple) | <input type="checkbox"/> Hip(s) | <input type="checkbox"/> Nose |
| <input type="checkbox"/> Back | <input type="checkbox"/> Kidney | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Blood | <input type="checkbox"/> Knee(s) | <input type="checkbox"/> Reproductive System |
| <input type="checkbox"/> Body System | <input type="checkbox"/> Leg(s) | <input type="checkbox"/> Shoulder(s) |
| <input type="checkbox"/> Buttocks | <input type="checkbox"/> Liver | <input type="checkbox"/> Throat |
| <input type="checkbox"/> Chest/Ribs | <input type="checkbox"/> Lower (Arms) | <input type="checkbox"/> Toe(s) |
| <input type="checkbox"/> Ear(s) | <input type="checkbox"/> Lower (Legs) | <input type="checkbox"/> Upper Arm(s) |
| <input type="checkbox"/> Elbow(s) | <input type="checkbox"/> Lung | <input type="checkbox"/> Upper Leg(s) |
| <input type="checkbox"/> Eye(s) | <input type="checkbox"/> Mind | <input type="checkbox"/> Wrist(s) |
| <input type="checkbox"/> Face | | |
| <input type="checkbox"/> Finger(s) | <input type="checkbox"/> Multiple (Specify) _____ | |
| <input type="checkbox"/> Foot/Feet | | |

Nature of Injury

- | | | |
|---|---|---|
| <input type="checkbox"/> Absorption | <input type="checkbox"/> Inhalation | <input type="checkbox"/> Overexertion |
| <input type="checkbox"/> Bite/Sting/Scratch | <input type="checkbox"/> Lifting | <input type="checkbox"/> Repeated Motion/Pressure |
| <input type="checkbox"/> Cardiovascular/Respiratory | <input type="checkbox"/> Mental Stress | <input type="checkbox"/> Rubbed/Abraded |
| System Failure | <input type="checkbox"/> Motor Vehicle Accident | <input type="checkbox"/> Shock |
| <input type="checkbox"/> Caught In or Between | <input type="checkbox"/> Multiple (Specify) _____ | <input type="checkbox"/> Struck Against |
| <input type="checkbox"/> Fall (from Elevation) | <input type="checkbox"/> Other (Specify) _____ | <input type="checkbox"/> Struck By |
| <input type="checkbox"/> Fall (Same Level) | | <input type="checkbox"/> Workplace Violence |
| <input type="checkbox"/> Ingestion | | |

Initial Diagnosis/Treatment Date: _____

Type of Treatment

- | | |
|---|--|
| <input type="checkbox"/> Admission to hospital/medical facility | <input type="checkbox"/> Prescription – single dose |
| <input type="checkbox"/> Application of bandages | <input type="checkbox"/> Removal of foreign bodies |
| <input type="checkbox"/> Cold/heat compression – multiple treatment | <input type="checkbox"/> Skin removal |
| <input type="checkbox"/> Cold/heat compression – one treatment | <input type="checkbox"/> Soaking therapy – multiple treatment |
| <input type="checkbox"/> First-degree burn treatment | <input type="checkbox"/> Soaking therapy – one treatment |
| <input type="checkbox"/> Heat therapy – multiple treatment | <input type="checkbox"/> Stitches/sutures |
| <input type="checkbox"/> Multiple (specify) _____ | <input type="checkbox"/> Tetanus |
| <input type="checkbox"/> Heat therapy – one treatment | <input type="checkbox"/> Treatment for infection |
| <input type="checkbox"/> Nonprescription medicine | <input type="checkbox"/> Treatment of 2 nd /3 rd -degree burns |
| <input type="checkbox"/> None | <input type="checkbox"/> Use of antiseptics – multiple treatment |
| <input type="checkbox"/> Observation | <input type="checkbox"/> Use of antiseptics – single treatment |
| <input type="checkbox"/> Other (specify) _____ | <input type="checkbox"/> Whirlpool bath therapy – multiple treatment |
| <input type="checkbox"/> Prescription – multiple dose | <input type="checkbox"/> Whirlpool therapy – single treatment |
| | <input type="checkbox"/> X-rays negative |
| | <input type="checkbox"/> X-rays positive/treatment of fracture |

Number of days doctor required employee to be off work: _____
Number of days doctor restricted employee's work activity: _____
Equipment Malfunction : Yes No Activity was a Routine Task: Yes No
Describe how you might have prevented this injury:

Physician Information

Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Hospital Information

Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Property Damage (Complete for Property Damage incidents only)

Property Damaged: _____ Property Owner: _____
Damage Description: _____
Estimated Amount: \$ _____

Spill or Release (Complete for Spill/Release incidents only)

Substance (attach MSDS): _____ Estimated Quantity: _____
Facility Name, Address, Phone No.: _____
Did the spill/release move off the property where work was performed?: _____
Spill/Release From: _____ Spill/Release To: _____

Environmental/Permit Issue (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue: _____
Permit Type: _____
Permitted Level or Criteria (e.g., discharge limit): _____
Permit Name and Number (e.g., NPDES No. ST1234): _____
Substance and Estimated Quantity: _____
Duration of Permit Exceedance: _____

Verbal Notification (Complete for all incident types) (Provide names, dates and times)

CH2M HILL Personnel Notified: _____
Client Notified: _____

Witnesses (Complete for all incident types)

Witness Information (First Witness)
Name: _____
Employee Number (CH2M HILL): _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Witness Information (Second Witness)
Name: _____
Employee Number (CH2M HILL): _____
Address: _____
City: _____
Zip Code: _____
Phone : _____

Additional Comments:

CH2MHILL

Incident Reporting and Investigation

Standard of Practice HSE-111

Appendix A: Incident Report Form Completion Guideline

Attachment A-2: Treatment Classification Table

FIRST AID TREATMENT	MEDICAL TREATMENT
	Treatment of INFECTION
Application of ANTISEPTICS during first visit to medical personnel	Application of ANTISEPTICS during second or subsequent visit to medical personnel
Treatment of FIRST-DEGREE BURN(S)	Treatment of SECOND- OR THIRD-DEGREE BURN(S)
Application of BANDAGE(S) during any visit to medical personnel	Application of SUTURES (stitches)
Use of ELASTIC BANDAGE(S) during first visit to medical personnel	Application of BUTTERFLY ADHESIVE DRESSING(S) or STERI STRIP(S) in lieu of sutures
Removal of FOREIGN BODIES NOT EMBEDDED IN EYE if only irrigation is required	Removal of FOREIGN BODIES EMBEDDED IN EYE
Removal of FOREIGN BODIES FROM WOUND ; if procedure is UNCOMPLICATED and is, for example, by tweezers or other simple technique	Removal of FOREIGN BODIES FROM WOUND ; if procedure is COMPLICATED because of depth of embedment, size, or location
Use of NONPRESCRIPTION MEDICATIONS and administration of single dose of PRESCRIPTION MEDICATION on first visit for minor injury or discomfort	Use of PRESCRIPTION MEDICATIONS (except a single dose administered on first visit for minor injury or discomfort)
SOAKING THERAPY on initial visit to medical personnel or removal of bandages by SOAKING	Use of hot or cold SOAKING THERAPY during second or subsequent visit to medical personnel
Application of hot or cold COMPRESS(ES) during first visit to medical personnel	Application of hot or cold COMPRESS(ES) during second or subsequent visit to medical personnel
Application of OINTMENTS to abrasions to prevent drying or cracking	CUTTING AWAY DEAD SKIN (surgical debridement)
Application of HEAT THERAPY during first visit to medical personnel	Application of HEAT THERAPY during second or subsequent visit to medical personnel
Use of WHIRLPOOL BATH THERAPY during first visit to medical personnel	Use of WHIRLPOOL BATH THERAPY during second or subsequent visit to medical personnel
NEGATIVE X-RAY DIAGNOSIS	POSITIVE X-RAY DIAGNOSIS (fractures, dislocations, etc.)

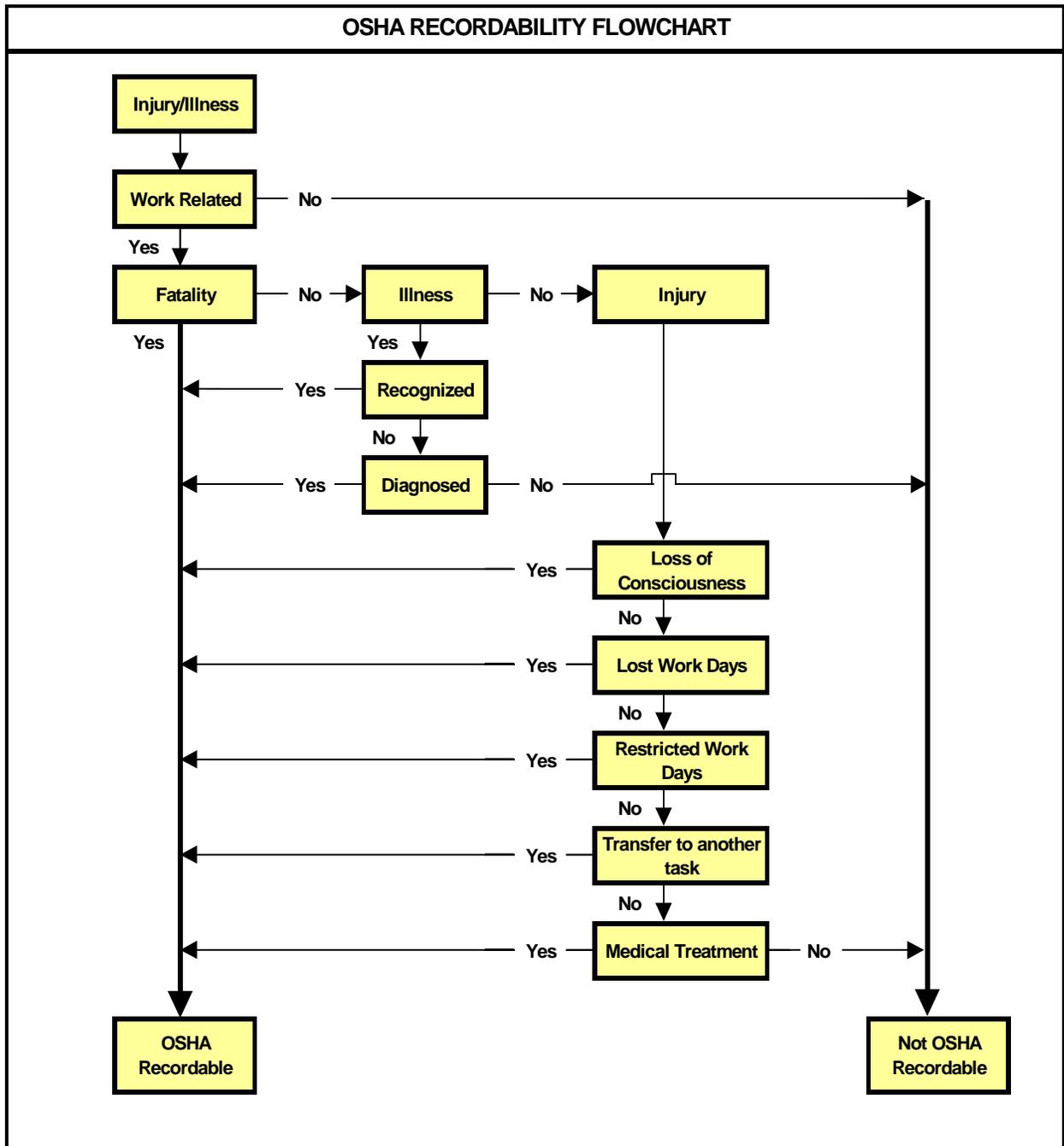
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Incident Reporting and Investigation

Standard of Practice HSE-111

Appendix A: Incident Report Form Completion Guideline

Attachment A-3: OSHA Recordability Flowchart



CH2MHILL

Incident Reporting and Investigation

Standard of Practice HSE-111

Appendix A: Incident Report Form Completion Guideline

Attachment A-4: Australia Reportable Injury/Illness Guidelines

All work-related incidents must be reported within 24 hours to Corporate HS&E. However, only certain incidents must be reported to the local agencies. In Australia, the following incidents are reportable to the local occupational health and safety agency within seven (7) days of occurrence:

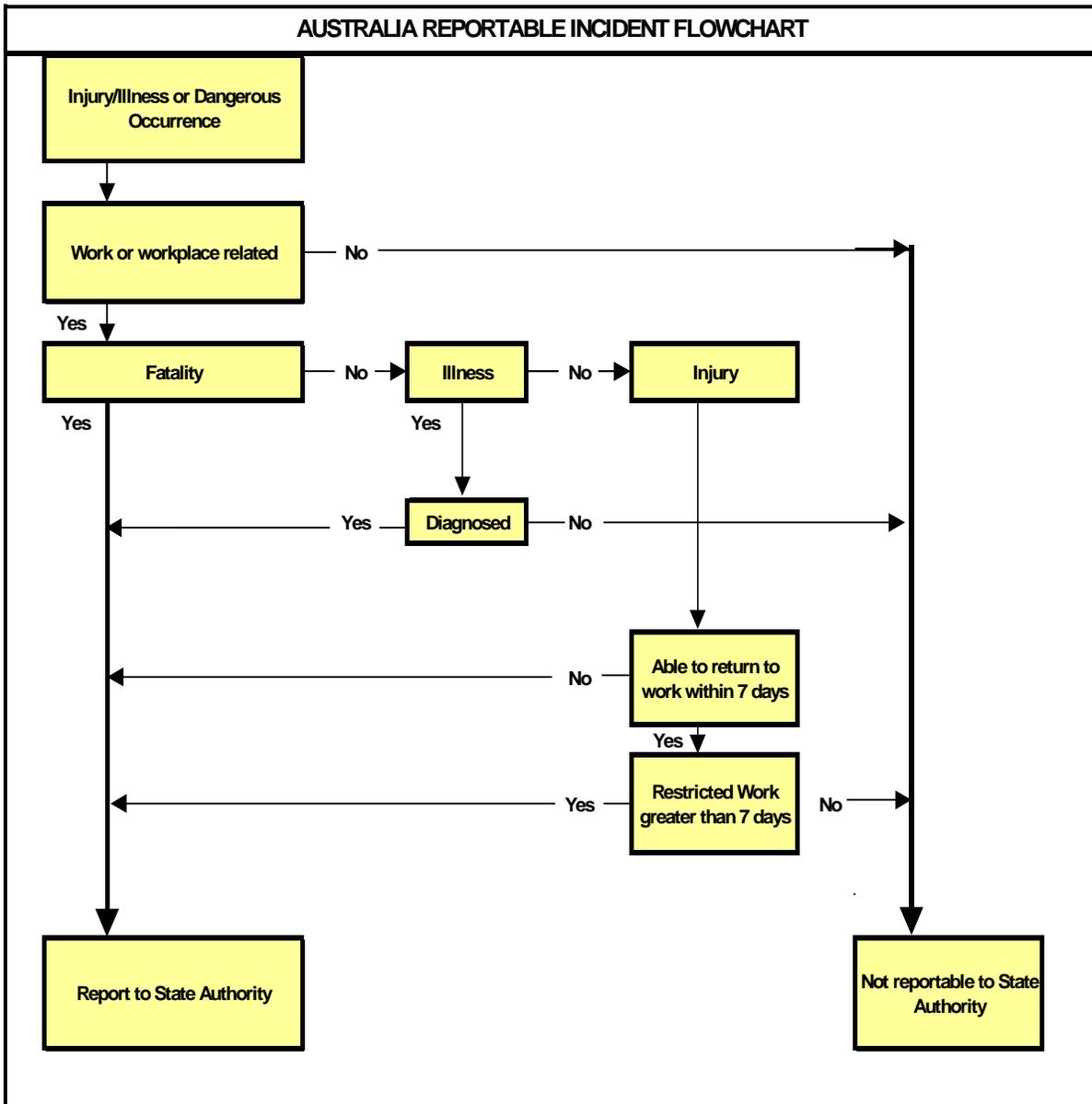
1. An accident or occurrence incurring death of a person in the workplace
2. Amputation of a limb as a result of the workplace and its operation
3. An injury to a person that results in the person being unfit, for a continuous period of at least (7) seven calendar days, to attend the person's usual place of work, to perform his or her usual duties at his or her place of work or, in the case of a nonemployee, to carry out his or her usual duties.
4. An illness of a person that is related to work processes and results in the person being unfit, for a continuous period of at least 7 days, to attend the person's usual place of work or to perform his or her usual duties at that place of work.
5. An accident or occurrence incurring electric shock
6. Damage to any plant , equipment, building, or structure or other thing that impedes safe operation,
7. An uncontrolled explosion or fire
8. An uncontrolled escape of gas, dangerous goods, or steam
9. A spill or incident resulting in exposure or potential exposure of a person to a notifiable or prohibited carcinogenic substance (as defined)
10. An accident or occurrence where an employee is injured and admitted to hospital as an in-patient following an exposure to a hazardous substance
11. An accident or occurrence involving the collapse, overturning, or failure of a load-bearing part of a lift, crane, hoist, lifting gear, or scaffolding
12. An accident or occurrence involving the collapse of shoring or an excavation which is more than 1.5m deep
13. Removal of workers from lead risk work due to excessive blood lead levels
14. Exposure to bodily fluids that presents a risk of transmission of blood-borne diseases

15. Any incident of violence at a place of work that results in an employee being unfit, for a continuous period of at least 7 days, to attend the employee's usual place of work or to perform his or her usual duties at that place of work

16. Any occurrence that involves a risk of:

- Explosion or fire
- Escape of gas, dangerous goods, or steam
- Serious injury to, or illness of, a person
- Substantial property damage

The following flowchart depicts when incidents must be reported to the appropriate agency in Australia.



In addition, some states in Australia have a category of incidents known as “non-disturbance occurrences,” which are serious, potentially life-threatening occurrences. Non-disturbance occurrences require immediate reporting to the authorities and often require the attendance of an inspector. These types of occurrences usually involve machinery, failure of structures or earthworks, or escape of hazardous substances.

CH2MHILL

Incident Reporting and Investigation Standard of Practice HSE-111

Appendix B: Investigation Guidelines

1.0 Introduction

This guideline is provided to assist in accessing, completing, and reviewing an incident investigation. It is important to remember the following when conducting an investigation:

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

2.0 Documentation

The following should be included in the IRF to document the incident.

Description

- Provide a description of the event and the sequence of events and actions that took place prior to the incident. Start with the incident event and work backwards in time through all of the preceding events that directly contributed to the incident. The information should identify why the event took place as well as who was involved, when and where the event took place, and what actions were taken.

Cause Analysis

Using the form and flowchart in Attachment 1, the root cause of the incident will be determined. This form must be retained in the project and/or regional HS&E files.

Immediate Causes – List the substandard actions or conditions that directly affected the incident. The following are examples of immediate causes:

Substandard Actions: Operating equipment without authority; failure to warn; failure to secure; operating at improper speed; making safety device inoperable; using defective equipment; failing to use PPE; improper loading; improper lifting; improper position for task; under influence of alcohol or drugs; horseplay.

Substandard Conditions: Exposure to hazardous materials; exposure to extreme temperatures; improper lighting; improper ventilation; congestion; exposure to fire and explosive hazard; defective tools, equipment, or materials; exposure to extreme noise; poor ventilation; poor visibility; poor housekeeping.

Basic Causes – List the personal and job factors that caused the incident. The following are examples of basic causes:

Personal Factors: Capability; knowledge; skill; stress; motivation.

Job Factors: Abuse or misuse; engineering; maintenance; purchasing; supervision; tools and equipment; wear and tear; work standards.

Corrective Action Plan

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a time frame for completion. Be sure the corrective actions address the causes. For example, training may prevent recurrence of an incident caused by a lack of knowledge, but it may not help an incident caused by improper motivation.

The following are examples of management programs that may be used to control future incidents. These programs should be considered when determining specific corrective actions.

Management Programs: Accident/incident analysis; emergency preparedness; engineering controls; general promotion; group meetings; health control; hiring and placement; leadership and administration; management training; organizational rules; personal protective equipment; planned inspections; program audits; program controls; purchasing controls; task analysis and procedures; task observation

3.0 Attachments

Attachment B-1 Root Cause Analysis Form and Flowchart

CH2MHILL

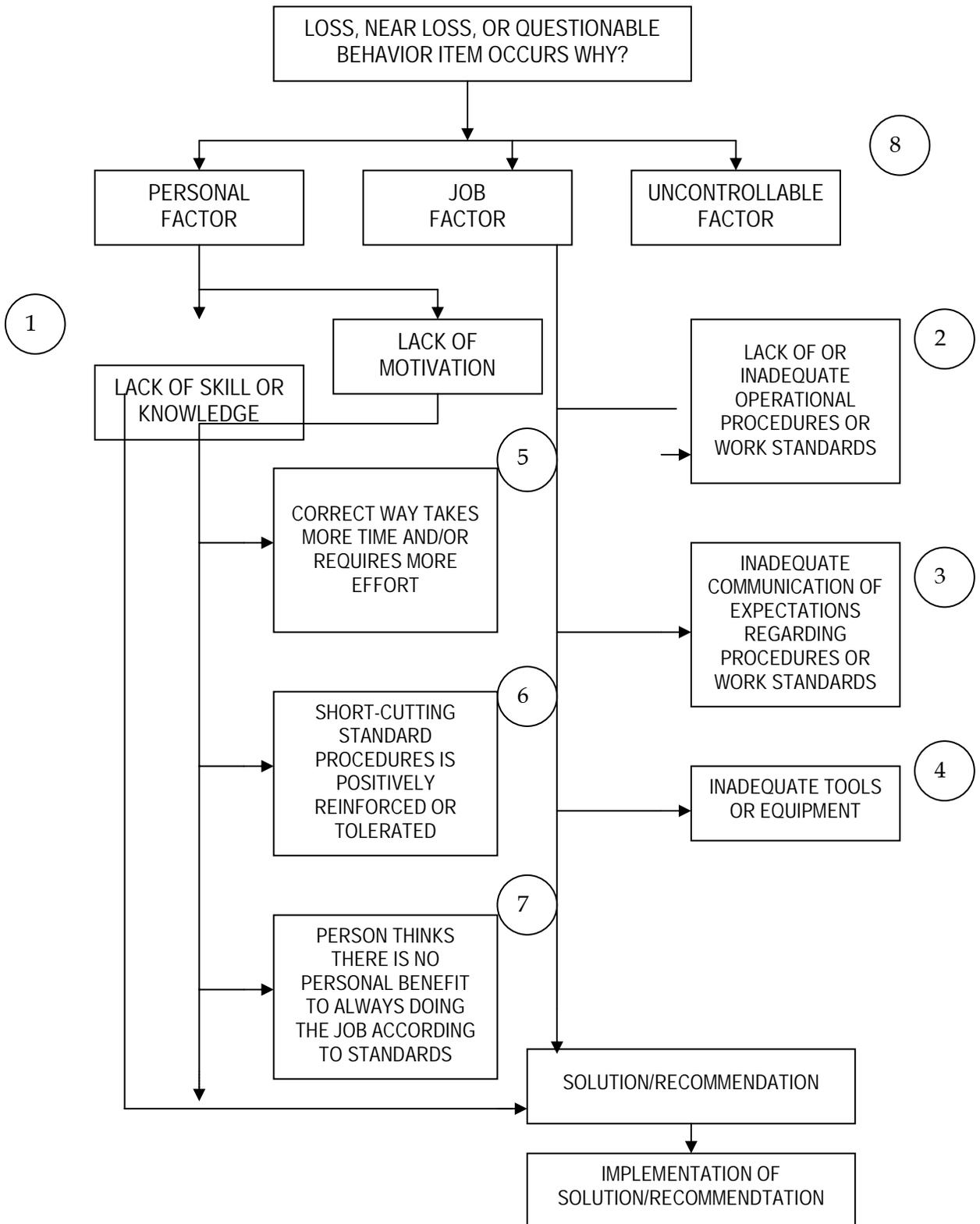
Incident Reporting and Investigation
 Standard of Practice HSE-111
 Appendix B: Investigation Guidelines

Attachment B-1: Root Cause Analysis Form and Flowchart

Root Cause Analysis Form

Root Cause Analysis (RCA)							
<p>Root Cause Categories (RCC): Select the RCC numbered below that applies for the root cause (RC) and/or contributing factor (CF) in the first column, then describe the specific root cause and corrective actions in each column.</p> <ol style="list-style-type: none"> Lack of skill or knowledge Lack of or inadequate operational procedures or work standards Inadequate communication of expectations regarding procedures or work standards Inadequate tools or equipment Correct way takes more time and/or requires more effort Short-cutting standard procedures is positively reinforced or tolerated Person thinks there is no personal benefit to always doing the job according to standards 							
RCC #	Root Cause(s)	Corrective Actions	RC ¹	CF ²	Due Date	Completion Date	Date Verified
¹ RC = Root Cause; ² CF = Contributing Factors (check which applies)							
Investigation Team Members							
Name		Job Title			Date		
Results of Solution Verification and Validation							
Reviewed By							
Name		Job Title			Date		

Root Cause Analysis Flowchart



ATTACHMENT B-14: HSE-106 Serious Incident Reporting Process

1.0 Introduction

The purpose of this procedure is to provide direction on the required standard notification and reporting process for serious incidents. This standard ensures timely notification to the appropriate Business Group Presidents or Geographic Region Managers and allows for positive control over flow of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. The standard notification process integrates Health, Safety, Environment & Quality (HSE&Q) and Firm Wide Security Operations (FWSO) requirements for the consistent reporting of and managing of serious events throughout our operations. The Standard of Notification applies to all CH2M HILL family of companies.

This document outlines the minimum requirements for the Serious Incident Reporting Process and is not intended as an exhaustive procedural description of the process. Exhaustive procedures for the Serious Incident Reporting Process are developed by each business group/facility or project in accordance with the direction stated herein.

2.0 Serious Incident Determination

Events which require prompt notification to senior management are determined through consideration of a number of factors including; type and seriousness of event, and need for quick Company response to expected client and public reaction. The following are general criteria for determining whether an incident on CH2M HILL owned or managed facilities or project sites is considered serious and must be immediately reported through the reporting/notification process:

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

3.0 Reporting/Notification Guidelines

For all serious incidents this standard reporting process is implemented immediately so as to ultimately achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team (see responsibilities) within 3 hours of incident onset or discovery.

4.0 Responsibilities

4.1 Facility or Project Employees

Will:

- Provide immediate verbal notification of serious incident to their Project Manager, Facility Manager, and/or Security Manager. Initial notification of serious incident must include:
 - a) Provide verbal notification to appropriate emergency responders
 - b) Provide verbal notification to Facility or Project Management
 - c) Notification must include:
 - Name of Facility or Project
 - Date/Time of incident
 - Location of incident (City, State, Country)
 - Type of incident (fatality, life threatening injury/illness, kidnap/missing person, act or threat of terrorism, fire/explosion, hazardous material spill, or other)
 - The number of fatalities or victims, including name and family contact information if readily available
 - Reporting party's name and contact number
 - Description of how event occurred
 - Description of immediate and/or short-term corrective actions

4.2 Facility Manager, Project Manager, and/or Security Manager

Will:

- Provide immediate verbal notification to appropriate emergency responders if not already notified
- Provide immediate verbal notification to Team Leader to assemble Local Crisis Management Team
- Provide immediate verbal notification to Crisis Manager via pager #720.286.4911
- Provide information to Crisis Manager on immediate and/or short-term corrective actions

4.3 Crisis Manager

Will:

- Provide immediate verbal notification to Geographic Region Managers
- Provide immediate verbal notification to Business Group/Geographic Region HSE&Q Representatives
- Provide immediate verbal notification to Corporate HSE&Q Vice President
- Assemble Crisis Management Support Team as necessary
- Ensure incident updates are maintained

4.4 Geographic Region Manager

Will:

- Allocate time to provide guidance to Local Crisis Management Team and follow incident through to resolution.

4.5 Business Group/Geographic Region HSE&Q Representative

Will:

- Provide immediate (within 2 hours of incident onset or discovery) verbal notification to Business Group President or Facility Manager.
- Immediate notification to Corporate Legal/Insurance Department via e-mail with a description of the incident, parties involved, and incident circumstances. E-mail must be completed as follows:
 - Address e-mail to Al Jerman/DEN and copy Kirby Wright/DEN, Julie Zimmerman/DEN, Keith Christopher/WDC, and Tom Horton/DEN.
 - Include the phrase “Confidential-Attorney/Client Privileged Communication” in the subject line or title of the e-mail.
 - Include the following at the end of the e-mail:

“Content of communication is a privileged attorney-client communication or privileged attorney work product. If this message was misrouted and you are not an intended recipient, please delete it immediately and notify the sender.”

4.6 Corporate HSE&Q Vice President

Will:

- Provide Corporate HSE&Q oversight support to the Business Group President and Crisis Management Support Team.

4.7 BG President or Facility Manager

Will:

- Provide immediate verbal notification to the Office of the Chief Executive Officer (OCEO) Coordinator, Bud Ahearn (or backup OCEO Coordinator Omur Akay).

