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FINAL TECHNICAL MEMORANDUM PLAN FOR PRE-REMEDIAL INVESTIGATION RECONNAISSANCE DIVE BOMBING TARGETS NAVAL AUXILIARY LANDING FIELD FENTRESS NAS OCEANA VA

2/1/2013

CH2MHILL

Final

Technical Management Plan
Pre-Remedial Investigation Reconnaissance
Dive Bombing Targets –
Naval Auxiliary Landing Field Fentress

Naval Air Station Oceana
Virginia Beach, Virginia

Contract Task Order WE03

February 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

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NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by

Virginia Beach, Virginia

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
DBTs	Dive Bombing Targets
DFOW	definable feature of work
DGM	digital geophysical mapping
DoD	Department of Defense
ERS	Ecological Risk Screening
ESS	Explosives Safety Submission
FTL	Field Team Leader
H&S	health and safety
HASP	Health and Safety Plan
HSM	Health and Safety Manager
MC	munitions constituents
MDAS	material documented as safe
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MRP	munitions response program
MRS	munitions response site
NAS	Naval Air Station
NALF	Naval Auxiliary Landing Field
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
PA	Preliminary Assessment
PM	Project Manager
QAPP	Quality Assurance Project Plan
QC	quality control
QCP	Quality Control Plan
RI	Remedial Investigation
SI	Site Inspection
STC	Senior Technical Consultant
TMP	Technical Management Plan
UXO	unexploded ordnance

SECTION 1

Introduction/Regulatory Framework

1.1 Introduction

This document presents the Technical Management Plan (TMP) for the pre-Remedial Investigation (RI) reconnaissance at the Dive Bombing Targets (DBTs) munitions response site (MRS) at Naval Air Station (NAS) Oceana, Naval Auxiliary Landing Field (NALF) Fentress, Virginia. The pre-RI reconnaissance activities are being performed under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Comprehensive Long-term Environmental Action—Navy 1000 Program, Contract Number N62470-08-D-1000, Contract Task Order WE03. The TMP was prepared in accordance with current Department of Defense (DoD); Department of the Navy (Navy); federal, state, and local regulations and guidance; and the contract Statement of Work.

This TMP presents the overall strategy for the project and the detailed technical approach, and includes the associated plans and documents required to successfully complete the project. The associated plans are presented as appendices and consist of the following: a Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Pre-RI Reconnaissance Anomaly Selection Process and Reacquisition Procedures. The associated project document is an Explosives Safety Submission (ESS) (CH2M HILL, 2012*)* approved by the Department of Defense Explosives Safety Board. The ESS will be fully implemented during the munitions response (MR) operations to ensure safe, compliant, and effective completion of the planned actions.

This TMP is composed of the following sections and appendices:

- **Section 1—Introduction/Regulatory Framework**
- **Section 2—Site Description**
- **Section 3—Site History**
- **Section 4—Munitions Response Site Background**
- **Section 5—Previous Investigations**
- **Section 6—Field Operations**
- **Section 7—Quality Control Plan**
- **Section 8—Project Management**
- **Section 9—Environmental Protection Plan**
- **Section 10—Remedial Investigation Report/After Action Report**
- **Section 11—References**
- **Appendix A— Munitions and Explosives of Concern Quality Assurance Project Plan:** Presents the detailed approach, methods, operational procedures and quality control (QC) requirements associated with the MEC and/or material potentially presenting an explosive hazard (MPPEH) related activities.
- **Appendix B— Health and Safety Plan:** Presents the health and safety (H&S) policy and procedures for work performed by CH2M HILL and its subcontractors for work at the subject munitions response program (MRP) sites.

Each of the associated project plans will be fully implemented during the pre-RI reconnaissance to ensure safe, compliant, and effective completion of the planned actions. Figures and forms referenced within the text are provided at the end of each section.

1.2 Regulatory Framework

The pre-RI reconnaissance will be performed in a manner consistent with Comprehensive Environmental Response, Compensation and Liability Act, Section 104, and the National Oil and Hazardous Substances Contingency Plan, Sections 300.120(d) and 300.400(e) (40 Code of Federal Regulations, July 2010). The Virginia Department of Environmental Quality will also maintain oversight. The project will be conducted in full compliance with DoD and Navy munitions guidance, including *DoD Ammunition and Explosives Safety Standards: General Explosives Safety Information and Requirement* (DoD, 2010) and OP5, Volume 1, Change 10, *Ammunitions and Explosives Safety Ashore* (Naval Sea Systems Command, 2011).

The MRS potentially contains MEC and/or MPPEH as a result of the historical range operations at the DBTs. The pre-RI reconnaissance will be used to guide subsequent RI activities for the DBTs. This TMP does not address munitions constituents (MC). MC sampling is not required because the practice bombs dropped on the targets contained only black powder.

This TMP identifies and explains the definable features of work (DFOWs) established to accomplish these objectives. The DFOWs are presented in Section 6 and explained in detail on Worksheets # 14 and 17 of the MEC-QAPP.

MR activities will be performed in accordance with the ESS. Safety requirements are presented in the HASP (Appendix B) and ESS (CH2M HILL, 2012).

SECTION 2

Site Description

NAS Oceana covers approximately 5,331 acres and is within the southeastern portion of the city of Virginia Beach, Virginia. NAS Oceana is a Master Jet Base, with the primary mission of providing personnel, operations, maintenance, and training facilities to ensure that fighter and attack squadrons on aircraft carriers of the U.S. Atlantic Fleet are ready for deployment. NALF Fentress is approximately 7 miles southwest of NAS Oceana, in Chesapeake, Virginia (**Figure 2-1)**, and comprises approximately 2,500 acres, with approximately 8,700 additional acres in restrictive easements.

Two adjacent DBTs, located west of the existing runway in the central portion of NALF Fentress, are shown on **Figure 2-2**. Each target covered approximately 6.5 acres. The areas where the DBTs were located are currently forested and undeveloped, except for all-terrain vehicle trails crossing the southernmost portion of the site. The DBTs are characterized as flat, with elevations of approximately 13 to 15 feet above mean sea level. Both areas are heavily wooded, and vegetation at the targets includes loblolly pine and sweet gum-tulip poplar trees, with some low lying brush and grasses. The DBTs are situated on a forested-shrub wetland.

2.1 Geology

The DBTs lie within the Atlantic Coastal Plain physiographic province, which is underlain with unconsolidated sediments generally of Quaternary ages. These surficial deposits include undivided sand, clay, gravel, and peat, which were deposited in marine, fluvial, aeolian, and lacustrine environments (Malcolm Pirnie, 2008).

2.2 Hydrology

NAS Oceana and NALF Fentress lie within the boundaries of three drainage basins: the Chesapeake Bay watershed in the north, the Southern Watersheds Area in the south, and Owls Creek watershed in the east. The Southern Watersheds Area is within the North Landing River, Northwest River, and Back Bay watersheds. Surface waters drain into the Chesapeake Bay via Great Neck, Wolfsnare, and London Bridge creeks; to the Southern Watersheds Area via West Neck Creek; and to Owls Creek watershed via Owls Creek and its tributaries (Geo-Marine, Inc., 2006).

Surface waters at NAS Oceana consist of several small ponds, wetlands, and an extensive network of artificial drainage channels and channeled stream courses. The station's ponds are not naturally occurring, but were formed as a result of borrow pit excavations (Geo-Marine, Inc., 2001).

Surface waters at NALF Fentress include extensive wetlands and a network of artificial drainages and channeled streams, including a major portion of Pacaty Creek (Malcolm Pirnie, 2008).

2.3 Vegetation, Fish, and Wildlife

The vegetation, fish, and wildlife at NAS Oceana are discussed in the Environmental Protection Plan (Section 9).

2.4 Climate and Weather

The climate of Virginia Beach is classified as humid subtropical. Winters are very mild, and snowfall is light. Summers are hot and humid, with warm evenings. The mean annual temperature is 59.6 degrees Fahrenheit (°F), with an average annual snowfall of 8.1 inches, although snowfall averages are lower to the south away from the Chesapeake Bay. Average annual rainfall is 45 inches. The wettest seasons are the spring and summer, although rainfall is fairly constant all year round. The highest recorded temperature was 105 °F in July 2010, and the lowest recorded temperature was 4 °F in January 1985 (http://www.noaa.gov/).

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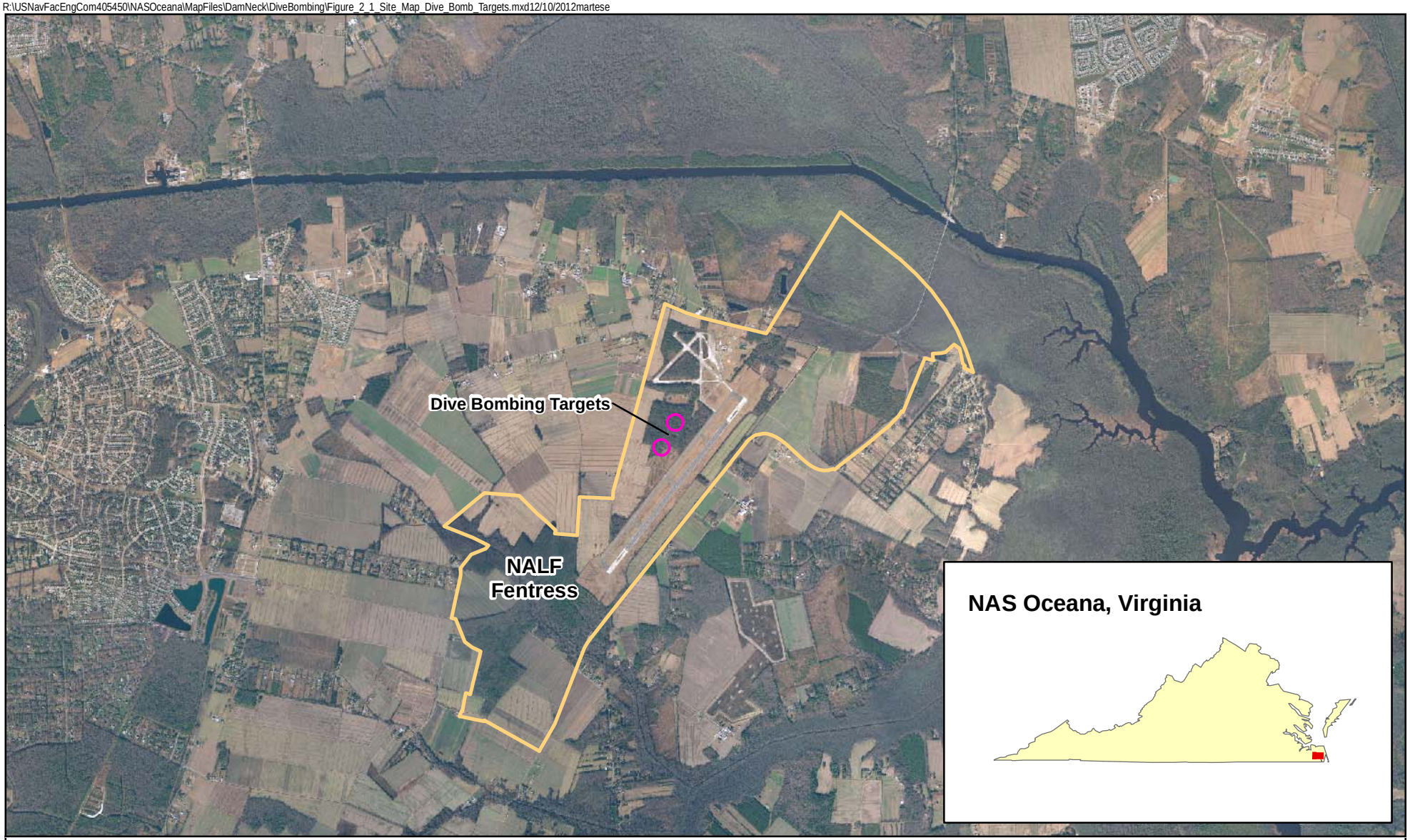

Legend
- NALF Fentress Boundary
- Dive Bomb Targets

N
W E
S

0 0.4 0.8
Miles

Figure 2-1
Site Location Map for the Dive Bombing Targets
NALF Fentress - Naval Air Station Oceana
Virginia Beach, Virginia

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Legend
- Target Center
- MRP Sites
- Target Areas

N
W E
S

0 300 600
Feet

Figure 2-2
Dive Bombing Targets
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia

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SECTION 3

Site History

This section summarizes the military and cultural use of NAS Oceana and NALF Fentress. Cultural, historic, and natural resources in the vicinity of the MRS, and the protection of these resources during the work activities are discussed further in the Environmental Protection Plan (Section 9).

3.1 Military Use

Principal operations at NAS Oceana consist of training and deployment of the Navy's fighter/attack squadrons of F/A-18 Hornet and Super Hornet aircraft. Pilots fly approximately 219,000 training sorties per year at NAS Oceana. In addition to the fighter squadrons, NAS Oceana is host to several other tenant commands, including the Strike Fighter Weapons and Tactics School, Atlantic; Navy Landing Signal Officer School; Naval Atlantic Meteorology and Oceanography Detachment; Fleet Area Control and Surveillance Facility Virginia Capes Operating Area; Fleet Aviation Specialized Operational Training Group, Atlantic; and Marine Aviation Training Support Group 33 (Malcolm Pirnie, 2008).

NALF Fentress is currently used by squadrons stationed at NAS Oceana or Naval Support Activity Norfolk Chambers Field for field carrier landing practice operations (Malcolm Pirnie, 2008).The MRS potentially contains MEC and/or MPPEH as a result of the historical range operations at the DBTs. The site history with respect to military use that may have resulted in MEC and/or MPPEH being present at the MRS was obtained from the Preliminary Assessment (PA) Report (Malcolm Pirnie, 2008).

Two adjacent DBTs, located west of the existing runway in the central portion of NALF Fentress, were identified on an archival map dated 1955. Mapping from 1954, 1963, and 1974 show no evidence of the targets.

3.2 Cultural Resources

There are no cultural resources located within the DBTs (Malcolm Pirnie, 2008).

SECTION 4

Munitions Response Site Background

Two adjacent DBTs, located west of the existing runway in the central portion of NALF Fentress, were identified on an archival map dated 1955 and are shown on **Figure 2-2**. The North DBT is at the end of runway 1-19. The South DBT is approximately 500 feet southwest of the North DBT. Each target covered approximately 6.5 acres. The areas where the DBTs were located are currently forested and undeveloped, except for all-terrain vehicle trails crossing the southernmost portion of the site. The MRP-eligible acreage for the DBTs is approximately 13 acres. Munitions used at the DBTs probably included practice bombs that contained small signal cartridges to indicate the point of impact.

SECTION 5

Previous Investigations

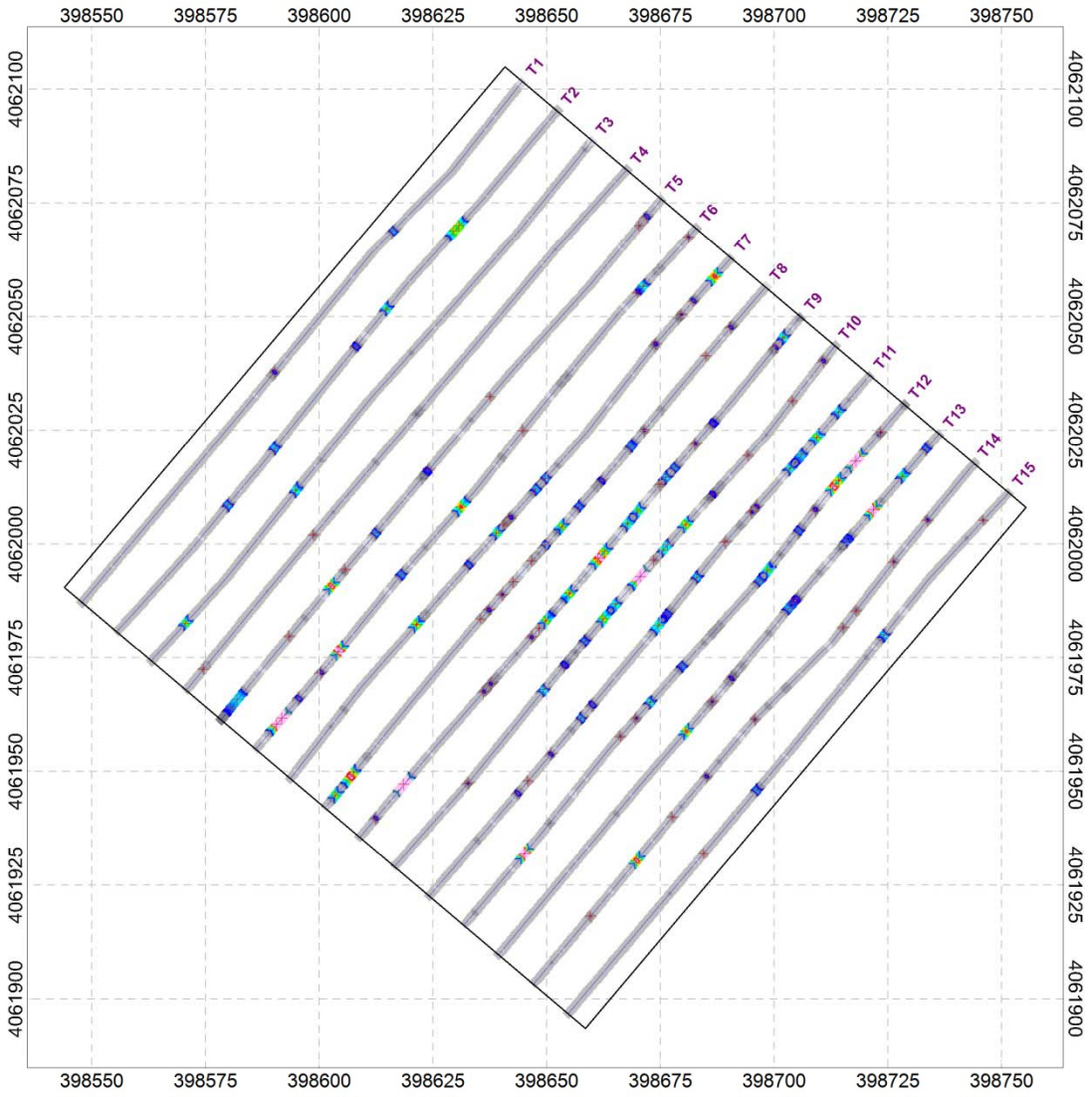
A PA was conducted by Malcolm Pirnie personnel in 2008. The DBT sites were inspected to identify possible MEC and/or MPPEH and any sources of MC-related contamination at the sites. Remnants from three AN-MK 43 miniature practice bombs were found near the South DBT (Malcom Pirnie, 2008).