4.8 OCEO Coordinator

Will:

- Make notification to OCEO
- Provide decision-making assistance or direction for incident resolution

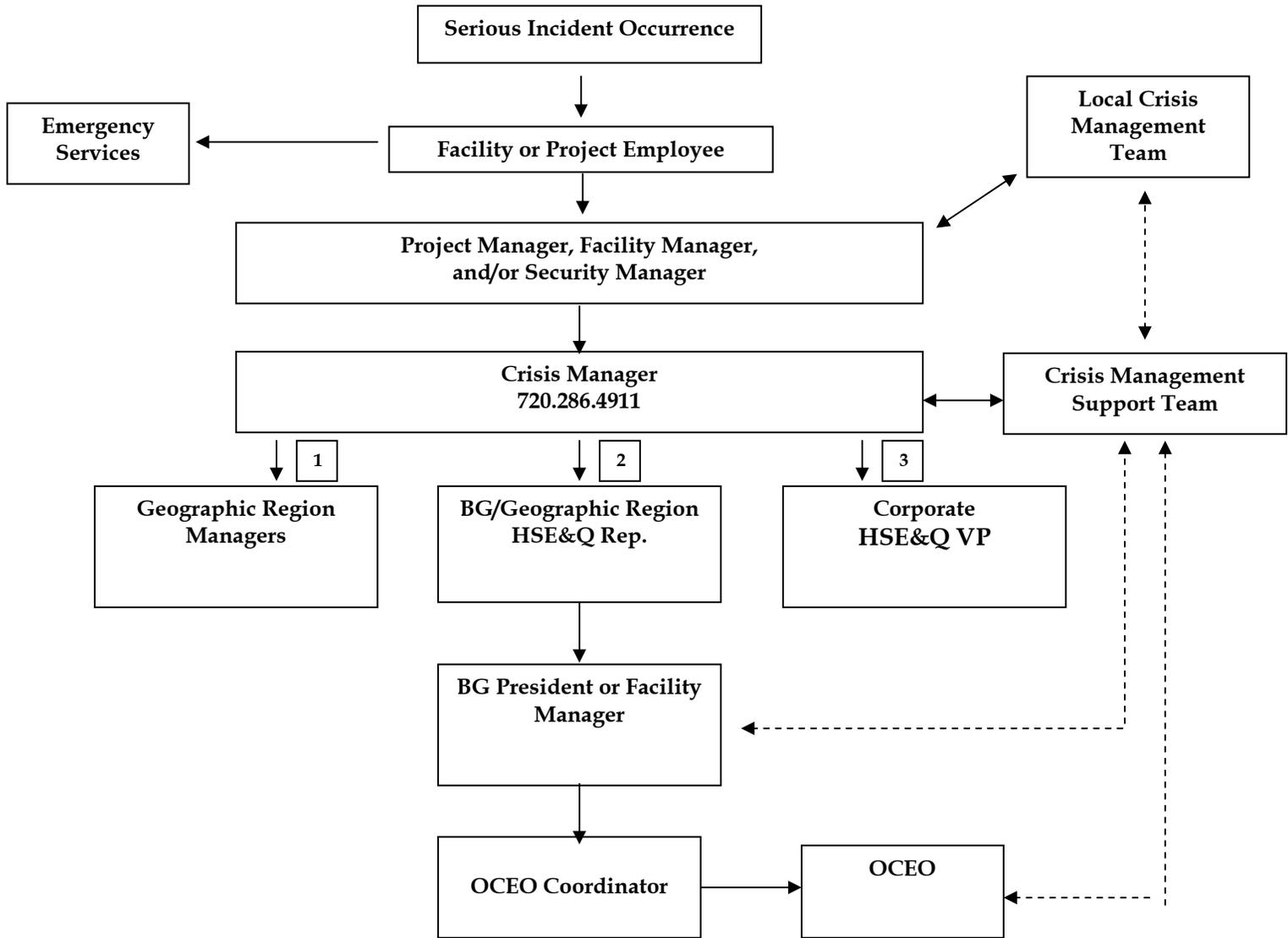
4.9 Local Crisis Management Team

- Team comprised of key local staff that is maintained at each facility and project and is activated to manage the crisis or serious event/incident on-scene. Each facility and project is responsible for staffing and managing the Local Crisis Management Team. The Local Crisis Management Team can be supplemented or augmented by members of the Crisis Management Support Team.

4.10 Crisis Management Support Team

- Team comprised of key corporate staff maintained at the corporate office and is activated to provide support, guidance, and augmentation to Local Crisis Management Operations.

5.0 Serious Incident Notification Chart



Legend:

—————> Direct line of communication

←----- Indirect line of communication

Definitions:

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

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

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

ATTACHMENT B-15: HSE-124 Injury Management



Injury Management/Return-to-Work Enterprise Standard Operating Procedure HSE&Q-124

1.0 Purpose

This Core Standard applies enterprise-wide to all CH2M HILL legal entities including CH2M HILL, Inc., CH2M HILL Constructors, Inc. (CCI), Lockwood Greene, IDC, OMI and their employees within the United States and Puerto Rico. This Core Standard outlines the mandatory components and criteria to provide for the orderly, effective and timely medical treatment and return-to-work transition of an employee who sustains a work-related injury or illness. Each legal entity must revise their existing procedures and processes, as necessary, to comply with this core standard.

1.1 References

The following programs, regulations and sources were consulted to prepare this Core Standard:

- CH2M HILL H&S Standard Operating Procedure 111, Incident Reporting and Investigation
- CH2M HILL H&S Standard Operating Procedure 601, Serious Incident Reporting

2.0 Scope and Application

This Core Standard applies to all CH2M HILL Legal Entities, their employees within the United States, including Puerto Rico. It applies to non-emergency injuries and illnesses. In case of emergency, dial 911 and follow procedures specified in the office or project Emergency Response Plan.

3.0 Definitions

3.1 Injury/Illness Early Intervention

Involves a designated physician or licensed health care professional (PLHCP) providing guidance and care to an employee as soon as a work-related injury/illness occurs.

3.2 Injury Management/Return-to-Work/Return-to-Work Program (IMRTW)

The process of providing initial and ongoing treatment, administration, and counseling to employees who have sustained a work-related injury/illness with the objective of ensuring that appropriate treatment and care has been provided for the employee's capability to safely return to assigned work duties.

3.3 Occupational Health Management Provider

A firm in the business of providing occupational health services that includes administration of Injury/Illness Early Intervention and Injury Management/Return-to-Work.

3.4 Telephonic Case Management (TCM)

The process during the first 30 to 60 days of actively following the progress of an employee's treatment and healing to facilitate their being able to return-to-work without jeopardizing their health by a designated licensed health care professional or workers compensation case manager maintaining contact with the employee by telephone. Typically, TCM is applied in cases where the employee has sustained an injury/illness that involved medical treatment resulting in days away from work, work restriction or job transfer.

3.5 Field Case Management (FCM)

A 60-day process implemented by a designated licensed health care professional or workers compensation case manager to actively follow the progress of an employee's treatment and healing through visits with the employee and their place of work or home to facilitate their return to work without jeopardizing their health. Generally FCM is applied in cases where the employee has sustained a more severe injury/illness that involved more ongoing or long-term medical treatment resulting in days away from work, work restriction or job transfer.

4.0 Roles and Responsibilities

4.1 Business Group Presidents

Each Business Group (BG) President is responsible for the following:

- Demonstrating leadership and commitment to the Injury Management/Return-to-Work Program.
- Designating staff within the BG responsible for coordinating the Injury Management/Return-to-Work program with the Occupational Health Management firm administering the program for their BG.

4.2 Operation Leaders/Supervisors/Group Leaders

Operation Leaders, Supervisors, or Group Leaders are responsible for:

- Verifying that H&S program requirements are implemented in the work facility and/or during project delivery.
- Ensuring that workers are informed of the Injury Management/Return-to-Work/Return-to-Work Program.
- Ensuring that suitable duties are identified and available for injured/ill workers who are determined to be medically fit to assume.
- Promptly responding to injuries or illnesses and ensuring that employees immediately call the Injury Management/Return-to-Work/Return-to-Work Program Administrator using the designated toll-free number, or as the situation requires, the Operations Leader, Supervisor, or Group Leader, places the call for the employee.

- Promptly documenting reported incidents involving a work-related injury or illness in accordance with HSE-111, "Incident Reporting and Investigation Standard Practice," and coordinating follow-up with the H&S representative.
- Ensuring the injured/ill employee is transported safely to the occupational clinic using company vehicle, rental, or taxi service, and when the situation requires, accompany the employee or assign a designee.
- Promptly completing the CH2M HILL "Authorization to Treat" form (refer to Attachment 3) and having the employee take the completed form with him/her to the medical facility or complete the form emailed by the occupational health nurse and forward it to the medical facility within 24 hours.
- Immediately notifying the pre-designated H&S representative, Human Resources (HR) representative, or assigned BG Injury Management/Return-to-Work/Return-to-Work Coordinator of any reported work related injury or illness.
- Monitoring the recovery status of injured/ill employees with H&S, HR, or the BG Injury Management/Return-to-Work/Return-to-Work Coordinator.

4.3 Employees

Employees are responsible for:

- Complying with H&S program requirements for preventing work-related injuries and illnesses to self and others.
- Providing immediate, direct, verbal notification of any known or suspected work-related injury or illness to their immediate supervisor (e.g., Group Leader).
- Immediately contacting the Injury Management/Return-to-Work Program Administrator using the assigned toll-free number to report their injury or illness and to follow the prescribed treatment, or as the situation requires, have the Operations Leader, Supervisor, or Group Leader, place the call for him/her.

4.4 Business Group H&S Leads and Regional H&S Staff

BG H&S and Regional H&S staff are responsible for:

- Establishing and monitoring the effectiveness of H&S programs in the work facility and during project delivery.
- Identifying suitable duties to be made available to injured workers who are determined to be medically fit to assume.
- Coordinating with the Injury Management/Return-to-Work Program Administrator to identify medical clinics for new projects that may not already exist in the provider network
- Communicating to management, supervisors, and employees the requirement to immediately report all workplace injuries/illnesses to their supervisor and call the toll-free number to speak with the Injury Management/Return-to-Work Program

Administrator occupational health nurse to receive assistance with the appropriate treatment.

- Ensuring the Injury Management/Return-to-Work Program toll-free number is prominently displayed in the work area or project site. (Refer to Attachment 4)
- Actively participating in the implementation of the program, including consulting with the employee, supervisor, HR, and the BG Injury Management/Return-to-Work Coordinator to ensure effective implementation
- Actively participating in the implementation of the program, including consulting with the employee, supervisor, HR, and the BG Injury Management/Return-to-Work Coordinator to ensure effective implementation
- Promptly following up with the Operation Leader/Supervisor/Group Leader on documenting reported incidents involving a work-related injury or illness in accordance with HSE-111, "Incident Reporting and Investigation Standard Practice."

4.5 Enterprise H&S

Enterprise H&S is responsible for:

- Development and implementation of the Injury Management/Return-to-Work Program with Legal and Insurance.
- Administrative management of the Occupational Health firm designated as the Injury Management/Return-to-Work Program Administrator.
- Periodic assessment of the Injury Management/Return-to-Work Program to determine its effectiveness, identify areas for improvement, and revise the procedure and elements of the core standard.

4.6 Legal and Insurance

The Legal and Insurance Department is responsible for:

- Overall administration of the Injury Management/Return-to-Work Program.
- Managing the Worker's Compensation Insurance Program including communication with Broker, Provider and Third-Party Administrator (TPA) regarding the expectations and requirements of the Injury Management/Return-to-Work Program.
- Implementing the Injury Management/Return-to-Work Program through the TPA and Injury Management/Return-to-Work Program Administrator, and establishing a reporting system to track worker compensation cases.
- Consulting with H&S, HR, and the BG Injury Management/Return-to-Work Coordinator to facilitate effective implementation.

4.7 Human Resources/Injury Management/Return-to-Work/Return-to-Work Coordinator

The Human Resources staffs are responsible for:

- Communicating to management, supervisors, and employees the requirement to immediately report all workplace injuries/illnesses to their supervisor and call the toll-free number to speak with the Injury Management/Return-to-Work Program Administrator occupational health nurse to receive assistance with the appropriate treatment.
- Managing the submittal of Worker's Compensation claims to our insurance provider.
- Assisting in the documentation of incidents involving a work-related injury or illness.
- Designating an Injury Management/Return-to-Work Coordinator.
- Actively participating in the implementation of the program including consulting with the employee, OL/Supervisor/GL, H&S, Legal and Insurance to ensure effective implementation.

4.8 Injury Management/Return-to-Work Program Administrator

The Injury Management/Return-to-Work Program Administrator is an Occupational Health Management Provider whose firm provides occupational health services that includes administration of Injury/Illness Early Intervention and Injury Management/Return-to-Work.

- Secure high quality medical providers who will endorse CH2M HILL policy regarding early intervention and Injury Management/Return-to-Work.
- Establish a toll-free reporting telephone line dedicated exclusively to CH2M HILL, provide an Occupational Health Nurse, 24 hours per day/7 day per week to receive employee calls and provide triage service.
- Provide direction on treatment and schedule appointments for employee to visit a selected network medical provider for treatment.
- Provide telephonic and field case management services to ensure appropriate treatment is followed, and maintaining ongoing communication with the employee, treating physicians, and insurance carrier to ensure the employee is able to safely resume work duties in a timely manner.
- Monitoring the employee's recovery status and providing feedback to their supervisor, H&S, HR, and Legal and Insurance to facilitate the employee assuming work duties in a timely manner.

5.0 Requirements

The following requirements outline the mandatory components and criteria that each business group must comply with when implementing this core standard. Each business group must implement the requirements of this Core Standard using their policies, procedures, processes, training and contracting documents.

5.1 General Requirements

CH2M HILL employees must immediately report workplace injuries/illnesses however minor, to their supervisor in accordance with HSE-111. When non-emergency work-related injuries or illnesses occur, the injured/ill employee immediately contacts his/her supervisor and calls the Injury Management/Return-to-Work toll-free number (Refer to Attachment 1, Injury Management/Return-to-Work Flow Chart). The employee's supervisor, Operation or Group Leader must ensure the employee calls the Injury Management/Return-to-Work toll-free number or place the call for him/her. Based on the outcome of the conversation with the Injury Management/Return-to-Work Occupational Nurse, an assessment will be made for the appropriate treatment and case management of the employee's injury/illness to facilitate recovery and the ability to assume work duties in a timely manner.

5.1.1 Workplace Injuries/Illnesses Requiring Emergency Services and Notification

In the event of a life threatening injury or illnesses immediately contact emergency services for response and treatment. Reporting of the incident must follow the CH2M HILL Serious Incident Reporting Procedure, HSE-601. After emergency services has responded and provided treatment and transport for the seriously injured/ill employee, the supervisor must contact the Injury Management/Return-to-Work Program Administrator toll-free number and brief the occupational health nurse on the incident for follow-up (Refer to Attachment 2, Emergency Procedure for Injury Management/Return-to-Work).

5.2 Subcontractors

Subcontractors shall not participate in the CH2M HILL Injury Management/Return-to-Work Program.

5.3 Injury Management/Return-to-Work Program Administrator Requirements

The Occupational Health firm designated as the Injury Management/Return-to-Work Program Administrator will be responsible for providing Early Medical Intervention services that include interviewing the injured or ill employee, performing a nursing assessment and triage decision process to determine the severity and appropriate treatment, followed by providing direction to the employee and their supervisor on what the treatment protocol will entail. Based on the severity and complexity of the employee injury or illness, the Injury Program Administrator will provide ongoing case management, initially by telephone, and in situations requiring longer -term follow-up (> 60 days) provide field case management.

5.4 Worker Compensation Carrier and Third-Party Administrator Requirements

The CH2M HILL worker compensation carrier and third-party administrator will coordinate with the Injury Management/Return-to-Work Program Administrator by sharing documentation on workers compensation cases and partnering on implementing treatment plans, telephonic and/or field case management activities.

5.5 Injury Management/Return-to-Work Operational Approach by the Program Administrator

The Occupational Health firm contracted as the Injury Management/Return-to-Work Program Administrator will implement the following operational approach:

- Establish a toll free reporting telephone line that is dedicated exclusively to CH2M HILL employees.
- When CH2M HILL employees experience a work-related injury or illness, they will use the toll-free number immediately to contact the occupational health nurse to receive an assessment of their injury/illness and follow the prescribed treatment protocol.
- In the event of a life threatening or serious injury requiring immediate medical attention, the occupational health nurse must instruct or assist the employee to immediately contact local emergency services for immediate response. After the employee's emergency medical needs have been attended to, the Injury Management/Return-to-Work Administrator occupational health nurse must be contacted by the supervisor for providing telephonic or field case management services.
- The occupational health nurse will implement triage protocol determining whether treatment is first-aid or requires referring the employee for medical treatment to a preferred provider within an established clinic network. All network clinics will have been educated on expected protocol and expectations for treatment.
- A consultation between the occupational health nurse and the attending physician will occur on the treatment protocol and any subsequent follow-up. In cases where a physician-to-physician consultation is preferred, the Medical Director of the Occupational Health firm will contact the treatment physician.
- A plan will be developed by the occupational health nurse for follow-up care and schedule ongoing examinations, or facilitate referral for rehabilitation (physical therapy, occupational therapy, vocational counseling) when needed.
- The occupational health nurse will contact the employee's supervisor, HR, and H&S, either by email, telephone or both, on the treatment plan and to coordinate appropriate work duties for the employee after initial consultation and treatment. Further, the occupational health nurse will email an electronic copy of the CH2M HILL "Authorization to Treat" form for the Supervisor to complete and forward to the medical facility/clinic within 24 hours.
- Documentation and communication of the ongoing treatment plan and progress will be provided to the employee, workers compensation TPA, Legal and Insurance, and HR, along with appropriate information to be shared with the OL/Supervisor/GL and H&S. The Occupational Health firm must expressly, through contract, be responsible for compliance with the federal Health Insurance Portability and Accountability Act (HIPAA) and state medical privacy laws when documenting and disseminating medical information.
- The treatment plan will be established with realistic goals and based on CH2M HILL policy and applicable workers compensation law.
- The occupational health nurse will continue to provide either telephonic or field case management for the employee until return to full-duty is realized or the workers compensation case is closed.

- Reports on the status of existing cases will be provided by the Occupational Health firm to the Legal and Insurance Representative, and applicable cases to the BG H&S, HR or BG Injury Management/Return-to-Work Coordinator will be provided monthly.

5.6 H&S Requirements

Based on the extent of the employee’s injury or illness and the treatment plan developed by the occupational nurse, the H&S representatives for the project and/or BG will provide employee work activity information to assist in the development of the employee treatment and recovery plan.

6.0 Training Requirements

CH2M HILL employees will receive training on key elements of the Injury Management/Return-to-Work Program as part of new employee orientation, as part of project start-up, annually, and periodically based on identified need by H&S (Enterprise, BG, Regional, Project) representatives.

7.0 Assessment Requirements

Periodic assessment of the effectiveness of the Injury Management/Return-to-Work Program will be conducted by the Enterprise H&S Programs & Services Director with the Enterprise Workers Compensation Program Manager.

8.0 Recordkeeping

Recordkeeping for the Injury Management/Return-to-Work Program will be maintained by the Occupational Health firm designated as the Injury Management/Return-to-Work Program Administrator, Workers Compensation Carrier and Third-Party Administrator, and the Enterprise Legal and Insurance Department.

9.0 Revision Log

Revision	Date	Description	File Name

Attachment 1 – [CH2M HILL Injury Management/Return-to-Work Flow Chart](#)

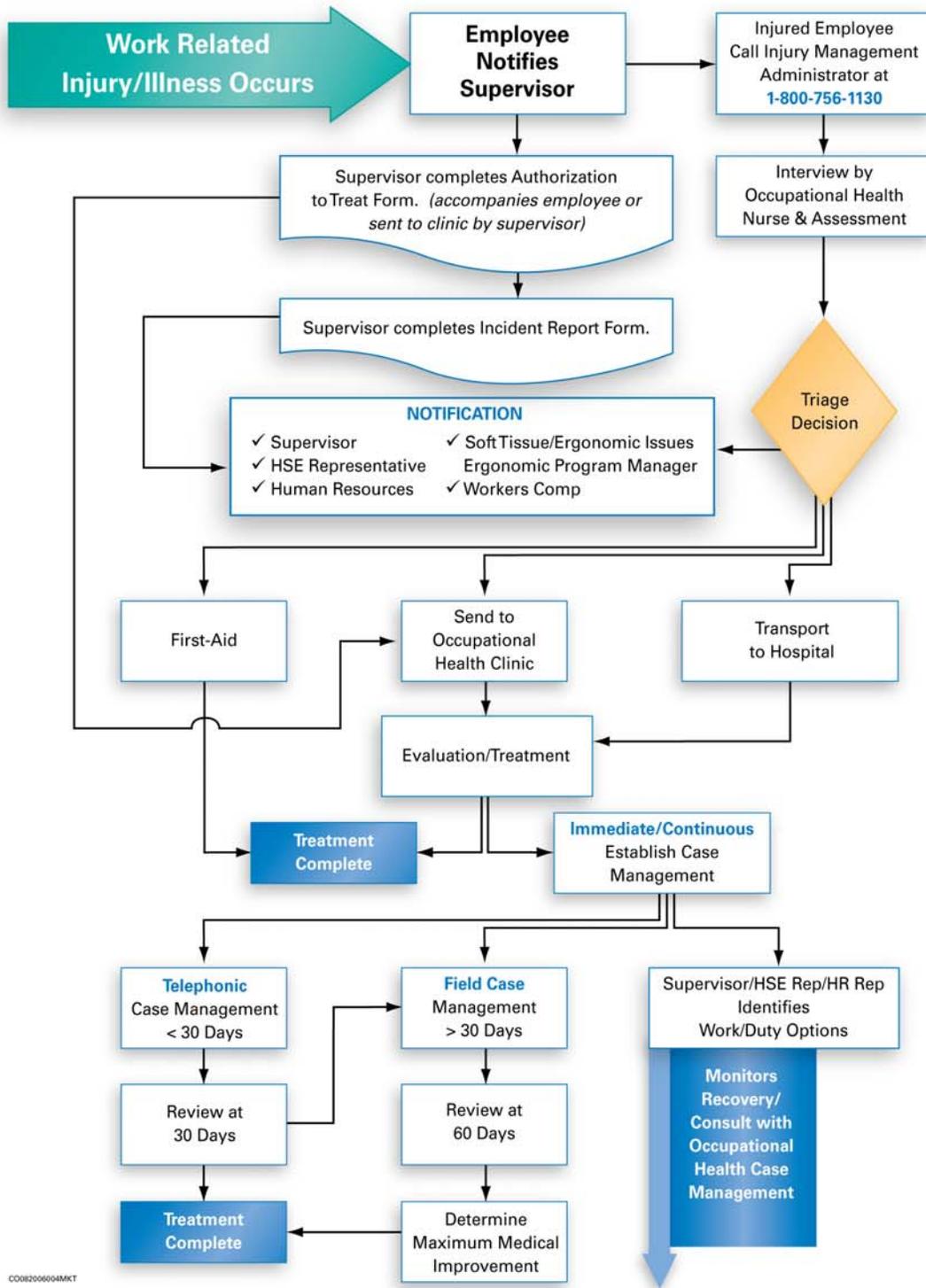
Attachment 2 – [CH2M HILL Emergency Procedure for Injury Management/Return-to-Work](#)

Attachment 3 – [CH2M HILL Authorization to Treat Form](#)

Attachment 4 – [CH2M HILL Injury Management/Return-to-Work Poster](#)

Attachment 1 – CH2M HILL Injury Management/Return-to-Work Flow Chart

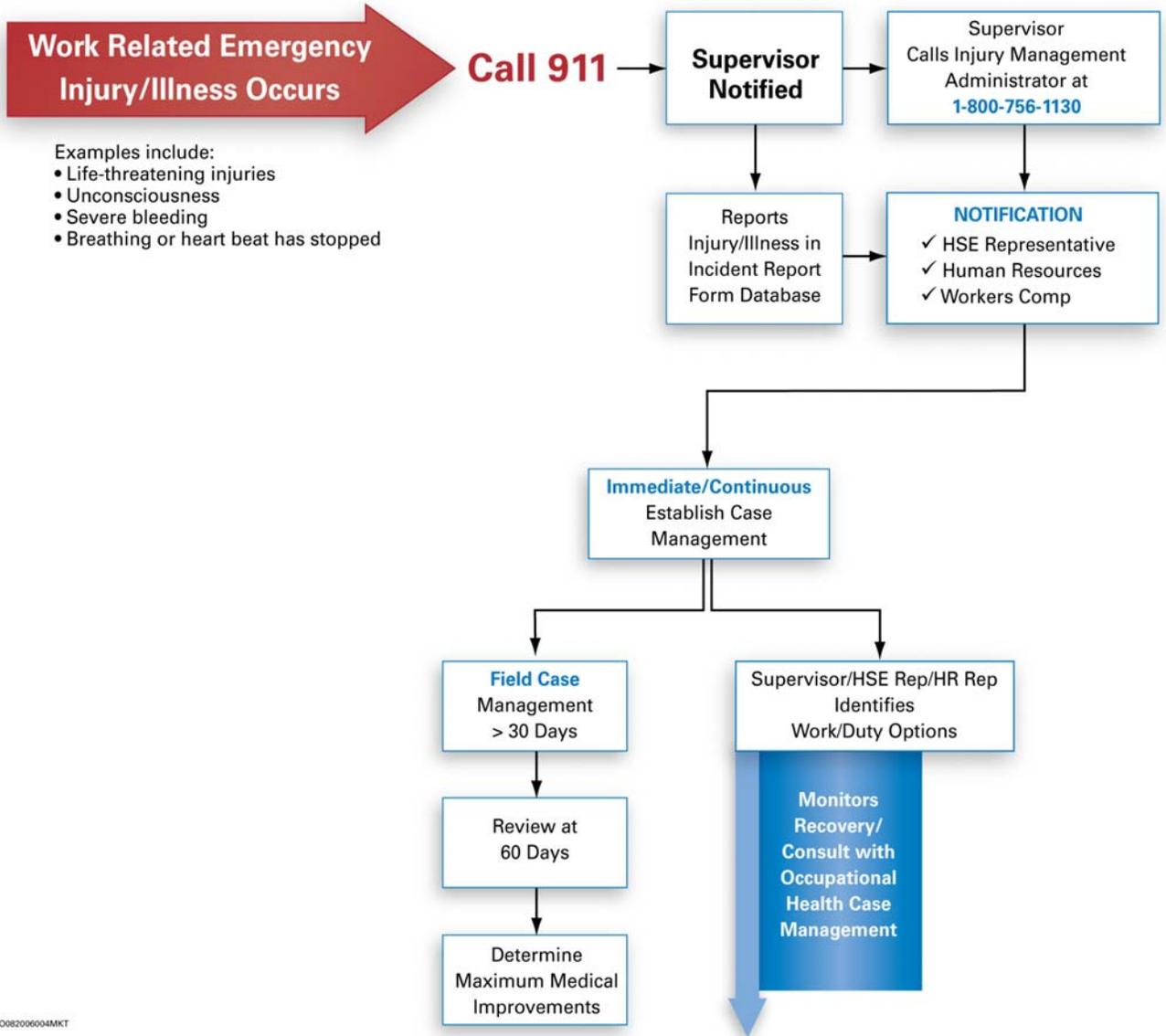
CH2M HILL Injury Management/Return-to-Work Program



CO082006004MKT

Attachment 2 – CH2M HILL Emergency Procedure for Injury Management/Return-to-Work

CH2M HILL Emergency Procedure Injury Management/Return-to-Work Program



CO082006004MKT

Attachment 3 – CH2M HILL Authorization to Treat Form



Initial Medical Treatment Form

To be completed by CH2M HILL Supervisor – Send with employee visiting medical facility or forward within 24 hours.

Employee name: _____ Date of Injury: _____

Supervisor: _____ HS Representative: _____

Visit Authorized by: _____ Phone #: _____

CH2M HILL Workers Compensation Administrator: Cambridge

Send Bills to: CH2M HILL
 Attn: Jennifer Rindahl
 P.O. Box 22508
 Denver, Colorado 80222-0508

To be completed by medical provider:

Physician's name: _____ Phone #: _____

Address: _____

CH2M HILL employee: _____ has been treated for: _____

It is the policy of CH2M HILL to provide temporary modified duty whenever possible for employees with physical restrictions resulting from an occupational injury or illness.

- Released to full duty
- Released to restricted duty only (list restrictions below)
- Out of work until _____ (date)

Please list any physical restrictions:

Expected duration of restricted duty? _____

CH2M HILL would like the best and most efficient care extended to all our employees. Please recommend over-the-counter (OTC) medication as a suitable alternative when medically feasible.

Prescribed medication: _____

Recommended OTC alternative: _____

Date of follow-up appointment: _____

Physician's signature: _____ Date: _____

Please return this form to the injured employee and FAX to Health Resources at 1-800-853-2641. If you want to discuss the employee's work restrictions, please call the person listed in the "Visit Authorized by" field

Attachment 4 – CH2M HILL Injury Management/Return-to-Work Poster



Experienced a work-related injury or illness?



Notify your supervisor,
then contact the company Occupational Health Nurse:

1-800-756-1130

For more information about our Injury Management / Return to Work program
visit us on the VO at Company Resources | Corporate Groups | Health, Safety, Environment & Quality

World-class safety starts with you!



Appendix C
VNTR Access Protocol

VNTR Access Protocol

This appendix will be revised and replaced in its entirety when changes or procedures occur.

- Access to the MRSs associated with planned visits to the former VNTR must be authorized by the U.S. Navy by notifying Mr. Christopher Penny, 757-422-3817; christopher.penny@navy.mil at least 72 hours in advance of the anticipated visit.
- Visits requiring immediate access to the MRSs (EPA unannounced audits, emergency response to individuals endangered within the restricted areas, etc.) must be authorized by the U.S. Navy by notifying either Mr. Christopher Penny, 757-422-3817; christopher.penny@navy.mil or the on-site NAVFAC Atlantic Field Representative, Mr. Carlton Finley 787-865-4066 or 787-509-3071, Finleyc@napr.navy.mil .
- All access, other than Essential Personnel, within the Exclusion Zones during the munitions response operation is strictly prohibited. The Exclusions Zones can be provided by the on-site NAVFAC Atlantic Field Representative, Mr. Carlton Finley 787-865-4066 or 787-509-3071, Finleyc@napr.navy.mil .
- All visitors to the MRS sites will require an escort by a qualified UXO Technician. The UXO Technician will escort the visitors to all areas within the MRS restricted areas (beyond the locked gates) until they leave the restricted area.
- The assigned UXO Technician escort will inform the visitors of where that day's MRP work is being conducted, where the EZs are established, and how the EZs are designated. The UXO Technician will also provide a safety brief to the visitor(s).

Appendix D

BIP/Demolition Operations Notification Protocol

APPENDIX D

MEC BIP/Demolition Operations Notification Protocol

The following notification protocol will be followed prior to the conduct of MEC Blow-in-Place (BIP)/Demolitions conducted within the former Vieques Naval Training Range (VNTR). This protocol is necessary to ensure that personnel and organizations listed in Table D-1, receive proper and timely notification as requested. Additional requests for other than those presented in Table D-1 will be considered on a case-by-case basis. Exhibit D-1 provides a sample format and necessary information to be provided to the FAA for Notice to Airmen advisories. MEC disposal operations will not commence until notification has been transmitted to all parties involved.

This appendix will be revised and replaced in its entirety when changes or procedures occur.

TABLE D-1
MEC BIP/Demolition Operations Notification

Organization	POC Name	Telephone Number(s)	Email Address	Notification Requirements	Additional Requirements/Remarks
NAVFAC Atlantic	Mr. Chris Penny	757-322-4815 (M) 757-748-4043	Christopher.penny@navy.mil	Email 24-48 hrs in advance.	Will be notified by Vieques Activity Mgr. upon cancellation and completion of ops.
NAVFAC Field Rep	Mr. Carlton Finley	(M) 787-509-3071	FinleyC@napr.mil esokir@yahoo.com	Email 24-48 hrs in advance.	Will normally be on site during ops.
CH2M HILL Activity Manager	Mr. John Tomik	757-671-8311 ext 413 (M) 757-589-5009	Johm.tomik@ch2m.com	Email 24-48 hrs in advance.	Notify upon cancellation and completion of ops.
CH2M HILL Program Manager	Mr. Stacin Martin	757-671-8311 ext 435 (M) 757-575-8001	Stacin.martin@ch2m.com	Email 24-48 hrs in advance.	
CH2M HILL MRP Director	Mr. Tim Garretson	757-671-8311 ext 512 (M) 757-287-5222	Timothy.Garretson@ch2m.com	Email 24-48 hrs in advance.	
CH2M HILL Site Manager	Dennis Ballam	(M) 757-270-0812	Update as required	CC only	Will normally be on site during ops.
CH2M HILL MRP Site Manager	Cliff Walden	(M) 334-462-3946	Update as required	CC only	Will normally be on site during ops.
U. S. Coast Guard	Mr. John Reyes	787-729-5381 (M) 787-475-6755	JReyes@gantsec.uscg.mil	Email 24-48 hrs in advance.	"Notice to Mariners" in place.
FAA	Ms. Marie Franqui-Valez <u>and</u> Mr. Felipe Fraticelli (Supervisor)	787-253-8682 787-253-8695	Maria.Franqui@faa.gov Cc: felipe.fraticelli@faa.gov	Telephone or Email minimum 48 -96 hours in advance. (See Remarks)	Request for Notice to Airman advisory requires a minimum 48 hour advance. If operations are planned/scheduled for a Monday or Tuesday, request must be made 96 hours in advance (preceding Thursday). A single request may be submitted that covers multiple days and times.
Organization	POC Name	Telephone	Email Address	Notification	Additional

TABLE D-1
MEC BIP/Demolition Operations Notification

Organization	POC Name	Telephone Number(s)	Email Address	Notification Requirements	Additional Requirements/Remarks
		Number(s)		Requirements	Requirements/Remarks
FAA - Control Room (San Juan)		787-253-8664/8665		See Remarks	Control Room requires notification 15 minutes prior to <u>each</u> demolition shot. Notification will be made by telephone from the field. Upon completion of operations and/or if operations are cancelled, Control Room must be notified by telephone.
DNER	Cdr. Luis Vega	787-852-3666 787-285-0530	jcvega@libertypr.net	Email 24-48 hrs in advance.	
PREQB	Ms. Yarissa Martinez	787-767-8181 ext 2953 (M) 787-365-8573	Yarissamartinez@jca.gobierno.pr	Email 24-48 hrs in advance.	For BIP operations not related to ongoing operations (e.g., TCRA), notify via telephone or voice mail in addition to Email.
USFWS Refuge Mgr.	Mr. Oscar Diaz	787-741-2138 ext 0659	Oscar.diaz@fws.gov	Email 24-48 hrs in advance.	
USEPA	Mr. Daniel Rodriguez	787-741-5201 (M)787-671-9879	Rodriquez.daniel@epa.gov	Email 24-48 hrs in advance.	
State Police (FURA)	Col. Juan Sanchez	787-273-5339 (M) 939-644-8524	juan.sanchez@fura.gobierno.pr	Email 24-48 hrs in advance.	
Municipality of Vieques	Mayor's Secretary	787-741-5051	secretariadelcalde@viequesrenace.com	Email 24-48 hrs in advance.	
AeroMed	Mr. Angel Rojas <u>and</u> Mr. Lester Marrero	787-765-3944	aeromedcentromedico@hotmail.com lmarrero@aeromedems.com	Email 24-48 hrs in advance.	Notify (email) both POC's

EXHIBIT D-1

Required information and format for "Notice to Airmen" requests to FAA

From: Requestor

To: Maria.Franqui@faa.gov

CC: felipe.fratlicelli@faa.gov

"others as required"

Subj: Request for Notice to Airmen Advisory

1. Request NOTAM be published as follows:

"Explosive Detonation of Unexploded Ordnance (UXO) will be conducted on the Eastern side of Vieques Island from (Date(s)) within a (XXXX) feet radius of (Lat/Long). Note: If additional operations are planned outside the above stated radius (EZ), provide the additional coordinates here. This block will be activated surface to 4,000 feet."

"Explosive Detonations will be performed between the hours of (XXXX) to (XXXX) Local (XXXXZ-XXXXZ) each day. Control Room will be notified 15 minutes prior to detonation(s) to verify that no commercial flights are over flying, arriving or departing operational area(s)."

2. Point of Contact is: (provide name and telephone number).

Appendix E

Management of MPPEH/MD

Management of Materials that Presents a Potential Explosive Hazard (MPPEH)/Munitions Debris (MD) *Collection and Inspection Procedures*

During removal operations, UXO Technicians will encounter the following types of metallic contamination: MEC items; MPPEH/munitions debris (MD) that is contaminated with explosives or other hazardous materials; non-hazardous ordnance-related scrap metal; and general metallic debris. Because the metal scrap recovered will ultimately be disposed of off-site, it is imperative that procedures be established to preclude live ordnance or hazardous materials from becoming intermingled with non-hazardous metal scrap.

Current and past practices have only required the inspection of MPPEH/MD and a certification by a qualified EOD/UXO technician that it is safe to the best of their knowledge. There are several pitfalls with this approach, depending on the type of ordnance being inspected. The following paragraphs provide guidance for avoiding these pitfalls.

References:

- | | |
|-----------------|--|
| DoD 4160.21-M | <i>Department of Defense Reutilization and Marketing Manual</i> |
| DoD 4160.21-M-1 | <i>Department of Defense Demilitarization Manual</i> |
| TB 700-4 | <i>Department of the Army Technical Bulletin - Decontamination of Facilities and Equipment</i> |

Collection Procedures

A systematic approach for collecting and inspecting metal scrap will be used. The approach is designed to ensure that the materials undergo a continual evaluation and inspection process from the time acquired until finally removed from the site.

At the operating site, two scrap metal containers will be pre-positioned. One container will be marked "Non-MEC Scrap Metal" and will be used to collect general metal debris. The other container will be marked "MD-Related Scrap Metal" and will be used to collect non-hazardous ordnance-related scrap metal (i.e., metal components that do not contain any explosives or other hazardous materials).

Collection 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 identified as non-ordnance-related scrap, it is placed in a temporary non-MEC/MPPEH scrap accumulation point located within the current operating grid. If the item is identified as MPPEH/MD, it is placed in a temporary MPPEH/MD accumulation point. Again, this point is located within the current operating grid.

Upon completion of operations within a grid, the UXO Supervisor for the team that cleared the grid will inspect each of the scrap piles and direct movement of the scrap into the appropriate site collection container. To preclude migration of the material from one pile to the other during movement to the scrap containers, each pile will be moved as a distinct and separate vehicle load.

Removal of Scrap Metal/Range Residue

An UXO Team (as described in Section 2) will collect the scrap piles deposited at the grid corner markers by the UXO Clearance Team and will perform an inspection to confirm that segregation of the MPPEH/MD has been done correctly and that no live MEC has been placed in the MPPEH/MD pile. The MPPEH/MD will be inspected and divided into two groups: 1) MPPEH requiring further demilitarization; and 2) MD that does not require further demilitarization. Figure E-1 is a Logic Diagram for the Collection and Disposition of MPPEH/MD Scrap.

Segregation of Scrap Metal/Range Residue

For purposes of disposal, MPPEH/MD shall be segregated and defined as either Group 1a, Group 1b, or Group 2.

Group 1, Scrap Metal/Range Residue

Group 1 includes property that previously contained explosives or that does not contain items of a dangerous nature and can be certified inert and/or free of explosives or other dangerous materials. Group 1 includes targets, certain expended ordnance, etc.

Group 1a, Scrap Metal/Range Residue

Group 1a includes firing-range-expended small arms cartridges and inert metals gleaned from range cleanup. Metals gleaned include material for which the only use is for its basic material content (clean shrapnel, target metal, etc.) and does not include material with any residual utility or capability or that is considered to be munitions list items (MLI) or CCLI. Such material is eligible under the Resource Recovery and Recycling Program for disposition by a Qualified Recycling Program (QRP) in accordance with DoD 7514.1, Pollution Prevention. DoD Components may exercise direct sale authority for firing-range-expended small arms cartridge cases provided that they are crushed, shredded, or otherwise destroyed prior to release from DoD control.

Group 1b, Scrap Metal/Range Residue

Group 1b includes any certifiable material or item not meeting the criteria in 1a above. A determination shall be made as to whether the material or item requires demilitarization. Damage sustained does not necessarily constitute demilitarization. Destruction shall, at a minimum, satisfy the provisions of DoD 4160.21-M-1. This material is not eligible for a QRP.

Group 2, Scrap Metal/Range Residue

Group 2 includes inherently dangerous items that may potentially contain munitions residue and cannot be certified as inert, such as practice bombs (duds, MEC, BDU-33, MK-106, etc.)

Disposition of Munitions List Items (MLI)

Demilitarization should be accomplished by the most cost-effective method consistent with adequate security and surveillance, as economically as practical in accordance with existing environmental standards and safety and operational regulations, to the point of assuring freedom from explosives, toxic or incendiary materials, smoke content, or design hazards by one of the following methods:

- a. By a sales contractor as a condition of sale. Unless otherwise authorized, property to be demilitarized in accordance with DoD 4160.21-M-1 must be demilitarized prior to transfer of title to a purchaser.
- b. By the DRMO, generating activity, designated Military Service/Defense Agency, or contractor personnel (qualified UXO personnel).
- c. Under a service/performance contract.

Assignment of Demilitarization Codes

The proper procedure requires that MPPEH/MD scrap be assigned a demilitarization code; that code determines the type of processing required. For almost all MPPEH/MD scrap, the assigned code should be "A." Assignment of this code is the responsibility of the generating activity. The contractor and MEC expert will assist in determining the demilitarization code to be assigned and the method and degree of demilitarization required.

Definition of Demilitarization Code G:

"G" MLI -- Demilitarization required - AEDA, Demilitarization, and if required, declassification and/or removal of sensitive markings or information will be accomplished prior to physical transfer to a DRMO. This code will be used for all AEDA items, including those which also require declassification and/or removal of sensitive marking or information. [When in doubt, assign Demilitarization Code "G" for all recovered ORS.]

Demilitarization Requirements

Demilitarization and decontamination of MPPEH/MD scrap are based on a system that assigns decontamination levels commensurate with the post-treatment use. For metal that is being released to the public as recyclable, 5X is the acceptable degree of decontamination.

Past practices for recovery and certification of MPPEH/MD scrap from range maintenance contracts, and removal actions have improperly certified MPPEH/MD scrap as safe for turn-in to DRMO for recycling based on inspection and certification by UXO/EOD technicians. In most cases this achieves a 3X level of decontamination *de facto*. This is not sufficient for resale to the public. Three X's indicate that MPPEH/MD scrap that have been examined and decontaminated by approved procedures; that no surface contamination remains, but significant amounts (enough to present an explosive safety hazard) may remain in less obvious places. Items decontaminated to this degree cannot be furnished to qualified DoD or industry users or subjected directly to open-flame cutting, welding, high-temperature heating devices, or operations that generate extreme heat (such as drilling and machining) to ignite residual contamination. Items decontaminated to the 3X level are safe for routine investigation, examination, and transport, but not for sale or use by the general

public. Newly implemented certification procedures require two signatures for certification, of which only one signature may be from a government contractor (U.S. Army, Industrial Operation Command, Pamphlet 385-1).

The only acceptable way to get to 5X decontamination is by partial or complete removal, neutralization, or destruction of explosives/explosive residue by flashing, steaming, neutralization, or other approved desensitizing method. This is often expensive and nullifies the value of the scrap. However, to leave MPPEH/MD scrap on a range site increases the possibility of residues such as RDX, HBX, and TNT entering the groundwater and causing a more expensive problem.

Technical instructions issued by the Defense agency or military service having procurement responsibility for the item involved and/or instructions provided through the DoD Demilitarization Bulletin Board System will determine and identify the method of demilitarization and the degree to which additional demilitarization is necessary to meet the requirements in their respective areas. For additional information, contact the following:

- a. For ammunition procured by the Department of the Army, technical instructions relating to ballistic missiles, and large rockets will be furnished by the Commander, U.S. Army Aviation and Missile Command (AMCOM), Attn: AMSAM-DSA-WO, Redstone Arsenal, AL 35898-5239.
- b. For conventional, chemical, and all other types of ammunition procured by the army except lethal chemical agents and waste munitions, technical instructions will be provided by the U.S. Army Industrial Operations Command, Attn: AMSIO-SMK, Rock Island, IL 61299-6000.
- c. For lethal chemical agents, including vesicants and nerve agents and their carriers, technical instructions will be furnished by the U.S. Army Armament Material Readiness Command Program Manager for the Demilitarization of Chemical Material, Edgewood Arsenal, Aberdeen Proving Ground, Maryland 21010.
- d. For ammunition procured by the Department of the Navy, technical instructions will be issued by the Commander, Naval Sea Systems Command, or by the Commander Naval Air Systems Command, Department of the Navy, Washington, D.C.
- e. For ammunition procured by the Department of the Air Force, technical instructions will be issued by the Engineering and Reliability Branch (MMWR), Ogden Air Logistics Center, Ogden, UT 84056-5609.

The following paragraphs provide guidance for the method and degree of required demilitarization for most types of MPPEH items.

Category III. Ammunition - Method and Degree of Required Demilitarization

- a. **Artillery/Mortar Ammunition Components and Similar Items of All Types** including but not limited to high-explosive, practice, inert-loaded, incendiary, and smoke fillers. Remove explosive filler from projectile (wash out, burn out, etc.). Remove rotating band and deform fuze cavity threads or score or deform bourrelet or gas check band. Burn propellant unless otherwise instructed to retain for sale or other purposes. Deform fin assembly threads or fin blades. Deform cartridge cases by off-center punch-out of

primer, or split case neck, or puncture the lower sidewall with a minimum of 3/4-inch hole, or deform lower sidewall (which prevents chambering), or crush, or press. Burn out smoke mixture or detonate smoke canister.

- b. **Inert Loaded Ammunition, Projectiles, and Similar Items of All Types** loaded with inert filler to simulate service item. Remove rotating band from artillery projectiles and open the closure of the projectile body to expose the inert filler. On items without rotating bands, open the body closure to expose the inert filler and damage the closure surface to prevent reloading or resealing.

NOTE: For inert-loaded items (concrete, sand, plaster), a potential explosive safety hazard exists when the internal filler is not exposed or unconfined during burning, melting, or cutting. Heat generated from a demilitarization process can cause the filler, moisture, and air to expand and burst sealed casings, causing a mechanical explosion. For this reason, DRMOs will not accept inert-loaded items unless the internal filler is exposed and unconfined. The internal filler may be exposed by removal of the fuze well from the cavity, removal of base plates, or by puncturing/drilling holes in the casing.

- c. **Ammunition and Components Which Have Been Fired or Expended, Range Residue and Other Non-Explosive Items.** All items will be rendered free of energetic materials prior to accomplishment of demilitarization. Range residue will be processed in accordance with the Defense Material Disposition Manual, DoD 4160.21-M, Chapter 4, paragraph B.3, after all required demilitarization is accomplished.

- (1) **Artillery/Mortar Ammunition Components and Similar Items of All Types.**
Remove rotating band and deform fuze cavity threads or score or deform bourrelet or gas check band. Score practice bomb with a torch, displacing a minimum of 1 cubic inch of metal; or shear into two pieces. Deform fin assembly threads and fin blades.
- (2) **Inert Loaded Ammunition, Projectiles, and Similar Items of All Types** loaded with inert filler to simulate service item. Remove rotating band from artillery projectiles and open the enclosure of the projectile body to expose the inert filler. On items without rotating bands, open the body closure to expose the inert filler and damage the closure surface to prevent relocating or resealing.

NOTE: For inert-loaded items (concrete, sand, plaster) a potential explosive safety hazard exists when the internal filler is not exposed or unconfined during burning, melting, or cutting. Heat generated from a demilitarization process can cause the filler, moisture, and air to expand and burst sealed casings, causing a mechanical explosion. For this reason, DRMOs will not accept inert-loaded items unless the internal filler is exposed and unconfined. The internal filler may be exposed by removal of the fuze well from the cavity, removal of base plates, or puncturing/drilling holes in the casing.

- (3) **Other Non-explosive Filled Items** that perform a major function essential to the basic mission of the end item. Cut, crush, or process through a deactivation furnace. Burn or cut cartridge case lines and propelling charge bags. Cut, burn, or

crush aircraft and ground signal cases. Crush or detonate piezoelectric (lucky) elements.

Category V. Military Explosives, Solid and Liquid Propellants, Bombs, Mines, Incendiary Agents, and their Constituents - Method and Degree of Required Demilitarization

- a. **Artillery/Mortar Ammunition Components and Similar Items of All Types** including but not limited to high-explosive, practice, inert-loaded, incendiary, and smoke fillers. Remove explosive filler from projectile (wash out, burn out, etc.). Remove rotating band and deform fuze cavity threads or score or deform bourrelet or gas check band. Burn propellant unless otherwise instructed to retain for sale or other purposes. Deform fin assembly threads or fin blades. Deform cartridge cases by off-center punch-out of primer, or split case neck, or puncture the lower sidewall with a minimum 3/4-inch hole, or deform lower sidewall (which prevents chambering), or crush, or press. Burn out smoke mixture or detonate smoke canister.
- b. **Inert Loaded Projectiles, Warheads and Similar Items of All Types** loaded with inert filler to simulate service item. Remove fuze and/or spotting charge, where applicable, and burn or detonate. Remove rotating band from artillery projectiles and open the enclosure of the projectile body to expose inert filler. On items without rotating bands, open the body closure to expose the inert filler and damage the closure surface to prevent reloading or resealing.
- c. **Bombs and Similar Items of All Types**, including but not limited to high-explosive, practice, inert-loaded, incendiary and photoflash fillers, military explosive excavating devices, demolition blocks, and grenades. Demilitarization will be accomplished by removal of explosive filler in an approved manner (e.g., wash-out, burn-out, etc.) and by deforming fuze cavity threads or removing base plate by other than normal disassembly (such as sawing) or by detonation. Grenades will be demilitarized by cutting or crushing (a minimum of 75 percent compression) the grenade body after item has been defuzed and explosive removed; or by detonation.
- d. **Small Explosive Items**, including but not limited to fuzes, boosters, primers, detonators, firing devices, ignition cartridges, blasting caps, grenade cartridges, tracer assemblies, and similar components. Demilitarization can be accomplished by processing through a deactivation furnace at settings of 1150 degrees at burner end and 450 to 500 degrees at stack end; or by mutilation. Incendiary projectiles will normally be decored to expose and assist in the complete burning of the incendiary composition. Where decoring of the projectile is not necessary, processing through the deactivation furnace is adequate. Burn out 20mm HE projectiles by processing through the deactivation furnace; or detonate. Processing complete small arms ammunition cartridges, all calibers, through the deactivation furnace at controlled temperatures will result in adequate demilitarization. Fuzes and boosters can be disposed of by disassembly and cutting, drilling, or punching to deform metal parts. Explosive components generated through disassembly are to be burned or detonated. Fuzes may also be processed through a deactivation furnace as a complete item when disassembly is not feasible. For grenades, demilitarization may be accomplished by removal of explosive components by crushing, cutting, breaking, melting, burning, etc., to fully preclude their rehabilitation or further use as grenade

components. Demilitarization may also be accomplished by detonation or burning as appropriate for the particular item involved.

- e. **Rocket Motors, Warheads, Components and Similar Items of All Types**, including high-explosive, inert, loaded, practice, and smoke. Wash out or burn out rocket warhead filler and mutilate casing by crushing or cutting by torch and deforming threaded area. Disassemble and remove or burn out rocket motor propellant, cut or crush case, and deform threaded area of case. Rocket motors and warheads may also be detonated.
- f. **Mines, Anti-Personnel/Anti-Tank Explosive, Components, and Similar Items of All Types**, including high-explosive, practice, inert-loaded, and associated explosive components. Wash out or burn out filler and mutilate by crushing, cutting by torch, and deforming threaded area; or detonate. Process mine fuzes, activators, and firing devices through a deactivation furnace, burn in a cage, or detonate. Mine firing devices such as the M56 or M61 types should be crushed, cut, or burned.
- g. **Ammunition and Components That Have Been Fired or Expended, Range Residue, and Other Non-Explosive Items**. All items will be rendered free of energetic materials prior to accomplishment of demilitarization. Range residue will be processed in accordance with the Defense Material Disposition Manual, DoD 4160.21-M, Chapter 4, paragraph B.3, after all required demilitarization is accomplished.
 1. **Artillery/Mortar Ammunition Components and Similar Items of All Types**, including but not limited to high-explosive, practice, inert-loaded, incendiary, and smoke fillers. Remove explosive filler from projectile (wash out, burn out, etc.). Remove rotating band and deform fuze cavity threads or score or deform bourrelet or gas check band. Score practice bomb with a torch, displacing a minimum of 1 cubic inch of metal; or shear into two pieces. Deform fin assembly threads and fin blades. Deform defective cartridge cases by off-center punch-out of primer, or split case neck, or puncture the lower sidewall with a minimum $\frac{3}{4}$ -inch hole, or deform lower sidewall (which prevents chambering), or crush, or press. Burn out smoke mixture or detonate smoke canister.
 2. **Inert-Loaded Ammunition, Projectiles, and Similar Items of All Types** loaded with inert filler to simulate service item. Remove rotating band from artillery projectiles and open the enclosure of the projectile body to expose the inert filler. On items without rotating bands, open the body closure to expose the inert filler and damage the closure surface to prevent relocating or resealing. **NOTE:** For inert-loaded items (concrete, sand, plaster), a potential explosive safety hazard exists when the internal filler is not exposed or unconfined during burning, melting, or cutting. Heat generated from a demilitarization process can cause the filler, moisture, and air to expand and burst sealed casings. For this reason, DRMOS will not accept inert-loaded items unless the internal filler is exposed and unconfined. The internal filler may be exposed by removal of the fuze well from the cavity, removal of base plates, or by puncturing/drilling holes in the casing.
 3. **Bombs and Similar Items of All Types**, including but not limited to high-explosive, practice, inert-loaded, incendiary and photoflash fillers, military explosive excavating devices, demolition blocks, and grenades. Demilitarization will be

accomplished by deforming fuze cavity threads or removing base plate by other than normal disassembly (such as sawing); or by detonation. Grenades will be demilitarized by cutting or crushing (a minimum of 75 percent compression) the grenade body after item has been defuzed and explosive removed; or by detonation.

4. **Rocket Motors, Warheads, Components, and Similar Items of All Types**, including high-explosive, inert-loaded, practice, and smoke. Demilitarize casing by crushing or cutting by torch, or by deforming threaded area. Cut, crush case, or deform threaded area of rocket motor cases.
5. **Mines, Anti-Personnel/Anti-Tank, and Similar Items of All Types**, including high-explosive, practice, inert-loaded, and associated components. Demilitarize casing by crushing, or by cutting with a torch, and deforming threaded area; or detonate. Mine firing devices such as the M56 or M61 types should be crushed, cut, or burned.

h. Instructions For Specific Ordnance Items:

1. BDU-50 Practice Bomb:
 - (a) Each bomb must be inspected by qualified EOD/UXO personnel to ensure that the bomb is a BDU-50 and that the bomb is expended. If the EOD/UXO personnel cannot verify both fuze wells, or absence thereof, it must be opened remotely by detonation.
 - (b) A ¼-inch hole will be punched in each of the two spanner wrench receptacles, fracturing the metal to a depth in excess of 1/10 inch into the concrete filler material.
 - (c) A ¼-inch punch will be used to further damage the threads of the nose plate, ensuring that the plate cannot be removed and replaced.
 - (d) Fins will be deformed or broken, and paint will then be used to place a mark of contrasting color on the bomb or near the nose.

Venting of MPPEH Scrap

Prior and current practices have taken this to mean that if the MPPEH item is intact and resembles a piece of military ordnance, such as a 105mm HEAT (Practice) projectile, it should have a hole punched through the side to expose the filler as non-explosive. This is typically accomplished through the use of a shaped-charge attack, or vented using remotely operated water-jet cutting technology. The explosively created hole exposes the filler and disfigures the projectile so that it cannot be used again. For a 105mm HEAT projectile, this approach is sufficient because the projectile never contained any explosives or energetic material used as a spotting charge. For a MK- 82 LDGP Bomb (Practice), this approach may not be sufficient because the bomb can contain various types of explosively activated spotting charges that have the capability to cause injury or death if exposed to the right elements such as flame from a cutting torch. And there is always the possibility that a shaped-charge attack may punch a hole in an explosive ordnance item, exposing the filler but not causing a detonation. Because some explosive fillers look like inert fillers, the possibility for misidentification and improper certification is real.

MPPEH known or suspected to be inert (filled with an inert substance to simulate the weight of an explosive filler) will be explosively vented with conical-shaped charges or vented using a remotely operated water-jet cutter. For the purpose of determining the fragmentation hazard area for venting, it will be assumed that the MPPEH has an explosive filler and that a high-order detonation will occur. Venting will be considered successful when the inert filler is exposed. The vented inert ordnance item can be treated and disposed of as scrap after the venting and demilitarization process is complete.

Certification/Disposal of Scrap Metal

The contractor will ensure that the quantities of demilitarized property designated for and recycled are accurate and that these quantities are readily verifiable. Recycling facilities will not accept any property unless the DD Form 1348-1A contains the demilitarization code or clear text statement of the demilitarization required. The generating activity is responsible for issuing a letter specifying who is authorized to sign the statement of inert certification. This letter will be kept in the project files and with the generating activity. It must be updated as needed. Personnel designated as authorized to sign on behalf of the contractor must have an authorization letter from the principle identified on that contractor's BATFE License.

All material generated from the firing and/or demilitarization of AEDA will be rendered **free from explosives** before being referred to a recycling facility for sale. All scrap metal generated at the site will be disposed of through an approved scrap metal dealer, and will be transferred using DD Form 1348-1A (Form E-1). Prior to release of the material, the Senior UXO Supervisor will physically inspect the material in the containers to ensure that they are free of dangerous items, or will conduct demilitarization operations. The Senior UXO Supervisor will sign the certificate, typed on the DD Form 1348-1A, which states:

"We certify and verify that the AEDA residue, Range Residue and/or Explosive Contaminated property listed has been 100 percent properly inspected by us and to the best of my knowledge and belief, are inert and/or free of explosives or other dangerous materials."

The certification will be verified (countersigned) by a technically qualified U.S. government representative (U.S. citizen) designated by the responsible commander/generating activity.

Scrap will be segregated into like metals (mainly steel, aluminum, and mixed metal) and placed into palletized wooden shipping boxes. Each item placed in an inert-certified box will be inspected. The boxes will be filled, the covers will be nailed on, and a lead seal will be affixed. A Statement of Inert Certification will then be attached to the box. The box can then be picked up by a local scrap yard for disposal or recycling.