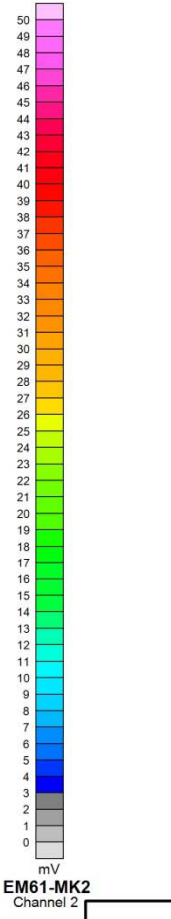
A Site Inspection (SI) was conducted by CH2M HILL in 2010 to evaluate the potential presence or suggested absence of MEC and/or MPPEH at the DBTs. A visual survey of the accessible areas at each DBT was performed to confirm the findings of the PA and seek evidence of any MEC and/or MPPEH. At the South DBT center, three MK-23 practice bombs and a signal smoke round were located on the ground surface. Several subsurface anomalies were detected using a handheld magnetometer. At the North DBT, a simulator booby trap flash M117 was located at the north bunker entrance and one subsurface anomaly was detected.

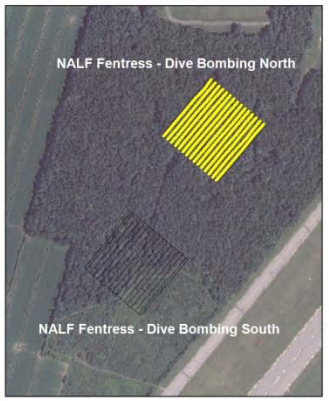
As part of the SI, a digital geophysical mapping (DGM) survey was conducted in March 2012 along 1-meter-wide transects, spaced at 10 meters apart. The DGM survey characterized the density and extent of subsurface geophysical anomalies (some of which may represent MEC and/or MPPEH) within the DBT areas. The DGM survey was conducted along 30 transects, consisting of 15 transects in the North DBT area and 15 transects in the South DBT area. A total of 518 anomalies were identified above a target threshold of 3 millivolts (slightly greater than the background geophysical response) — 145 anomalies in the North DBT area and 373 anomalies in the South DBT. The DGM survey results are presented in **Figures 5-1 and 5-2.**

Figures 5-3 and 5-4 present results of a geostatistical analysis of anomaly density for each area. Visual Sample Plan software (Battelle Memorial Institute, 2012) was used to estimate anomaly densities in each area. The average target density at the North DBT area was calculated to be 260 targets per acre, with the highest concentration of targets near the center to the northeast of the DBT area. The total number of anomalies estimated in the North DBT area is 1,690. The average target density at the South DBT area was calculated to be 667 targets per acre, with the highest concentrations also near the center to the northeast of the DBT area. The total number of anomalies estimated in the South DBT area is 4,335.

These findings provide strong lines of evidence that MEC and/or MPPEH may be present in the subsurface. The objective of the pre-RI reconnaissance is to investigate the nature of MEC and/or MPPEH in the subsurface. The results of the pre-RI reconnaissance will be used to guide subsequent RI activities for the DBTs.







Legend

North Target Area Boundary

Selected Target

Transect Line Paths

25 0 25 50

(meters)

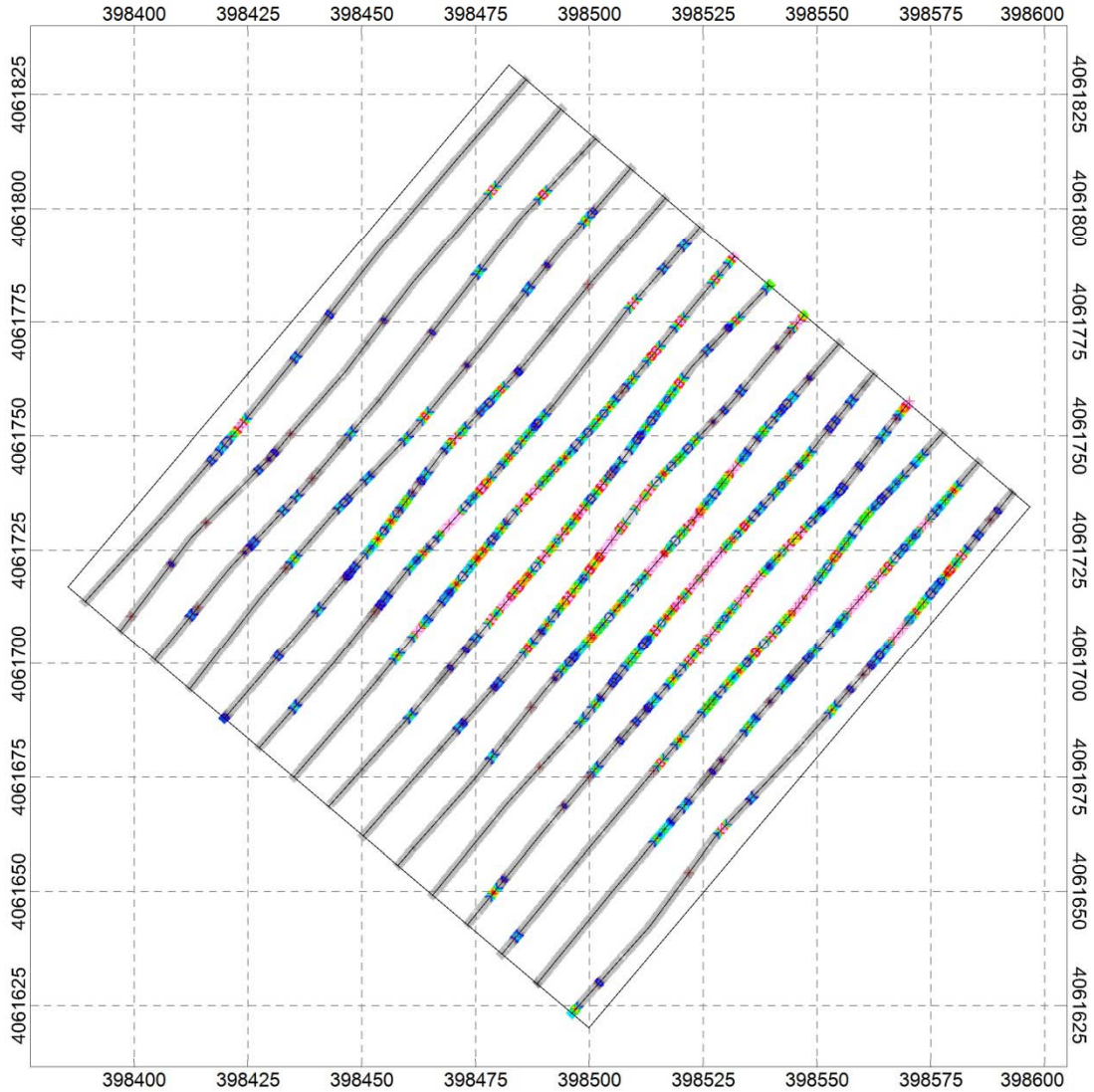
NAD83 / UTM zone 18N

Figure 5-1

DGM Survey Results - North Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia
Source: NAEVA Geophysics Inc

Date of Survey: April 16, 2012

Map Approver: T. Klaff



Legend

- South Target Area Boundary
- Selected Target
- Transect Line Paths

25 0 25 50

(meters)

NAD83 / UTM zone 18N

mV

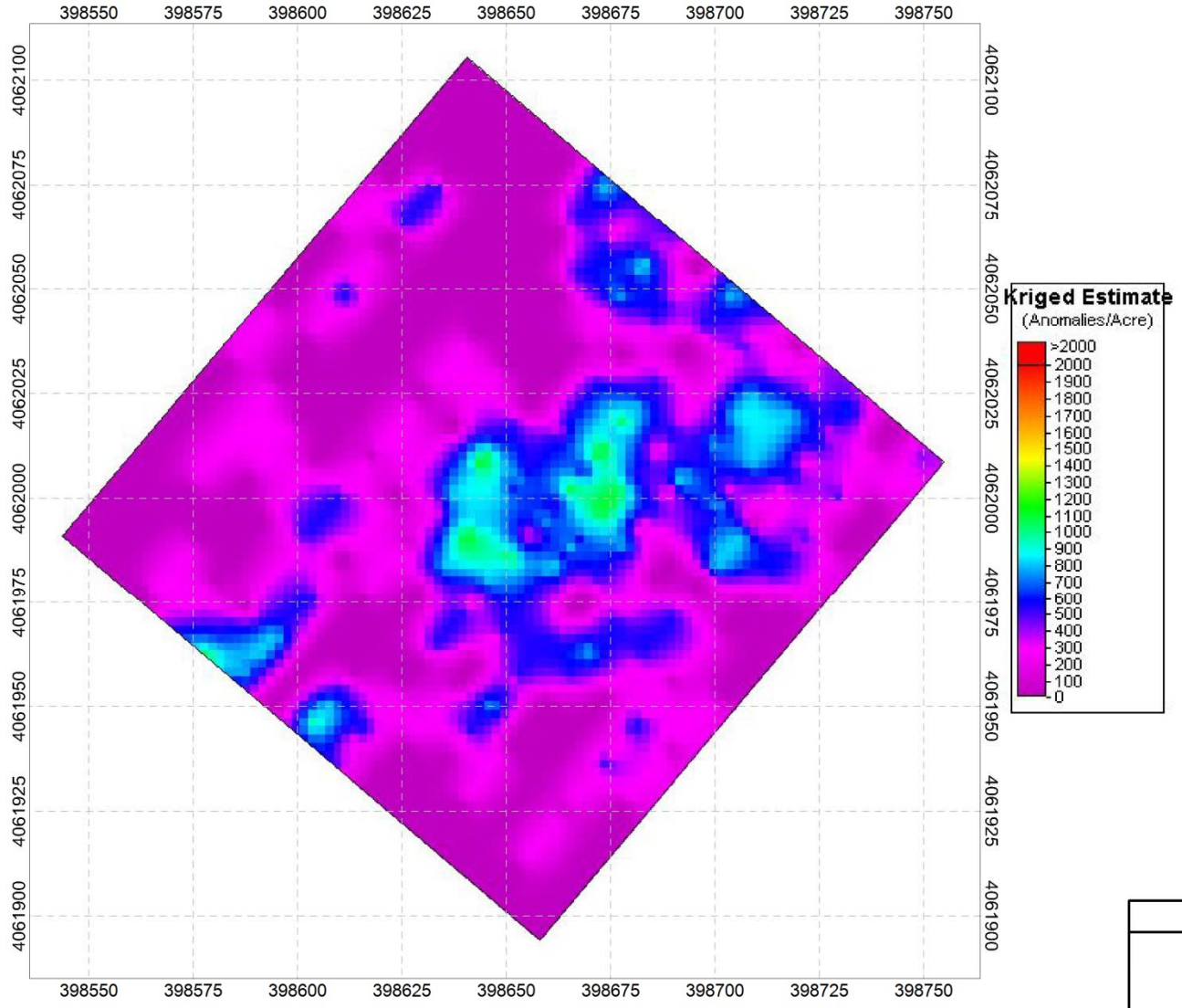
EM61-MK2
Channel 2

Figure 5-2

DGM Survey Results - South Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia
Source: NAEVA Geophysics Inc

Date of Survey: April 17, 2012

Map Approver: T. Klaff



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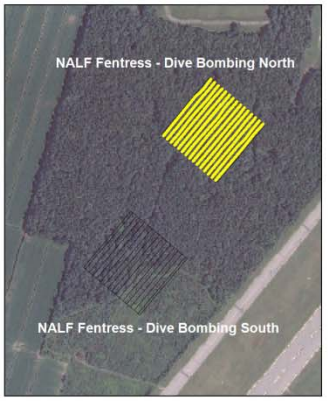


Legend

North Target Area Boundary

25 0 25 50

(meters)

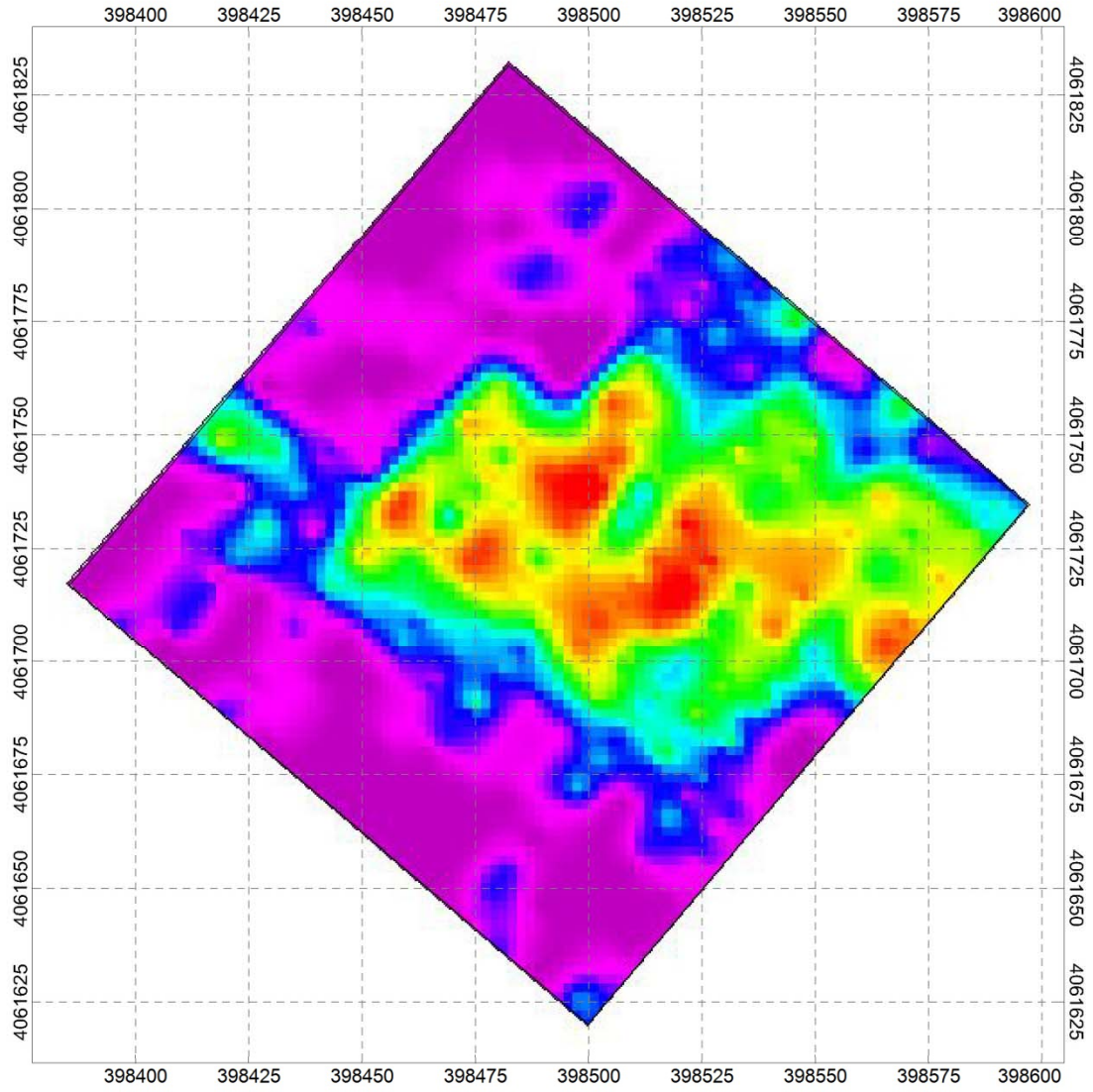
NAD83 / UTM zone 18N

Figure 5-3

Geostatistical Analysis - Anomaly Density Estimate
Northern Dive Bomb Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia

Date of Map Creation: April 25, 2012

Map Approver: T. Klaff



Kriged Estimate
(Anomalies/Acre)

- ≥2000
- 2000
- 1900
- 1800
- 1700
- 1600
- 1500
- 1400
- 1300
- 1200
- 1100
- 1000
- 900
- 800
- 700
- 600
- 500
- 400
- 300
- 200
- 100
- 0

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Legend

South Target Area Boundary

25 0 25 50

(meters)

NAD83 / UTM zone 18N

Figure 5-4

Geostatistical Analysis - Anomaly Density Estimate
Southern Dive Bomb Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia

Date of Survey: April 17, 2012
Date of Map Creation: April 25, 2012

Map Approver: V Rystrom

SECTION 6

Field Operations

This section presents a summary of the DFOWs to be performed during the pre-RI reconnaissance. The MEC-QAPP (**Appendix A**) presents the detailed approach, methods, operational procedures and QC requirements associated with the MEC and/or MPPEH-related activities. **Table 6-1** identifies each DFOW and references where the detailed information on each DFOW can be found (Worksheets #14 and #17 of the MEC-QAPP). The QC requirements for these activities are found in Worksheets #28, #34, and #35 of the MEC-QAPP.