Using these procedures ensures that the collected scrap metal is properly inspected and classified. Our method includes three distinct inspections, which are performed by persons of increasing levels of responsibility. The first inspection is performed at the operating grid by a qualified UXO Technician, the second is performed by the supervisor responsible for the operating grid, and the final inspection is performed by the Senior UXO Supervisor who is vested with overall responsibility.

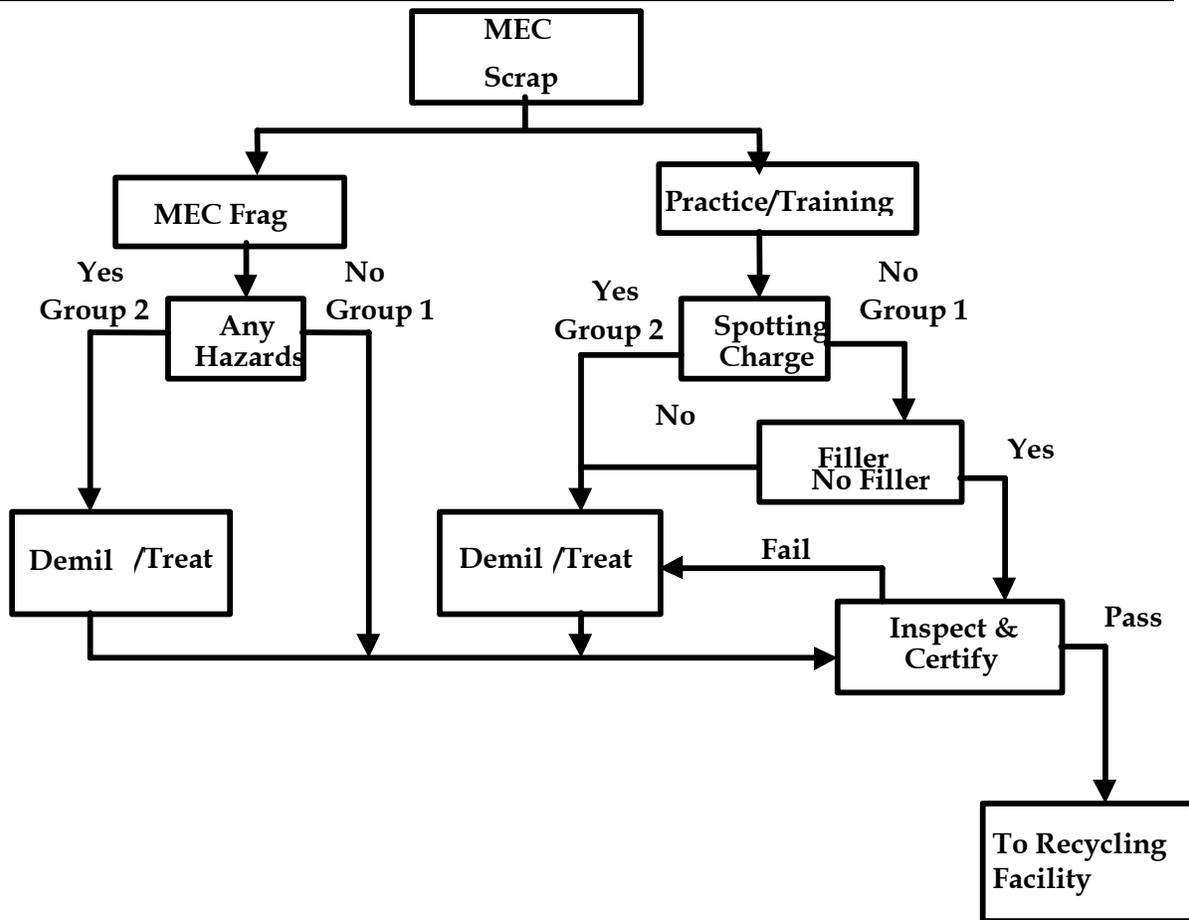


FIGURE E-1
Logic Diagram for the Collection and Disposition of MPPEH/MD Scrap

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

27. ADDITIONAL DATA		26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)		25. NATIONAL STOCK NO & ADD (8-22)		24. DOCUMENT NUMBER & SUFFIX (30-44)													
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Appendix F
Geophysical Prove-Out Plan

Geophysical Prove-Out Plan

Purpose

The following sections present the general Geophysical Prove-Out (GPO) Plan in support of the digital geophysical mapping (DGM) activities that will be implemented during investigation of MRSs at the Former VNTR. Site specific GPO plans will be provided in SSWPs developed prior to investigation of each MRS.

The primary objective of the GPO is to demonstrate and document the site-specific capabilities of a DGM system to operate as an integrated system capable of meeting data quality objectives (DQOs) for project performance goals. For the purposes of this work, a system is considered to include the survey platform, sensors, navigation equipment, data analysis and management, and associated equipment and personnel. The actual objectives of the site-specific GPOs may vary from site to site and will be specified in the SSWPs; the following are some examples of these possible objectives:

- Document the consideration given to various geophysical detection instruments for use at an MRS, the criteria used to identify geophysical instruments for consideration, and the causes for their respective selection or rejection.
- Document the capabilities and limitations of each geophysical detection instrument selected for consideration at the site-specific GPO.
- Confirm the achievable percent detection with respect to the specific items, orientations and depths seeded in the GPO to support decision-making at the site.
- Observe each geophysical detection instrument operating in the DGM Contractor's configuration, using the DGM Contractor's personnel and methodologies.
- Evaluate the DGM Contractor's data collection, data transfer quality and data QC method(s).
- Evaluate the DGM Contractor's method(s) of data analysis and evaluation.
- Evaluate estimated field production rates and estimated false positive ratios, as related to project cost.
- Establish anomaly selection criteria.
- Document system reliability.

Data Quality Objectives (DQOs)

The DGM operations performed in the GPO area will demonstrate the ability of each tested system to achieve specific project DQOs. The system will not be used for site surveys until it is able to meet the DQOs or until the project team agrees on reasoning behind a DQO not

being met and an appropriate revised DQO. The data quality objectives and evaluation criteria specific to the GPO are discussed below.

Data quality objectives particular to GPOs at VNTR are discussed below. Some sites may require modification of the DQOs based on site conditions or target MEC. Any modification to the DQOs will be discussed in the SSWPs.

MEC Detection

The DQO for MEC detection is to detect all MEC to their maximum detectable depths. Although it is understood that actual detection depths may vary based on site-specific and munition-specific circumstances, such as:

(1) item orientation, (2) site background/ noise levels, (3) masking effects from adjacent metallic items, (4) item shape, (5) magnetic conductivity of item materials, and (6) weathering effects on the magnetic conductivity of item materials, an equation has been developed based on empirical data that describes typical detection depths for most MEC items:

$$\text{Estimated Detection Depth (meters)} = 11 * \text{diameter (mm)} / 1000$$

(Depth is to center of mass of the item.)
(COE DID OE-005-05.01)

This relationship reflects the fact that MEC detection capability is reduced with greater item depth and/or decreased item size.

The GPO process should be used to validate this equation as an appropriate DQO for specific sites at VNTR sites.

Lane Spacing (Sensor Separation)

The DQO for lane spacing (sensor separation) is to achieve at least 98% coverage of contiguously surveyed areas. (No greater than 2% of site may have data gaps, or “white space,” as reflected on the final contoured representation of the data.) In order to calculate this, the effective “footprint” width of the sensor must be established for the smallest MEC item of interest at the site. For example, an instrument being used to survey a site where a 20mm projectile is the smallest MEC item of interest may have an effective footprint of 2-ft, meaning that any location on the ground surface that is greater than 1-ft from the center of the instrument would be considered a data gap. Data gaps greater than 4 square feet are not considered to meet this DQO (i.e. the 2% allowable data gaps must be spread across the survey area so that no particular area has been significantly “under-surveyed.”)

False Positives

The DQO for “false positives” (anomalies reacquired that result in no detectable metallic material recovered during excavations) is to have no greater than 15%. Achieving this DQO is highly dependent on the size and anticipated depth of the smallest MEC item of interest at the site. A revised DQO may be necessary for sites where small and/or deep MEC items are required to be found.

Positioning Accuracy

The DQO for horizontal positioning accuracy is 95% of all DGM Contractor selected anomaly locations (as shown on the dig sheets) must lie within a one (1) meter radius of a point on the ground surface directly above the source of the anomaly.

Reacquisition

The DQO for reacquisition is 95% of all reacquired anomaly locations (after “pinpointing” with DGM instrument) must lie within a 35 cm (1.15 ft) radius of a point on the ground surface directly above the source of the anomaly.

Data Handling

The DQO for data handling is that all data must be delivered in a timely manner and in a useable format. Because of the need for rapid feedback during GPO operations in order to effectively test potential DGM systems, the DQO for data handling during GPO activities is to have “final” data packages (see Section 5) completed and delivered to the Title 2 Services Contractor within 1 working day of data collection.

Procedures

A qualified MEC DGM operations experienced geophysical team will separately employ each system to be tested on the GPO plot. Figure 2 illustrates the GPO process and the procedures to be employed are listed below:

1. A “background” DGM survey will be performed by the DGM Contractor with each instrument to be tested in the GPO. The data will be post-processed (i.e. filtered and positions attached to the geophysical data) but the DGM Contractor will not view the results apart from this. The data will be provided to the Title 2 Services Contractor QA Geophysicist for evaluation. This step will allow background geophysical conditions to be recorded, will help determine the appropriateness of the location (i.e., few existing anomalies), and will verify that items are not seeded near existing anomalies.
2. A sufficient number of seed items should be buried at a range of depths and orientations to document detection limits within the GPO grid. The targets will include inert MEC or simulated MEC items of various types intended to represent the types of MEC found (or expected) at the specific VNTR site. A list of the specific inert (or simulated) items, their intended burial depths, orientations, azimuths and locations to be buried will be provided to the U.S. Navy by the Title 2 Services Contractor prior to mobilization for the GPO. (The list will not be provided in the SSWPs as it will not be provided to the DGM Contractor.) For consistency, the azimuth and orientation guide shown as Figure 1 should be used throughout the VNTR program.

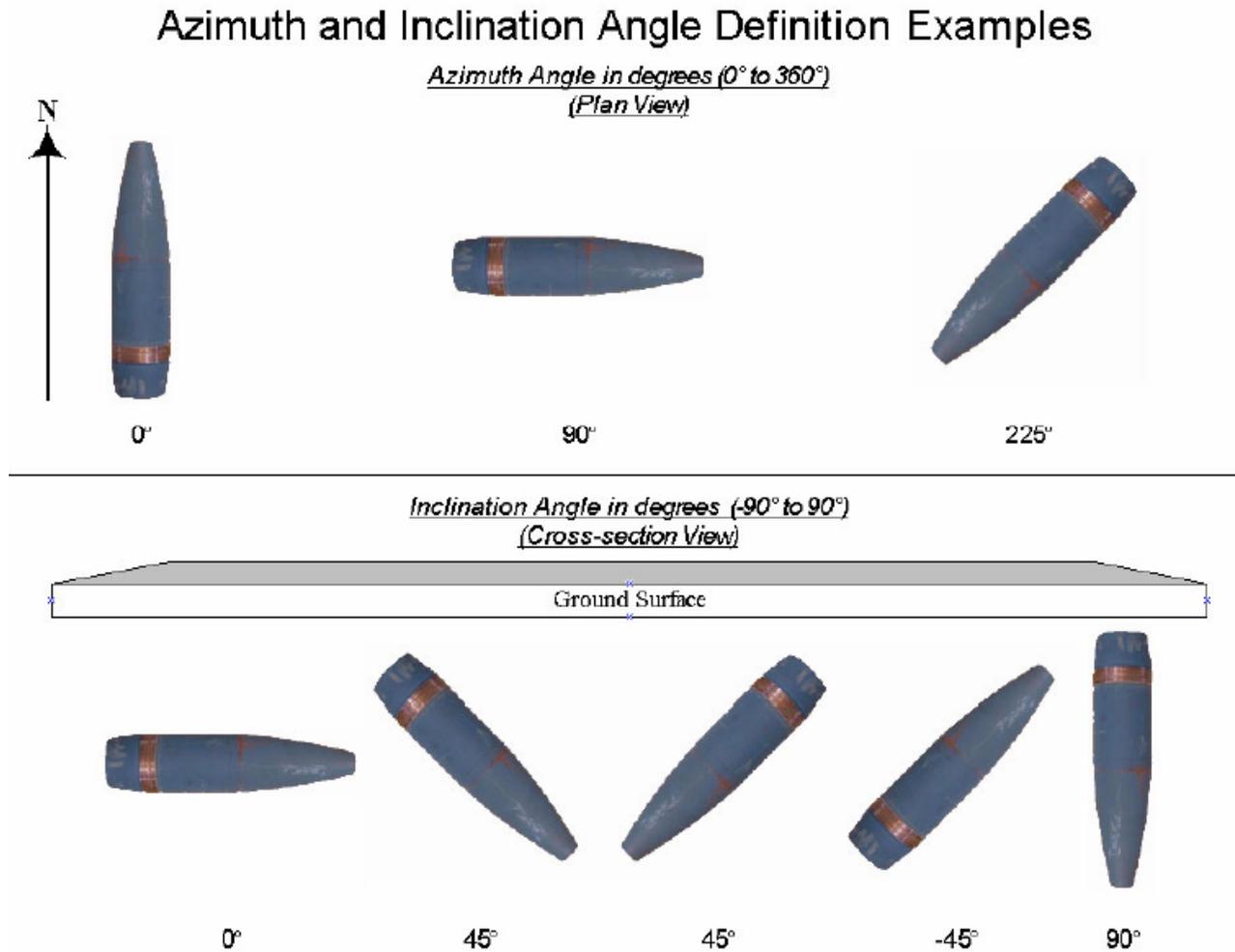


FIGURE 1
Azimuth and Inclination Definition Examples (From Ordnance and Explosives Digital Geophysical Mapping Guidance - Operational Procedures and Quality Control Manual - DACAA87-00-D-0012 Task Order 003.)

3. Construction of the GPO will be done by the Title 2 Services Contractor personnel. These personnel will emplace each seed item and record the emplacement data (depth, orientation and azimuth).
4. A Registered Land Surveyor (RLS) will use Real-Time Kinematic Differential Global Positioning System (DGPS) or conventional Total Station survey equipment to record target locations, providing an Easting and Northing for the center and each end (where applicable) of the targets. The location of the four corners of the grid will also be recorded. All target markings in the GPO grid will be removed and the grid will be returned as near as possible to its natural condition. Information on the seeded target's location will not be released to the DGM Contractor.
5. An Equipment Check Area (ECA) will also be constructed by the Title 2 Services Contractor where similar types of items will be buried and the information provided to

the DGM Contractor. This will allow the team to adjust their systems to site conditions and ensure their equipment is functioning properly before entering the GPO plot.

6. The data will be processed and interpreted by the DGM Contractor and anomaly selections made. "Final" data packages will be provided to the Title 2 Services Contractor QA Geophysicist for evaluation.
7. The DGM Contractor will then proceed to reacquire the anomalies selected from the geophysical data and record the locations in the GPO plot. The recorded locations will be provided to the Title 2 Services Contractor QA Geophysicist for comparison to the known seed item locations and evaluation of whether the GPO DQOs have been met. This step will be repeated for each set of survey results.
8. If the DQOs have not been met, the Title 2 Services Contractor QA Geophysicist will meet with the DGM Contractor to discuss whether modifications can be made to the DGM system (e.g. sensor spacing, lower sensors) or procedures (e.g. lane spacing) in order to meet the DQOs. If modifications are made, the process of survey, analysis and reacquisition will be repeated.
9. If the DQOs cannot be met by The DGM Contractor, the Title 2 Services Contractor QA Geophysicist will meet with the U.S. Navy to discuss a resolution (i.e. modification of a DQO) prior to completing the GPO.

Additional GPO Considerations

In addition to the procedures outlined in this plan, there are several other potential topics to be considered in designing the GPO. The topics outlined below should be considered in the design of the site-specific GPO plan and incorporated when applicable:

- GPO plot location (to include geology, vegetation and terrain)
- Full investigation/removal of metallic debris in GPO plot prior to seeding (may be required for areas where a "clean" site cannot be found)
- Full coverage vs. transect GPO setup
- Quantity of seeded items
- Number and types of geophysical instruments and technologies selected for testing
- Number and types of positioning instruments and technologies selected for testing
- Adding seeded clutter (e.g. nails, wire, other metallic debris) to evaluate system discrimination between clutter and MEC
- Scoring protocol (some sites may require emphasis on some scoring parameters over others)
- GPO site security

Quality Control

Quality Control (QC) for GPO operations will be defined on a site-specific GPO basis and be specified in each SSWP. In general, QC will be dictated by the sensors, navigation methods, and survey modes utilized to achieve the site-specific GPO objectives. However, the systems will be field tested frequently by the DGM Contractor to ensure that they are operating properly. Several QC tests will be incorporated into all GPO operations. A description of each test, its acceptance criteria and frequency is provided below and summarized in Table 1.

1. Equipment Warm-up: This is an instrument specific activity (although a standard warm-up time is 5 minutes.) Some geophysical systems require more warm-up time than others do. For example, the Geometrics G-858 system has an on-screen display that indicates when the sensors have warmed up sufficiently and are ready to be used for survey activities. A system specific SOP should be attached to the SSWP to define the equipment warm-up time. Equipment warm-up is performed each time the instrument is first turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to “cool-down.”
2. Record Sensor Positions: Positioning accuracy of the final processed data is demonstrated by operating the equipment over one or more known points, usually in a “cross” or “star” pattern, and plotting the track on a map. It is important that the positioning system be tested in exactly the same manner in which it is to be used during the actual surveys. The accuracy of the data positioning is assessed by calculating the difference between the location where the track-plots cross each other on the map and the actual location of the known point(s). Presumably, the actual track-plots will cross exactly over the known point when the data was collected, and the difference, if any, observed on the final track-plot map is a direct measure of the positioning system’s accuracy. In some cases where absolute positioning errors need to be quantified, the DGM Contractor should “force” the sensors to cross over the known point(s) using guides or rails (wood 2 X 4’s or PVC pipe split in half) placed on the ground, which force the sensor to travel over an exact path while collecting data. The sensor position test is conducted at the beginning of the survey operations for each work day.
3. Personnel Test: This test checks the response of instruments to the personnel and their clothing/proximity to the system. On a daily basis, instrument coils are checked for their response to the personnel operating the system, with response 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 is conducted at the beginning of the survey operations for each work day.
4. Vibration Test (Cable Shake): This test checks the response of instruments to vibration. On a daily basis, instrument coils are checked for their response to vibrations in the cables, with response 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 is conducted at the beginning of the survey operations for each work day.
5. Static Background and Static Spike: Static tests are performed by positioning the survey equipment within or close to the survey boundaries in an area free of metallic contacts

and collecting data for a specific period, while holding the instrument in a fixed position without a “spike” (known standard) and then with a “spike.” The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test is conducted at the beginning and end of each survey operation.

6. Azimuthal Test: This test is performed to ensure that a system’s sensors are oriented in such a way that they minimize data drop-outs and maximize instrument response. This test is typically only performed for magnetometer systems and should be done the first time the system is used at the site.
7. Six Line Test: The “Six Line Test” is a standard response test consisting of a predetermined route (survey line) established on or near the site in an area free of metallic contacts. The beginning, midpoint, and end of the line are marked, and data is collected along the line. The line is traversed a total of six times as follows: 1) *normal* data collection speed *without* a “spike” at the centerpoint; 2) *normal* data collection speed *without* a “spike” at the centerpoint; 3) *normal* data collection speed *with* a “spike” at the centerpoint; 4) *normal* data collection speed *with* a “spike” at the centerpoint; 5) *fast* data collection speed *with* a “spike” at the centerpoint; 6) *slow* data collection speed *with* a “spike” at the centerpoint. The test is conducted the first time a system is used at the site.
8. Octant Test (Heading Error Test): This test is done to document “heading” error associated with magnetometer systems so the error can be corrected during data processing. The test is conducted the first time a system is used at the site.

TABLE 1
Geophysical Instrument Standardization Tests and Acceptance Criteria
Former VNTR, Vieques, Puerto Rico

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	1st Time Instr. Used	10% of Total Area Surveyed
1	Equipment Warm-up	Equipment specific (typically 5 min)	X				
2	Record Sensor Positions	+/- 1 inch (2.54 cm)		X			
3	Personnel Test	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response.		X			
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X			
5	Static Background & Static Spike	+/- 20% of standard item response, after background correction			X		
6	Azimuthal Test *	Sensor orientation that minimizes drop-outs				X	

TABLE 1
Geophysical Instrument Standardization Tests and Acceptance Criteria
Former VNTR, Vieques, Puerto Rico

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	1st Time Instr. Used	10% of Total Area Surveyed
7	Six Line Test	Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm				X	
8	Octant Test (Heading Error Test) *	Document heading error for post-processing correction				X	

* Magnetometer Only

Records Management

All raw data files, final processed data files, hard copies, and field notes will be maintained by the DGM Contractor for the duration of the GPO and then turned over to the Title 2 Services Contractor.

Data Delivery

The following are the DGM data delivery requirements:

- All sensor data shall be correlated with navigational data based upon a local “third order” (1:5,000) monument or survey marker. If a suitable point is not available, the Title 2 Services Contractor shall have a Professional Land Surveyor (PLS) establish a point.
- All sensor data shall be preprocessed for sensor offsets, diurnal magnetic variations, latency corrections, drift corrections, etc. and correlated with navigation data.
- Diurnal magnetic variations measured at a base-station must be collected at a minimum of once per minute.
- The DGM system shall digitally capture the instrument readings into a file coincident with the grid coordinates.
- All raw and final processed data shall be delivered corrected and processed in ASCII files.
- Corrections such as for navigation, instrument bias, and diurnal magnetic shift shall be applied.
- All corrections shall be documented (see Table 1).

- Data shall be presented in delineated fields as x, y, z, v1, v2, etc., where x and y are UTM Grid Plane Coordinates in Easting (meters) and Northing (meters) directions, z (elevation is an optional field in meters), and v1, v2, v3, etc., are the instrument readings.
- The last data field should be a time stamp.
- Each data field shall be separated by a comma or tab.
- No individual file may be more than 100 megabytes in size and no more than 600,000 lines long.
- Each grid (or set) of data shall be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel.
- Within 1 working days after collection, the DGM Contractor shall furnish final data packages for each system's survey via internet using FTP, E-mail attachment for small files under 5 Mb, digital compact disk (CD) or other approved method. Final data packages must include the following:
 - dig sheets (anomaly selections) in Microsoft Excel formats,
 - pdf file(s) of color contoured geophysical results with anomaly selections shown and labeled at a readable scale,
 - raw data files,
 - final processed data files,
 - all quality control data files associated with the survey files,
 - Microsoft Word 6.0 or higher file documenting the field activities associated with the data, and the processing performed (see Table 2),
 - digital planimetric map, in Geosoft or ArcView format, and coincident with the location of the geophysical survey.

Reporting

The Title 2 Services Contractor will prepare a Geophysical Prove-Out Letter Report detailing the GPO operations, seed item specifics (actual burial locations, depths, etc.), an as-built map of the GPO plot and GPO results, including a recommended system for the site DGM operations.

On-site DGM surveys will only commence once project team concurrence on the GPO results has been achieved.

TABLE 2
Processing Documentation Requirements

Information Type	Final Data Delivery	Must be in File Headers
Site ID	X	X
Geophysical instrument type used	X	X
Positioning method used	X	X
Instrument serial numbers (geophysical and positioning)	X	
Coordinate system and unit of measure	X	X
Grid ID (or other identifier of surveyed area)	X	X
Date of data collection	X	X
Raw data file names associated with delivery	X	X
Processed data file names associated with delivery	X	X
Name of Project Geophysicist	X	
Name of Site Geophysicist	X	
Name of data processor	X	X
Data processing software used	X	
Despiking method and details	X	
Sensor drift removal and details	X	
Latency correction and details	X	
Heading correction and details	X	
Sensor bias, background leveling and/or standardization adjustment method and details	X	
Diurnal correction (magnetic data)	X	
Geophysical noise identification and removal (spatial, temporal, motional, terrain induced) and details	X	
Other filtering/processing performed and details	X	
Gridding method	X	
Anomaly selection and decision criteria details	X	
Other processing comments	X	
Date data processing is completed	X	
Data delivery date	X	
Scanned copy of field notes and field PDA notes (if applicable)	X	

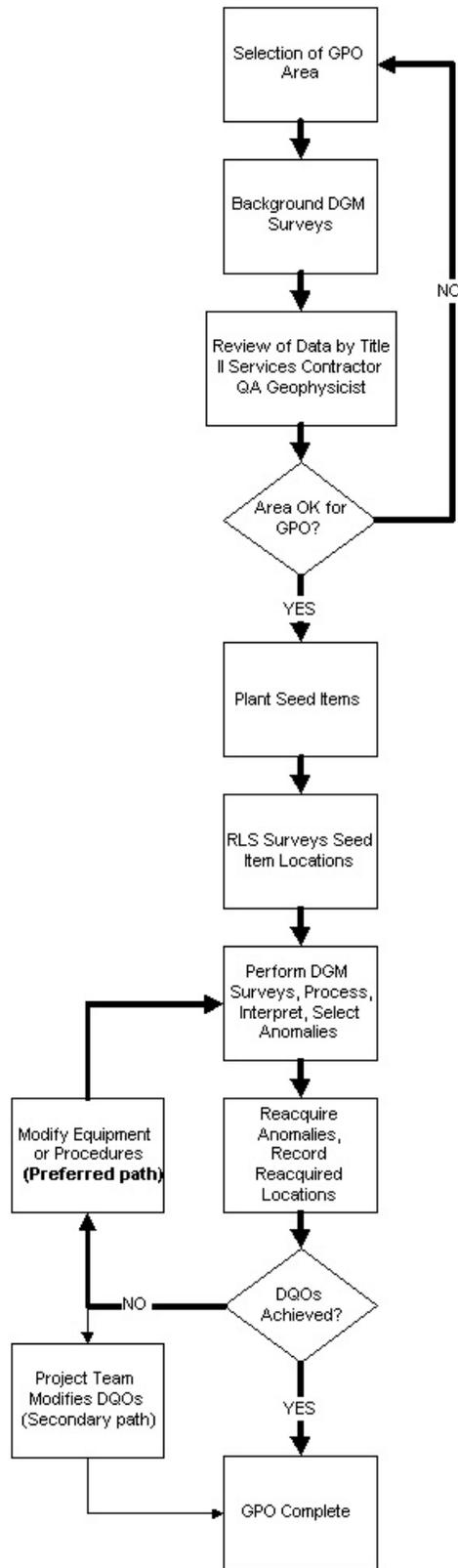


FIGURE 2
GPO Process and Procedures

Appendix G

Master Field Sampling Plan

Final
Master Field Sampling Plan
Former Vieques Naval Training Range (VNTR)
Vieques, Puerto Rico

Contract Task Order 0047

December 2006

Prepared for
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Prepared by



Virginia Beach, Virginia

Contents

Acronyms and Abbreviations	vi
1. Introduction.....	G-1
2. Field Activities	G-3
2.1 Analytical Services.....	G-3
2.1.1 Field Measurements.....	G-3
2.1.2 Routine Sample Analysis	G-3
2.2 Field Quality Control (QC) Procedures.....	G-3
2.2.1 Blanks.....	G-4
2.2.2 Duplicates.....	G-4
2.2.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)	G-4
2.3 Geophysical Surveys	G-5
2.3.1 Electromagnetic Induction.....	G-5
2.3.2 Ground Penetrating Radar (GPR).....	G-5
2.3.3 Magnetometry.....	G-5
2.3.4 Downhole Geophysics.....	G-6
2.4 Soil Gas Survey	G-6
2.5 Surface Water and Sediment Sampling.....	G-7
2.5.1 Surface Water Sampling.....	G-7
2.5.2 Sediment Sampling.....	G-9
2.6 Surface Soil Sampling.....	G-11
2.7 Soil Borings.....	G-11
2.8 Subsurface Soil Sampling	G-11
2.9 Monitoring Well Installation.....	G-12
2.9.1 Monitoring Well Construction	G-12
2.9.2 Monitoring Well Development	G-13
2.10 Monitoring Well Abandonment.....	G-14
2.11 Groundwater Sampling from Monitoring Wells.....	G-14
2.12 Direct-Push Groundwater Sampling	G-15
2.13 Aquifer Testing	G-16
2.13.1 Slug Tests.....	G-16
2.13.2 Step-Drawdown Pumping Tests	G-16
2.13.3 Constant-rate Pumping Tests	G-16
2.14 Hydrologic Measurements.....	G-16
2.14.1 Groundwater Level Measurements.....	G-16
2.14.2 Surface Water Level Measurements	G-17
2.15 Sewer Sampling	G-17
2.16 Test Pits/Trenching.....	G-17
2.17 Surveying.....	G-17
2.18 Investigation-Derived Waste Sampling.....	G-18
2.19 Decontamination.....	G-18
2.19.1 Sampling Equipment Decontamination.....	G-18
2.19.2 Personnel Decontamination.....	G-19

2.20 Health and Safety Monitoring G-19

2.21 Field Tests G-19

3. Documentation..... G-21

3.1 Sample Designation..... G-21

3.2 Sample Shipping Procedures G-22

Tables

2-1 Required Containers, Preservatives, and Holding Times for
Water Samples G-8

2-2 Required Containers, Preservatives, and Holding Times for
Soil and Sediment..... G-10

Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
ATV	All-terrain vehicle
BGS	Below ground surface
°C	Degrees Centigrade
CLP	Contract laboratory program
COC	Chain-of-custody
D.O.	Dissolved oxygen
EPA	Environmental Protection Agency
EM	Electromagnetic induction
FID	Flame ionization detector
FSP	Field Sampling Plan
GPS	Geographic Positioning System
GPR	Ground penetrating radar
HCl	Hydrochloric acid
HNO ₃	Nitric acid
HSP	Health and Safety Plan
IDW	Investigation-derived waste
IDWMP	Investigation-derived waste management plan
LANTDIV	Atlantic Division
MHZ	Megahertz
MP	Master Plan
MS/MSD	Matrix spike, matrix spike duplicate
MSL	Mean sea level
NaOH	Sodium hydroxide
NAS	Naval Air Station
NAVFACENGCOM	Naval Facilities Engineering Command
NTR	Navy Technical Representative
NTU	Nephelometric turbidity unit
OVM	Organic vapor monitor
PAH	Polycyclic Aromatic Hydrocarbon
PC	Personal computer
PCB	Polychlorinated biphenyl
PID	Photoionization detector
PVC	Polyvinyl chloride

QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SOP	Standard operating procedures
SSP	Site screening process
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
USCS	Unified soil classification system
USGS	United States Geological Society
VOC	Volatile organic compound
VNTR	Vieques Naval Training Range
XRF	X-Ray Fluorescence

SECTION 1

Introduction

This Master Field Sampling Plan (FSP) is a compilation of the anticipated field activities that may be performed to support Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) activities at the former Vieques Naval Training Range (VNTR) on Vieques Island, Puerto Rico. The purpose of the Master FSP is to describe the types of field procedures which may be performed during the course of field activities, and how these procedures will be completed. This Master FSP does not include site-specific information regarding past activities, nor does it include potential sample locations or the number of samples to be collected. Site-specific field activities will be described in separate Site-Specific Work Plans. These work plans will reference this Master FSP, rather than repeat the information contained in this plan.