TABLE 6-1
Definable Features of Work and Supporting Documents

Definable Feature of Work	Description	Supporting Document(s)
Pre-Mobilization Activities	Develop and obtain approval of the proposed pre-RI reconnaissance and RI approach Procure subcontractors Hold pre-construction meeting	HASP, MEC-QAPP
Mobilization/Site Preparation	Mobilize crew and equipment Perform an onsite document review Establish communications and logistics Establish site boundary Perform site-specific training	MEC-QAPP
Anomaly Reacquisition	Reacquire the anomalies identified as representing potential subsurface MEC and/or MPPEH during the March 2012 DGM investigation (The anomaly selection process and reacquisition procedures are presented in Appendix B of the MEC QAPP)	MEC-QAPP
Intrusive investigation of DGM identified anomalies	Execute manual intrusive investigation to identify the source of individual anomalies following reacquisition of selected anomalies	MEC-QAPP
Anomaly Removal Verification	Perform anomaly removal verification and excavation backfilling	MEC-QAPP, ESS
Demilitarization of MEC/MPPEH	Perform demilitarization of all MEC and MPPEH	MEC-QAPP, ESS
Disposition of material documented as safe (MDAS)	Recycle MDAS	MEC-QAPP, ESS
Demobilization	Demobilize crew and equipment	MEC- QAPP
Report and Closeout	Use the results from intrusive investigations and into work planning documents for forthcoming RI Incorporate the results and findings into the After Action Report that will be prepared at the conclusion of the RI	MEC-QAPP

SECTION 7

Quality Control Plan

This QC plan (QCP) describes the QC approach and procedures for the pre-RI reconnaissance. The requirements and systems established in this QCP are relevant and applicable to project work performed by CH2M HILL and its subcontractors. The QC forms (Forms 7-1 through 7-6) are presented at the end of the section.

The MR Safety and Quality Lead is responsible for verifying compliance with this QCP through audits and surveillance. The MR Senior Technical Consultant (STC) is the technical lead for MRP conformance to approved processes and procedures and provides oversight and review of MR-related activities. The Project Manager (PM) or a designee is to inspect and audit the quality of work being performed for each DFOW. The PM or a designee is to verify that procedures conform to applicable specifications stated in this TMP or other applicable guidance. Identified deficiencies are to be communicated to the responsible individual and documented in the QC logbook and Weekly QC Report. Corrective actions are to be verified by the MR Safety and Quality Lead 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 Worksheet #12-2 of the MEC-QAPP (**Appendix A**). The QC performed for the field activities will be tracked and will be audited by the Unexploded Ordnance (UXO) Quality Control Specialist or his designee on a daily basis.

7.1 Inspection Process

QC will be monitored for each DFOW presented in Section 6 using a three-phase control process. The MR Safety and Quality Lead is responsible for ensuring that the three-phase inspection process, consisting of the Preparatory Phase, Initial Phase, and Follow-up Phase, is implemented for each DFOW listed, regardless of whether it is performed by CH2M HILL or its subcontractors. Each inspection phase is important for obtaining a quality product and meeting the project objectives; however, the preparatory and initial audits are particularly valuable in preventing problems. Work is not to be performed on a DFOW until successful Preparatory and Initial Phases have been completed.

7.1.1 Preparatory Phase Inspection

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

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

8. Confirm any required permits and other regulatory requirements are met.
9. Verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

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

Results of the activity are to be documented in the Preparatory Inspection Checklist (Form 7-1) specific for the DFOW and summarized in the Weekly QC Report (Form 7-2) provided at the end of this section.

7.1.2 Initial Phase Inspection

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

During the Initial Phase, the initial segment of the DFOW is observed and inspected to ensure that the work complies with contract and TMP requirements. **Table 6-1** identifies each DFOW. The Initial Phase should be repeated if acceptable levels of specified quality are not met. The following shall be performed for each DFOW:

1. The Field Team Leader (FTL) will ensure that the field teams are aware of expectations associated with the field methods established under the Preparatory Phase by observing the initial work activities and interacting with the PM, Activity Manager, and responsible subcontractors' supervisors.
2. Resolve conflicts. The MR STC will guide the PM and responsible supervisor(s) in resolving conflicts. Should conflicts arise in establishing the baseline quality for the DFOW, the responsibility to resolve the conflict falls to the PM. Should the conflict not be resolved in a manner that satisfies the project requirements, the MR STC must elevate the conflict to the program level (i.e., the Program QC Manager) and issue a non-conformance report. The MR STC could require a cessation of work activity with the concurrence of the Program QC Manager should the issue jeopardize the results of the DFOW or put the project at risk of non-conformance.
3. Verify with the HSM that the site HASP was developed to ensure that the identified hazards adequately address field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of Initial Phase activities, the results are to be documented in the Initial Phase Checklist (Form 7-3) and the QC logbook and summarized in the Weekly QC Report (Form 7-2). Should results be unsatisfactory, the Initial Phase will be rescheduled and performed again.

7.1.3 Follow-up Phase Inspection

Completion of the Initial Phase of QC activity leads directly into the Follow-up Phase, which covers the routine day-to-day activities at the site. Inspection and audit activities associated with each DFOW are discussed in Worksheet #12-2 of the MEC-QAPP (**Appendix A**). Specific concerns associated with the Follow-up Phase are:

1. Inspection of the work activity to ensure work complies with the contract, TMP, and associated documents.
2. Evaluation and confirmation that the quality of work is being maintained at least at the level established during the Initial Phase.
3. Evaluation and confirmation that required testing is being performed in accordance with procedures established during the Preparatory Phase and confirmed during the Initial Phase.
4. Confirmation that nonconforming work is being corrected promptly and in accordance with the direction provided by the PM, FTL, MR STC, or MR Safety and Quality Lead.

To conduct and document these inspections, the FTL is to generate the Follow-up Phase Checklist (Form 7-4). The Follow-up Phase inspections will be performed daily or as otherwise identified in this QCP until each DFOW is completed.

The FTL is responsible for onsite monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, project, and approved project plans and procedures. The FTL is also responsible for verifying that a daily H&S inspection is performed and documented as prescribed in site-specific HASP. Discrepancies between site practices and approved plans and procedures are to be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the MR STC before granting approval to continue work. Follow-up Phase inspection results are to be documented in the QC logbook and summarized in the Weekly QC Report.

7.1.4 Additional Audits

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

7.1.5 Final Acceptance Audit

Upon completion of the DFOWs and before project closeout, the Final Acceptance Inspection must be performed to verify that project requirements relevant to the work are satisfied. Outstanding and nonconforming items are to be documented on the Final Inspection Checklist (Form 7-5). Resolution of each item must be noted on the checklist. Contractor acceptance and closeout of each DFOW is a prerequisite to project closeout.

7.2 Equipment Operational Parameters

Testing and maintenance of equipment such as geophysical instruments, radios, cell phones, and vehicles will be performed according to the manufacturer's specifications, this TMP, Worksheets #12-1b and #12-2 of the MEC-QAPP (**Appendix A**), and all applicable standard operating procedures.

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

The FTL is responsible for ensuring that the tests are performed and that the results are summarized and provided with the Weekly QC Report (Form 7-2). To track each failing test for future retesting, the failing test must be noted on the deficiency log. Resolution of the failing test is complete when retesting is performed and the corrective action is verified on the deficiency log.

7.3 Inspection Schedule

The Inspection Schedule and Tracking Form (Form 7-6) is to be used by the MR Safety and Quality Lead 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 MR Safety and Quality Lead for planning purposes. Audit activities and corrective actions are to be documented by the MR Safety and Quality Lead in accordance with this section. Audit records are to be maintained as part of the project QC file.

7.4 Quality Control Meetings

7.4.1 Coordination and Mutual Understanding Meetings

A pre-construction meeting will be held in advance of the proposed mobilization date for field activities. At the meeting, CH2M HILL will present an overview of the intrusive investigation and discuss project scope, schedule, planned invoicing, H&S concerns, QC procedures, and any site logistical issues.

7.4.2 Onsite Quality Control Meetings

During the field investigation phase of the project, the field teams will meet daily to review the status of the project and to discuss technical and safety issues. When necessary, other meetings will be scheduled or the FTL will meet individually with field personnel or the subcontractors to resolve problems. During the field effort, the FTL will prepare a weekly report detailing project progress, as discussed in Section 7.5.1.

During the field effort, the FTL will be in regular telephone or face-to-face contact with the project team. When significant problems or decisions requiring additional authority occur, the FTL can immediately contact the PM for assistance.

7.5 Quality Control Documentation

7.5.1 Field QC Log

The FTL is responsible for preparing and submitting the daily and weekly QC reports (Form 7-2) to the MR Safety and Quality Lead for the project file and providing concurrent courtesy copies to the PM. The Weekly QC Report with attachments is to be submitted to the Program QC Officer on the first workday following the dates covered by the report.

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

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

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

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

7.5.2 Project Files

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

The files (in either paper or digital format) will include copies of the following:

- Qualifications and training records of all site personnel
- Submittals
- Schedule and progress reports
- Survey records
- Conversation logs
- Meeting minutes and agenda
- Audit logs and schedules
- Photo documentation
- Site maps
- Equipment check records
- Nonconformance and corrective action reports

- Daily work activity summary reports, which could include:
  - Weekly QC Report
  - Daily H&S Report
  - Daily Report (including activity log)
  - Daily Team Logs (Field Data Sheets)
  - Reports on any emergency response actions (Explosive Ordnance Disposal will handle munitions-related emergencies on this project)
  - Equipment check records
  - Chain-of-custody records
  - Incident reports
  - Truck load tickets and shipping papers (if applicable)

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

FORM 7-1

PREPARATORY INSPECTION CHECKLIST
(PART I)

Contract:

Date: _____

Title and No. of Technical Section: _____

_____

_____

_____

A. Planned Attendees:

	Name	Position	Company
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			

B. Submittals required to begin work:

	Item	Submittal No.	Action Code
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			

FORM 7-1

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 7-1

PREPARATORY INSPECTION CHECKLIST
(PART II)

A. Persons in attendance: See Meeting Attendance Sheet (attached)

B. Because of mutual understanding developed during review of preparatory outline and Contract Requirements: (Contract items not specifically covered during the preparatory inspection conference are assumed to be in strict conformance with the contract requirements.)

The items noted above constitute a memorandum of mutual understanding and will be performed as planned and specified.

UXOQCS

Technical Representative

Form 7-2
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:

_____
_____
_____

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

_____
_____
_____

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

_____
_____
_____

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

_____
_____
_____

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

_____
_____
_____

Form 7-2
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:

_____
_____
_____

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.*

Onsite QC Manager (or designee) Signature:_____

FORM 7-3

INITIAL PHASE CHECKLIST

Contract No.:

Date: _____

Title and No. of Technical Section: _____

Description and Location of Work Inspected: _____

A. Key Personnel Present:

	Name	Position	Company
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 needeed: _____

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

If no, corrective action taken: _____

_____

UXOQCS

FORM 7-4

FOLLOW-UP PHASE CHECKLIST

Date:
Contractor:
Contract No:

Y=YES; N=NO; SEE REMARKS BLANK=NOT APPLICABLE	
WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE	

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION, AND LIST PERSONNEL PRESENT

TESTING PERFORMED & WHO PERFORMED TEST (Include number of samples and/or tests taken)

QA Representative **Date**

UXOQCS **Date**

FORM 7-5

FINAL INSPECTION CHECKLIST
(PART I)

Date: _____

Contract No.:

Project / Area of Inspection: _____

A. Definable Features of Work: Status of Inspection:

I hereby certify, that to the best of my knowledge and belief, that the work inspected is complete and all materials and equipment used and work performed were completed in accordance with plans submitted and approved.

_____
Quality Control Manager

B. Final Acceptance is Approved, Subject to the Correction of the Punchlist Items Below:

FORM 7-5
FINAL INSPECTION CHECKLIST
(PART I)
(CONTINUED)

A. Persons in Attendance: See Meeting Attendance Sheet (attached)

B. Resolution of Punchlist Items:

The items noted above constitute a memorandum of mutual understanding and work has been performed as planned and specified.

QCM

Technical Representative

FORM 7-5

FINAL INSPECTION CHECKLIST
(PART II)

MEETING ATTENDANCE LIST

Meeting:		**Date:**
Name	**Organization**	**Phone Number**

FORM 7-6

INSPECTION SCHEDULE AND TRACKING FORM

Project:	**Project Manager:**	**QCM:**

Reference Number	Definable Feature of Work	**Preparatory**		**Initial**		**Follow-Up**		**Completion**		
		Date Planned	Actual Date	Date Planned	Actual Date	Planned Begin/End	Actual Dates	Planned Begin/End	Actual Dates	Status

SECTION 8

Project Management

The key organizations that will be involved in the pre-RI reconnaissance at the DBTs NALF Fentress are the Navy (NALF Fentress), NAVFAC Mid-Atlantic, Virginia Department of Environmental Quality, and CH2M HILL. Project execution will be conducted by CH2M HILL and it major subcontractor, USA Environmental, which will provide MEC services.

As the prime contractor, CH2M HILL is the primary point of contact with NAVFAC Mid-Atlantic. CH2M HILL will manage the overall project, providing day-to-day oversight and related management support to execute the project successfully. Project duties controlled by CH2M HILL include the following:

- Project planning, implementation, and reporting
- Subcontractor selection, management, and control
- Program- and project-level QC
- Program- and project-level H&S oversight
- Site management
- Performance of pre-RI reconnaissance field activities
- Analysis of data to support planning for the subsequent RI
- Project closeout

The following services will be provided by subcontractor USA Environmental:

- MEC services (intrusive investigation of DGM anomalies, MEC and/or MPPEH management and disposition)

8.1 Project Organization

The project organization chart is presented in **Figure 8-1**.

8.1.1 Responsibilities and Qualifications for Key Management Personnel

The responsibilities and qualifications for key management personnel are discussed in Worksheets #6 and #7 of the MEC-QAPP (**Appendix A**).

8.1.2 Project Personnel Training

Project personnel will be qualified to perform their assigned jobs in accordance with terms outlined in the contract, project plans, and the HASP (**Appendix B**).

All site personnel, including visitors, must complete the training outlined in the HASP before beginning onsite work. The required training includes the U.S. Occupational Safety and Health Administration 40-hour hazardous waste operators training, annual 8-hour refresher (29 Code of Federal Regulations 1910.120) and site-specific training program.

The site-specific training program will ensure that project personnel understand the following:

- Roles and responsibilities
- Onsite safety conditions and other hazards
- Use of personal protection equipment
- Processes and procedures necessary to perform assigned tasks
- Operation of required tools
- Acceptance and rejection criteria for the work process
- Consequences of inadequate quality levels
- Emergency response plan

In addition, site personnel should be provided with the necessary training for continued maintenance of job proficiency. Site personnel must be knowledgeable regarding their quality improvement and empowerment responsibilities.

The review and verification of personnel qualifications are to be documented on the Personnel Qualification Verification Form (Form 8-1) provided at the end of this section. The FTL will maintain records documenting the required qualifications and training for each site worker. The FTL will also monitor expiration dates to provide advance warning to the PM as to when employees will require refresher training or other requirements. The FTL will maintain these records onsite.

8.2 Coordination

8.2.1 Project Tracking Tools

During the field investigation phase of the project, the project will be tracked using a variety of tracking tools including the field logbook, QC forms, and electronic data loggers.

8.2.2 Problem Identification/Resolution

Although deficiency identification and resolution occurs primarily at the operational level, QC audits provide a backup mechanism to address deficiencies that either are not identified or cannot be resolved at the operational level. Through implementation of the audit program prescribed in the QCP (Section 7), the QC staff is responsible for verifying that deficiencies are identified, documented, and corrected in a timely manner, as presented in Worksheet #32 of the MEC-QAPP (**Appendix A**). Deficiencies identified by the QC staff are to be corrected by the operational staff and documented by the QC staff.

8.3 Submittal Management

8.3.1 General Requirements

The PM is responsible for review, schedule and tracking of project submittals. The PM is responsible for completing a detailed review of all submittals to ensure that they comply with applicable contractual specifications and project plans. The PM is also responsible for ensuring that all submittals are added to the project file.

8.3.2 Project Records

This project will require the administration of a central project file. The data and records management protocols set forth herein will provide adequate controls and retention of all materials related to the project. A summary of the project documents and records is presented in Worksheet #29 of the MEC-QAPP (**Appendix A**). Records control will include receipt from external sources, transmittals, transfer to storage, and indication of records status. Records retention will include receipt at storage areas, indexing, filing, storage, maintenance, and retrieval.

8.3.3 Review of Plans

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

8.3.4 Review and Approval of Submittals

The CH2M HILL MR Safety and Quality Lead, the MR STC, and the PM must review submittals prepared by CH2M HILL and subcontractors for completeness and compliance with the specifications of the project and contract. Noncompliant submittals are to be returned to the originator for corrective action and re-submittal to the PM or his designee.