This Master FSP describes field investigation procedures and practices to be followed at former VNTR and is organized in three sections. Section 1 is a general introduction. Section 2 addresses analytical services and describes the different field activities which may be performed. Section 3 provides protocol for sample documentation and custody. All analyses will be performed in accordance with standard EPA Contract Laboratory Program (CLP) protocol or EPA Test Methods for Evaluating Solid Waste (SW-846) Third Edition. The potential field activities that may be conducted at the base include:

- Geophysical surveys
- Soil gas surveys
- Surface water and sediment sampling
- Surface soil sampling
- Soil boring installation
- Subsurface soil sampling
- Monitoring well installation and development
- Monitoring well abandonment
- Groundwater sampling
- Direct-Push groundwater sampling
- Aquifer testing
- Hydrologic measurements
- Sewer Sampling
- Trenching
- Land surveying
- Investigation derived waste sampling
- Decontamination
- Health and Safety Monitoring

The background and setting for former VNTR is described in the Master WP and is not repeated here. Site-specific information regarding individual sites will be included in Site-Specific Work Plans.

SECTION 2

Field Activities

This section describes analytical field sampling analytical/quality control protocol and field activities which may be performed at former VNTR. Not all of these activities will be conducted at all sites.

The sampling activities at former VNTR conform to U.S. Navy specifications and guidelines.

2.1 Analytical Services

Analytical services include the measurement of field parameters, routine analyses of environmental samples, and data validation.

2.1.1 Field Measurements

The field parameters temperature, pH, dissolved oxygen (DO), turbidity, oxidation reduction potential (ORP), and specific conductance are measured as screening tools. These parameters will be used to evaluate groundwater and surface water conditions prior to sample collection. These parameters will also be used to estimate the effectiveness of well development activities.

Field screening also includes the use of an organic vapor monitoring instrument to measure organic vapors in air and an explosimeter to measure the vapors associated with combustible gasses. These data will be used for the following:

- Evaluation of ambient air conditions during field activities to meet the requirements of the HSP
- Assist in the gross screening of soil samples

2.1.2 Routine Sample Analysis

The routine analysis of environmental samples will be requested for Appendix IX constituents and explosives.

These data will be used for the following:

- Risk assessment
- Characterization of the native soil and fill
- Characterization of groundwater, sediment, and surface water

2.2 Field Quality Control (QC) Procedures

QC duplicate samples and blanks are used to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process.

2.2.1 Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. American Society for Testing and Materials (ASTM) Type II water will be used for blanks. Four types of blanks will be generated during sampling activities: trip blanks, field blanks, equipment blanks, and temperature blanks.

One trip blank will be included each day for each cooler containing samples for volatile organic compound (VOC) analysis. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the sampling bottles, and sent to the laboratory unopened for analysis. Trip blanks will not be prepared or handled in the field. Trip blanks will indicate whether contamination is introduced during shipment to the field, storage in the field, or shipment from the field to the analytical laboratory.

One field blank will be collected each week of sampling. The field blanks will indicate whether contamination has been introduced by ambient air conditions in the field or by handling the sample bottle in the field or in the laboratory. The pre-preserved sample container will be filled with ASTM Type II water in the field at the time of sampling.

One equipment blank will be collected each day during sampling. The equipment blanks will indicate the completeness of equipment decontamination procedures.

A temperature blank will be included in each cooler containing samples requiring preservation so that the laboratory can record the temperature without disturbing the samples. The temperature blank will not be given a sample number nor listed as a sample on the chain-of-custody (COC).

2.2.2 Duplicates

Field duplicate samples will be collected in accordance with procedures described in Sections 3.2.3 and 3.2.4 of the Site-Specific Work Plan at a frequency of 1 per 10 field samples per matrix. The locations from which the duplicates are taken will be selected with a bias for locations where contamination is expected. The duplicate sample will be submitted for analysis as two independent samples with different sample numbers. Data validators will use these results to evaluate the precision of the analytical data.

2.2.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of 1 per 20 field samples. For the MS/MSD measurement, three aliquots of a single sample are analyzed. The matrix spike is an aliquot of sample spiked with a known concentration of target analyte(s). The matrix spike duplicate is an intra-laboratory split sample spiked with identical concentrations of a target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document accuracy in a given sample matrix. The MSD is used to document the precision in a given sample matrix. Thus, the matrix accuracy is evaluated from spike recoveries, while the precision is evaluated from comparison of the spike concentrations (SW846) of the MS and MSD. Data validators will use the results to evaluate the accuracy of the analytical data and precision through comparison of the duplicate spike results.

2.3 Geophysical Surveys

Geophysical survey methods that may be used include electromagnetic induction (EM), ground penetrating radar (GPR), magnetometry, and downhole geophysical surveys. Appropriate survey methods will be selected to delineate potential areas of buried wastes and utilities at the areas under investigation. Utility clearance will be performed by former VNTR and/or its subcontractors prior to any soil disturbance. The results from these surveys will be used to determine the locations of subsequent soil borings and monitoring wells and to characterize the condition of the subsurface.

In general, grids will be established in the field at areas to be evaluated at an appropriate spacing (e.g., 15 to 20 feet), depending on the geophysical method being used and the size of the site. Smaller grid spacings may be used in areas where greater subsurface definition is required (e.g., locating an underground storage tank). The grid spacings will be tied to existing permanent structures (e.g., buildings, monitoring wells) so they can be referenced to later land surveys. In some areas, brush and tree clearing may be required for the geophysical surveying operations. The criteria used to determine grid spacing will be further defined in the Site-Specific Work Plans.

2.3.1 Electromagnetic Induction

EM terrain conductivity profiling is a non-invasive method used to identify lateral changes in subsurface conductivity through inductive electric measurements made at the ground surface. The EM survey is a rapid, cost effective reconnaissance tool. Areas of higher-than-background conductivity may be associated with surficial and buried wastes, contaminants, or metal objects (i.e., buried drums and storage tanks, product lines, utility lines). EM may also be used for contaminant plume mapping, locating abandoned trenches and lagoons, and locating lateral anomalies such as pockets or pits of different materials.

EM data will be digitally recorded and downloaded to a personal computer (PC) for processing and analysis. Data will be profiled and contoured over the area of investigation to determine inordinately high and low conductivity values. Areas interpreted to represent buried waste, contaminants, or metals will be delineated.

2.3.2 Ground Penetrating Radar (GPR)

GPR is an active geophysical system which transmits high frequency EM waves into the ground and detects the energy reflected back to the surface. The GPR transmits electromagnetic waves of radio and microwave frequencies (e.g., 80 megahertz [MHz] to 1,000 MHz). Reflections typically occur at lithologic changes, subsurface discontinuities, and internal soil structures. GPR is useful for determining the presence of underground utilities and buried metallic objects, and for further characterizing buried wastes by producing a graphic cross section of the subsurface. Other applications include locating concrete foundations, buried archaeological artifacts, excavations, filled pits, and lagoons.

2.3.3 Magnetometry

Magnetometry measures local perturbations in the earth's magnetic field. Both naturally-occurring and man-made magnetic materials can modify the ambient field. Buried ferrous

objects, such as drums, tanks, and product lines, usually produce a detectable magnetic anomaly.

Magnetic data will be digitally recorded and downloaded to a PC for processing and analysis. Data will be profiled and contoured over the area of investigation to facilitate identification of anomalous magnetic intensities. Areas interpreted to represent buried waste, contaminants, or metals will be delineated.

2.3.4 Downhole Geophysics

Downhole geophysical methods are used to characterize or log the stratigraphy, geology, morphology, and hydrology of a well or open bore hole. Methods that are commonly utilized and what is recorded are summarized below:

- Caliper log - measures changes in the diameter of the borehole
- Fluid resistivity log - records natural variations in electrical resistivity (resistance) of borehole and interstitial fluids
- Electrical resistivity log - records natural variations in electrical resistivity (resistance) between contrasting lithologic types and interstitial fluids
- Spontaneous potential log - records natural variations in electrical potential (voltages) between contrasting lithologic types
- Gamma log - records natural variations in gamma radiation between contrasting lithologic types
- Acoustic (sonic) log - records natural variations in density (porosity) between contrasting lithologic types
- Neutron logs - records natural variations in neutron emission between contrasting lithologic types
- Temperature log - records variations in water temperature within a borehole
- Fluid movement (flow) log - records variations in borehole groundwater flow-through

2.4 Soil Gas Survey

Soil gas surveys are expected to be used in areas where materials containing petroleum-based compounds, VOCs, or other hydrocarbon compounds were used, spilled, or stored. Soil gas survey results will be used to help delineate the extent and concentration of organic vapors in the vadose zone which may be indications of soil and/or groundwater contamination. The results may also be used to determine the need for and locations of confirmatory soil borings and monitoring wells.

Soil gas samples will be collected in-situ and analyzed onsite. Samples may be analyzed for hydrocarbon compounds and/or selected chlorinated compounds (i.e., trichloroethylene, tetrachloroethylene, and 1,1,1-trichloroethane) using gas chromatographic techniques. Samples can also be analyzed for combustible gases using a portable combustible gas indicator.

2.5 Surface Water and Sediment Sampling

Surface water and/or sediment samples will be collected from the Caribbean Sea sewers, sumps, and other structures across the site. For the sewers, sampling will proceed from downstream to upstream locations to reduce the amount of turbidity and potential cross-contamination of downstream samples. Sampling will be conducted at low tides, where appropriate, and low flow to minimize dilution of possible contaminants. Sampling activities will not occur after periods of heavy rainfall.

2.5.1 Surface Water Sampling

Field parameters (e.g., DO, temperature, specific conductance, pH, and ORP) will be measured prior to sample collection. Surface water samples will then be collected by submersing the sampling container directly into the surface water body or by using a “thief” type sampler and then transferring the sample to the sample container. The body of the immersed sampling container will face downstream so that any sediment disturbed during the immersion of the container does not enter the sampling vessel. If the volume of surface water encountered is insufficient to allow the direct submersion of the sampling containers, a glass interim vessel will be used to transfer the surface water sample to the sample containers. The glass interim vessel will be laboratory cleaned to the same specifications as the sample containers.

Table 2-1 presents the required containers, preservatives, and holding times for water samples. All appropriate preservatives will be added to the sample containers by the contracted laboratory before shipment to the environmental contractor’s field team. All samples will be kept cool in the field at 4 degrees Celsius (°C), using bagged ice.

For VOC samples, the bottles will be filled so as to minimize aeration of the samples. During the collection of surface water samples, care will be taken to ensure that any pre-added preservative is not rinsed from the sampling container during sample collection. Sample vials will be filled completely and capped to prevent the entrapment of any air bubbles in the vial.

TABLE 2-1
Required Containers, Preservatives, and Holding Times for Water Samples

Analysis	Analytical Preparation/ Method Number	No. of Containers	Sample Container	Preservative	Holding Time	Volume of Sample Collected
VOCs	SW-846 Method 5030B/8260B, 8015	3	Three 40-ml glass vials w/Teflon-lined cap	HCl to pH <2; Cool to 4°C	14 days	Fill completely; no air bubbles
SVOCs	SW-846 Method 3510C/8270C	2	Two 1-liter bottles	Cool to 4°C	7 days extraction/40 days to analysis	Fill to shoulder
Pesticides/PCBs	SW-846 Methods 3510C/8081A and 3510C/8082	2	Two 1-liter bottles	Cool to 4°C	7 days extraction/40 days to analysis	Fill to shoulder
Metals	SW-846 Methods 3010A/6010B and 3010A/7000 series	1	1-liter polyethylene bottle	HNO ₃ to pH <2; Cool to 4°C	6 months (28 days for mercury)	Fill to shoulder
Cyanide	SW-846 Methods 9010B and 9012A series	1	1-liter polyethylene bottle	NaOH to pH >12; Cool to 4°C	14 days	Fill to shoulder
Lead and Arsenic	SW-846 Methods 3010A/7421 and 3010A/7061A	1	1-liter polyethylene bottle	HNO ₃ to pH <2; Cool to 4°C	6 months	Fill to shoulder
Explosives	SW-846 Method 8330	1	1-Liter Amber	Cool to 4°C	14 days/ extraction/40 days to analysis	Fill to shoulder
Total Organic Carbon	EPA Method 9060	1	500-ml amber glass	H ₂ SO ₄ or HNO ₃ to pH<2; Cool to 4°C	28 Days	Fill completely, no air bubbles
TCLP VOCs	SW-1311/5030B/ 8260B	3	40-ml glass vials w/Teflon-lined cap	Cool to 4°C	14 days to filter/14 days to analysis	Fill completely; no air bubbles
TCLP SVOCs, Pesticides, Metals	SW-1311 SW-3510C/ 8270C/8081A SW-3010A/6010B SW-7470A for mercury	2	1-liter bottles	Cool to 4°C	14 days to extraction /7 days to SVOC and Pest analysis; 28 days to mercury analysis; 180 days to metals analysis	Fill to shoulder
Total Suspended Solids (TSS)	EPA Method 160.2	1	500 ml bottle	Cool to 4°C	7 days	Fill to shoulder
Total Dissolved Solids (TDS)	EPA Method 160.1	1	250 ml bottle	Cool to 4°C	7 days	Fill to shoulder
Alkalinity	EPA Method 310.1	1	250 ml bottle	Cool to 4°C	14 days	Fill to shoulder
Hardness	EPA Method 130.2	1	250 ml bottle	HNO ₃ to pH <2; Cool to 4°C	6 months	Fill to shoulder
Acrolein/ Acrylonitrile	SW846 5030B/8260B/8015	1	40 ml glass vial w/Teflon lined cap	HCL to pH 4-5 cool to 4°C or unpreserved	14 days preserved or 7 days unpreserved	Fill completely no air bubbles
Reactivity	SW7.3.3.2	1	1-liter polyethylene bottle	Cool to 4°C NaOH	48 hours	Fill to shoulder

2.5.2 Sediment Sampling

Sediment samples will typically be collected with surface water samples. At locations where both sediment and surface water samples are being collected, the surface water sample will be collected first. This will ensure that any sediment disturbed during the sediment sampling does not enter the surface water sampling container.

Several different techniques may be used to collect sediment samples, including stainless steel trowel sampling, stainless steel hand auger sampling, and grab sampling with a Ponar Dredge. The method selected will typically depend on the flow and depth of water at the sampling location. Sewers will be sampled only at manholes. Brief descriptions of these sampling techniques and their applicability are provided in Section 2.5.2.3 of the Master Field Sampling Plan. Table 2-2 lists required containers, preservatives, and holding times for sediment samples.

During sediment sample collection, the VOC sample containers will be filled first. The sample will be placed directly into the VOC sample container to minimize the volatilization of organic compounds. The remaining sample volume will be placed into a stainless steel bowl and mixed thoroughly. After mixing, all other sample containers will be filled.

2.5.2.1 Stainless-Steel Trowel

A stainless steel trowel will be used to collect sediment samples in areas where there is minimal water flow across the sampling location and depth specific characterization is not required. The trowel will be used to transfer the sediment from the sampling location into the sample containers.

2.5.2.2 Stainless-Steel Hand Auger

For depth-discrete sediment sampling, a clean stainless steel, hand-held coring instrument with a disposable plastic liner tube, fitted with an eggshell catcher to prevent sample loss, will be used. The coring device will be pushed through the thickness of the sediments. The core will either be extruded into a stainless steel bowl or directly into the appropriate sample bottles. The sample recovery will be noted, and the discrete interval (e.g., 0 to 4 inches, 4 to 8 inches, 8 to 12 inches, or deeper if needed) will be placed in a stainless steel mixing bowl.

2.5.2.3 Ponar Dredge Sampling

A Ponar Dredge will be used to collect sediment samples from beneath any surface water greater than 1 foot in depth. The ponar dredge is a “clamshell” type sampling device consisting of the bucket/jaws and the sampler arms. During sampling activities, a length of rope is attached to a ring on the top of the sampler arms. The sampler arms are then pushed toward the bucket to open the sampler jaws. The jaws are locked in the open position by inserting a spring-loaded steel pin through a small hole in the arms. The sampler is lifted by the rope, with the sampler’s weight creating the tension that holds the locking pin in place. The sampler is lowered until the sediments are encountered, pulled up approximately 6 inches, and allowed to free fall. With the tension relieved, the spring on the locking pin forces the pin out of the hole in the arms. As the sampler is retrieved the jaws close, trapping the sediment sample inside. Any surface water entrapped in the sampler is slowly decanted through a screened port on the top of the ponar.

TABLE 2-2
Required Containers, Preservatives, and Holding Times for Soil and Sediment

Analysis	Analytical Preparation/ Method Number	No. of Containers	Sample Container	Preservative	Holding Time	Volume of Sample
VOCs	SW-846 Method 5035/8260B	3 to 4	3-4 each 5-g En Core™ sampler	4°C	48 hours to extraction and 14 days from extraction to analysis	Fill completely with no air bubbles
SVOCs	SW-846 Method 3550B/8270C	1	8-oz. Glass jar ¹	4°C	14 days to extraction and 40 days from extraction to analysis	Fill completely
Pest/PCBs	SW-846 Methods 3550B/8081A/ and 3550B/8082	1	8-oz. Glass jar ¹	4°C	14 days to extraction and 40 days from extraction to analysis	Fill completely
Pesticides	SW-846 Method 3550B/8081A	1	8-oz. Glass jar ¹	4°C	14 days to extraction and 40 days from extraction to analysis	Fill completely
Metals	SW-846 Methods 3050B/6010B 7000 series	1	4-oz. Glass jar ¹	4°C	6 months, 28 days for mercury	Fill to shoulder
Cyanide	SW-846 Methods 9010B and 9012A series	1	8-oz plastic or glass bottle	Cool to 4°C	14 days	Fill completely
Lead/Arsenic/Explosives	SW-846 Methods 3050B/7421 and 3050B/7061 A	1	8-oz plastic or glass bottle	Cool to 4°C	6 months	Fill to shoulder
Explosives	SW-846 Methods 8330	1	4-oz. Glass jar ¹	4°C	7 days to extraction and 14 days from extraction to analysis	Fill completely
Total Organic Carbon	EPA Method 9060	1	8-oz plastic or glass bottle	Cool to 4°C	28 days	Fill completely
Grain Size	ASTM 0421-58/0422-63	1	Quart size plastic bag	Cool to 4°C	--	Approximately 1/3 rd full
TCLP VOCs	SW846 Method 1311 SW-5030B/8260B	2	2 each 25 gram En Core™ sampler	Cool to 4°C	14 days to extraction/14 days to analysis	Fill completely
TCLP SVOCs, Pesticides, Metals	SW846 Method 1311 SW-3510C/8270C/ 8081A SW-3010A/6010B SW-7471A for mercury	1	8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days to extraction/40 to SVOC and Pest analysis; 28 days to mercury analysis; 180 days to metals analysis, 7 days extraction	Fill completely
Reactivity	SW-846 Sections 7.3, 3.2/7.3, 4.2	1	8-oz plastic or glass bottle	Cool to 4°C	48 hours	Fill completely
Corrosivity	SW-846 Section 7.2	1	8-oz plastic or glass bottle	Cool to 4°C	28 days	Fill completely
Ignitability	SW 846 Method 1010/1020A	1	8-oz plastic or glass bottle	Cool to 4°C	ASAP	Fill completely

1- Teflon lined cap

2.6 Surface Soil Sampling

Sampling techniques that may be employed for surface soil sampling include stainless steel trowel sampling and stainless steel hand auger sampling, depending on the nature of the material to be sampled. A stainless steel trowel will typically be used to collect samples of loosely packed materials and a stainless steel hand auger for densely packed materials. Surface soil samples will be obtained from a depth of 0 to 6 inches below ground surface (bgs) and typically be used to investigate leaks and spills on the ground surface. Samples collected from beneath paved or gravel surfaces are not considered surface samples. Table 2-2 lists the required containers, preservatives, and holding times for soil samples.

2.7 Soil Borings

Before soil borings (or well borings) are initiated, utility clearances will be obtained from the Navy. Borings will be advanced by a tripod, van-mounted probe, truck-mounted drill rig, or all-terrain vehicle (ATV) drill rig, using a split-spoon sampler. The sampler is driven into unconsolidated materials using a falling weight connected to the drill rig. Alternatively, soil samples will be collected using thin-walled tubes for geophysical analysis.

If physical access to areas is restricted, soil borings may also be advanced using a hand auger or a tripod-mounted sampling device. The locations and total depth of hand-augered boreholes will be determined in the field based upon subsurface soil conditions and site-specific sampling objectives.

The soil borings performed under these investigations will typically be sampled continuously (every 2 feet) or periodically (every 5 feet) to depth, as necessary, for lithologic and/or chemical characterization. Soil samples obtained by probe using direct-push methods will be collected either intermittently or continuously at intervals predicated by the equipment used. A geologist will observe the drilling and sampling operations. The soil will be classified according to the Unified Soil Classification System (USCS). Field observations of lithology, moisture content, discoloration, odors, and other visible features will be described and recorded in the field logbook and on to a soil boring log provided in the Field Sampling Plan. During advancement of the boring, a photoionization detector (PID) will be used to measure volatile organic contamination in the soil cuttings and split spoon samples. Subsurface soil samples may be analyzed from all or selected boreholes.

To the extent possible, soil cuttings will be returned to the borehole. A labeled stake will be placed at the ground surface near the borehole for future reference for soil borings on unpaved areas. Asphalt or other surface material will be patched and the boring location will be identified with spray paint. Auger cuttings will be managed in accordance with the Master Investigation Derived Waste Management Plan.

2.8 Subsurface Soil Sampling

Subsurface soil densities vary from site to site across Vieques and will dictate subsurface soil sampling methodologies. Split spoon sampling techniques will typically be used at locations where samples are being collected from depths greater than 3 to 5 feet, discreet sampling

intervals, from beneath asphalt, or where compaction of the soil has made sample collection using manual augers or trowels impossible. Alternatively, soil will be sampled using direct-push methods and sampling tubes where soil densities are low enough.

A drill rig will be used to advance 3-¹/₄-inch to 6-¹/₄-inch hollow stem augers to the top of the desired sampling interval. A stainless steel split-spoon sampler will be attached to the proper length of drilling rod and inserted through the hollow stem augers. A 150-pound hammer will be used to advance the split-spoon sampler up to 2 feet below the auger or until refusal, as required for sample collection. The split-spoon sampler will then be retrieved and the sample handled in accordance with site-specific SAPs. Direct-push methods will obtain the sample from the desired depth by pushing the sampling tube directly to that depth.

2.9 Monitoring Well Installation

Monitoring wells will be installed in selected boreholes. Boreholes drilled for monitoring well installation will be lithologically logged by the Field Geologist as described in Section 2.7. Well locations will be determined based upon previous analytical results, or other pertinent field data, as described in the site-specific work plans.

Monitoring well borings will usually be installed using hollow stem augers, unless field conditions require the use of a rotary or sonic method. The rotary method will utilize the addition of drilling water, not drilling mud. Well screens will be placed within the zone of interest. Specific well screen placement will be discussed in the Site-Specific Work Plans.

At locations where permanent wells are not required or well installation cannot be completed using a truck-mounted or ATV drilling rig, drive points may be installed. Drive points are 2-inch-diameter, stainless steel monitoring wells with short screens, and are installed by driving the well point into the ground. These will be installed in wet areas where the weight of a drilling rig cannot be supported, or because of steep slopes or dense forest. Drive points may also be installed in an open borehole.

2.9.1 Monitoring Well Construction

Monitoring wells will be constructed of 2-inch inside diameter (I.D.), Schedule 40 polyvinyl chloride (PVC) risers and screen, with flush joint threads. Wells will be completed with 10-foot-long No. 10 slot size screens. Well construction may differ at locations that warrant larger size diameter wells such as potential free phase product accumulation areas. At these locations, screen lengths may be increased to 15 feet and slot sizes increased to No. 20. Samples of aquifer material for grain size analysis may be collected from selected well borings if unusual size materials are observed; from this information, screen slot size and sand pack particle size will be determined for these wells. Wells also may be constructed of stainless steel rather than PVC in areas where high concentrations of solvents are present in the groundwater that could degrade a PVC well. Permanent water level measurement notches will be made on the northern side of the riser casing to keep water level gauging events consistent.

A sand pack will be placed around the screened interval to 1 to 2 feet above the top of the screen. A minimum of 2 feet of bentonite will be placed above the sand pack. If above the

water table, bentonite will be hydrated with potable water prior to grouting. Grout will be placed via a side-discharging tremie pipe above the bentonite pellets to within 1 foot of the ground surface.

Drive points may be constructed in one of two ways. If the drive point is hammered into place, no other well construction will be necessary, and the well assembly is fabricated from 2-inch-diameter stainless steel and includes a screen (anticipated to be 2 to 3 feet in length), casing, and a hardened point. If a hand-augered borehole is used, the procedure will consist of:

- Advancing a 4-inch-diameter hand auger to the desired depth below the water table
- Installing a temporary casing if the borehole collapses using PVC pipe hammered into the collapsing borehole and reaugered to clean out the soils until final depth is achieved
- Placing a 2-inch-diameter drive point in the open borehole
- Placing sand pack around the drive point to a depth that is approximately 1 foot above the screened interval
- Placing a bentonite seal above the sand pack to the top of the borehole
- Grouting will not be used in drive points

In high traffic areas, wells will be completed with a flush mounted protective casing with locking cap. A 2-foot x 2-foot x 4-inch concrete pad will be installed in the asphalt or concrete to reinforce the shallow wells. This will be sloped away from the well to prevent surface water infiltration. Monitoring well numbers and other pertinent information will be marked either on the concrete pads or on stainless steel well tags attached to the concrete pads.

Wells completed where there is no vehicular traffic will have 2 to 3 feet of “stickup” above ground surface. A steel protective casing will be placed over the riser and cemented into a 4-foot x 4-foot x 4-inch concrete pad. Steel guard posts will be placed around the protective casing to prevent accidental damage. The pad will be sloped away from the well to prevent surface water infiltration.

Piezometers may be installed to be used to measure water levels. These piezometers are not expected to be sampled but will be constructed in the same manner as wells are.

Some wells may require that a surface casing be installed to prevent potential contamination from migrating between water-bearing units separated by low-permeability materials. Surface casings will consist of either PVC or steel. The casings will be set into low-permeability material separating the water-bearing units and will be grouted in place.

2.9.2 Monitoring Well Development

Monitoring wells will be developed prior to groundwater sampling by removing water from each well using a peristaltic pump or submersible pump. The development water will be discharged into 55-gallon drums or other storage containers (e.g., tankers). A surge block also will be used to aid in development. If dedicated sampling equipment is not used, equipment will be decontaminated between wells.

Well development will be performed after the grout used to construct the well has been allowed to adequately set at least 24 hours. The groundwater levels will be measured to the nearest 0.01 foot from the top of the PVC casing. Development will consist of removing at least three borehole volumes of water, plus the amount of water added during the drilling or installation process. Development will continue until groundwater turbidity levels reach 50 nephelometric turbidity units (NTUs), or until 6 hours of development has passed, whichever comes first. The goal of 50 NTUs was developed due to the nature of geology on Vieques and the persistence of wells going dry during purging activities. Water clarity will be measured with a Hach™ NTU meter or equivalent. Development information, including water clarity, pH, specific conductivity, and temperature, will be recorded in the field logbook.