FORM 8-1

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:		

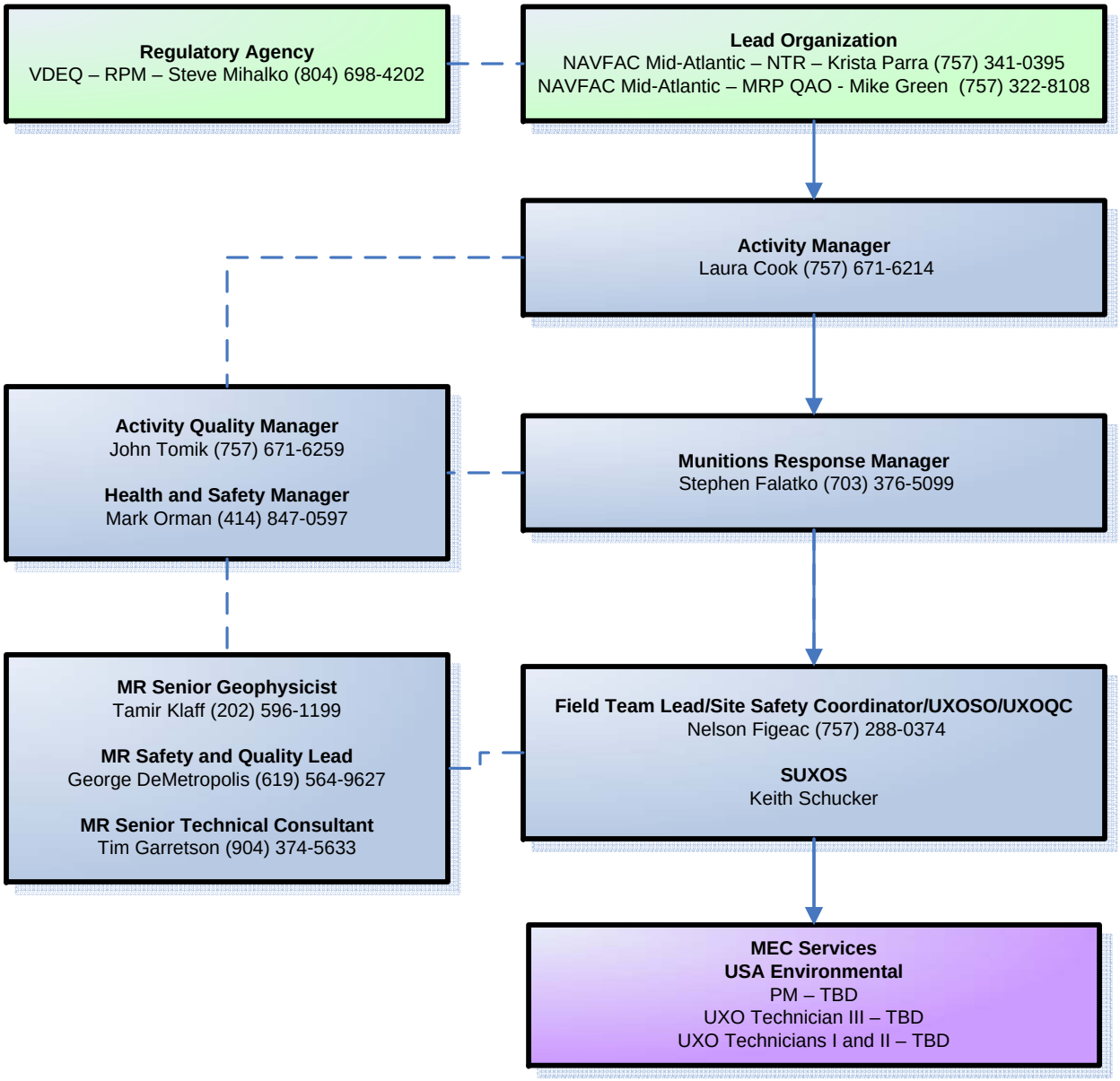

Figure 8-1
Project Organizational Chart
Technical Management Plan
Dive Bombing Targets NALF Fentress
Naval Air Station Oceana
Virginia Beach, Virginia

SECTION 9

Environmental Protection Plan

To date, no cultural resources have been identified on the MRSs. There are no known federally listed threatened and endangered species onsite. One state-listed species of concern— the canebrake rattlesnake—has historically been located on station. The Migratory Bird Treaty Act is also in effect from April 1 to September 30.

SECTION 10

Remedial Investigation Report/After Action Report

The results from this field effort will be used to plan the forthcoming RI, and will ultimately be included in the RI report and an After Action Report. Those reports will be prepared after the RI field activities have been completed.

SECTION 11

References

CH2M HILL. 2012. *Explosives Safety Submission for Naval Auxiliary Landing Field Fentress Dive Bombing Targets, Naval Air Station Oceana, Virginia Beach, Virginia. November*.

Department of Defense (DoD). 2010. *DoD Ammunition and Explosives Safety Standards: General Explosives Safety Information and Requirements.* DoD 6055.09-M. August.

Geo-Marine, Inc. 2001. *Integrated Natural Resources Management Plan, Naval Air Station Oceana and Naval Auxiliary Landing Field Fentress*. November.

Geo-Marine, Inc., 2006. *Integrated Natural Resources Management Plan (Final), Naval Air Station Oceana, Dam Neck Annex and Naval Air Station Oceana, South Virginia Beach Annex (Camp Pendleton).* November.

Malcolm Pirnie. 2008. *Final Preliminary Assessment, Naval Air Station Oceana, Dam Neck Annex and Naval Auxiliary Landing Field Fentress, Virginia.* October.

Naval Sea Systems Command. 2011. *Ammunitions and Explosives Safety Ashore.* OP5, Volume 1, Change 10. July.

Appendix A
Munitions and Explosives of Concern Quality Assurance Project Plan

Munitions and Explosives of Concern Quality Assurance Project Plan for Pre-Remedial Investigation Reconnaissance Dive Bombing Targets – Naval Auxiliary Landing Field Fentress

Naval Air Station Oceana
Virginia Beach, Virginia

Contract Task Order WE03

February 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by

CH2MHILL

Virginia Beach, Virginia

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Worksheet #1—Title and Approval Page

Munitions and Explosives of Concern
Quality Assurance Project Plan
Pre-Remedial Investigation Reconnaissance
Dive Bombing Targets – Naval Auxiliary Landing Field Fentress

Naval Air Station Oceana
Virginia Beach, Virginia

January 2013

Prepared for:
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Prepared by:
CH2M HILL
5701 Cleveland Street, Suite 200
Virginia Beach, VA 23462

Prepared under:
NAVFAC CLEAN 1000 Program
Contract No. N62470-08-D-1000
Contract Task Order WE03

QUALITY ASSURANCE REVIEW:

John Tomik
CH2M HILL Activity Quality Manager — Date 2/19/13

Stephen Palatko
CH2M HILL Munitions Response Manager and Project Manager — Date 2/19/13

Other Approvals:

PARRA.KRISTA.R.1381421593 Digitally signed by PARRA.KRISTA.R.1381421593
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=PARRA.KRISTA.R.1381421593
Date: 2013.02.21 08:33:23 -05'00'

Krista Parra
NAVFAC Navy Technical Representative — Date

GREEN.MICHAEL.DAVID.1042977876 Digitally signed by GREEN.MICHAEL.DAVID.1042977876
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=GREEN.MICHAEL.DAVID.1042977876
Date: 2013.02.20 08:58:36 -05'00'

Mike Green
NAVFAC Munitions Response Program Quality Assurance Officer — Date

2-19-13

Stephen Mihalko
Virginia DEQ Remedial Project Manager — Date

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Executive Summary

This Munitions and Explosives of Concern (MEC) – Quality Assurance Project Plan (QAPP) is prepared to support the pre-Remedial Investigation (RI) reconnaissance field activities associated with the Dive Bombing Targets (DBTs) munitions response site (MRS) at Naval Auxiliary Landing Field (NALF) Fentress, Naval Air Station (NAS) Oceana, Virginia. The pre-RI reconnaissance activities are being performed under Contract Number N62470-08-D-1000, Contract Task Order WE03.

Two adjacent DBTs are located west of the runway in the central portion of NALF Fentress. The first, northernmost target (the North DBT), is at the end of runway 1-19. The second, southernmost target (the South DBT) is approximately 500 feet southwest of the existing target. Each DBT covered approximately 6.5 acres. Munitions used at the DBTs probably included practice bombs with small signal cartridges to indicate the point of impact.

The objective of the pre-RI reconnaissance is to investigate the nature of MEC in the subsurface. The results of the pre-RI reconnaissance will be used to guide subsequent RI activities for the DBTs. Recovered MEC and /or material potentially presenting an explosive hazard will be managed and disposed of in accordance with the *Final Explosives Safety Submission for Naval Auxiliary Landing Field Fentress Dive Bombing Targets, Naval Air Station Oceana, Virginia Beach, Virginia* (CH2M HILL, 2012a), approved by the Department of Defense Explosives Safety Board.

This MEC-QAPP is intended to be the primary work plan for the activities being performed at the site and serves as a guideline for the field activities and data quality assessment. The Standard Operating Procedures are provided in Appendix A of. This MEC-QAPP was developed in general accordance with the following U.S. Environmental Protection Agency (EPA) guidance documents:

- *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, QAMS (EPA, 2002)
- *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) (EPA, 2005)
- *EPA Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006)

This document consists of 37 worksheets, which are based on the UFP-Sampling and Analysis Plan format designed specifically for chemical sampling. Worksheets that are not applicable to this MEC-QAPP format have been modified to meet the intent of the worksheet with respect to MEC, or have been designated as “Not Applicable.” All tables are embedded within the worksheets.

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MEC-QAPP Worksheets

Appendices

Table

Figures

Abbreviations and Acronyms

AM	Activity Manager
AQM	Activity Quality Manager
CA	corrective action
DBT	dive bombing target
DDESB	Department of Defense Explosives Safety Board
DFOW	definable feature of work
DGM	digital geophysical mapping
DQI	data quality indicator
ECP	entry control point
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
ESS	Explosives Safety Submission
EZ	exclusion zone
FP	Follow-up Phase
FTL	Field Team Leader
H&S	health and safety
HASP	Health and Safety Plan
HSM	Health and Safety Manager
IAW	in accordance with
ID	identification
IP	Initial Phase
MDAS	material documented as safe
MDEH	material documented as an explosive hazard
MEC	munitions and explosives of concern
MPC	measurement performance criteria
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MRM	Munitions Response Manager
MRP	Munitions Response Program
MRS	munitions response site
N/A	not applicable
NALF	Naval Auxiliary Landing Field
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NTR	Navy Technical Representative
PA	Preliminary Assessment
PAL	project action limit
PM	Project Manager
POC	point of contact
PP	Preparatory Phase
PQO	project quality objective
QA	quality assurance

QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
RPM	Remedial Project Manager
RRR (or 3-R)	Recognize, Retreat, Report
SI	Site Inspection
SOP	standard operating procedure
SSC	Site Safety Coordinator
STC	Senior Technical Consultant
SUXOS	Senior Unexploded Ordnance Supervisor
TM	Task Manager
TMP	Technical Management Plan
UFP	Uniform Federal Policy
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
VDEQ	Virginia Department of Environmental Quality

Worksheet #2—QAPP Identifying Information

Site Name/Number: Dive Bombing Targets (DBTs)

Operable Unit: Not applicable (N/A)

Contractor Name: CH2M HILL

Contract Number: N62470-08-D-1000, Contract Task Order WE03

Contract Title: Comprehensive Long-term Environmental Action—Navy 1000

1. **This Quality Assurance Project Plan (QAPP) was prepared in accordance with (IAW) the requirements of the following U.S. Environmental Protection Agency (EPA) documents:**
   - *Uniform Federal Policy – Quality Assurance Project Plans* (EPA, 2005)
   - *Guidance for Quality Assurance Project Plans (QAPPs) USEPA QA/G-5, QAMS* (EPA, 2002)
   - *EPA Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006)
2. **Identify regulatory program:**
   - Comprehensive Environmental Response, Compensation, and Liability Act of 1980
3. **This is a project-specific QAPP for munitions response (MR) activities at the DBTs.**
4. **List dates of scoping sessions that were held:**

Scoping Session	Date
Naval Air Station (NAS) Oceana Partnering Meeting	11/15/2012

5. **List dates and titles of any QAPP documents written for previous site work that are relevant to the current investigation.**

Title	Author/Date
Draft Geophysical Investigation Plan NALF Fentress Dive Bombing Targets Naval Air Station Oceana, Virginia Beach, Virginia	CH2M HILL/2012b
Technical Memorandum Geophysical Investigation Results and Proposed Pre-Remedial Investigation Reconnaissance and Remedial Investigation Approach Dive Bombing Targets - NALF Fentress Naval Air Station Oceana, Virginia	CH2M HILL/2012c

6. **List organizational partners (stakeholders) and connection with lead organization:**

   Lead organization: Department of the Navy (Navy) Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic
   Installation: NAS Oceana
   Lead Regulatory Agency: Virginia Department of Environmental Quality (VDEQ)

7. **Lead organization (see Worksheet #7 for detailed list of data users)**
   - NAVFAC Navy Technical Representative (NTR) (Krista Parra),
   - NAVFAC Munitions Response Program (MRP) Quality Assurance Officer (QAO) (Mike Green)

Worksheet #2—QAPP Identifying Information (continued)

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

The worksheets that are not applicable to this MEC format of the Uniform Federal Policy (UFP)-QAPP are as follows: **Worksheets #15, #19, #20, #23-28,** and **#30**. These worksheets pertain to samples that are collected from the site and sent to an analytical laboratory. Because this phase of the project does not involve the collection of samples from the site, there is no information to enter into these worksheets. These worksheets are designated as "Not Applicable" in the document.

UFP-QAPP Worksheet #	Required Information	Included or Excluded
A. Project Management		
Documentation		
1	Title and Approval Page	Included
2	Table of Contents Sampling and Analysis Plan Identifying Information	Included
3	Distribution List	Included
4	Project Personnel Sign-Off Sheet	Included
Project Organization		
5	Project Organizational Chart	Included
6	Communication Pathways	Included
7	Personnel Responsibilities and Qualifications Table	Included
8	Special Personnel Training Requirements Table	Included
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	Included
10	Problem Definition, Site History, and Background Site Maps (historical and present)	Included
11	Site-Specific Project Quality Objectives (PQOs)	Included
12	Measurement Performance Criteria (MPC) Table	Included
Project Planning/Problem Definition (continued)		
13	Sources of Secondary Use Data and Information Secondary Use of Data Criteria and Limitations Table	Included
14	Summary of Project Tasks	Included
15	Reference Limits and Evaluation Table	Excluded
16	Project Schedule/Timeline Table	Included
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	Included

Worksheet #2—QAPP Identifying Information (continued)

UFP-QAPP Worksheet #	Required Information	Included or Excluded
18	Sampling Locations and Methods/Standard Operating Procedure (SOP) Requirements Table Sample Location Map(s)	Included
19	Analytical Methods/SOP Requirements Table	Excluded
20	Field Quality Control (QC) Sample Summary Table	Excluded
21	Project Sampling SOPs References Table Sampling SOPs	Included
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Included
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	Excluded
24	Analytical Instrument Calibration Table	Excluded
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Excluded
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving, and Disposal Sample Handling Flow Diagram	Excluded
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	Excluded
QC Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	Excluded
Data Management Tasks		
29	Project Documents and Records Table	Included
30	Analytical Services Table Analytical and Data Management SOPs	Excluded
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	Included
32	Assessment Findings and Corrective Action (CA) Responses Table	Included
33	Quality Assurance (QA) Management Reports Table	Included
D. Data Review		
34	Verification (Step I) Process Table	Included
35	Validation (Steps IIa and IIb) Process Table	Included
36	Validation (Steps IIa and IIb) Summary Table	Included
37	Usability Assessment	Included

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Worksheet #3—Distribution List

Name of QAPP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Krista Parra	NTR	NAVFAC Mid-Atlantic	(757) 341-0395	krista.parra@navy.mil
Mike Green	MRP QAO	NAVFAC Mid-Atlantic	(757) 322-8108	mike.green@navy.mil
Steve Mihalko	Remedial Project Manager (RPM)	VDEQ	(804) 698-4202	stephen.mihalko@deq.virginia.gov
Laura Cook	Activity Manager (AM)	CH2M HILL	(757) 671-6214	laura.cook@ch2m.com
Stephen Falatko	Munitions Response Manager (MRM) and Project Manager (PM)	CH2M HILL	(703) 376-5099	stephen.falatko@ch2m.com
Joe Kenderdine	Task Manager (TM)	CH2M HILL	(703) 376-5156	joseph.kenderdine@ch2m.com
John Tomik	Activity Quality Manager (AQM)	CH2M HILL	(757) 671-6259	john.tomik@ch2m.com
George DeMetropolis	MR Safety and Quality Lead	CH2M HILL	(619) 564-9627	george.demetropolis@ch2m.com
Kevin Lombardo	MR Operations Lead	CH2M HILL	(703) 376-5175	kevin.lombardo@ch2m.com
Timothy Garretson	MR Senior Technical Consultant (STC)	CH2M HILL	(904) 374-5633	timothy.garretson@ch2m.com
Tamir Klaff	MR Senior Geophysicist	CH2M HILL	(202) 596-1199	tamir.klaff@ch2m.com
Mark Orman	Health and Safety Manager (HSM)	CH2M HILL	(414) 847-0597	mark.orman@ch2m.com
Nelson Figeac	Unexploded Ordnance Safety Officer (UXOSO)/UXO Quality Control Specialist (UXOQCS)/Field Team Leader (FTL)/Site Safety Coordinator (SSC)	CH2M HILL	(757) 288-0374	nelson.figeac@ch2m.com
Ted Dingle	Senior UXO Supervisor (SUXOS)	CH2M HILL	(757) 955-0591	theodore.dingle@ch2m.com
Rob Gucwa	PM	USA Environmental	(757) 689-4818	rgucwa@usatampa.com

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Worksheet #4—Project Personnel Sign-Off Sheet

Name	Organization/Title/Role	Telephone Number (optional)	Signature/email Receipt	QAPP Section Reviewed	Date QAPP Read
Krista Parra	NAVFAC NTR	(757) 341-0395			
Steve Mihalko	VDEQ RPM	(804) 698-4202			
Laura Cook	CH2M HILL/AM	(757) 671-6214			
Stephen Falatko	CH2M HILL/MRM and PM	(703) 376-5099			
Joe Kenderdine	CH2M HILL/TM	(703) 376-5156			
John Tomik	CH2M HILL/AQM	(757) 671-6259			
George DeMetropolis	CH2M HILL/MR Safety and Quality Lead	(619) 564-9627			
Timothy Garretson	CH2M HILL/MR STC	(904) 374-5633			
Tamir Klaff	CH2M HILL/MR Senior Geophysicist	(202) 596-1199			
Nelson Figeac	CH2M HILL/UXOSO/UXOQCS/FTL/SSC	(757) 288-0374			
Ted Dingle	CH2M HILL/SUXOS	(757) 955-0591			
Mark Orman	CH2M HILL/HSM	(414) 847-0597			
Rob Gucwa	USA Environmental/PM	(757) 689-4818			

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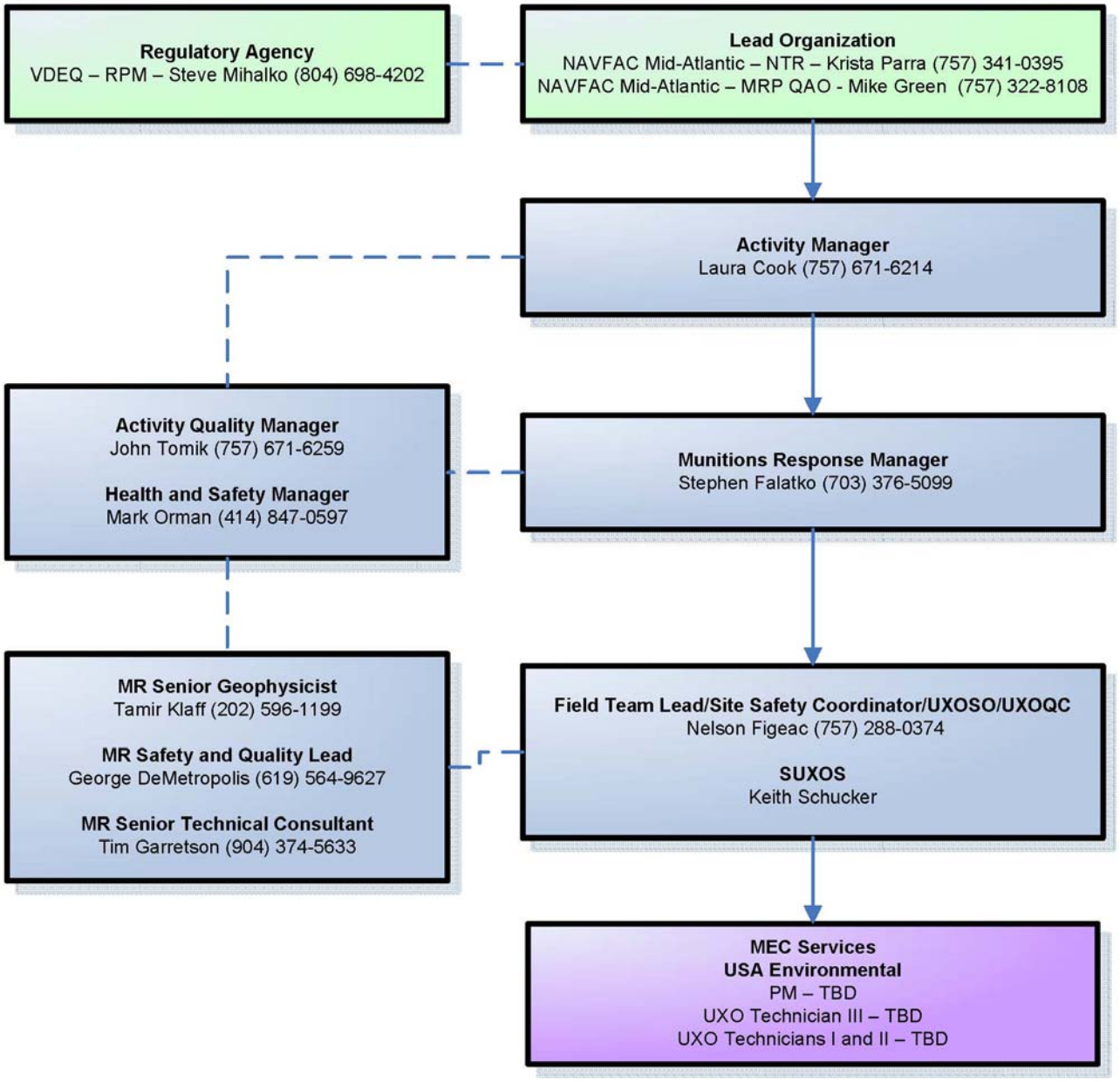
Worksheet #5—Project Organizational Chart



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Worksheet #6—Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Telephone Number	Procedure
Communication with Navy (lead agency)	NAVFAC NTR for NAS Oceana MRP	Krista Parra	(757) 341-0395	Primary point of contact (POC) for Navy, stakeholder and agency managers; can delegate communication to other internal or external POCs. Any issue that may affect project work should be reported to NAVFAC NTR immediately.
Communication with VDEQ	RPM	Steve Mihalko	(804) 698-4202	Primary POC for VDEQ; can delegate communication to other internal or external POCs. Upon notification of field changes, VDEQ will have 24 hours to approve or comment on the field changes. All data results will be presented and discussed during site meetings.
Oversight of Environmental Restoration Program (ERP) implementation	CH2M HILL ERP AM for NAS Oceana	Laura Cook	(757) 671-6214	ERP POC for CH2M HILL; can delegate communication to other contract staff as appropriate. Issues reported to the Navy NTR immediately and followed up in writing within 2 business days.
Oversight of MRP implementation	CH2M HILL MRM for NAS Oceana	Stephen Falatko	(703) 376-5099	MRP POC for CH2M HILL; can delegate communication to other contract staff as appropriate. Issues reported to the Navy NTR immediately and followed up in writing within 2 business days.
Management of MRP Implementation	CH2M HILL PM	Stephen Falatko	(703) 376-5099	Primary POC for MR field and project-specific activities; timing dependent on nature of communication and predefined schedules as applicable and as requested by stakeholder agencies.
Management of MRP Implementation	CH2M HILL TM	Joe Kenderdine	(703) 376-5156	POC for field and project-specific activities; timing dependent on nature of communication and predefined schedules as applicable and as requested by stakeholder agencies. All information and materials about the project will be forwarded to the PM and AM on a daily basis.
QAPP changes in the field	CH2M HILL FTL/SSC/UXO QC	Nelson Figeac	(757) 288-0374	Notify the PM by phone and email of changes to the QAPP made in the field and the reasons within 24 hours. Documentation of deviations from this MEC-QAPP will be kept in the field logbook; deviations made only with the approval of the PM.
Field CA	CH2M HILL FTL/SSC/UXO QC	Nelson Figeac	(757) 288-0374	The need for CA for field and analytical issues will be determined by the FTL and AQM. The AQM will ensure QAPP requirements are met by the field staff. The FTL will notify the PM of any needed field CAs. The PM will have 24 hours to respond to the request for field CA.

Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Telephone Number	Procedure
Technical communications for MEC-QAPP implementation, data interpretation	CH2M HILL MR Senior Geophysicist	Tamir Klaff	(202) 596-1199	Contact MR Senior Geophysicist regarding questions/issues encountered in the field, input on data interpretation, as needed. AQM will have 24 hours to respond to technical field questions as necessary. Responses will be communicated to the PM via email or phone.
Field and Data Collection CAs	CH2M HILL MR Senior Geophysicist	Tamir Klaff	(202) 596-1199	Any CAs for field and data collection issues will be identified by the FTL and/or the MR Senior Geophysicist and reported to the PM within 24 hours.
MR-related CAs	CH2M HILL MR Safety and Quality Lead	George DeMetropolis	(619) 564-9627	Any MR-related CAs for field and data collection issues will be identified by the FTL, UXOQCS/UXOSO and/or the MR Safety and Quality Lead and reported to the PM within 24 hours.
Technical communications for project implementation, and data interpretation	AQM	John Tomik	(757) 671-6259	Contact AQM regarding questions/issues encountered in the field, input on data interpretation, as needed. AQM will have 24 hours to respond to technical field questions as necessary. Responses will be communicated to the PM via email or phone.
Health and Safety (H&S)	FTL/SSC/UXOQCS	Nelson Figeac	(757) 288-0374	Responsible for the adherence of team members to the site safety requirements described in the Health and Safety Plan (HASP). Will report H&S incidents and near-losses to PM.
Implementation of TMP	CH2M HILL SUXOS	Ted Dingle	(757) 955-0591	Plans, coordinates, and supervises all explosives operations; supervises all personnel inside the exclusion zones (EZs).
MEC-related QC provisions	CH2M HILL UXOSO/UXOQCS	Nelson Figeac	(757) 288-0374	Any MEC-related QC provisions will be identified by the FTL, UXOQCS/UXOSO and/or the MR Safety and Quality Lead and reported to the PM within 24 hours

Worksheet #7—Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Krista Parra	NTR	NAVFAC	Provides project oversight and direction, assists with coordination of project activities between CH2M HILL and installation operations personnel, provides technical review of deliverables, and serves as primary regulatory interface for the Navy and the project team.
Mike Green	MRP QAO	NAVFAC	Provides quality review of MRP-related projects and activities for NAVFAC, including review of MEC-QAPP documents.
Steve Mihalko	RPM	VDEQ	Provides regulatory review of project documents and activities for the Commonwealth of Virginia.
Laura Cook	ERP AM	CH2M HILL	Responsible for CH2M HILL ERP project implementation at NAS Oceana.
Stephen Falatko	MRM and PM	CH2M HILL	Responsible for CH2M HILL MRP project implementation at NAS Oceana. Ensures proper implementation of all phases of work for the project. Directs and oversees staff.
Joe Kenderdine	TM	CH2M HILL	Ensures proper implementation of all phases of work for the project. Directs and oversees staff.
John Tomik	AQM	CH2M HILL	Provides program-level review of MEC-QAPP. Provides oversight and approval for all technical issues related to the project.
George DeMetropolis	MR Safety and Quality Lead	CH2M HILL	Provides approval for all MRP-related issues for the project. Implements CH2M HILL standard munitions QC procedures and conducts audits to confirm that QC protocols are being followed.
Timothy Garretson	MR STC	CH2M HILL	Technical lead for MR program conformance to approved processes and procedures. Provides oversight and review of MR-related activities.
Tamir Klaff	MR Senior Geophysicist	CH2M HILL	Provides oversight and review of all digital geophysical mapping (DGM) -related activities.
Nelson Figeac	FTL/SSC/UXOSO/UXOQCS	CH2M HILL	Provides technical oversight and support for MEC-QAPP revisions and field work implementation. Supervises and coordinates all field activities. Implements the MEC-related QC provisions of the project. Implements the HASP, including MEC-related and general safety components.
Ted Dingle	SUXOS	CH2M HILL	Implements approved TMP. Plans, coordinates, and supervises all explosives operations. Coordinates all aspects of QC and H&S with the UXOQCS/UXOSO.
Rob Gucwa	PM	USA Environmental	Maintains communication with CH2M HILL PM and SUXOS.

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Worksheet #8—Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Pre-RI Rreconnaissance	Hazardous waste operations and emergency response 40-hour training or 8-hour annual refresher, as appropriate	Registered training organization	Agency- and contractor-specific	FTL and SSC; Navy and regulatory agency representatives	FTL and SSC from CH2M HILL; UXO personnel; onsite visitors from Navy and regulatory agencies	Contractor, Navy, or regulatory agency human resources department
Field Work	MEC Awareness Training†	CH2M HILL UXO Technician	Prior to mobilization	All non-UXO technicians who will work at the site	FTL and SSC from CH2M HILL Field team members from subcontractor	Project folder

† MEC training is often referred to as Recognize, Retreat, Report (RRR or 3-R) training. This training is intended to make the trainees aware of the potential presence of MEC, ways to recognize potential MEC, and what to do if potential MEC is observed. This training DOES NOT enable the trainee to identify the type of MEC or handle the potential MEC item.

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Worksheet #9-1—Project Scoping Session Participants Sheet

Project Name: Pre-RI Reconnaissance **Projected Date(s) of Sampling:** N/A **PM:** Stephen Falatko/CH2M HILL	**Site Name:** DBTs **Site Location:** NALF Fentress, NAS Oceana, Virginia Beach, VA
Date of Session: November 15, 2012 **Scoping Session Purpose:** NAS Oceana Munitions Response Program Partnering Meeting	

Name	Title	Affiliation	Phone #	E-mail Address
Krista Parra	NTR	NAVFAC-Mid Atlantic	(757) 341-0395	krista.parra@navy.mil
Steve Mihalko	RPM	VDEQ	(804) 698-4202	stephen.mihalko@deq.state.va.us
Laura Cook	AM	CH2M HILL	(757) 671-6214	laura.cook@ch2m.com
Stephen Falatko	MRM/PM	CH2M HILL	(703) 376-5099	stephen.falatko@ch2m.com
Joe Kenderdine	TM	CH2M HILL	(703) 376-5156	joseph.kenderdine@ch2m.com

Comments:

The team discussed pre-RI reconnaissance and RI approach for the DBTs. The team agreed with not sampling for munitions constituents based on the ordnance used because the practice bombs contained only black powder. The team agreed with the RI approach presented in the *Geophysical Investigation Results and Proposed Pre-Remedial Investigation Reconnaissance and Remedial Investigation Approach Technical Memorandum, Former Dive Bombing Targets - NALF Fentress Naval Air Station Oceana, Virginia* (CH2M HILL 2012c). The team agreed that existing Site Inspection (SI) planning documents can be used for the pre-RI reconnaissance and that the RI planning documents will be completed before beginning intrusive investigation of anomalies at the RI stage.

Action Items and Resolution

CH2M HILL: Proceed with the preparation of the pre-RI reconnaissance TMP.

Consensus Decisions

The team agreed with performing a limited intrusive investigation, consisting of 2 days of activities (1 day at each site). The following documents will be prepared:

- TMP
- MEC QAPP
- Explosives Safety Submission (ESS)
- Site-specific HASP

During plan preparation, a sample of the anomalies identified during the March 2012 DGM survey will be selected to represent various amplitudes of anomalies. The selected sample will result in a general understanding of the types of metal in the subsurface at the site. The selected anomalies identified for excavation will be re-located using existing survey stakes. A procedure for locating the position of selected anomalies is presented in Appendix C of the TMP. Locations will be marked by placing a non-metallic pin flag at each anomaly location. A UXO Technician will be onsite to oversee all anomaly reacquisition activities.

Excavation at individual geophysical anomaly locations will be performed and supervised by qualified UXO Technicians using hand-excavation tools. Recovered items will be assessed, have their explosives safety status determined, and be segregated as MEC, material potentially presenting an explosive hazard (MPPEH), material documented as safe (MDAS), or non-munitions related scrap and other refuse, as outlined in the ESS (CH2M HILL, 2012a). The UXO technician will check the excavation location with the Schonstedt GA-52Cx to confirm that the

source of the anomaly has been removed. Upon completion of excavation, the UXOQCS will check the excavation location using the EM61-MK2 in analog mode to confirm that all detectable metallic items have been removed.

These activities will be conducted IAW the TMP, which will present the overall strategy for the project and the detailed technical approach, and will include the associated plans and documents to successfully complete the project. The associated plans will be presented as appendices to the TMP and will include a MEC QAPP and HASP. An ESS approved by the Department of Defense Explosives Safety Board (DDESB) will be prepared and fully implemented during the MR operations to ensure safe, compliant, and effective completion of the planned actions.

Worksheet #10—Problem Definition Overview

Step 1. Problem Statement

The March 2012 DGM survey identified 518 anomalies along the transects, and a geostatistical analysis of the results suggests that there are more than 6,000 anomalies in the two DBT areas. In addition, practice bombs and an unfuzed smoke signal grenade were observed on the surface. These findings provide strong lines of evidence that MEC is present in the subsurface. The objective of the pre-RI reconnaissance is to investigate the nature of MEC in the subsurface. The results of the pre-RI reconnaissance will be used to guide subsequent RI activities for the DBTs.

Step 2. Identify Decisions to be made

1. Are any of the sources of the anomalies identified during the 2012 DGM investigation MEC?

   Anomalies identified during the March 2012 DGM survey will be reacquired and intrusively investigated during MEC removal operations as described in **Worksheet #17**. A limited intrusive investigation will be conducted, consisting of 2 days of activities (1 day at each site). Approximately 100 anomalies will be investigated at each site.

2. Is further investigation or action warranted at the munitions response site (MRS)?

   The results of the pre-RI reconnaissance will be used to guide subsequent RI activities for the DBTs.

Step 3. Identify Information Inputs

During plan preparation, a sample of the anomalies identified during the pre-RI reconnaissance DGM survey will be selected to represent various amplitudes of anomalies. The anomaly selection process includes random and biased sample selection and is presented in Appendix B. The selected sample will result in a general understanding of the types of metal in the subsurface at the site.

Step 4. Define the Boundaries of the Study

The boundary of the investigation was established based on the distribution of anomalies identified during 2012 DGM survey. Boundaries of the pre-RI reconnaissance are presented in Figures 10-1 and 10-2.

Step 5. Develop Analytical Approach

The pre-RI reconnaissance will use existing survey stakes to reacquire the position of selected anomalies potentially representative of MEC. Excavation at individual geophysical anomaly locations will be performed and recovered items will be assessed, have their explosives safety status determined, and be segregated as MEC/MPPEH, MDAS, or non-munitions related scrap and other refuse as outlined in the ESS (CH2M HILL, 2012a).