Wells installed as part of previous investigations will be evaluated in the field to determine if redevelopment is required. Redevelopment will be considered necessary if 10 percent or more of the screen length has been “silted in” (i.e., filled in by soil particles; this soil matter leads to turbid samples and possibly incorrect conclusions about groundwater analytical results). Redevelopment will also be conducted at wells where high turbidity levels are exhibited and water yields are sufficient to warrant redevelopment efforts. If redevelopment is necessary, it will follow similar procedures as for newly installed wells; however, additional time and volume of water removed may be needed to remove the fine sediment from the well.

After installation of drive points, the inside of each drive point screen will be scrubbed with a 2-inch-diameter round steel brush to clean out any mud or sediment that might clog the screen slots. The water in the drive point will then be bailed out. If necessary, certified laboratory grade distilled water may be added and the screens scrubbed again to facilitate water flow through the screen. This procedure may be repeated two or three times to clean the screen.

2.10 Monitoring Well Abandonment

Well abandonment will be performed on monitoring wells which are no longer in use or which are improperly constructed. The well abandonment procedures will be in accordance with Navy requirements. The objective of this procedure is to prevent contamination from reaching groundwater through the well. Abandonment will consist of over-drilling the well using hollow stem augers and, if possible, removing the screen and riser pipe. The riser and screen will be decontaminated, cut into small sections approximately 3 feet long, and disposed of as regular trash. The well borehole will then be filled with cement grout by a tremie pipe, which will extend to the bottom of the well borehole. As the grout fills the well borehole, the pipe will be raised until a return of grout is noted at the surface.

2.11 Groundwater Sampling from Monitoring Wells

Monitoring wells will not be sampled for at least 2 weeks after the well has been developed. This will allow an adequate amount of time for the well to recover. Prior to sampling, groundwater will be purged from each well. Purging will be performed until at least three borehole volumes have been removed and the temperature, specific conductance, and pH

have stabilized to within 10 percent for three consecutive readings. The borehole volume will be calculated using values for the depth of the well, the depth to water, and the well diameter. Purging will be accomplished using low flow pumps or bailers. Well purging data will be recorded in the field logbook. The Investigation-Derived Waste Management Plan (IDWMP) discusses treatment and disposal of purge water.

Samples will be collected after the field parameter measurements have stabilized. Wells that are pumped dry during purging will be allowed to recover before sampling; the sample will be obtained as soon as a sufficient volume of groundwater to fill all sample containers has entered the well.

Purging activities will be conducted in a manner which minimizes agitation of groundwater in the wells, and at a pumping rate not to exceed one liter per minute. Purging will be conducted using low flow peristaltic pumps when the depth to water will allow the use of these pumps. Peristaltic pumps, however, can only pull water from a depth of approximately 25 feet. Therefore, in instances where groundwater is greater than approximately 25 feet below grade, variable speed submersible environmental pumps (Grundfos or equivalent) will be utilized for purging. Bladder pumps were ruled out for use at the former VNTR for purging because of the difficulty in obtaining compressed gasses on the island. All down-hole and effluent tubing will be Teflon® lined or Teflon®.

Groundwater samples will be collected from the discharge hose of the purge pump into properly-labeled, laboratory-prepared sampling containers filled and/or preserved as appropriate; cooled to approximately 4 °C; and shipped to the analytical laboratory under appropriate COC documentation procedures. The pump rate shall be reduced to below one liter per minute, for all samples to reduce the potential for collecting turbid groundwater samples. Clean, double check valve bailers may be used for sampling as a last resort in wells in which the depth to water or other extenuating circumstances preclude the collection of non-turbid samples through the pump. In this case, care will be taken when lowering the bailer not to agitate the water surface. Table 2-1 shows the required containers, preservatives, and holding times for water samples.

2.12 Direct-Push Groundwater Sampling

Groundwater samples may be collected using a direct-push (e.g., Geoprobe® or HydroPunch®) hydraulic sampler mounted on a 4-wheel-drive truck where permanent wells are not installed and the extent of groundwater contamination needs to be defined. Prior to sampling activities, utility clearances will be performed. The direct-push probe will be advanced to the desired depth and the sample will be collected. Alternatively, the borehole will be advanced using a drill rig and hollow stem auger techniques to reach the depth of interest in the aquifer. At that depth, the drill rods will be removed and the direct-push samplers hydraulically pushed to the zone of interest. The cover will then be retracted, allowing water to flow into the device. Groundwater samples will either be retrieved using a double check valve sampling tool or a “mini” bailer. Samples will be collected directly into sample containers that have been precleaned and preserved by the analytical laboratory to EPA specifications.

Table 2-1 shows the required containers, preservatives, and holding times for groundwater samples.

2.13 Aquifer Testing

Aquifer testing that might be completed include slug tests, step-drawdown pumping tests, and constant-rate pumping tests.

2.13.1 Slug Tests

Rising and falling head slug tests may be performed in monitoring wells to evaluate aquifer hydraulic conductivity in the vicinity of the well. Slug tests will be performed after groundwater sampling using solid PVC slugs with clean bailer rope. A pressure transducer attached to an electronic recording device, such as an In-Situ Hermit™, will be used to record changes in pressure associated with water level recovery. Tests will be repeated three times to verify reproducibility. Alternatively, tests will be performed by sealing the top of the well riser, forcing the water level in the well down with nitrogen, releasing the nitrogen pressure, and recording the water level recovery.

The *Bower & Rice* method for unconsolidated aquifers will be used to evaluate the hydraulic conductivity's of the aquifer.

2.13.2 Step-Drawdown Pumping Tests

Step-drawdown pumping tests might be performed to ascertain the efficiency (specific capacity) of a well and to determine an appropriate pumping rate for conducting a constant-rate pumping test. Methodology will be described in site-specific WPs and FSPs.

2.13.3 Constant-rate Pumping Tests

A constant-rate pumping test might be performed on a well to ascertain the transmissivity and storage coefficient or storativity of the aquifer for use in modeling and capture zone analyses. Methodology will be described in site-specific WPs and FSPs.

2.14 Hydrologic Measurements

Groundwater or surface water hydrologic measurements may be collected at former VNTR. Measurement procedures are described below.

2.14.1 Groundwater Level Measurements

Groundwater level measurements will be measured in monitoring wells, piezometers, and drive points. Fluid level measurements will be used to evaluate the movement of groundwater, the horizontal hydraulic gradient, the vertical hydraulic gradient, and the thickness of any free product, if present. This information, when combined with other site-specific information such as hydraulic conductivity, extent of contamination, and product density, may be used to estimate contaminant movement or source areas. Fluid levels will be measured with a water level indicator or oil/water interface probe, as appropriate. The depth from the top of casing to fluid level will be recorded to the nearest 0.01 foot.

2.14.2 Surface Water Level Measurements

Surface water level measurements may be read from surveyed staff gauges placed in surface water bodies. Surface water level measurements will be used with groundwater measurements to help determine communication between surface water and groundwater. Depth of surface water bodies may be measured using a graduated weighted tape or similar device.

2.15 Sewer Sampling

Samples of surface water and/or sediment may be collected from storm sewers on the site to determine if contaminants are being transported in the sewers. All samples will be collected from manholes that provide access to the sewers. Manholes are confined-space entry areas and samples will be collected from the surface, if possible, to avoid the need of staff to enter manholes. Weighted bottles and samplers attached to poles will be used to avoid confined-space entries.

2.16 Test Pits/Trenching

Test pits or trenches may be completed in areas where characterization of fill or other waste materials is required or the extent of contamination needs to be determined. Test pits and trenches may be excavated up to 15 feet in length and to a maximum depth of 10 feet. Samples of materials excavated from the trench will be collected from the bucket of the backhoe or the pile of excavated material using a stainless steel trowel or spoon. Test pits and trenches will not be entered by any member of the sampling team.

The position of the test pit or trench will be determined in the field by the Project Geologist/Scientist. Utility clearance will be obtained from the Navy prior to excavation. Excavation equipment will be decontaminated prior to and after each test pit or trench excavation. Excavation will proceed by removing lifts of no more than about 6 to 12 inches, until an assessment of the material can be made. The material removed from the trench will be placed on plastic sheeting. A geologist will log the test pit materials. The cross section will be sketched or described and notable features will be identified in the field log book. Depths will be measured from the ground surface. The length and width of the test pit will also be measured. The test pits and trenches will be backfilled with the material removed from the excavation immediately after being completed to reduce site hazards and minimize the potential for rainwater accumulation and subsequent contaminant migration.

2.17 Surveying

Surveying activities will be necessary to establish northing and easting data for subsequent transfer to site maps and for development of groundwater flow maps. Surveying efforts will be completed by a qualified surveying subcontractor utilizing the Puerto Rico coordinate system, NAD 1983 Vertical Datum Grid System as the reference datum. The following land surveying activities may be conducted at the Base:

- Obtaining elevations of groundwater monitoring wells, piezometers, soil borings, and drive points, to an accuracy of 0.01 feet, referenced to mean sea level (MSL). Elevations will be determined from a United States Geological Survey (USGS) benchmark located at the facility. Benchmarks may not be readily accessible to the survey sites.
- Establishing the elevation reference point for wells at the top of the inner PVC well casing, and a permanent mark designating the elevation point. The ground surface elevation for each well and boring will be established to an accuracy of 0.01 feet. Horizontal control shall be established to the 0.1 foot.
- The location of each well, boring, and test pit will be tied into permanent land monuments (e.g., building corners). Horizontal control shall be established to the 0.1 foot.
- Grid intersections (for soil gas or geotechnical surveys) will be marked with wooden stakes or spray paint and will be numbered by the surveyor with a unique location number.
- Surveying of surface water/sediment sampling stations will be performed using geographic positioning system (GPS) equipment.

Portable GPS systems may also be used to determine horizontal coordinates for points, such as sampling locations and grid points. Horizontal control varies with different GPS systems.

2.18 Investigation-Derived Waste Sampling

IDW includes disposable materials used in the normal course of field operations, such as health and safety equipment and sampling equipment. IDW also includes materials generated from drilling and sampling activities, such as drill cuttings, development and purge water, and decontamination water. Base-wide IDW management is addressed in the Master IDWMP.

2.19 Decontamination

Temporary decontamination pads will be placed at strategic locations throughout former VNTR prior to field activities generating large quantities of water. The decontamination pads will be constructed of high density polyethylene and wood with elevated sides and a sump to collect fluids. These fluids will be pumped into a tank designated for that site. The location of the decontamination pads will be finalized during mobilization, as directed by former VNTR, and will be based upon areas or sites that are under investigation. Specific elements of decontamination are described below.

2.19.1 Sampling Equipment Decontamination

Sampling equipment (e.g., split-spoons, sampling trowels, bucket augers, bailers, etc.) will be decontaminated prior to sampling and between samples. Waters generated during decontamination of sampling equipment at each site will be contained in 55-gallon drums, pending receipt of analytical results and final disposition recommended to the facility.

Decontamination water will be segregated from all other water because of solvents and acids introduced into the water.

All heavy equipment, including the drilling rig, rods and augers, and other downhole equipment used during site investigation activities will be decontaminated prior to use and between locations using a high-pressure steam wash at a decontamination pad located on or near the site. The steam-cleaning water will be from a potable source. The decontamination water will be pumped into drums with a sump pump and the drums will be emptied immediately into a tank that is centrally located at each site. Monitoring well casings and screens will also be steam-cleaned using the same procedure, unless they are certified by the manufacturer as clean, and plastic seals are intact.

2.19.2 Personnel Decontamination

Personnel decontamination is discussed in the Master HSP.

2.20 Health and Safety Monitoring

The ambient air will be monitored during most field activities to determine the presence of organic and/or explosive vapors that may pose a health risk. The monitoring activities are discussed in detail in the Master HSP.

2.21 Field Tests

Various field tests may be performed during sampling activities. Field tests are commonly used at former VNTR to measure water quality parameters of groundwater and surface water and to assess the chemical properties of soil.

Water quality parameters that may be measured during field activities include pH, specific conductance, DO, temperature, alkalinity, and turbidity. Measurement of these parameters will be performed in accordance with site-specific WPs and FSPs,.

Field tests used to assess the chemical properties of site soils include, but are not limited to, X-ray fluorescence (XRF) field screening (to identify soil containing concentrated amounts of heavy metals); immunoassay screening (to determine the presence of polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons [PAHs], benzene, or trinitrotoluene [TNT] above certain concentrations); flame ionization detector (FID) and PID headspace screening (to detect the presence of organic and inorganic vapors being emitted from soil). All soil field tests will be performed in accordance with site-specific WPs, FSPs, and SOPs included therein.

Documentation

3.1 Sample Designation

Each sample will be designated by an alphanumeric code that identifies the site and matrix sampled and contains a sequential sample number. Site-specific procedures are elaborated below.

Location types will be identified by a two-letter code. Each sampling location will be identified with a two-digit number corresponding to the well or sampling location.

The following is a general guide for sample identification:

First Segment of Sample Number	Second Segment of Sample Number	Third Segment of Sample Number	
Naval Installation Abbreviation	Site Number	Sample Type	Sample Location
AA	AAA	AA	AAAAA

Symbol Definition:

A = Alphanumeric

Site Abbreviation:

AA = Two letter abbreviation identifying the Naval Installation where the sample was collected. Vieques Island = VI.

Site Number:

AAA = One letter and two numbers or three numbers identifying the site on the facility where the sample was collected (i.e., S01 = Site 1 and 201 = AOC 201)

Sample Type:

SS = Soil Sample
 SB = Soil Boring (subsurface soil) Sample
 SD = Sediment Sample
 SW = Surface Water Sample
 GP = Direct-Push Groundwater Sample
 GW = Groundwater Sample
 DR = Drum Sample
 PZ = Piezometer Sample
 SG = Soil Gas Sample
 TR = Trench Sample
 IS = IDW Soil Sample
 IW = IDW Water Sample

Sample Location

AAAAA = Unique sample number and qualifiers

Qualifiers

P = Duplicate Sample

L = Diluted for laboratory analysis

R = Rerun of laboratory analysis

Numbering Format for QA/QC Samples

QA/QC samples will follow the following pattern:

AA-DDMMYY

where the two digits before the hyphen will be alphabetic, by QA/QC type, and the six digits after the hyphen will designate the date on which the samples were collected. Eligible QA/QC sample types are:

FB	Field blank
TB	Trip blank
EQ	Equipment blank

The date designation will always have six digits in a DDMMYY format. Examples of this numbering approach for QA/QC samples are:

FB-100196	Field blank collected on October 1, 1996
TB-072997	Trip blank collected on July 29, 1997
EQ-080198	Equipment blank collected on August 1, 1998

3.2 Sample Shipping Procedures

All field sampling activities will be documented through the use of field logs and COC procedures. Sample containers will be provided by the laboratory as certified clean. An identification label, indicating the sample number, station number, analysis to be performed, preservative used, date and time of sample collection, and the name of the responsible sampling team member, will be attached to each sample container.

After being collected, samples will be packed in coolers with vermiculite and ice for delivery to the laboratory. COC forms will be taped to the inside of the lid of each cooler. COC forms contain general information about the location of the activity and the members of the sampling team, as well as specific information about type of sample, sample location, number of sample containers from each station, and analyses to be performed. Each time the sample is relinquished or received, the party involved signs the form and notes the time and date.

The coolers used to deliver the samples will be sealed with strapping tape. Evidence tape will be placed across the front and back of each lid to control tampering. The samples will be delivered to the laboratory at the end of each day of sampling to ensure that holding times are not exceeded.

Appendix H
Master Investigation-Derived Waste
Management Plan

Final

Master Investigation-Derived Waste Management Plan

U.S. Naval Ammunition Support Detachment (NASD) & Former
Vieques Naval Training Range (VNTR)
Vieques, Puerto Rico

Contract Task Order 047

Prepared for
Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

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Contents

List of Acronyms	iv
Introduction	H-1
Waste Handling	H-3
2.1 Solid IDW	H-3
2.1.1 Soils and Soil Cuttings	H-3
2.1.2 Non-Soil Solids.....	H-4
2.2 Liquid IDW.....	H-4
General Considerations	H-7
3.1 Minimization of IDW Volume.....	H-7
3.2 Labeling Drums	H-7
3.3 Storing IDW.....	H-7

List of Acronyms

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
IDW	Investigation-Derived Waste
IDWMP	Investigation-Derived Waste Management Plan
IR	Installation Restoration
NASD	U.S. Naval Ammunition Support Detachment
NAVFAC	Naval Facility Engineering Command
PPE	Personal Protective Equipment
TCLP	Toxicity Characteristic Leaching Procedure
VNTR	Former Vieques Naval Training Range

SECTION 1

Introduction

This Master Investigation-Derived Waste Management Plan (IDWMP) has been prepared for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigations at the former U.S. Naval Ammunition Support Detachment (NASD) and the Former Vieques Naval Training Range (VNTR) on Vieques Island, Puerto Rico. Investigation-derived waste (IDW) includes disposable materials used in the normal course of field operations, such as health and safety equipment and sampling equipment. IDW also includes materials generated from drilling and sampling activities, such as drill cuttings, development and purge water, and decontamination water. IDW generated during field activities will require waste management and disposal in a manner that is consistent with CERCLA regulations and minimizes potential hazards to the public. This IDWMP describes the methodologies and procedures that Navy and CH2M HILL field personnel will implement to handle, manage, and dispose of IDW at the former NASD and former VNTR.

Some examples of IDW that may be generated during field activities include:

- Soil cuttings generated during drilling
- Groundwater extracted during well development and sampling procedures
- Residual soil and water generated during the decontamination of field equipment
- Non-soil solids including used personal protective equipment (PPE) and disposable sampling equipment

SECTION 2

Waste Handling

This section describes the waste handling procedures to be followed during the field activities.

2.1 Solid IDW

Solid wastes, including soils, soil cuttings, and non-soil wastes, will be produced during field investigations. These types of solid IDW are discussed below.

2.1.1 Soils and Soil Cuttings

To the extent possible, soil cuttings generated during soil borings will be returned to the boreholes. Excess soil cuttings and soil cuttings generated during well installation will be contained in 55-gallon drums, roll-off containers, or other types of approved containers. In addition, soil that accumulates in the decontamination pad from the washing of drilling equipment will be containerized. Drums will be sealed and appropriately labeled.

At the conclusion of a drilling event, drums filled with potentially contaminated soil cuttings will be temporarily stockpiled at a location designated by Navy personnel. The Navy will then verify whether or not the material in the drums is hazardous, as specified in Title 40, Code of Federal Regulations, Part 261 (40 CFR 261). Sampling of the material in the drums will be conducted in accordance with the *Disposal of Waste Fluids and Solids* SOP.

Upon the receipt of these results, CH2M HILL will formulate a preliminary assessment of any potential hazards posed by the IDW and submit waste management recommendations to the Navy. If historical site information and the characterization sampling results do not suggest the presence of listed hazardous wastes and are below Toxicity Characteristic Leaching Procedure (TCLP) and characteristic regulatory limits, CH2M HILL will recommend that the waste management subcontractor dispose of the soil at a non-hazardous waste disposal facility.

If the composite soil samples from the drums contain contaminant concentrations above the regulatory limits, or the soil is determined to be a listed hazardous waste, the drummed soil will be considered hazardous. The waste management subcontractor will ship the hazardous waste to a regulated hazardous waste landfill.

The proposed steps for accumulating, handling, and disposing of IDW soils and soil cuttings are as follows:

1. Once soil cuttings have been returned to borehole to the extent possible, shovel excess soils and soil cuttings from the boring into 55-gallon drums or roll-off containers.
2. Stockpile drums or roll-off in the area(s) designated by the Navy.
3. Upon completion of field activities, perform waste characterization sampling appropriate for the site and potential disposal facility. Collect composite samples from

the drums and submit them to an approved offsite laboratory for the analyses required by the proposed disposal facility and any additional analyses appropriate for the particular site.

4. If the waste is considered non-hazardous, upon receipt of concurrence by the Navy, the waste management subcontractor will dispose of the soil in a non-hazardous landfill.
5. If the waste is considered hazardous, upon receipt of concurrence by the Navy, the waste management subcontractor will dispose of the waste at a regulated hazardous waste landfill where it will either be treated or stockpiled. The Navy will be responsible for signing all manifests, but may delegate this authority to CH2M HILL.

2.1.2 Non-Soil Solids

Non-soil solid material (e.g., disposable sampling equipment, personal protective equipment, etc.) may be decontaminated in accordance with the Equipment Decontamination SOP and disposed of with normal trash. Otherwise, the non-soil solid material will be placed in 55-gallon steel drums. Examples of PPE to be contained include nitrile gloves, tyveks, rubber boots, and respirator cartridges. Any expendable items that are used during sampling that are not decontaminated, such as in-line water filters, C-flex tubing, and paper towels, will also be contained in drums. Drums will be sealed and labeled appropriately and managed in accordance with the results of the soil and liquid IDW characterization results.

2.2 Liquid IDW

Groundwater as IDW will be produced during monitoring well development and groundwater purging and sampling. Groundwater will be contained in 55-gallon drums, or other types of approved containers. In addition, water generated during decontamination processes and excessive liquids separated from soil cuttings will be added to drums containing groundwater IDW. Drums will be sealed and appropriately labeled.

If groundwater is extracted from a background location or from where previous investigations have confirmed that contamination does not exist at the site, the groundwater will be discharged at grade in an area that will not affect the well being sampled or adjacent sampling locations.

At the conclusion of field activities, drums containing liquid IDW will be temporarily stockpiled at a location designated by Navy personnel. The Navy will then verify whether or not the material in the drums is hazardous, as specified in Title 40, Code of Federal Regulations, Part 261 (40 CFR 261). Sampling of the material in the drums will be conducted in accordance with the *Disposal of Waste Fluids and Solids* SOP.

Upon the receipt of these results, CH2M HILL will formulate a preliminary assessment of any potential hazards posed by the IDW and submit waste management recommendations to the Navy. If historical site information and the characterization sampling results do not suggest the presence of listed hazardous wastes and are below Toxicity Characteristic Leaching Procedure (TCLP) and characteristic regulatory limits, CH2M HILL will recommend that the waste management subcontractor dispose of the groundwater at a non-hazardous waste disposal facility.

If the groundwater sampling results indicate contaminant concentrations above regulatory limits, or the groundwater is determined to be a listed hazardous waste, the drummed water will be considered hazardous. The waste management subcontractor will ship the liquid IDW to a regulated hazardous wastewater treatment facility.

The proposed steps for accumulating, handling, and disposing of IDW liquids are as follows:

1. If previous investigations have either confirmed or suggested the existence of contamination at the site, or if investigations have not yet been conducted at the site, groundwater will be contained in 55-gallon drums or other suitable containers. In addition, water generated during decontamination processes and excessive liquids that separated from soil cuttings will be added to drums containing groundwater IDW. The drums will be sealed and appropriately labeled.
2. If groundwater is extracted from a background location that is not associated within a site or from where previous investigations have confirmed that contamination does not exist at the site, groundwater will not be contained during field activities."
3. Stockpile drums in the area(s) designated by the Navy.
4. Upon completion of field activities, perform waste characterization sampling appropriate for the site and potential disposal facility. Collect composite samples from the drums and submit them to an approved offsite laboratory for the analyses required by the proposed disposal facility and any additional analyses appropriate for the particular site.
5. If the waste is considered non-hazardous, upon receipt of concurrence by the Navy, the waste management subcontractor will haul the liquid IDW to the industrial wastewater treatment facility or remove it from the island and deliver to a certified industrial landfill.
6. If the waste is considered hazardous, upon receipt of concurrence by the Navy, the waste management subcontractor will haul the liquid IDW to a regulated hazardous wastewater treatment facility where it will be treated until it meets standards for disposal as appropriate. The Navy will be responsible for signing all manifests, but may delegate this authority to CH2M HILL.

General Considerations

General considerations pertinent to the generation and handling of IDW are documented in this section. These include the minimization of waste volume, drum labeling and storage, and disposal and manifesting protocol.

3.1 Minimization of IDW Volume

To minimize the volume of IDW soil generated during drilling of soil borings (not for well installation), cuttings will be used to backfill the boreholes from which they were removed to the maximum extent possible. Excess cuttings will then be contained as IDW.

Soil generated during trenching will be minimized by backfilling the trench pits with soil that was extracted from them during the excavation process. Excess soil will be graded with a backhoe in the vicinity of the filled trench.

To minimize the volume of IDW groundwater, only the minimum volume of discharge purge water necessary to stabilize the pH, conductivity, temperature, and other parameters, will be purged from wells. In addition, groundwater will not be contained if extracted from a background location not associated with a site or from where previous investigations have confirmed that contamination does not exist at the site.

3.2 Labeling Drums

Each 55-gallon drum containing IDW will be labeled with the following information: the type of IDW (groundwater, soil, PPE, etc.); the date the drum was filled and sealed; and a brief warning not to handle the drum or its contents without permission from the generator. The following is an example of the information to be included on each drum:

Investigation Derived Wastes
Purge Water from Site 2 - MW1
4-8-96
Do Not Handle - Analysis Pending
Ms. Madeline Rivera, Naval Activity Puerto Rico (NAVFAC ATLANTIC field office)

3.3 Storing IDW

Drums containing IDW will be stockpiled at an onsite location designated by Navy personnel, pending the receipt of characterization and sampling analytical results. The drums will remain at this location until the particular investigation is completed and the waste characterization results received and discussed with the Navy. Following Navy concurrence upon the recommended disposal option, the IDW will be removed by the waste management subcontractor.

Appendix I

Response to Comments

Response to Comments on *Draft Munitions and Explosives of Concern (MEC) Master Work Plan, Former Vieques Naval Training Range (VNTR), Vieques Island, Puerto Rico (CH2M HILL, September 2005)*

TO: Vieques Munitions Response Subcommittee

COPIES: NAVFAC Atlantic

FROM: CH2M HILL

DATE: April 4, 2006

This memorandum compiles the Navy's responses to all of the comments received on the *Draft Munitions and Explosives of Concern (MEC) Master Work Plan, Former Vieques Naval Training Range, Vieques Island, Puerto Rico (CH2M HILL, September 2005)*. For each reviewing agency, the comments have been reproduced, followed by the response in bold type.

EPA General Comments

1. The Munitions and Explosives of Concern (MEC) Master Work Plan (MWP) indicates in Section 1.5 (Former VNTR History) that an ammunition storage facility was completed on the western end of the island during 1943 and closed during 1948. This ammunition storage facility is apparently referred to as the "Former NASD" on Figure 1-1, but no definition as to what NASD represents is provided there or elsewhere in the MWP. Please provide an explanation as to what the acronym NASD means in the Acronyms and Abbreviations section of the MWP.

The following will be added to the Acronyms and Abbreviations list:

NASD - Former U.S. Naval Ammunitions Support Detachment

2. The MWP does not appear to have a complete listing of the munitions types and quantities employed at the Former VNTR since it was established. For example, Section 1.6.1, Live Impact Area (MRA-LIA), states that air-to-ground training activity began there in 1965, and naval gunfire was practiced there beginning in the mid-1970s. Section 1.6.2, Surface Impact Area (MRA-SIA), indicates that artillery firing at targets constructed in the area began in the 1950's, inert bombing began in 1969, and strafing started in 1971. Section 1.6.3 Eastern Maneuver Area (MRA-EMA) notes that small arms, tank and artillery firing began there in 1947. However, inspection of the tables in Appendix A, Historical Munitions Use at the Former VNTR, reveals that no types or quantities of munitions/weapons employed earlier than 1974 are provided therein. In

addition, these tables indicate that submunitions were employed at the Former VNTR, but they do not indicate the types of submunitions used. Since many types of submunitions exist and their hazards vary significantly by type, it is essential that this information be made available to persons performing MEC related work at the Former VNTR.

Please review the available source documents and verify whether or not records of munitions/weapons employed at the Former VNTR prior to 1974 are available. Please state the results of this verification in an appropriate location in the MWP, and include the records if they are located. In addition, please provide the types of submunitions employed at the Former VNTR or include a reference as to where this information may be found.

Information in the MWP reflects research from all available documents uncovered during the archive records survey. The EOD team range refurbishment data provides adequate information to safely conduct the anticipated munitions response actions at the former VNTR. Safety relevant to submunitions is addressed via a picture book document that is updated as previously unaddressed items are discovered. Safety briefings and precautions are structured to ensure all personnel are updated and briefed as to these findings. The MWP is not intended to include information as specific as this.

3. The MWP does not appear to address MEC which may be located in the waters contiguous to the listed range/maneuver areas, despite the fact that these areas are very likely contaminated with ordnance. The MWP should include information concerning the procedures for any work to be conducted in these water areas, or it should provide a reference as to where this information may be found. If this work plan applies only to terrestrial sites, Navy should add a statement to that effect and indicate whether a new document will be developed or this MEC MWP will be modified for any aquatic MEC cleanup/investigation work. Please revise the MWP to address this issue.

Information regarding MEC densities located in the contiguous, off-shore areas is provided in the ERA/Phase I SI Report (CH2M HILL, March 2006). Because the general scope for underwater work has not yet been developed by the Navy, specific procedures for work to be conducted underwater have not been addressed in this work plan. Future water-borne surveys and applicable work plans will be developed to cover this in the future when the general scopes are developed.

4. The document uses the terms Munitions Response Area and Munitions Response site without adequately defining the terms. Suggest using the definitions listed in the final Munitions Response Site Prioritization Protocol.

Definitions for MRS and MRA from the Prioritization Protocol will be added. Specifically, IAW EP 385-1-95a (27Aug04)

“Munitions Response Area (MRA) Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.”

“Munitions Response Site (MRS) A discrete location within a MRA that is known to require a munitions response.”