Step 6: Specify Performance or Acceptance Criteria

The performance and acceptance criteria of the data are presented in **Worksheet #12**.

Step 7: Develop the Plan for Obtaining Data

Worksheet #14 contains a summary of the definable features of work (DFOWs). **Worksheet #17** contains the detailed approach, methods, operational procedures and QC requirements associated with the MEC field-related activities.

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Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements

Who will use the data?

The data will be used by the Navy and VDEQ.

What are the project action limits (PALS)? (Specified detailed list should be provided in Worksheet #15)

Due to the nature of this investigation, there are no traditional reference or action limits that can be established for this phase of the RI.

What will the data be used for?

The results of the pre-RI reconnaissance will be used to guide subsequent RI activities.

What types of data are needed?

Identification of quantities and types of MEC will be performed by a qualified UXO technician.

How "good" does the data need to be to support the environmental decision?

Not applicable.

How much data are needed?

Data collection from these excavated locations will allow the Navy and stakeholder agencies to identify the nature of MEC in the subsurface, which will be used to make decisions about additional RI activities.

Where, when and how should the data be collected/generated?

- The data will be collected from the DGM-identified anomaly locations.
- The schedule is identified on QAPP **Worksheet #16**. The field event is planned to occur in early 2013.
- Data will be collected IAW the procedures outlined in this MEC QAPP.

Who will collect and generate the data?

UXO personnel from USA Environmental Inc. will reacquire the position of selected anomalies with an EM61 and perform the intrusive investigation of each anomaly. The results of each excavation will be recorded in paper or digital logbooks.

How will the data be archived?

- All files will be made available for QC verification during the project to verify that the field procedures are properly implemented. All data files, hard copies, and field notes will be maintained for the duration of the project. Electronic data will be stored on the local CH2M HILL server and will be posted to the Navy's file transfer protocol site.
- The data will be archived IAW Navy guidance. At the end of the project, archived data will be returned to the Navy.

PQOs listed in the form of if/then qualitative and quantitative statements.

The level of data to be collected during this initial investigation of the site does not allow for a quantitative risk-based decision. Therefore, specific "quantitative" PQOs are not currently developed. Data from this investigation may be used during future project activities to further develop PQOs for any additional investigations or activities.

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Worksheet #12-1a—Measurement Performance Criteria Table – Environmental Restoration

Matrix:

Analytical Group:

Concentration Level:

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	MPC	QC Sample Assesses Error for Sampling (S), Analytical (A), or both (S&A)

Worksheet #12-1b—Measurement Performance Criteria Table – Munitions Response

DFOW Data Type	Geophysical Anomaly Measurement DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency
Equipment Warm-up	Completeness	Daily, prior to instrument use	Power on	Minimum of 5 minutes prior to the instrument use
Equipment functional test	Accuracy and Sensitivity	Confirmation of analog system (used by UXO Technicians for pinpointing anomaly source during intrusive investigation) detection capabilities.	Items are detected in the expected location in Equipment Check Area.	Daily (prior to instrument use)
Reacquisition of DGM Anomaly	Sensitivity	The EM61 is placed within or near the survey boundaries in an area free of metallic contacts and collects data for (minimally) a 1-minute period.	Performed to determine if unusual levels of instrument or ambient noise exist.	At the beginning and end of each work day
Reacquisition of DGM Anomaly	Sensitivity	The EM61 is operated with standard metallic object at measured distance and orientation from system transmit/receive coil.	Performed to determine that system responds with 20% of expected amplitude for standard item	At the beginning and end of each work day
Intrusive Operations Anomaly Resolution Data	Completeness	QC audit of anomaly identification data; QC of post excavation to ensure removal of anomaly sources to specified depth.	Every anomaly ≤ to 3' below ground surface has been resolved (anomalies > 3' will not be resolved).	Daily and weekly

Worksheet 12-2—Definable Features of Work Auditing Procedure

DFOW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Pre-mobilization Activities	Document Management and Control	Verify appropriate measures are in place to manage and control project documents	Preparatory Phase (PP)	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
	Data Management	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
	Subcontractor Procurement	Ensure procurement of subcontractors and verify qualifications, training, licenses	PP/Initial Phase (IP)	Once	Subcontractors' qualifications, training, and licenses are up to date and acceptable	Ensure subcontractor provides qualifications, training, and licenses or change subcontractor
	TMP	Verify the TMP has been developed and approved	PP/IP	Once	TMP has been prepared and approved, all parties agree to the technical and operational approach	Do not proceed with field activities until criterion is passed
Mobilization/ Site Preparation	Onsite Document Review	Verify project plans are approved and review with project team and get appropriate signatures	PP/IP	Once	Document is approved and has been reviewed and acknowledged by appropriate project team members	Personnel who are not familiar with the project plans may not proceed with field activities until criterion are passed
	Establish Communication and Logistics	Verify functionality of communications equipment and logistical support is coordinated	PP/IP	Once	Communications and other logistical support are coordinated	Do not proceed with field activities until criterion is passed
	Local Agencies and Emergency Services Notification	Verify local agencies and emergency services have been notified of site activities	PP/IP	Once	Emergency services and local agencies are aware of site activities	Do not proceed with field activities until criterion is passed
	Verify site specific training	Verify all site specific training has been performed and acknowledged	PP/IP	Once	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed
	Site Boundary	Verify boundary matches project plans/statement of work	PP/IP	Once	Boundary is correct	Stop activities until boundary is verified and matches statement of work coverage

Worksheet 12-2—Definable Features of Work Auditing Procedure (continued)

DFOW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Anomaly Reacquisition	Equipment Testing	Verify equipment testing has been performed and equipment is functional	IP/Follow-up Phase (FP)	Once/Daily/ As Required	Equipment passed functionality test as required by this MEC-QAPP	Repair or replace instrument
	Work Methods	Verify work methods are established and communicated	IP/FP	Daily	Work methods are established and communicated and being performed in accordance with (IAW) this MEC-QAPP and SOPs	Stop activities until the MEC-QAPP and SOPs can be followed and any activities not performed within compliance are re-evaluated and re-performed, if necessary
Intrusive investigation of DGM-identified Anomalies	Equipment Testing	Verify equipment tested IAW the TMP	IP/FP	Daily	Equipment testing performed and tests passed	Repair or replace instrument.
	Work Methods	Verify operations are conducted IAW ESS, TMP, MEC-QAPP, MEC Removal SOPs, and the HASP: • Survey • DGM Anomaly Investigation • Ammunition and Explosives Transportation • Explosives Storage and Accountability • Disposal/Demolition Operations • Scrap Inspection Operations	IP/FP	Daily	Work performed IAW TMP, referenced MEC SOPs, and the HASP.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
	Work Methods	DGM Identified targets cleared using EM61	FP	Daily	Sub-EM61 used to verify anomaly clearance.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary

Worksheet 12-2—Definable Features of Work Auditing Procedure (continued)

DFOW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Anomaly Removal Verification	Work Method	Verify 10% of the excavated anomalies have been cleared	FP	Daily	Anomaly signature, metal 2-inch x2-inch or greater, MPPEH, MEC left within area or anomaly location	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
	Data Management	Verify that the anomaly recovered during intrusive excavations is appropriate to the amplitude of the initial anomaly detected during the DGM.	IP/FP	Daily	Recovered anomaly is appropriate to the amplitude of the initial anomaly detected during the DGM.	Return to the location of the anomaly excavation to determine if additional anomalies are present. If anomalies being recovered continue to be inappropriate for the amplitude as detected during the DGM, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Demilitarization of MEC/ MPPEH	Final inspection of MEC/MPPEH	UXOQCS final inspection of MEC/MPPEH	FP	Each occurrence	All crevices and aspects of site can be visually inspected to verify free of explosive material	MEC/MPPEH item is re-processed by detonation or any other demilitarization method outlined within the ESS.
Material Transportation	MDAS Packaging and Labeling	Inspection of MDAS packaging and labeling	FP	Each occurrence	Labeling and Packing of MDAS conforms to OP5	MDAS will not be shipped until it conforms to OP5 (Naval Sea Systems Command, 2011)
Demobilization	Demobilize from the site	Verify equipment and personnel have been demobilized from the site and the site is returned to pre-mobilization condition	FP	Once	All personnel and equipment have been demobilized and the site is in pre-construction condition	Restore site to preconstruction condition, package and ship all equipment offsite, demobilize crew

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Worksheet #13—Secondary Data Criteria and Limitations Table

Secondary Data	Data Source	Data Generator(s)	How Data Will Be Used	Limitations on Data Use
Final Preliminary Assessment Report	Final Preliminary Assessment – Naval Air Station Oceana, Dam Neck Annex and Auxiliary Landing Field Fentress, Virginia	Malcolm Pirnie, 2008	Information from this report will be used to define the MRS and potential MEC that may have been used at the site.	Limited historical records were available/identified during the Preliminary Assessment.
SI Report	Site Inspection Report, Munitions Response Program, Munitions Response Sites at Dam Neck Annex and Naval Auxiliary Landing Field Fentress, Virginia Beach, Virginia	CH2M HILL, 2011	The DGM report will be used to identify the locations of the 125 priority 1 anomalies.	None
ESS	Explosives Safety Submission for Naval Auxiliary Landing Field Fentress Dive Bombing Targets, Naval Air Station Oceana, Virginia Beach, Virginia	CH2M HILL, 2012a	The ESS will be followed during the munitions response activities at the MRS.	None
Geophysical Investigation Results Technical Memorandum	Geophysical Investigation Results and Proposed Pre-Remedial Investigation Reconnaissance and Remedial Investigation Approach Technical Memorandum, Dive Bombing Targets - NALF Fentress, Naval Air Station Oceana, Virginia.	CH2M HILL, 2012c	The geophysical investigation results will be used to identify anomalies during the munitions response activities.	None

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Worksheet #14—Summary of Project Tasks

Activities to be performed at the site have been divided into DFOWs, and the tasks to be completed are outlined in the table below and summarized in **Worksheet #17**. Procedures for these tasks, including QC checks, recording and correcting data, data processing, data management, and information management, will be performed IAW the SOPs listed in below and presented in the **Appendix A**.

DFOW	Tasks	SOP
Pre-mobilization Activities	TMP Development and Approval Geographic Information System Setup Document Management and Control Data Management Subcontractor Procurement	SOPs will be provided by USA Environmental upon procurement.
Mobilization/Site Preparation	Mobilize Crew and Equipment Onsite Document Review Communications and Logistics Establishment Local Agencies and Emergency Services Notification Site-specific Training Site Boundary Establishment Establish EZs and Entry Control Points (ECPs)	SOPs will be provided by USA Environmental upon procurement.
Anomaly Reacquisition	Equipment Testing and Setup Survey Confirmation	SOPs will be provided by USA Environmental.
Intrusive investigation of DGM identified anomalies	Team Separation Equipment Testing and Setup Anomaly Investigation Record Recovered Items Management of Recovered MEC/MPPEH IAW ESS Management of Scrap	SOPs will be provided by USA Environmental
Anomaly Removal Verification	Equipment Testing and Setup Anomaly Removal Verification	SOPs will be provided by USA Environmental.
Demilitarization of MEC/MPPEH	MEC/MPPEH Inspection and Classification Demilitarization of MEC/ material documented as an explosive hazard (MDEH) IAW the ESS	SOPs will be provided by USA Environmental.
Demobilization	Demobilize Crew and Equipment	--
Final Report and Closeout	After Action Report RI Report Preparation Data Archiving Procurement Closeout	--

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Worksheet #15a—Reference Limits and Evaluation Table (Environmental Response)

Matrix:

Analytical Group:

Concentration Level:

Analyte	Chemical Abstract Service Number	Tap Water Regional Screening Levels	Maximum Contaminant Levels	Project Quantitation Limit Goal	Laboratory-Specific Limits	
					Quantitation Limits	Method Detection Limits

Worksheet #15b—Reference Limits and Evaluation Table (Munitions Response)

As discussed in **Worksheet #11**, data collected during this investigation will be used to plan for future RI activities. Therefore, due to the nature of this investigation, there are no traditional reference or action limits that can be established for this phase of the RI.

MEC Item	PAL	PAL Reference	Project Quantitation Limit Goal	Validated Detection Limits for Specific Munitions Detection System

Worksheet #16—Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable
		Anticipated Date(s) of Initiation	Anticipated Date of Completion	
TMP Development	CH2M HILL	11/27/12	01/03/13	Pre-Draft Project Plans
Navy Review	NAVFAC	01/10/13	01/28/13	Navy Comments
Respond to Navy Comments	CH2M HILL	01/28/13	01/31/13	Response to Navy Comments
Regulatory Review	VDEQ	02/01/13	01/15/13	Regulatory Comments
Respond to Regulatory Comments	CH2M HILL	02/18/13	02/20/13	Response to Regulatory Comments
Issue Final TMP Documents	CH2M HILL	02/21/13	02/22/13	Final Project Plans
Mobilization and Site Setup	CH2M HILL and USA Environmental	03/11/13	03/11/13	None
Field Work	CH2M HILL and USA Environmental	03/12/13	03/14/13	Field Documentation, QC Reports and H&S documents

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Worksheet #17—Sampling Design and Rationale

The DFOWs for the pre-RI reconnaissance are presented in **Worksheet #14** and described in Table 17-1.

TABLE 17-1
Definable Features of Work

DFOW	SOP	Supporting Document(s)
Pre-Mobilization Activities	-	MEC-QAPP
Mobilization/Site Preparation	-	MEC-QAPP
Anomaly Position Reacquisition	Reacquire the position of select geophysical anomalies identified as representing potential subsurface MEC and/or MPPEH during the March 2012 DGM investigation. The anomaly selection process and positional re-acquisition procedures are presented in Appendix B.	MEC-QAPP
Intrusive investigation of DGM identified anomalies	SOPs will be provided by USA Environmental upon procurement.	MEC-QAPP
Anomaly Removal Verification	SOPs will be provided by USA Environmental upon procurement.	MEC-QAPP, ESS
Demilitarization of MEC/MPPEH	SOPs will be provided by USA Environmental.	MEC-QAPP, ESS
Disposal of MDAS	SOPs will be provided by USA Environmental.	MEC-QAPP, ESS
Demobilization	-	MEC-QAPP
Final Report and Closeout	-	MEC-QAPP

Pre-mobilization Activities

Before mobilization to the site, planning activities will be performed to enhance timely project execution. This MEC-QAPP has been developed to provide detail for how the project will be performed and the quality standards to which it will be compared. Before mobilization to the site, this plan will be reviewed and approved by CH2M HILL, the Navy, and regulators to ensure that the scope is executed, and H&S protocols are adhered to as outlined herein. Additionally, coordination will be made to ensure GIS information and equipment are available and updated for project activities, document and data management procedures are in place, and all subcontractors have been procured. Subcontractor qualifications, certifications, and licenses will be reviewed before selection.

A pre-construction meeting will be held in advance of the proposed mobilization date for field activities. At the meeting, CH2M HILL will present an overview of the intrusive investigation and discuss project scope, schedule, planned invoicing, H&S concerns, QC procedures, and any site logistical issues.

Mobilization/Site Preparation

Mobilization

Mobilization consists of transporting personnel and equipment to the work site and establishing temporary facilities and site controls, consisting of portable sanitary facilities, decontamination area, and site refuge area. General mobilization activities are listed below:

- Identify/procure, package, ship, and inventory project equipment.

Worksheet #17—Sampling Design and Rationale (continued)

- Notify local agencies, including police, hospital, and fire department, as appropriate to the site activities and ensure that they are appropriately equipped to respond to site emergencies.
- Finalize operating schedules.
- Organize support facilities.
- Establish a project command post in an area that is convenient to intrusive activities, but outside the EZs.
- Test and inspect equipment during mobilization and continue daily throughout the duration of the project to ensure proper functionality and prevent damage. Repair or replace as necessary to ensure quality performance.
- Assemble and transport the work force.
- Establish onsite communications (e.g., mobile phones, two-way radios) between team members.
- Conduct site-specific training on the TMP, HASP, and MEC procedures and hazards, including "3R training" (recognize, retreat, report). Minimum training requirements are listed in **Worksheet #8**.
- Verify that all onsite personnel review this MEC-QAPP and all applicable SOPs and appendices.
- Verify that all forms and project documentation are in order and project team members understand their responsibilities with regard to completion of project reporting requirements.
- Inform Base and security personnel of site activities and duration of work.

During mobilization, a kickoff and site safety meeting will be conducted. This meeting will include a review of the Work Plan and review and acknowledgment of the HASP by all site personnel. Additionally, a morning safety meeting will be conducted each day to review the tasks to be performed that day and any potential hazards. Additional meetings will be conducted as needed when new personnel, visitors, and/or subcontractors arrive at the site.

Site Preparation

Site preparation activities include establishing boundaries; vegetation removal, if required; and establishing EZs. MEC avoidance techniques will be implemented by a UXO escort to avoid any potential surface or subsurface MEC; surface avoidance will be performed during vegetation removal operations. If MEC or MPPEH is identified during site preparations, the item will be disposed of IAW the ESS.

Establish Exclusion Zones

EZs and ECPs will be required and enforced throughout implementation of the pre-RI reconnaissance, IAW the ESS (CH2M HILL, 2012a). While an EZ is in effect, access to these areas will be limited to essential personnel and authorized visitors. Non-essential personnel will be prohibited from entering established EZs. Signs and/or barriers will be located at ECPs to the EZ.

Vegetation Removal

Vegetation removal is not anticipated during this investigation. However, if vegetation removal is required, the UXO team will use manually operated gas-powered tools, such as weed-eaters and/or chainsaws. UXO technicians will ensure that vegetation removal tools operate a minimum of 6 inches above the ground surface.

Anomaly Reacquisition

A select number of anomalies identified for excavation will be re-located using existing survey stakes. Approximately 100 anomalies will be investigated at each site.

Worksheet #17—Sampling Design and Rationale (continued)

CH2M HILL and USA Environmental will perform the anomaly position relocation using the survey stakes installed during the March 2012 DGM investigation. After locating the approximate anomaly position, the location will be flagged using a polyvinyl chloride flag with the unique identifier number recorded in indelible ink. The location will be flagged 1 foot north of the actual field location of each re-located anomaly.

Intrusive Investigation

The selected anomalies will be reacquired with an EM61 and intrusively investigated in accordance with Section 6.1.3 of the ESS (CH2M HILL, 2012a). MEC removal operations will be performed via hand excavation to identify the source of individual anomalies to a maximum of 3 feet. Handheld metal detectors (e.g., Schonstedt GA-52Cx or White's XLT) may be used by UXO Technicians to assist in pinpointing the source(s) of anomalies; however, final confirmation of a cleared hole will be performed with an EM61. The intrusive investigation will continue at each site until such time as the project delivery team determines that the objective to determine the presence or suggested absence of MEC has been achieved.

Details associated with this operation are included in the SOPs presented in the **Appendix A**. The SOPs will be provided by the subcontractors once procured. The following basic techniques will be used for anomaly excavation:

- The UXO technician will investigate within a 1-meter radius, or to the limits of detection, of the flagged anomaly using an appropriate geophysical instrument for pinpointing assistance.
- Until identified otherwise, the anomaly is assumed to be MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument.
- Using progressively smaller and more-delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine if it is MEC and/or MPPEH.
- Recovered MEC and MPPEH will be assessed and their explosives safety status documented in accordance with the ESS (CH2M HILL, 2012a).
- If the item is not MEC, it will be removed and the area will be rechecked with an EM61 to ensure that a MEC item was not hidden beneath the removed item. The excavation team will then annotate the results of the excavation on the dig sheet and move on to the next marked DGM anomaly.
- Anomaly locations inspected, along with results of the inspection, will be documented by USA Environmental and provided to the CH2M HILL MR Senior Geophysicist.

Anomaly Removal Verification

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

- After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and the polyvinyl chloride flag placed in the hole or bent after the investigation is completed to indicate to the QC team that they can inspect the hole.
- The UXOQCS will inspect the intrusively investigated anomaly locations using an EM61 to determine whether all detectable metallic items within a 1-meter radius of the hole and within the 3-foot excavation depth have been identified.
- All holes related to intrusive investigations will be filled back to original grade or covered before departing the project site each day following QC verification.

Worksheet #17—Sampling Design and Rationale (continued)

- Anomaly locations inspected, along with results of the inspection and corrective actions planned (in the event that the UXOQCS decides that inspection results require a change in intrusive team procedures or a re-performance of any work), will be documented and provided to the CH2M HILL MR Senior Geophysicist.
- Additional QC analysis of intrusive results vs. original amplitude of geophysical anomalies will be performed by the CH2M HILL MR Senior Geophysicist. Anomaly locations that are determined to need re-investigation through this process will be reinspected.

Demilitarization of MEC/MPPEH

All explosive operations will follow the procedures outlined in TM 60A-1-1-31. Demolition operations will be performed daily, or the MEC will be properly secured until operations can be conducted. Demolition operations will be performed within the MRS. Recovered MEC and MPPEH will be evaluated by the SUXOS and UXOSO and classified as either acceptable-to-move or unacceptable-to-move. Recovered MEC/MDEH classified as unacceptable-to-move will be blown-in-place (BIP). If MEC/MDEH is acceptable to move, it may be carried by hand within the MRS for demolition. If the MEC/MDEH item cannot be disposed on the day of discovery, the item will be flagged, secured, and continually guarded until such time as demolition operations occur. Base security will also be notified.

All recovered MEC and MPPEH classified as unsafe to move will be BIP and managed IAW the ESS.

A MEC/MPPEH holding area will not be established. MEC/MPPEH will be disposed of IAW Section 6.4 of the ESS.

Demolition Team

The Demolition Team will be composed of a minimum of three UXO-qualified individuals. The Demolition Team Supervisor will coordinate with the UXOSO, who is not a member of the Demolition Team. The Demolition Team Supervisor will inspect each post-detonation location after a minimum of 5 minutes have passed to confirm a complete detonation, assess fire hazards, assess the response, and recover potential remaining explosives that were not consumed in the explosion.

Demilitarization Operations

Before demilitarization operations begin, the SUXOS will notify and coordinate with local emergency services to reduce public exposure, maintain safety, and keep the public informed. The emergency contacts and phone numbers are provided in the HASP.

All nonessential personnel to the operations will be evacuated to a distance greater than the established minimum safe distance for the MEC being detonated. Before priming of demolition charges, all avenues of entry will be physically blocked and positive control will be maintained. ECPs shall be established IAW the ESS (CH2M HILL, 2012a). Radio communications shall be maintained among all concerned parties. Avenues of ingress will not be opened without the express permission of the Demolition Team Supervisor.

While preparing MEC for detonation, the Demolition Team Supervisor will ensure that the number of personnel onsite is kept to the minimum required to safely accomplish the disposal mission. The MEC disposal process will be performed in accordance with demolition practices outlined in TM 60A-1-1-31 and manufacturer's guidelines.

During demolition operations, the Demolition Team Supervisor will control and be responsible for explosive disposal operations to ensure the following:

- The area is clear and remains clear of unauthorized personnel.

Worksheet #17—Sampling Design and Rationale (continued)

- The UXOSO shall have sole custody of and maintain the firing device, and shall not delegate or authorize connection to the firing device or initiation of the pyrotechnic chain until the maximum fragmentation distance is secured for horizontal and vertical fragmentation distances. Only the UXOSO may give permission to the Demolition Team Supervisor to prime a detonation and ignite or fire a detonation.
- The Demolition Team Supervisor shall confirm by verbal communication and document the time of communication approval from the UXOSO to authorize an explosion.
- Preparatory activities for demolition are summarized below and detailed in the applicable SOPs listed **Worksheet #21b**:
  - Review of the DDESB-approved ESS for conformance to plan criteria
  - Review and conform to Explosive Management Plan guidance and requirements
  - Identify MEC or MPPEH item and applicable technical publication or ORDATA II Database (http://ordatamines.maic.jmu.edu), for functioning, hazards, safeties, warnings, and/or notes.
  - Document (demo/safety logbooks) Demolition Team Supervisor and UXOSO review of commercial explosives manufacturer's: safety notes, warnings instructions, and Material Safety Data Sheets for explosives and as applicable initiation or firing device or systems manufacture's guidelines.
  - Review POC list, emergency upwind rally points and evacuation points, location and directions to hospital; ensure that detonation and safety support vehicles have directions and map to the hospital with communications; and ensure demolition vehicle has two 20-pound BC-rated fire extinguishers.
  - Ensure emergency response equipment identified within HASP is on hand.
  - Ensure two means of communication are available.
  - Designate essential personnel to be involved in the operation.
  - Acquire protective work materials and implement approved engineering controls.

Following the completion of demolition activities, CH2M HILL will notify the Navy NTR to provide a summary of the demolition activities and outcome.

MEC Data Reporting

The collection of accurate and detailed data is essential to documenting MEC-related discoveries and resulting disposition of MEC for future reference. Digital MEC, MDEH, and MDAS tracking forms will be used to list data for each MEC item encountered. The MEC tracking form will be filled out with the following information:

- **Unique identity number**—Also to be incorporated in photographs of the item (by using a dry erase board, for example)
- **Location**—Northing and easting coordinates
- **Depth to Item**—If the item is partially buried, depth to the center of the mass of the item (recorded in inches)
- **Orientation**—Geographical direction (N, S, E, W) the item is pointing, unless vertical
- **Type and Nomenclature**—Type of ordnance and nomenclature, as specifically as possible; to also be incorporated in photographs of the item (by using a dry erase board, for example)
- **Filler**—Type of filler, such as none, inert, high explosive, white phosphorus, illumination, incendiary, chemical, or smoke

Worksheet #17—Sampling Design and Rationale (continued)

- **Fuze**—Type of fuze, such as none, inert, point detonating, powder train, or base detonating for MDEH items identified
- **Date and Time Found**—Date when the MEC/MDEH/MDAS item was found and approximate time it was found
- **Team or Individual**—Team number or individual's name that found the MEC/MDEH/MDAS item
- **Disposal**—Disposal status
- **Date Disposed**—Date when the MEC/MDEH/MDAS item was disposed of
- **Photo identification (ID)**—Photo number(s) from camera or ID number if included in photo
- **Comments**—Any noteworthy comments.

Certification of Scrap Metal

Before release of the material for disposal, the SUXOS and UXOSO will inspect the material in the containers to ensure that they are free of dangerous items. DD Form 1348-1A will be used as 100 percent inspection/ 100 percent reinspection documentation. All DD Form 1348-1A documentation will clearly show the following information in typed or printed letters:

- Name of SUXOS and the government representative (or designee)
- Organization
- Two signatures not in the same chain of command (i.e., SUXOS and the UXOSO, SUXOS, and a government representative)
- Contractor's office
- Field office phone number(s) of the persons certifying and verifying the MDAS
- Basic material content (type of metal [e.g., steel, mixed])
- Estimated weight
- Unique identification of each sealed container
- Location where MDAS was obtained
- Seal identification, if different from the unique identification of the sealed container

CH2M HILL will coordinate with the NAVFAC NTR to maintain the chain of custody and final disposition of the certified and verified materials. The certified and verified materials will be released to an approved processing facility for disposal. If the chain of custody is broken, the affected MPPEH will undergo a second 100 percent inspection, a second 100 percent reinspection, and be documented to verify its explosive safety status (identified as either munitions debris or other debris).

Disposal of MDAS

Munitions debris certified as MDAS will be accumulated in appropriately sized containers, characterized, transported, and disposed of IAW the ESS (CH2M HILL, 2012a).

Unintentional Detonation

These emergency procedures provide a plan in the event of an explosive emergency and provide procedures to be followed to limit the extent of injury and damage until qualified professionals can arrive to provide assistance.

Worksheet #17—Sampling Design and Rationale (continued)

After an explosion occurs, additional explosions may occur. Therefore, the response to unintentional detonations should involve a minimal number of personnel. Emergency steps are as follows:

- Contact emergency services
- Minimal number of personnel (one person if possible) provides first aid
- Additional personnel withdraw to safe rally point
- One MEC-qualified person meets first responders and escorts them to the explosion site

Demobilization

Full demobilization of equipment and personnel will occur when site activities are complete and appropriate QA/QC checks have been performed.

Final Report and Closeout

Pre-RI reconnaissance results will be used to support the planning for the forthcoming RI. The results will be included with the RI report after the investigation is completed.

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Worksheet #18a—Sampling Locations and Methods/SOP Requirements Table (Environmental Response)

Sampling Location/ ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference

Worksheet #18b—Sampling Locations and Methods/SOP Requirements Table (Munitions Response)

Location	Exclusion Areas	Matrix	Depth relative to Ground Surface	Survey Methodology	Degree of Investigation or Coverage	SOP Reference
Anomaly ID and location are in Tables B1 and B2 of Appendix B - Pre-RI Reconnaissance Anomaly Selection Process and Reacquisition Procedures	None	Soil	Unknown	Geonics EM61-MK2 Schonstedt	A select number of anomalies identified for excavation will be re-acquired using existing survey stakes. Approximately 100 anomalies will be investigated at each site.	ES–S01-01-501P

Worksheet #19—Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method/ SOP Reference	Containers	Sample Volume	Preservation Requirements (Chemical, Temperature, Light Protected)	Maximum Holding Time (Preparation/Analysis)

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Worksheet #20—Field Quality Control Sample Summary Table

Matrix	Characterization or Clearance Procedure	Number of Units Applicable to QC Survey	Number of Seed Items per Area	Total Number of QC Seed Items
Soil	EM61 to verify hole is clear of metallic debris	100%	2	4

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Worksheet #21a—Project Sampling SOP References Table (Environmental Response)

Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments

Worksheet #21b—Project Sampling SOP References Table (Munitions Response)*

Reference Number	Title, Revision Number and/or Date	Originating Organization	Equipment Type	Modified for Project Work?	Comments
ES–S01-501-P	Surface Clearance and Subsurface Excavation of MEC	CH2M HILL		No	
ES-S01-502-P	Explosive Demolition Operations	CH2M HILL		No	
ES-S01-503-P	Material Potentially Presenting an Explosive Hazard (MPPEH) Processing	CH2M HILL		No	
ES-S01-504-P	Munitions Response Technical Risk Evaluation	CH2M HILL		No	
NA	EM61-MK2 SET UP AND USE FOR REACQUIRE AND POST INTRUSIVE CHECKS	CH2M HILL		No	
OPS-03	DEMOLITION/DISPOSAL OPERATIONS	USA Environmental		No	
OPS-04	DGM ANOMALY INVESTIGATIONS	USA Environmental		No	
OPS-05	DIGITAL GEOPHYSICAL MAPPING	USA Environmental		No	
OPS 13	MPPEH MANAGEMENT	USA Environmental		No	
OPS-14	MEC ANALOG DETECTION AND REMOVAL ACTIONS	USA Environmental		No	

Worksheet #22—Field Equipment Calibration, Maintenance, Testing, and Inspection Table

See also **Worksheet #12-1b**.

Field Equipment	Activity[1]	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference	Comments
EM61-MK2 (or equivalent)	Verification	At the beginning of each work day when used DGM system is warmed up prior to use and QC tests are run to ensure stability and functionality.	System passes QC test measures	Inspect/repair equipment until functioning properly.	Equipment operator	SOPs will be provided by USA Environmental.	MR Senior Geophysicist to confirm test performed through data collection notes and data evaluation.
Schonstedt or White's XLT (or equivalent)	Verification	At the beginning of each work day when used	System responds to items in Equipment Check Area	Inspect/repair equipment until functioning properly.	Equipment operator	SOPs will be provided by USA Environmental.	UXOQCS verifies daily equipment check of handheld magnetometers.

[1] Activities may include: calibration, verification, testing, and/or maintenance.

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Worksheet #23—Analytical SOP References Table

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

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Worksheet #24—Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference

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Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference

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Worksheet #26—Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
SAMPLE RECEIPT AND ANALYSIS
SAMPLE ARCHIVING
SAMPLE DISPOSAL

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Worksheet #27—Sample Custody Requirements Table

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):
Sample Identification Procedures:
Chain-of-custody Procedures:

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Worksheet #28-1—Laboratory QC Samples Table

Matrix:

Analytical Group:

Analytical Method/SOP Reference:

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	MPC
Method Blank						
Laboratory Control Standard						
Internal Standards						
System Monitoring Compounds/Surrogates						

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Worksheet #29—Project Documents and Records Table

Document/Report/Form	Generator	Definable Feature of Work	Frequency of Completion	Location/Where Maintained
Field Notebook	CH2M HILL FTL	All Fieldwork	Daily	CH2M HILL local server, hard copy onsite then in project file
Field Work Plans	CH2M HILL	Pre-mobilization activities	Once prior to beginning fieldwork	CH2M HILL local server, hard copy onsite then in project file
CA Forms	CH2M HILL	All Fieldwork	As necessary	CH2M HILL local server and project file
Dig Sheets	CH2M HILL and MEC Subcontractor	Intrusive Investigation	As necessary based upon data collection	CH2M HILL local server
Meteorological Data from Field	CH2M HILL	All Fieldwork	Daily	Field Notebook
Equipment/Instrument Check Logs	CH2M HILL, MEC and Reacquisition Subcontractors	Anomaly Reacquisition/Intrusive investigation of DGM identified anomalies/Anomaly Removal Verification	As required by this MEC-QAPP	CH2M HILL local server, hard copy onsite then in project file
MEC Subcontractor Notes and Field Logs	MEC Subcontractor	Anomaly Reacquisition	Daily	Onsite then transfer copy to CH2M HILL to store on local server
MEC Subcontractor Notes and Field Logs	MEC Subcontractor	Intrusive investigation of DGM identified anomalies/ Anomaly Removal Verification	Daily	Onsite then transfer copy to CH2M HILL to store on local server
Field Photograph Log	CH2M HILL	All Fieldwork	Daily/As necessary	CH2M HILL local server
Daily Project Reports	CH2M HILL	All Fieldwork	Daily	CH2M HILL local server, hard copy onsite then in project file
Daily H&S Documents	CH2M HILL	All Fieldwork	Daily	CH2M HILL local server, hard copy onsite then in project file
Training Records	CH2M HILL and Subcontractors	All Fieldwork	Prior to mobilization to the site	Hard copy onsite and with Human Resources
Meeting Agendas, Minutes, Presentation, etc.	CH2M HILL	All DFOWs	As necessary	CH2M HILL local server
Summary Reports	CH2M HILL	Final Reports and Closeout	Once upon completion of site activities	CH2M HILL local server

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Worksheet #30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ ID Number	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization	Backup Laboratory/ Organization

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Worksheet #31—Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CA	Person(s) Responsible for Monitoring Effectiveness of CA
Field Performance Audit	Once during field event	Internal	CH2M HILL	FTL and or MR Senior Geophysicist	FTL	FTL	CH2M HILL
Data storage and transfer system check	Prior to initial data collection and once weekly	Internal	CH2M HILL	CH2M HILL MR Senior Geophysicist	FTL	FTL	CH2M HILL
Excavation activities	Daily (inspections) Weekly (formal observations)	Internal	CH2M HILL	UXOSO	UXO Team Leader	SUXOS	UXOSO

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Worksheet #32—Assessment Findings and CA Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Field Performance Audit	Checklist and Written Audit Report	CH2M HILL PM	Within 1 week of audit	Memorandum	CH2M HILL FTL CH2M HILL MR Senior Geophysicist	Within 1 week of receipt of CA Form

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Worksheet #32-1—Corrective Action Form

Person initiating corrective action (CA) _____ **Date** _____

Description of problem and when identified (Submit a drawing/sketch if necessary):

_____

_____

_____

Cause of problem, if known or suspected:

_____

_____

_____

Resolution/Sequence of CA: (including date implemented, action planned and personnel/data affected)

_____

_____

_____

_____

_____

_____

_____

CA implemented by: _____ **Date:** _____

CA initially approved by: _____ **Date:** _____

Follow-up date: _____

Final CA approved by: _____ **Date:** _____

Information copies to:

_____

_____

_____

_____

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Worksheet #32-2—Field Performance Audit Checklist

Project Responsibilities

Project No.: _____ Date: _____

Project Location: _____ Signature: _____

Team Members:

Yes No 1) Is the approved work plan being followed?