EPA Specific Comments

5. **Acronyms and Abbreviations, page xi:** The definition of the acronym “DDES” is given as “DoD Explosive Safety Board.” The correct definition should read “DoD Explosives Safety Board.” Please make this correction.

Acronyms and Abbreviations page will be updated with the correct definition: ‘DoD Explosives Safety Board’ for ‘DDESB’

6. **Figure 1-3, MRA, Parcel, and MRS Boundaries:** The legend provided on this Figure contains a red rectangle with the number “1” in it. It is indicated that this represents “MRA-LIA-SIA (C).” A review of the MWP finds no other use of this combination elsewhere in the document. It is, therefore, unclear as to what is meant by this combination of letters. Please review the noted portion of the legend and correct it as necessary.

The legend for Figure 1-3 has been revised to more clearly indicate that the red boundaries and number indicate the MRS boundary and MRS number.

7. **Section 1.0, Introduction, page 1-1:** The text regarding standard operating procedures (SOPS) could/should be more direct. It is somewhat vaguely worded and gives the impression that SOPs will be developed on a site-by-site basis. Later in the document Sections 2 through 13 describe in detail the overarching aspects of the SOPs. In many cases in very good technical detail. Recommend that the Navy make it clear that the provisions described in Sections 2 through 13 govern the SOPs for the individual sites, and that there may be reasons for some site-by-site modifications. Statements along these lines would more accurately reflect and support the later sections.

The second paragraph has been re-written as shown below.

“The objective of this Work Plan is to provide a description of general standard operating procedures for conducting MEC investigation, removal, and disposal actions at the Former VNTR. Specific locations and operating procedures for each site will be provided in separate Site Specific Work Plans (SSWP). Standard operating procedures may be modified to meet site specific conditions or to provide up-to-date revisions for procedures that have changed and are agreed to by the Navy and regulatory agencies. Deviations from procedures listed in this work plan will be noted in SSWPs.”

8. **Section 1.1, Background, page 1-1:** Recommend including a discussion of the NPL listing for Vieques, and the fact that response actions are being taken pursuant to CERCLA.

Section 1.5.1 has been added “Regulatory History” and the following text is included:

“A RCRA Part B Hazardous Waste Facility Operations Permit Application was submitted by the Navy to USEPA in 1988 for the operation of an Open Burn/Open Detonation (OB/OD) unit. A Draft Closure Plan for the OB/OD site was submitted to the stakeholder agencies, comprising the USEPA Region II, PREQB, and the DOI, by the Navy in February 2004 (CH2M HILL, February 2004). Comments were addressed from these agencies and the Draft Final Closure Plan (CH2M HILL, July 2004) was submitted for public comment; the public comment period was held from December 1, 2004 through January 31, 2005. The USEPA prepared responses to the public comments and submitted them on May 17, 2005. Based on the response to comments, the implementation of the Closure Plan will be delayed pending completion of clearance work for MEC throughout the VNTR.

In 2003, the Governor of Puerto Rico requested USEPA to list the VNTR (and NASD) on the NPL. On May 26, 2004, the President of PREQB sent a letter to the Regional Administrator of USEPA acknowledging that USEPA, PREQB, and DOI concurred with the designation of the former Naval facilities of eastern and western Vieques as an NPL site. In addition, a clarification of the Atlantic Fleet Weapons Training Area (AFWTA) was provided and stated that initial areas of Preliminary Assessment/Site Investigation (PA/SI) under CERCLA will focus on “Agreed Areas” in and around Vieques and Culebra where the Navy conducted operations, including “those waters in and around Vieques where contamination has come to be located.” On February 7, 2005, Vieques was placed on the NPL.

As a result of the NPL listing, a Federal Facility Agreement (FFA) is being developed that will be signed by the Navy, USEPA, and DOI. The purpose of the FFA is to ensure that potential environmental contamination from past activities are adequately evaluated and appropriate remedial actions are implemented, as necessary, to protect human health and the environment. The FFA will also establish the procedural framework and schedule for implementing these activities. With the listing on the NPL and the creation of an FFA, all future environmental restoration activities on Vieques will be conducted under CERCLA, with USEPA as the lead regulatory agency.”

9. **Table 1-1, Potentially Applicable or Relevant and Appropriate Requirements (ARARs) To Be Considered, page 1-2.** Recommend re-wording this Table as “Potential Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements under CERCLA.” Further recommend that the text that accompanies the table include a paragraph on ARARs and TBCs in the CERCLA process in order to give this context. Also recommend that the ARAR items to be expanded and listed separately from the TBCs. Most of what is in this table is DoD TBC requirements. CERCLA/SARA is not ARARs or TBCs. Also, correct/add the following:

- Add the Munitions Response Site Prioritization Protocol to the ARARs lists,
- Correct the EPA FUDS Policy reference to be the *EPA Policy Towards Privately-Owned Formerly Used Defense Sites*, 21 March 2002 as TBC.

- Under the EPA section, add the *Draft EPA Guidelines for Munitions Response Actions*, October 24, 2003 as TBC.
- The EPA Handbook reference is incorrect. The correct version and title of the EPA Handbook is: *EPA Handbook on the Management of Munitions Response Actions* (May 2005) and it is a TBC, not an ARAR.
- Under the EPA section, add the DoD and EPA *Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges*, March 7, 2000 as TBC.
- Under the EPA section, add the *Uniform Federal Policy for Implementing Environmental Quality Systems (EPA 505-F-03-001) (July 2004)*, the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) Manual (EPA 505-B-04-900A)*, and the *OSWER Directive 9272.0-17 Implementation of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) at Federal Facility Hazardous Waste Sites* as TBCs.

The last sentence in the third paragraph of Section 1.2 will be reworded to read 'MEC investigations and response actions will be executed... the MEC requirements of DoD 6055.9-STD; and any other Applicable or Relevant and Appropriate (ARAR) requirements and To Be Considered (TBC) requirements listed in Table 1-1.

Table 1-1 will be renamed: 'Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements under CERCLA'. In addition, Table 1-1 will be split into 2 sections: Table 1-1a - ARARs and Table 1-1b - TBCs.

The following additions and or corrections will be made to Table 1-1

- Remove the following: CERCLA 42 USC Sec 9601, SARA 42 USC Sec 11001, RCRA 42 USC Sec 6901.
- Update the EPA FUDS policy to read 'EPA Policy Towards Privately-Owned Formerly Used Defense Sites, 21 March 2002 as a TBC.
- Update the Handbook on Management of UXO at Closed, Transferring, and Transferred Ranges to read 'EPA Handbook on the Management of Munitions Response Actions, May 2005 as a TBC.
- Add 'Munitions Response Site Prioritization Protocol 32 CFR, Part 179, October 2005' as an ARAR.
- Add 'Draft EPA Guidelines for Munitions Response Actions, October 24, 2003' as a TBC.
- Add 'Uniform Federal Policy for Implementing Environmental Quality Systems, EPA 505-F-03-001, July 2004' as a TBC.
- Add 'Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) Manual, EPA 505-B-04-900A' as a TBC.

- **Add 'Implementation of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) at Federal Facility Hazardous Waste Sites, OSWER Directive 9272.0-17' as a TBC.**

The following paragraphs will be added after Table 1-1 in Section 1-2 to describe ARARs and TBCs:

'Applicable Requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited (appropriate) to the particular site. Requirements must be relevant and appropriate to be an ARAR of this type.

TBCs are non-promulgated, non-enforceable guidelines or criteria that may be useful for establishing a cleanup level or for designing the remedial action, especially when no ARARs exist or they are not sufficiently protective.'

10. **Section 1.4.7, Groundwater, page 1-17:** The text describes some of the results a USGS groundwater survey (Vargas 1995) and concludes that groundwater is non-potable due to high sodium levels. The text infers this information came from wells sampled near Esperanza. It is not logical that a blanket statement on potability can be drawn from wells in one area. This has important implications for activities like blow in place and sampling for munitions constituents where transport to groundwater resources is possible.

The text in this section is stating that a groundwater study conducted on Vieques "included" tests on wells near Esperanza. The text is not meant to infer that only wells near Esperanza were studied. For clarity, the first sentence of the fourth paragraph of Section 1.4.7 will read 'The U.S. Geological Survey performed a groundwater study throughout Vieques Island, including tests on wells near Esperanza.'

11. **Section 1.5, Former VNTR History, pages 1-17 to 1-18:** The first paragraph of this section notes that, "The Navy has owned portions of Vieques since 1941, when land was purchased for use as ammunitions storage facility in support of World War II training requirements. Construction of facilities for ammunition storage, located on the west end of Vieques, was completed in 1943. These facilities operated until 1948 when they were closed. Although the island of Culebra was the focal point for naval gunfire in the 1960s and early 1970s, AFWTF began developing facilities on the eastern end of Vieques in 1964 when it established a gunnery range in the MRA-LIA. In 1965, the Navy established a LIA, also known as the air impact area, and began construction

activities at OP-1 on Cerro Matias.” No mention is made in this section of any training involving firing activities during the period 1941 through 1959. However, the last paragraph of this section on page 1-18 states that, “Portions of the training areas acquired within the VNTR were in continuous use since World War II, when the Navy acquired land, until 2003.” This seems to state that there was training conducted at the VNTR during the period 1941-1959, but does not state whether this involved range firing, or which ranges/facilities were used to conduct the training. Please review the cited paragraphs of this section and revise them as necessary to better describe the VNTR history including the location and type of training conducted during the 1941-1959 time-frame.

The military activity prior to 1947 was confined to west Vieques. The following text will be added following the third sentence identified in quotes above: “In 1947 the Navy purchased the land on the eastern end of the island, now known as the former VNTR. Training for amphibious and ground warfare commenced shortly after the U.S. government purchased the land. To support the deployment of a Marine regiment (3,000 people) at Vieques, the Fleet Marine Force (FMF) constructed a camp (Camp Garcia) in 1954 and 1955. FMFLANT designated Camp Garcia a separate organization in 1960; and tasked it with providing logistical and training support to FMFLANT units using the EMA. At the height of activity at Camp Garcia in the mid 1950s and early 1960s over 300 military and 60 civilians were employed at the camp,, However, both military and civilian employment have declined steadily, and Camp Garcia was closed on December 14, 1978 ”.

12. **Section 1.6.3, Eastern Maneuver Area (MRA_EMA), page 1-19:** The third paragraph of this section notes that, “A detailed field reconnaissance for each of these gun positions was completed and is summarized in the Preliminary Range Assessment Report (CH2M HILL, April 20003) summarizes these field visits.” This sentence appears to be incorrectly constructed and is difficult to understand. Please review the cited sentence and correct it as necessary to better express the intended meaning.

The third sentence in the third paragraph of section 1.6.3 will read ‘A detailed field reconnaissance for each of these gun positions was completed and is summarized in the Preliminary Range Assessment Report (CH2M HILL, April 2003).’

13. **Section 1.9, Work Plan Revisions, page 1-20:** Please modify to provide for EPA review of any changes to the MWP.

The last sentence in the second paragraph will read ‘NOSSA, in conjunction with the USEPA and PREQB, will review all proposed Work Plan revisions.’

14. **Section 2.2, Guidance, Regulations, and Policy, page 2-1:** The word “applicable” has specific meaning under CERCLA. Policies and guidance cannot be ARARs. However, DoD may be compelled by internal policies to follow them. Need to be clear on the distinctions between DoD requirements and statutory compliance. For example, DDESB 6055.9 is not an ARAR under CERCLA. It is a TBC. DoD still has to follow it.

Also, recommend adding EPA Guidance for Conducting RI/FS under CERCLA.

Section 2.2, first paragraph, second sentence will be revised to read ‘Additional guidance, regulations, and policies that are potentially applicable or to be considered to the Former VNTR (ARARs and TBCs) are referenced in Table 1-1 of this Master Work Plan.’

Additionally, all regulations listed are TBCs. Therefore, all references to ‘applicable’ have been replaced with ‘to be considered’ under the listed regulations within Section 2.2.

15. **Section 2.4.8, Vegetation Removal, pages 2-15 to 2-16:** In the fourth paragraph of this section, which is the second paragraph on page 2-16, it is noted that, “When mechanized vegetation removal methods are selected and initial cut may be made prior to the surface sweep with the aid of magnetometers. If no MEC or metallic debris is found, the vegetation can be cut to within 6 to 12 in. above ground level.” This seems to omit what happens if MEC or metallic debris is found. If it is found, is it removed and the cutting proceeds? Please expand this paragraph to explain what is done if MEC or metallic debris is found during the surface sweep.

Section 2.4.8, Vegetation Removal, page 2-16, second paragraph will be revised to read “When mechanized vegetation removal methods are selected an initial cut may be made prior to the surface sweep for MEC. Vegetation will be cut to height no lower than 24-in. above ground level. UXO technicians will then perform a surface sweep with the aid of handheld magnetometers. If MEC debris is found and can be moved, it will be transferred to a consolidation point prior to further cutting to the 6-in. to 12-in. level. If it is determined that the MEC can not be moved without adversely affecting the ongoing clearance effort, the it will be marked and the vegetation removal and subsequent surface clearance will avoid that area and continue. The MEC or metallic debris will be addressed at a time when it does not adversely affect production of the vegetation removal and surface clearance. If no MEC or metallic debris is found, the vegetation can be cut to within 6 to 12 in. above ground level”

16. **Section 2.4.10, Anomaly Excavation, Hand Excavation Tools, page 2-16:** This section limits hand excavation to 1.0 feet below ground surface. There is no reason given for this depth restriction. Please include discussion on the basis for this restriction.

The text “The excavation activities will be limited to a depth of 1-ft” will be replaced “Anomaly excavation will be accomplished using guidance provided in USACE EP 75-1-1, paragraph 6-7.g and safety considerations regarding excavation shafts in soil provided by EM 385-1-1, paragraph 26.F.01. Specifically, all excavation within 12-inches of the anomaly will be accomplished by hand.”

17. **Section 2.4.10. Anomaly Excavation, pages 2-16 to 2-17:** In this subsection entitled Hand Excavation Tools, subparagraph number 2 on page 2-16 and 2-17 states that, “Until the anomaly is identified otherwise, it is assumed that the anomaly is MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will

continue down until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument, or until the maximum depth of excavation required by the work plan is reached.” No statement is made as to what additional actions will be taken if the anomaly is not resolved when the maximum depth of excavation is reached.

In addition, subparagraph number 7 indicates that, “The hole will be backfilled only after the UXOQCS concurs that the excavation is complete.” No statement is made as to whether the Navy quality personnel will be informed prior to the backfilling of the excavation.

Please revise subparagraph number 2 to include the actions to be taken if the anomaly being investigated is not resolved when the maximum depth of excavation is reached, to include the organizations notified and the methods for ensuring that the abandonment in place of an unresolved anomaly is noted in the formal record. Also, please revise subparagraph number 7 (or any other appropriate subparagraph) to include a statement regarding how and when the Navy quality personnel will be invited to inspect the excavation.

An additional bullet (number 8) has been added to the text: ‘Anomalies not unearthed during excavations completed to the maximum depth identified in the site specific work plan will be recorded in the project database, which will include at a minimum depth of excavation and coordinate location, and will be included in the appropriate investigation/removal action report.’

An additional bullet (number 9) has been added to the text: ‘Excavations will not be backfilled until the QA process has been completed and the designated NAVFAC QA personnel indicated the excavation can be backfilled.’

18. **Section 2.4.11. MEC Procedures, pages 2-17 to 2-20:** In the subsection entitled Hazardous, Toxic and Radioactive Waste found on page 2-20, the first sentence notes that, “There is documented use of 25mm depleted uranium (DU) projectiles at the former VNTR during a one time event, where approximately 250 to 300 rounds were fired in the vicinity of the ‘convoy target’ located east of the ‘mock runway,’ of the rounds fired approximately one half were recovered.” This sentence appears to be an inadvertent combination of what should be two sentences, which makes it difficult to understand. Please revise the cited sentence.

The first paragraph of the HTRW in Section 2.4.11; a period will be inserted after ‘mock runway’ and the second sentence will begin with ‘Of the rounds fired,’

19. **Section 2.4.11, MEC Procedures, page 2-19:** The text states that the Navy will alert USFWS, USEPA, and PREQB in the event there are trespassers so that these agencies can notify proper enforcement authorities. It would be more efficient for the Navy to notify the enforcement authorities directly as well as notify the agencies for support.

In this paragraph (last paragraph under “MEC Holding Areas”), the intent is to notify the USFWS, USEPA, and PREQB personnel of the ‘possibility of increased

trespassing’. If a change in site conditions or a specific incident raises question as to the security of the site, enforcement agencies for both waterway access and land access should be notified by government agencies via site workers. In the event of actual trespassing, authorities will be notified immediately along with the timely notification of USFWS, USEPA, and the PREQB.

The following sentence will be added as the second to last sentence in this paragraph ‘In the event of actual trespassing incident, proper authorities will be notified immediately along with the timely notification of USFWS, USEPA, and PREQB.

20. **Section 2.4.14, Statistical Sampling Methodologies, pages 2-22 to 2-23:** The text mentions that transect sampling methods are difficult in heavy vegetation. This is accurate. However all of the sampling methods described here in the text are difficult in heavy vegetation. In regard to the meandering path method, based on discussions with USACE, this is not a “random” transect methodology. It is designed to recognize that in certain vegetation, straight or near straight lines for parallel transects will not be possible. However, the expectation is that a generally parallel transect investigation will be conducted. It is important to keep in mind that this type of investigation takes place when in the search mode for target area and other high density areas. Once these areas are located more intensive geophysics can be undertaken to better define the nature and extent. Also, the statement “Statistical sampling has evolved over the years as follows:...”incorrectly infers that this list is a hierarchy of methods with the last being the “best” or state of the art (meandering path?)

Nowhere is it stated that the ‘meandering path’ is a random transect methodology. The random pattern sampling is a distinct technique that employs randomly selected grids. Meandering does not imply a random sampling process.

The second sentence in the first paragraph of Sampling Methodologies will be revised to read ‘Statistical sampling has evolved over the years to generate the following techniques:’

The last sentence in the 5th bullet in Section 2.4.14 will be deleted.

21. **Section 2.4.14, Statistical Sampling page 2-23:** EPA does not agree that the use of SiteStats/GridStats can result in a statistically defensible sampling approach for a munitions investigation. See the *EPA Interim Guidance on the Use of SiteStat/GridStats and other Army Corps of Engineers Statistical Techniques to Characterize Military Ranges, January 19, 2001*

Section 2.4.14, page 2-23, first bullet. The Random-Pattern Sampling bullet will be removed.

22. **Section 9.0, Quality Control Plan, pages 9-1 to 9-22:** The pages of this section in the copy of the MWP are numbered beginning with 9-1 and running through 9-9. Page 9-

10 is omitted, and then the pages run from 9-11 through 9-22. Either a page numbering error exists or a page is missing. Please review this and correct as necessary.

There are no missing pages. This will be corrected by reformatting.

23. **Section 9.5.2, Level of QC Inspection, page 9-9:** Recommend defining the verification level and proper use of MIL STD 1916 and the procedures that will be followed. Delray Cheah (US Navy) and Arkie Fanning (USACE) are co-authoring a paper on proper use of MIL STD 1916 for MEC response actions. That report when finalized should be followed.

Depending on the definable feature of work or operation being audited, initial VLS may vary. As indicated, site specific work plans will identify the initial VL.

24. **Section 9.7, Government QA Activities, page 9-18:** The text here states that the Navy will use AQAPs for QA/QC. How will this interface with MIL STD 1916 procedures?

AQAPS, as stated, is a repository for QA results and a management tool. This is separate from the MilStd 1916, which is a QA process.

25. **Table 10-2 Rare and Endangered Terrestrial and Amphibious Wildlife at VNTR, page 10-2:** In this table, all of the rare or endangered species listed are noted as not having been observed during the study, with the exception of Trimeresurius (Fer-De-Lance). This would seem to indicate that this species was observed during the survey. However, this species is listed in the table as "Rare or Extinct." It would seem very unlikely that this species is extinct if one was observed during the referenced study. Please review this table and correct it as necessary.

Footnote for Trimeresurius has been revised on Table 10-2 to indicate "not observed during study".

26. **Section 10.4, Water Resources within the Project Site, page 10-3:** The text only describes ocean water resources. It should include groundwater. See comment#9 above.

Section 10.4 will be re-titled 'Surface Water and Groundwater Resources within the Project Site'.

Additionally, the entire section will be replaced with 'Based on available aerial photography, surface water resources located within or adjacent to the project area, are the Caribbean Sea to the north, south, and east and several lagoons primarily along the coast.'

27. **Section 10.8, Compliance with ARARS, page 10-4:** Need to expand the compliance with ARARs discussion to include; what they are; chemical specific action specific, location specific; difference between applicable and relevant and appropriate; clearly describe that NPL sites must meet ARARs - this is a threshold CERCLA/NCP requirement; be clear that for most activities conducted entirely on-site, permits are not required. etc.

The definition of ARARs and TBCs is provided following Table 1-1 in Section 1.2.

The discussion of chemical, action, and location specific ARARs is beyond the intended scope of this document. Further explanation of compliance with ARARs as required for environmental site implementation is contained in the Environmental MWP for Vieques, CH2M HILL, January 2001.

The last sentence in Section 10.8 Compliance with ARARs will be changed to read 'Other ARARs and TBCs to be followed were presented in Table 1-1.' The following sentence will be added as the last sentence in the paragraph 'All sites addressed under the NPL must meet the ARARs set forth in this document, the Environmental MWP (CH2M HILL, January 2001), and other ARARs as necessary.'

28. **Table 10-3, ARARs for Environmental Protection, page 10-4:** This table lists three laws that pertain to environmental protection. There are many more; as an example, Essential Fish Habitat, as well as other state environmental protection.

See response to USFWS Comment# 1.

29. **Section 11.4, Disposition of Material that Presents a Potential Explosive Hazard (MPPEH)/Munitions Debris (MD), page 11-2:** need to explore if actual 90 day Emergency RCRA Permit would be required for onsite work.

The first bullet in Section 11.4 has been changed to read: 'Prior to the treatment of any MPPEH/MD State and Federal regulatory agencies will be notified.'

30. **Appendix A Historical Munitions Use at the Former VNTR in Table A-1 Types of Ordinance Used on the Inner Range, 1983-2003, on page 1,** the term "inner Range" is used with no explanation as to what area of the VNTR this encompasses. Please define the boundaries of the "Inner Range" at an appropriate location in the MWP.

The term "inner range" is outdated and was used to refer to the LIA, SIA, and EMA operational areas. The title of Table A-1 will be revised to 'Types of Ordnance Used at the Former VNTR, 1983-2003'.

31. **Appendix E, Management of MPPEH/MD, Demilitarization Requirements, page E-3:** The text indicates a 5X requirement for decontamination of MMPEH/MD. Section 11.4, Disposition of MPPEH/MD, has the requirement as #X. Please correct for consistency.

The following has been added to the second bullet in Section 11.4: 'MPPEH/MD that will be released for public use will be certified 5X'.

U.S. Fish and Wildlife Service Comments

1. **Table 1-1 Potential Applicable or Relevant and Appropriate Requirements (ARARs) To Be Considered:** This table does not include the following Federal ARARs; Endangered Species Act, Migratory Bird Treaty Act, National Wildlife Refuge System Improvement Act, Clean Water Act and Magnuson-Stevens Act. While some of these are mentioned in Section 10, they should also be included in Table 1-1. We have noticed that there seems to be some confusion regarding environmental ARARs. We highly recommend a meeting with the concerned Commonwealth and Federal resource agencies, Navy, its consultants, the EPA project manager and EPA ARAR

specialists. This would assure that all ARARs are addressed and that the goals and purpose of the Master Work Plan are met.

Table 1-1 is a list of ARARs to be considered (TBCs). Table 10-3 addresses specific environmental ARARs. The following Federal Acts will be added to Table 10-3: Clean Water Act, Endangered Species Act, Fish and Wildlife Conservation Act, Magnuson-Stevens Fishery Conservation and Management Act, Migratory Bird Treaty Act, and the National Wildlife Refuge System Improvement Act. The Endangered Species Act and Migratory Bird Treaty Act are already listed. See response to USFWS Comment #5.

2. **Section 2 Technical Management Plan: Section 2.3 Project Team.** The description of the Project Team Organizational Structure does not mention who or how coordination with the Vieques Island National Wildlife Refuge (VINWR) Refuge Manager will take place.

Section 2.4.2 Archive Search. While an archive records search was conducted in 2002, DOI has previously questioned whether or not the search was as complete as it could be. The Navy should consider a supplemental Archive Search.

Section 2.4.3 does state that DOI personnel on Vieques will be contacted during pre mobilization, however, we would like to see additional details. Close coordination with the Service is essential to assure compliance with ARARs and avoid unnecessary delays.

Section 2.4.12 Operations In Sensitive Areas: In order to aid the Project Manager in identifying sensitive areas, we recommend that an environmental sensitive area map be developed and included in the Master Work Plan, sites specific work plans, and contractor work plans. This map can be a combination of the existing NOAA Sensitivity Index Map and the maps developed for the Integrated Natural Resource Management Plan (INRMP). Production and distribution of such a map to all levels would assist administrative and field personnel in identifying sensitive areas well in advance of field activities.

The following has been added after the third bullet in Section 2.3.1: 'All communications with the landowner, stakeholders, and regulators will be made through the NAVFAC RPM or NAVFAC Field Representative. Other project personnel may be identified as points of contact on a project specific basis.'

Section 2.4.3, the last bulleted item under pre-mobilization will say "Coordinate with DoI personnel on Vieques Island to ensure compliance with all ARARs and identify in advance of mobilization specific operational areas".

Prior to conducting any significant vegetation or MEC clearance activities, the Navy will conduct a biological survey to identify any potential endangered plants and provide this information to the USFWS for review. A Biological Assessment is being conducted for cleanup activities associated with Vieques Island. The USFWS will be consulted during the preparation of an accurate graphical representation of sensitive areas located within work areas, which will be given in the site specific work plans. Administrative and field personnel will be familiar with this

document prior to the implementation of any field work conducted. In areas where there is a potential for the munitions response actions to impact cultural resources, any notifications to the SHPO will be copied to the USFWS. To ensure effective communications with DOI meetings are held on a quarterly basis with DOI, as well as other agencies to provide update of upcoming field activities.

An archive records search was completed for the Preliminary Range Assessment in 2003. Additional records were reviewed and interviews were conducted for for the Environmental Baseline Survey in 2003 and the RCRA Facility Investigation in 2004. Furthermore, additional potential munitions response sites were identified in two separate aerial photo analyses completed for the PRA and the ERA/ Phase I SI. If any of the agencies are aware of documents that were not reviewed during these archive searches, the Navy would be glad to incorporate the findings of the documents into future phases of the SI.

3. **Section 10 Environmental Protection Plan: Table 10-1 Rare and Endangered Terrestrial Plant Species of VNTR:** The section includes several species lists, Table 10-1 and Table 10-2. We recommend developing a list for federally listed species and a list for migratory birds known to occur or expected to occur in the area covered by the master plan. The list of federally listed species should include all plant and animal species known from Vieques, and species for which the project area provides suitable habitat. These species include: *Eretmochelys imbricata* (Endangered), *Dermochelys coriacea* (E), *Chelonia mydas* (Threatened), *Caretta caretta* (T), *Trichechus manatus manatus* (E), *Pelecanus occidentalis occidentalis* (E), *Sterna dougalii dougalii* (T), *Epicrates monensis granti* (E), *Stahlia monosperma* (T), *Chamaecrista glandulosa var mirabilis* (E), *Goetzea elegans* (E), and *Calyptanthes thomasi* (E). Suitable habitat for each of the federally-listed species should be identified by qualified personnel in conjunction with the Service on an aerial photo or a map, and not just in a table format.

Migratory bird habitat should also be identified in coordination with Service personnel and also be depicted on photos or maps.

Protection of Commonwealth listed species should be considered another ARAR and coordinated with the Puerto Rico Department of Natural and Environmental Resources.

The following has been added after the second sentence in Section 10.1: 'These actions will include, for areas identified, vegetation, habitat, and wildlife surveys.'

The Biological Assessment that is currently in progress will address ecological issues including those dealing with species known to occur or expected to occur within the LIA and provide the measures necessary to avoid impacts to ecological resources. The biological assessment will be expanded to other areas with USFWS concurrence and will be included in a revision to this document when finalized.

4. **Section 10.2 Wetlands within the Project Site:** We believe that it is erroneous to state that no wetlands are expected to be impacted. Wetlands exist throughout VNTR as mangrove lagoons, salt flats, and streams. Three coastal lagoons, Laguna Anones,

Laguna Gato and Laguna Icacos, are all located within the proposed LIA work area. These lagoons are heavily pitted with bomb craters and have exposed MEC. Currently these lagoons are flooded during heavy rain events. Several other herbaceous wetland areas are associated with these lagoons as well.

A map depicting the wetlands within VNTR should be included in this section. This could be included in the proposed sensitive area map, or separately. The FWS National Wetland Inventory or Navy INRMP maps can be used as a basis for this map. This information should be provided to personnel at all levels.

Impacts to wetland during MEC operations should be expected since there are wetlands associated with the LIA, EMA and SIA. Mitigation measures to minimize impacts to wetlands should be discussed in this Master Work Plan. The Service considers the Navy's MEC work in these areas to be a form of partial wetland restoration and recommends that after the MEC removal, reforestation and restoration of hydrology to these wetlands should be considered.

The first paragraph in section 10.2 will be replaced with:

'The impact to wetland areas will be variable depending on the MEC identified and the method of clearance. Prior to mobilization, each site will be carefully screened for adjacent wetlands, mangrove lagoons, salt flats, or other herbaceous wetland areas by qualified personnel. In the event that wetlands may be impacted, coordination with USFWS will be initiated to determine the necessary steps to take prior to initiating work. In such a case, mitigation measures will be taken to reduce the impact on the wetland ecosystem.'

A map depicting all wetland areas will be included in the site specific work plans when the areas to be addressed have wetlands or operations may impact wetlands. Additionally, the Biological Assessment, when expanded, will address ecological resources outside the LIA.

5. **Section 10.8 Compliance with ARARS:** As stated previously several ARARs are missing, and the contents of Table 10-3 should also be reflected in Table 1-1. To resolve this we recommend a meeting with the resource agencies, Navy and EPA to resolve the ARAR issue.

The following ARARs will be added to Table 10-3: Clean Water Act, Fish and Wildlife Conservation Act, Magnuson-Stevens Fishery Conservation and Management Act, and the National Wildlife Refuge System Improvement Act. These will be considered ARARs for site work conducted within the VNTR.

Subcommittee meetings for the Munitions Response Subcommittee and Environmental Restoration Subcommittee are held, at a minimum quarterly, with representatives from EPA, EQB, the Navy and USFWS. These meetings are held to discuss the technical approach for work plans and reports, including discussions of how ARARs are to be met for specific response actions.

See response to Comment #1.

6. **Section 10.9 Detail Procedures and Methods to Protect and/or Mitigate the Resources/Sites Identified:** We do not believe that the two measures provided in Section 10.9 satisfy the requirements of the ESA. As we have indicated in previous correspondence and expressed in several meetings with the Navy and its consultants, the Navy needs to develop a Biological Assessment or Biological Evaluation for the cleanup activities. This is particularly needed when a master plan is being developed that will serve as a guide for all future cleanup activities.

The assessment/evaluation should: 1) provide information regarding the species present/possibly present in the Action Area; 2) evaluate potential direct and indirect effects on listed species and their habitats; 3) discuss the conservation measures to be incorporated into the project plans to minimize possible adverse effects, and 4) assist in determining the type of consultation required for the action. For example, the assessment should also include the specific protocols or monitoring plans for searching endangered plants, sea turtle nests, and migratory bird colonies within the Action Area. If possible adverse effects are anticipated, formal consultation should be initiated with the Service.

The draft Biological Assessment for the LIA (GeoMarine, February 2006) is currently under review by USFWS. After the biological assessment has been finalized it will be expanded to the other areas, with concurrence from USFWS, in the VNTR where MEC work will be carried out. When any versions of the biological assessment are finalized this document will be revised to include those documents or references to those documents. The following has been added to the first paragraph in Section 10.9: 'A draft Biological Assessment for the LIA (GeoMarine, February 2006) is under review by USFWS. The Biological Assessment will be expanded to other MEC operational areas, with concurrence from USFWS, after the current document is finalized. In the interim, USFWS will be consulted on all MEC operations to ensure the appropriate measures are in place to protect ecological resources.'

7. **Appendix A Historical Munitions Use at the Former VNTR:** In addition to simply listing munitions types, this section should have a photograph or drawing of each munitions item along with a description of its use. This is partly done in Table A-1 in the shaded area "Description of Selected Ordnance Terminology". This terminology should be applied to all items listed in Table A-1. The same should apply to submunitions. This would help non EOD users of this Master Work Plan including site managers to have a better knowledge of what these items are and the risks involved with each. Also the type of explosive compound or filler of these items should be listed since this may drive future sampling plans. For example, MK-77 is listed as one of the live ordnance used on Vieques. This item is listed in various references as a fire bomb or napalm bomb. Table A-3 shows that about 200 of these items were used in 1975. If in fact this is the item listed in Table A-1, then sampling around the areas where they were used may need to be modified.

As stated in Section 1.5 VNTR was also used by NATO and other allied armies. A listing of all foreign MEC that could possibly be found should also be included in this appendix along with drawings and details of these items as well.

This Appendix should be updated if new items, not already on the list are found.

Items identified as part of investigations or removal actions are recorded and presented in the appropriate report for that action. The item filler, if known, is recorded as part of the project database. The expansion of Appendix A on a continuous basis would result in a voluminous document that would not serve the broader purposes of this document. Additionally, diagrams for items present or potentially present would result in a multi-volume document that once again goes beyond the scope of this work plan. As the reviewer has found there are a number of references available which give information regarding munitions items. For safety purposes an on-site log of photos of items of interest is updated regularly for on-site personnel.

Personnel without the appropriate UXO training are not allowed on-site without an escort who meets the appropriate requirements and all MEC are considered to pose an acute hazard to human health unless otherwise deemed safe. Any potential environmental hazards associated with an item will be related to the standard attributes recorded in the project database (e.g., filler).

8. **Appendix B Site Safety and Health Plan: Section B.4.3.17, Biological Hazards and Controls** needs to include several toxic native plants. These are manchineel, castor bean, *Comocladia* and *Croton*. Manchineel (*Hippomane 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*) also has sap that can cause skin lesions and is found in previously disturbed coastal areas. *Comocladia* is a small shrub found in limestone soils such as the eastern part of the LIA, it has toxic sap and can cause allergic reactions. Another invasive shrub is *Croton discolor*. This small shrub rapidly invades cleared or disturbed areas and can cause respiratory allergies. Photos of these plants and appropriate first aid should be included in this Master Work Plan.

Information concerning manchineel, castor bean, *Comocladia* and *Croton* will be added to Appendix B Site Safety and Health Plan: Section B.4.3.17.6 Other Anticipated Biological Hazards.

9. **Appendix G Section 2.16.2 Fish Sampling:** Any fish collected as part of a sampling plan should follow the protocols established in the Illustrated Field Guide for Assessing External and Internal Abnormalities in Fish (USGS/BRD/ITR 2002-0007) and Biomonitoring of Environmental Status and Trends Program: Selected Methods for Monitoring Chemical Contaminants and their Effects in Aquatic Ecosystems (USGS/BRD/ITR 2000-0005). These protocols are designed to determine if impacts to fish are occurring at a physiological level.

This appendix is taken from the Environmental MWP. For continuity, any changes recommended for this appendix should be addressed to the Environmental MWP and this appendix will be updated or revised to include the information.

UXO Pro, Inc. Comments

1. **Section 1.9, Pg 1-20:** Please add that EQB will be notified of revisions to this work plan prior to their implementation.

The last sentence in the second paragraph will read: ‘NOSSA, in conjunction with the USEPA and PREQB, will review all proposed Work Plan revisions.’

2. **Section 2.4.3, Pg 2-12:** Please add a requirement under “pre-mobilization” for the RA contractor to develop a site-specific work plan containing all of the required site-specific information.

The following bulleted item will be added to the ‘pre-mobilization’ list

- **Development of a site-specific work plan by the Remedial Action contractor containing all of the required site-specific information.**

3. **Section 2.4.6, Pg 2-14:** This section refers to the MR-SIMS system that is used to collect field data. It is recommended that data collection requirements for this system be reviewed by the MR Committee so they can examine what data is going to be captured. Note that the MR committee was assigned by the CTC to review the data being collected and has never completed that task.

Noted. The MRSIMS system has been demonstrated to some project team personnel. A future demonstration will be scheduled.

4. **Section 2.4.8, Pg 2-15:** There is no mention of potentially clearing vegetation by controlled burning. Since this is a MWP it may be appropriate to say that controlled burning is being considered, may be implemented if regulatory issues can be resolved, and, if used, will be described in a site-specific work plan.

At this time, due to the legal limitations, controlled burning cannot be conducted at the Former VNTR. If this changes this document will be revised to include that vegetation clearance method as an option. Specific plans to carry out this operation will be developed and any general procedures will be included in a revision of this document.

5. **Section 2.4.10, Pg 2-16:** This section on “hand excavation tools” limits the depth of excavation to 1-ft. It is recommended that this limit be removed from the work plan because in some circumstances it may be easy to dig to deeper depths by hand (for example, on a beach). The dept limit for excavation should be specified in the site specific work plan, not this master work plan.

See response to EPA comment number 16.

6. **Section 2.4.11, Pg 2-20:** This section requires that Fort Gillem, Georgia be contacted in the event that RCWM is found. Please inform EQB why this unit has been selected.

Other Navy units may be closer and able to respond faster. Is there a requirement to contact the 52nd Ordnance Group in this case?

Currently the 52nd Ordnance Group is DoD's point of contact for all RCWM. After notification to the 52nd Ordnance Group they may elect to have a geographically closer unit respond.

7. Section 2.4.13, Pg 2-21: The first bullet on the page says that the contact information for EQB and other organizations can be found in Appendix A. This is not correct (appendix A is "historical munitions use"). Possibly this reference should be appendix D, the "BIP notification protocol".

The reference will be corrected to indicate 'Appendix D.'

8. Section 2.4.13, Pg 2-21: It is recommended that the disposal notification requirement for EQB be added to this section. Otherwise, it is only found on Appendix D (24-48 hours).

The following will be added as the second to last sentence in the Notification Procedures section: 'The PREQB shall be notified within 24 to 48 hours.'

9. Section 2.4.13, Pg 2-21: Range fires have been a problem. It is recommended to include precautions to be taken to prevent range fires caused by MEC detonations in this section on MEC disposal or to include a new section on this subject. It is appropriate that the MWP identify this problem and analyze applicable solutions.

A Prescribed Burn Plan for the TCRA within the LIA, which contains several preventative measures for the spread of fire resulting from MEC detonations, is currently under review by EPA, DOI and EQB. Fire preventative measures proposed include: the establishment of fire breaks surrounding the detonation areas, vegetation clearance of selected areas to suppress the spread of fire and the maintenance of a standby water supply to wet down fire breaks away from any range fires. Once the Draft Prescribed Burn Plan is finalized the fire prevention measures can be amended to the Master Work Plan.

10. Section 3.1, Pg 3-1: This general introduction should say that the specific explosives that will be procured and the procedures to be used for transportation and storage will be included in the site-specific work plan. Including this statement would be consistent with other chapters that say the MWP is general guidance and specific requirements will be covered in the site-specific work plan (see sections 2.1 and 5.1 for examples).

The following will be added as the last sentence in Section 3.1 General: 'Specific explosives that will be procured and the procedures to be used for storage and transportation will be included in the associated site-specific work plan.'

11. Section 3.2, Pg 3-1: Reference the Puerto Rico explosives law (which requires users and transporters of explosives to have a permit from the Superintendent of Police) as required permit.

The following will be added as the last sentence in Section 3.2 Licenses and Permits: 'In addition, users and transporters of explosives over public transportation routes will be required to obtain a permit from the Superintendent of Police, as required by the Commonwealth of Puerto Rico law.'

12. Section 3.3.1, Pg 3-1: EQB and EPA have publicly recommended that minimally polluting explosives be used as donor explosives for MEC disposal on Vieques because of the intense public concern about airborne emissions. It is highly recommended that this section be modified to include use of explosives identified as minimally polluting. There has been significant research by DoD into this issue in the past few years and it may be possible to use explosives identified as minimally polluting. It is recommended that some research be put into examining the characteristics of binary explosives and other "green explosives" that maybe be suitable substitutes for the referenced explosives which are known to have caused environmental contamination at other sites. Another potential source of information is Randall J. Cramer at the Navy Surface Warfare Center, Indian Head, Maryland who has published information on this subject (cramerrj@ih.navy.mil).

The Navy will research the cost- benefit of utilizing green explosives during munitions response actions. The analytical testing of soils and air completed to date within the LIA have not demonstrated there is no adverse impacts from the detonations that have occurred.

13. Section 3.4.3, Pg 3-3: This section says that a guard will be posted during non-working hours. However, there is a new guidance to the Puerto Rico explosives law ("Guidance for the Administration, Application and Oversight of the Puerto Rico Explosive's Law", Chapter XVIII, "Magazines, Guidance, Safety Precautions to be taken in the Magazines' Surroundings") that requires a guard at all times (24 hours/day) whenever explosives are stored. It is recommended that this guidance be added to the list of ARARs.

The following ARAR will be added to Table 1-1 in Section 1.2: 'Guidance for the Administration, Application and Oversight of the Puerto Rico Explosive's Law, Puerto Rico explosives law Chapter XVIII.'

However, it should be noted that NAVFAC is in consultation with PR State Police to clarify the requirements for guards. Because during working hours personnel are on-site in the vicinity of the storage area and during non-working hours a security guard is stationed in the vicinity of the stored explosives, it is believed the intent of the law is being met. The results of these discussions will be included in revisions to this document.

14. Section 3.8, Pg 3-6: Please add to this section that the NAVFAC RPM will notify EQB and the Puerto Rico Police in the event that explosives are found to be lost or stolen.

The following will be added as the last sentence in the first paragraph of Section 3.8: 'The NAVFAC RPM will notify EQB and the Puerto Rico Police.'

15. Section 9.3.1 – 9.3.9, Pg9-5: These sections are confusing and should be revised. Section 9.3 discusses "definable features of work". However, the DFW discussed in

9.3.2 are different than the DFW identified in Table 9-1. It is recommended that the text be modified to discuss the same DFW that are identified in Table 9-1.

The following sentence will be added to the end of the first paragraph of Section 9.3.1: 'The following are some examples of DFWs. A comprehensive list of DFWs along with Work Audit Procedures can be found in Table 9-1.'

16. Table 9-1: Table 9-1 is a good effort at identifying all of the relevant QC inspections. However, it appears that the DFW contained in Table 9-1 are not complete. For example, there are no DFW associated with geophysics, subsurface clearance or UXO disposal. It is recommended that Table 9-1 be modified to completely capture all of the DFW that are relevant to the full spectrum of activities that can be conducted at VNTR.

Table 9-1 will be revised to include additional definable features of work including the following: digital geophysical surveys, geophysical prove-outs, subsurface MEC clearance and MPPEH processing.

17. Section 9.5.4, Pg 9-18: This section references a "deficiency log". However, an example of this log is not provided. It is recommended that an example "deficiency log" be added to the forms at the end of this chapter.

The text of the second paragraph in Section 9.5.4 has been changed to read '...will be noted on the deficiency log (Form 9-11) so it can be...'

18. Section 9.8.2, Pg 9-20: This section describes determining whether a Corrective Action Request is "high priority" or "low priority". However, there is no guidance on how to make this determination. It is recommended that this section be modified to provide guidance for determining the priority of the CAR.

Section 9.8.2 will be modified to reflect the prioritization of Corrective Action Requests.

19. Appendix D: It is recommended that EQB be notified via telephone or voicemail message in addition to E-mail.

Due to the number of people and entities that need to be notified the preferred method of notification is by email, particularly for ongoing operations such as the TCRA. Appendix D has been revised by adding the following to the "Additional Requirements/Remarks" block in Table D-1 for PREQB 'For BIP operations not related to ongoing operations (e.g., TCRA) notify via telephone'.

**RESPONSE TO SECOND COMMENTS ON THE DRAFT MUNITIONS AND
EXPLOSIVES OF CONCERN (MEC) MASTER WORK PLAN
FORMER VIEQUES NAVAL TRAINING RANGE (VNTR)
VIEQUES, PUERTO RICO
APRIL 2006**

EPA General Comment 3 that was provided to the U.S. Navy on the *Draft Munitions and Explosives of Concern (MEC) Master Work Plan, Former Vieques Naval Training Range (VNTR)*, Vieques, Puerto Rico, dated September 2005, reads as follows:

“The MWP does not appear to address MEC which may be located in the waters contiguous to the listed range/maneuver areas, despite the fact that these areas are very likely contaminated with ordnance. The MWP should include information concerning the procedures for any work to be conducted in these water areas, or it should provide a reference as to where this information may be found. If this work plan only applies to terrestrial sites, the Navy should add a statement to that effect and indicate whether a new document will be developed or this MEC MWP will be modified for any aquatic MEC cleanup/investigation work. Please revise the MWP to address this issue.”

The U.S. Navy response to this comment reads as follows:

“Information regarding MEC densities located in the contiguous, off-shore areas is provided in the ERA/Phase I SI Report (CH2M HILL, March 2006). Because the general scope for underwater work has not yet been developed by the Navy, specific procedures for work to be conducted underwater have not been addressed in this work plan. Future water-borne surveys and applicable work plans will be developed to cover this in the future when the general scopes are developed.”

While this response provides an acceptable explanation as to why no process for dealing with underwater MEC is included in the MWP, no statement that the MWP will be modified to reflect this is included in the response. Please revise the MWP to include a statement that includes the information on underwater MEC response that is provided in the U.S. Navy response to EPA General Comment 3.

Response: The following will be attached to the end of the first paragraph of the introduction of the MWP “*This Master Work Plan applies to terrestrial sites at the former VNTR; areas below the low tide line will be addressed during future work following the terrestrial investigations/removal actions.*”

EQB comments requiring additional response:

EQB Comment 3. Section 2.4.6, Pg 2-14: This section refers to the MR-SIMS system that is used to collect field data. It is recommended that data collection requirements for this system be reviewed by the MR Committee so they can examine what data is going to be captured. Note that the MR committee was assigned by the CTC to review the data being collected and has never completed that task.

The U.S. Navy response to this comment reads as follows:

“Noted. The MRSIMS system has been demonstrated to some project team personnel. A future demonstration will be scheduled.”

EQB reply: Yarissa Martinez (EQB), Jim Pastorick (EQB consultant) and Daniel Rodríguez (EPA) have received a demonstration of the MR SIMS and the data collection and handling system. Comments on this system were made in EQB’s Site Visit Report and were sent to the Navy as Enclosure 2 in a letter from Yarissa Martinez to Chris Penny dated March 7, 2005. Those comments are reproduced below for use in revising the MWP:

1. Photo documentation of objects found is not strictly controlled. Indeed, EQB’s Comment #1 to the MKM work plan states in part: *“Section 2.11.1 provides only generalities such as, “Data collected during the site clearance will consist primarily of field observations and measurements of the munitions items found” and, “Photographs of munitions items will be collected as deemed necessary”. It is recommended that the plan be modified to note what data is going to be collected on MEC. For example, when should it be considered necessary to collect photos of MEC?”*

Indeed, the MKM Project Manager and QC Manager told me that they are taking numerous photographs of the site, MEC, targets, debris, etc. However, they said that this is not a requirement of their contract. They keep their own photo log and the photographs are currently not a part of the Vieques GIS.

It is recommended that the Navy be informed of the value of adding site photographs to the GIS. For example, if a local resident accuses the Navy of finding chemical or depleted uranium MEC it would be helpful for the Navy to have a photograph, linked to the GIS, of every MEC that was disposed of by blow-in-place. With this information the Navy could demonstrate that no chemical or depleted uranium MEC were disposed of.

Adding site photographs to the Vieques GIS would be an easy task (most GIS systems have a photo log and site photos incorporated into them) and it is highly recommended that the Navy make this improvement to the current GIS system. It is recommended that the Navy be requested to add this topic to the agenda for the next CTC meeting.

2. The Vieques GIS is a very efficient system. Using this system it should be easy and cost effective for CH2M Hill to produce data reports to include with the bi-weekly reports. Another good option would be for the Navy to give the regulators and USFWS access to the web-based GIS. This would allow persons with access to view the project progress and data at any time. It is recommended that the Navy be requested to include discussion of producing specific data reports on request or allowing the regulators and USFWS to have access to the web-based GIS on the agenda for the next CTC meeting.

Response: *Types of data collected in the field for each MEC will be added to section 2.4.6 “Data collected in the field on MEC consists of the following PDA fields: Item group (for example- UXO, MPPEH, non-MD), class (for example-projectile/mortar, rocket/guided missile, scrap), category (for example-20mm projectile, 5-inch rocket, scrap), filler type, fuzing, quantity, weight, if demo is required, date found, operation type (for example-visual surface clearance, vegetative clearance), grid cell, X coordinate, and Y coordinate. In*

some instances all of this information may not be available for an item. If that is the case as many of the parameters as can be determined will be recorded."

MEC types not previously discovered or representative items will be photographed, and included in the log book of types of items found. Currently the Vieques database for the GIS is being configured to include photos of the unique and representative items. Other photos of information deemed to be important to the field crew at the time will be collected also. The information collected on each item, as described at the beginning of this response, are sufficient to describe items requiring demolition.

The Navy has recently provided the regulators and USFWS access to the web-based GIS showing the progress map of the Time Critical Removal Action. The map is updated every 2-3 days and shows the status of what grids have been surface cleared, what grids have been cleared of vegetation, and what grids have been QCd and QAd. Homeland security constraints do not allow the release of specific information on the munitions found because the information could potentially be FOIA'd from regulators. Additionally, after action reports will be generated for investigation and removal actions, which will provide the full spectrum of information gathered during those efforts.

EQB comment 6. Section 2.4.11, Pg 2-20: This section requires that Fort Gillem, Georgia be contacted in the event that RCWM is found. Please inform EQB why this unit has been selected. Other Navy units may be closer and able to respond faster. Is there a requirement to contact the 52nd Ordnance Group in this case?

Navy's Response:

"Currently the 52nd Ordnance Group is DoD's point of contact for all RCWM. After notification to the 52nd Ordnance Group they may elect to have a geographically closer unit respond."

EQB reply: The plan may be correct that the 52nd Ordnance Group should be called in the event that RCWM is found. However, several indicators point to the fact that this is not the correct procedure including:

1. A reviewer from EQB called the number provided in the plan (404 469-3333) at 4:30 PM EST on April 5, 2006 and was forwarded to a voicemail box. It is not likely that a phone number that automatically directs the caller to voicemail is the correct phone number to be used in this potential emergency situation.
2. The U.S. Army Corps of Engineers Huntsville Engineering and Support Center has posted an Interim Guidance Document on their website from Army Chief, Environmental

Community of Practice, Directorate of Military Programs, dated April 23, 2004 titled: Interim Guidance - Notification Procedures for Discovery of Recovered Chemical Warfare Materiel (RCWM) During USACE Projects. This guidance provides specific and different contact and reporting requirements than those provided in the MWP.

Although this isn't a USACE project, the Navy has used USACE guidance in the past where that guidance was adequate and was further developed than available Navy guidance. Since the Army is the Program Manager for CWM within the DoD it may be appropriate to

consider adopting the reporting requirements contained in this document available at:
<http://www.hnd.usace.army.mil/oew/interimguid.aspx>

Response: The phone number is correct for chemical warfare materials.

The new contact for suspect DU rounds is the Radiological Affairs Support Office (RASO). The contact information is: Steven W. Doremus, Ph.D. Director, Environmental Radiation Programs NAVSEADET RASO, (757) 887-7745, DSN 953-7745, fax (757) 887-3235. This information will be added to Section 2.4.11.

EQB comment 11. Section 3.2, Pg 3-1: Reference the Puerto Rico explosives law (which requires users and transporters of explosives to have a permit from the Superintendent of Police) as required permit.

Navy's Response:

"The following will be added as the last sentence in Section 3.2 Licenses and Permits: 'In addition, users and transporters of explosives over public transportation routes will be required to obtain a permit from the Superintendent of Police, as required by the Commonwealth of Puerto Rico law.'"

EQB reply: Puerto Rico Law No. 134 of, June 28, 1969, requires more than obtaining permits for "users and transporters of explosives over public transportation routes". The following text, taken directly from Law 134, requires permits for manufacture, transport, receipt, storage, possession, handling and use of explosives. It is recommended that the MWP be modified to completely comply with Law 134.

"(a) No person shall carry out any or any one of the activities herein listed without having first obtained the corresponding permit or permits from the Superintendent issued in accordance with the provisions of this chapter and its regulations:

- (1) Manufacture explosives or substances that may be used to manufacture explosives;
- (2) transport explosives or substances that may be used to manufacture explosives;
- (3) receive, store or possess explosives or substances that may be used to manufacture explosives;
- (4) use explosives or substances that may be used to manufacture explosives;
- (5) operate an establishment where explosives or substances are handled that may be used to manufacture explosives."

Response: Madeline Rivera, NAVFAC has been in contact with the Puerto Rico police about compliance with Puerto Rico Law No. 134. The police have confirmed our compliance and have indicated that oversight of explosives receiving/storage/possession as part of this project is the responsibility of the Bureau of Alcohol, Tobacco and Firearms.. The following will be added as the last sentence in Section 3.2 Licenses and Permits: 'In addition, users or transporters of explosives over public transportation routes, as well as manufacturers, receivers, storers or possessors of explosives will be required to

obtain a permit from the Superintendent of Police, as required by the Commonwealth of Puerto Rico law or as directed by the Superintendent of Police..'

12. Section 3.3.1, Pg 3-1: EQB and EPA have publicly recommended that minimally polluting explosives be used as donor explosives for MEC disposal on Vieques because of the intense public concern about airborne emissions. It is highly recommended that this section be modified to include use of explosives identified as minimally polluting. There has been significant research by DoD into this issue in the past few years and it may be possible to use explosives identified as minimally polluting. It is recommended that some research be put into examining the characteristics of binary explosives and other "green explosives" that maybe be suitable substitutes for the referenced explosives which are known to have caused environmental contamination at other sites. Another potential source of information is Randall J. Cramer at the Navy Surface Warfare Center, Indian Head, Maryland, who has published information on this subject (cramerrj@ih.navy.mil).

Navy Response:

"The Navy will research the cost- benefit of utilizing green explosives during munitions response actions. The analytical testing of soils and air completed to date within the LIA have not demonstrated there are adverse impacts from the detonations that have occurred."

EQB reply: EQB agrees that the practical effect on contamination of using low-polluting explosives is likely to be minimal. However, since this is an issue of great concern to Vieques residents it is recommended that this approach be taken.

Another measure, discussed at the last CTC meeting, is using small shaped charges to open the MK 80 series bombs to determine that they are inert filled. Adding this procedure to the MWP will be an additional way to demonstrate that the plan incorporates using the minimum amount of donor explosives for MEC disposal.

Response: The use of small shaped charges to vent larger ordnance to determine if they are inert filled is already standard practice, and will be clarified in Section 3.3.1; however, depending on conditions and availability of various donor explosives the use of shaped charges may not always be the most effective or time efficient manner for venting ordnance items. As stated in the EQB comment above, the practical effect on contamination of using low-polluting explosives is likely to be minimal. The Navy is researching the cost-benefit of utilizing green explosives during munitions response actions. The analytical testing of soils and air, completed to date, within the LIA have not demonstrated there is an adverse impact from the detonations that have occurred.

**RESPONSE TO THIRD COMMENTS ON THE DRAFT MUNITIONS AND
EXPLOSIVES OF CONCERN (MEC) MASTER WORK PLAN
FORMER VIEQUES NAVAL TRAINING RANGE (VNTR)
VIEQUES, PUERTO RICO
NOVEMBER 2006**

December 2005 EQB comment 6. Section 2.4.11, Pg 2-20: This section requires that Fort Gillem, Georgia be contacted in the event that RCWM is found. Please inform EQB why this unit has been selected. Other Navy units may be closer and able to respond faster. Is there a requirement to contact the 52nd Ordnance Group in this case?

Navy's Response:

"Currently the 52nd Ordnance Group is DoD's point of contact for all RCWM. After notification to the 52nd Ordnance Group they may elect to have a geographically closer unit respond."

April 2006 EQB additional comment: The plan may be correct that the 52nd Ordnance Group should be called in the event that RCWM is found. However, several indicators point to the fact that this is not the correct procedure including:

1. A reviewer from EQB called the number provided in the plan (404 469-3333) at 4:30 PM EST on April 5, 2006 and was forwarded to a voicemail box. It is not likely that a phone number that automatically directs the caller to voicemail is the correct phone number to be used in this potential emergency situation.
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August 2006 EQB Additional Comment: It doesn't appear to make sense that the Navy is

required to contact the Army 52nd Ordnance Group when CWM is unexpectedly found while the Army Corps of Engineers itself doesn't use this Army point of contact. The Interim Guidance noted above in the previous EQB comment has the following benefits:

1. It provides clear instructions to be followed when unexpected CWM is found including a form containing the information that is required for reporting and security procedures.
2. It contains a phone number for 24-hour reporting. The phone number in the work plan for the 52nd ordnance group is only manned during working hours and even then may go to voicemail. One would think that if a specific 24-hour phone number has been established for reporting finding CWM then that is the number that the Navy would want to use as opposed to a number, which is not established for this purpose and may not be manned when needed.

EQB cannot force the Navy to use any specific technical procedure and EQB will not issue additional comments on this issue. EQB feels that it has established a clear record for advocating use of the established procedures and format for reporting findings of CWM and for using the special 24-hour emergency phone number that has been established solely for this purpose as contained in the referenced Interim Guidance.

Navy Response: Both numbers will work. Both numbers are correct. The contact number to the Army 52nd Ordnance Group is the Navy's designated point of contact for CWM finds reporting, and is a 24 hour number established for this purpose. If the assigned officer is driving, the number goes to voicemail and the office will call back as soon as possible. Both numbers are really "clearing house" numbers in that they will identify the correct team to respond based on the location of the find and the availability of qualified EOD staff nationwide.

In response to the concerns expressed by EQB, the emergency contact number for the U.S. Army Corps of Engineers referenced by EQB (Chemical Warfare Design Center 296-895-1180) will be added to the MWP as a secondary number, should the first number be non-responsive.

Appendix J

Prescribed Burning Plan

Prescribed Burning Plan under review, and will be incorporated on approval.