Comments _____

Yes No 2) Was a briefing held for project participants?

Comments _____

Yes No 3) Were additional instructions given to project participants?

Comments _____

DGM Operations

Yes No 1) Are routine inspections and QC checks of the equipment being performed as outlined in this MEC-QAPP?

Comments _____

Yes No 2) Is the proposed location of transect lines clearly communicated with DGM Survey Team?

Comments _____

Yes No 3) Is data collection being performed as required by the MEC-QAPP?

Comments _____

Yes No 4) Are data stored properly and uploaded for transfer in a timely manner?

Comments _____

Yes No 5) Are photographs taken and documented?

Comments _____

Worksheet #32-2—Field Performance Audit Checklist (continued)

Document/Data Control

Yes No 1) Are all work plan documents available onsite for review?

Comments _____

Yes No 2) Are daily reports and other documentation completed as required by the MEC QAPP?

Comments _____

Yes No 3) Are equipment QC data and collected field data properly transferred for review?

Comments _____

Worksheet #33—QA Management Reports Table

Type of Report	Frequency	Projected Delivery Date	Person Responsible for Report Preparation	Report Recipient(s)
Daily QC Report	Daily	Following day	FTL/SSC/UXO QCS/CH2M HILL	Navy
QC Meeting Minutes	Post meeting	Within 7 days	FTL/SSC/UXO QCS/CH2M HILL	Navy
Preparatory Inspection Forms	Once for each applicable DFOW(prior to start of task)	With daily reports the following day after meeting	FTL/SSC/UXO QC/CH2M HILL	Navy
Initial Inspection Forms	Once for each applicable DFOW (prior to start of task)	With daily reports the following day after meeting	FTL/SSC/UXO QCS/CH2M HILL	Navy
Follow-up Inspection Forms	Once for each applicable DFOW (document in daily reports)	Document in daily reporting	FTL/SSC/UXO QCS/CH2M HILL	Navy
RI Report	Post-field event	See Worksheet #16	PM/CH2M HILL	Stakeholders, see Worksheet #4

The data gathered during this investigation will be used in the planning of the subsequent RI.

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Worksheet #34—Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (name, organization)
Evidence of required approval of plan (MEC-QAPP)	Evidence of approval and completeness of MEC-QAPP. Includes establishment of PQOs, QC criteria, SOPs, project specific action limits, figures, etc.	Internal	PM CH2M HILL
Site-specific Training Records	Ensure project personnel have proper training and certification to perform site activities and achieve project data quality objectives	Internal	PM and FTL/SSC/UXOQCS CH2M HILL
Data Collection and Transfer	Ensure data collection is complete and recorded accurately and that data transfer protocols are adequate.	Internal	MR Senior Geophysicist MR STC CH2M HILL
Performance Requirements (including QC criteria)	Ensure performance requirements are fully established (see Worksheet #12-1b and Worksheet #15).	Internal	MR Senior Geophysicist CH2M HILL
Field Log Notebooks	Field notes will be reviewed to ensure completeness of field data collection, data collection times, onsite operations, site conditions, etc. The logbook will also be used to document, explain, and justify all deviations from the approved MEC-QAPP and other work planning documents.	Internal	PM and FTL/SSC/UXOQCS CH2M HILL

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Worksheet #35—Validation (Steps IIa and IIb) Process Table

Step IIa/IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
IIb	Onsite Screening	Ensure that all field data meet Work Plan requirements for completeness and accuracy based on the field calibration records.	FTL CH2M HILL
IIa	Performance requirements (including QC criteria)	Establish that QC tests were performed and compliant with method-required limits as specified in Worksheet #12-1b.	FTL and MR Senior Geophysicist CH2M HILL
IIa	Field Log Notebooks	Review field logbooks, field documents, and data deliverables for compliance to methods and signatures.	FTL and PM CH2M HILL
IIb	Performance requirements (including QC criteria)	Ensure that the data report has been provided and that all data are complete. Assess whether all data collection procedures were followed with respect to the equipment and QC process.	MR Senior Geophysicist CH2M HILL

[1] IIa = compliance with methods, procedures, and contracts
IIb = comparison with MPC in the QAPP

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Worksheet #36—Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	-	Anomalies identified during reacquisition	Satisfactory review of data	CH2M HILL MR Senior Geophysicist

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Worksheet #37—Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

- If all QC criteria are met, then the data are usable.
- If QC criteria are not met, then data are suspect and cannot be used until confirmed.

Describe the evaluative procedures used to assess overall measurement error associated with the project.

- If significant inconsistencies in data are encountered, the data will be evaluated to assess impact on decision making.
- If significant deviations are noted between QC of equipment, background information, and field data, the cause will be further evaluated to assess impact on decision making.

Describe the documentation that will be generated during the usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

- The RI report will identify any data usability limitations and make recommendations for future actions, if necessary.
- A data quality evaluation section will be included as part of the RI report to summarize the results of the data collection and interpretation.
- The RI report will identify any data usability limitations and make recommendations for CA if necessary.

Identify the personnel responsible for performing the usability assessment.

- The PM, MR Senior Geophysicist, and other team members will be responsible for collecting and compiling the data. The data will then be presented to the Navy and VDEQ, who will evaluate the data usability according to project objectives.

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References

CH2M HILL. 2012a. *Explosives Safety Submission for Naval Auxiliary Landing Field Fentress Dive Bombing Targets, Naval Air Station Oceana, Virginia Beach, Virginia.* November.

CH2M HILL 2012b. Draft *Geophysical Investigation Plan, Naval Auxiliary Landing Field Fentress Dive Bombing Targets, Naval Air Station Oceana, Virginia Beach, Virginia.*

CH2M HILL 2012c. *Geophysical Investigation Results and Proposed Pre-Remedial Investigation Reconnaissance and Remedial Investigation Approach Technical Memorandum, Former Dive Bombing Targets - NALF Fentress Naval Air Station Oceana, Virginia.* November.

CH2M HILL. 2011. *Site Inspection Report, Munitions Response Program, Munitions Response Sites at Dam Neck Annex and Naval Auxilary Landing Field Fentress, Naval Air Station, Oceana, Virginia Beach, Virginia.* February.

Malcolm Pirnie. 2008. *Final Preliminary Assessment, Naval Air Station Oceana, Dam Neck Annex and Naval Auxiliary Landing Field Fentress, Virginia.* October.

EPA. 2002. *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS.*

EPA. 2005. *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP).*

EPA. 2006. *EPA Guidance on Systematic Planning Using the Data Quality Objectives Process*

Naval Sea Systems Command. 2011. *Ammunitions and Explosives Safety Ashore* Volume 1, Change 10.

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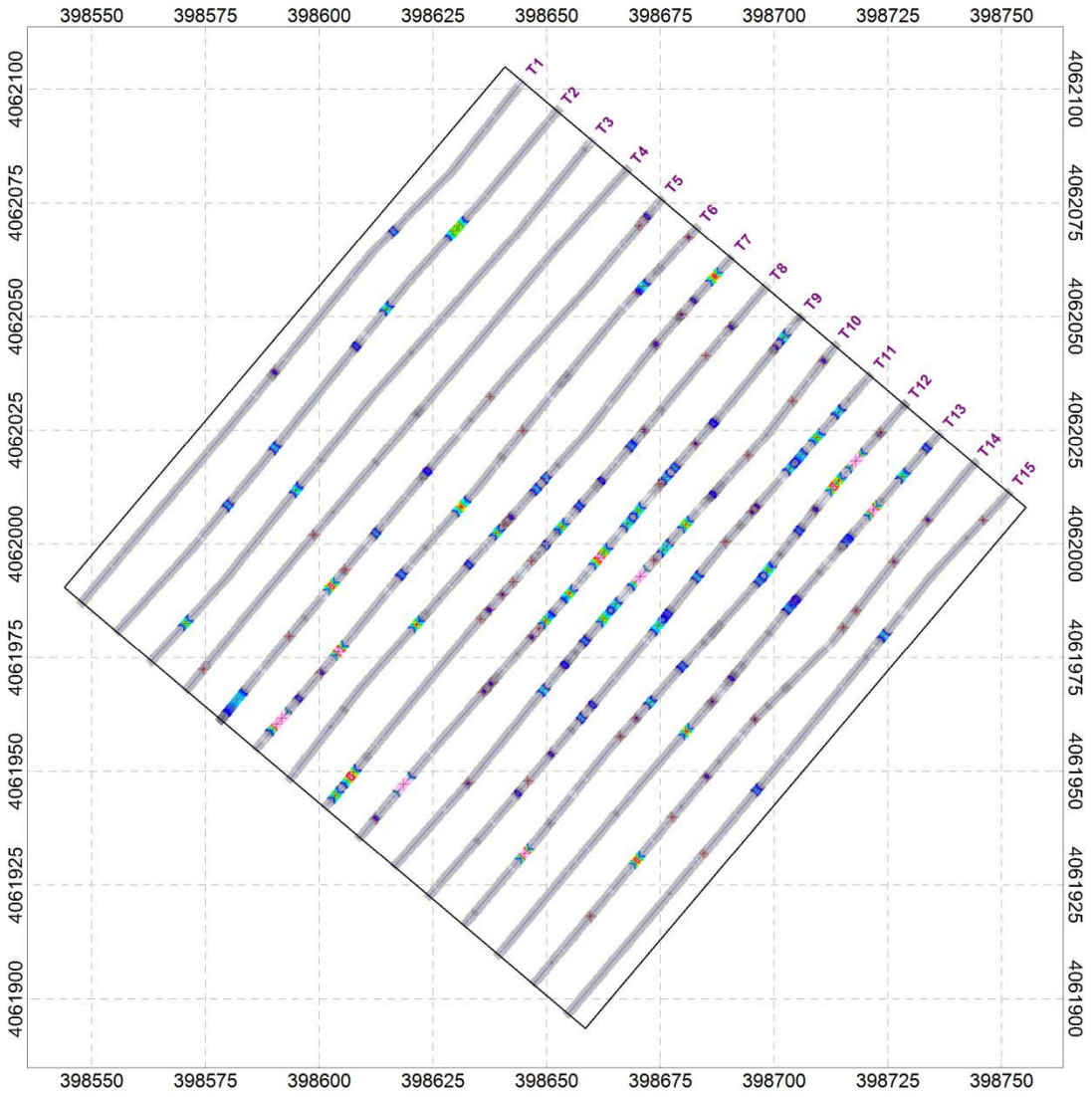
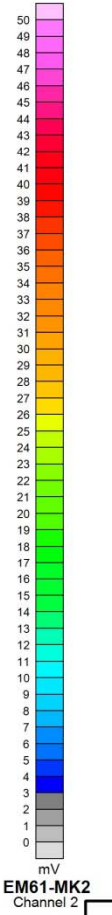
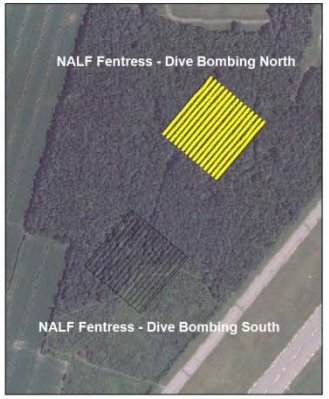
Figures







Legend

North Target Area Boundary

Selected Target

Transect Line Paths

25 0 25 50

(meters)

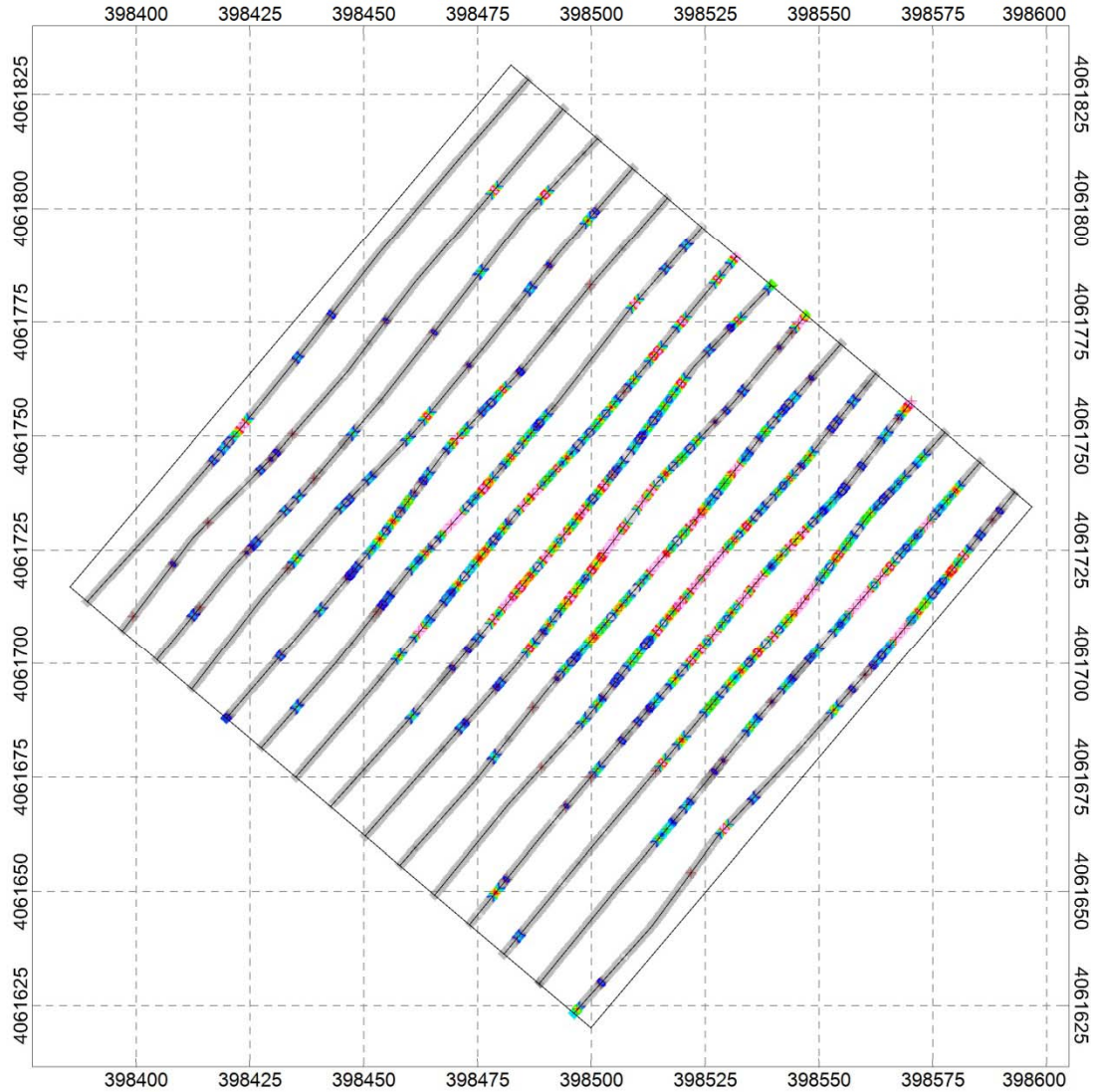
NAD83 / UTM zone 18N

Figure 10-1

DGM Survey Results - North Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia
Source: NAEVA Geophysics Inc

Date of Survey: April 16, 2012

Map Approver: T. Klaff



Legend

- South Target Area Boundary
- Selected Target
- Transect Line Paths

25 0 25 50

(meters)

NAD83 / UTM zone 18N

mV

EM61-MK2
Channel 2

Figure 10-2

DGM Survey Results - South Target Area
NALF Fentress - Naval Air Station Oceana
Chesapeake, Virginia
Source: NAEVA Geophysics Inc

Date of Survey: April 17, 2012

Map Approver: T. Klaff

Appendix A
Standard Operating Procedures

Rev. No.	Effective Date	Revision Description	Procedure Owner Approval	Process Owner Approval
001	7.19.11	Original Issue	Jim Greeley	Mike Szomjassy
002	6/18/12	Revised procedure number and template	Jim Greeley	Mike Szomjassy

A. PURPOSE

The purpose of this policy is to outline how risks associated with the planning and execution of munitions response projects involving any level of self-performance should be managed. This policy specifies additional review requirements and a risk acceptance process for such projects. ESBG employees should minimize these risks by following these requirements when preparing to execute munitions response projects involving self-performance.

B. SCOPE

1. The performance of all ESBG munitions response project scopes beyond oversight activities associated with our Construction Manager (CM) at risk construction model is considered self-performance. As such, this policy applies to clearance and excavation, detonation of munitions & explosives of concern (MEC), processing of MPPEH, and/or the operation of construction-related equipment related to construction tasks (e.g. water truck, backhoe, dozer, track hoe, dump truck, screen-all, etc.) associated with munitions response work.

2. Munitions response activities not subject to this policy include:
   - Quality Assurance or Quality Control inspections of material potentially presenting an explosive hazard (MPPEH) or munitions debris (MD);
   - Munitions & Explosives of Concern (MEC) avoidance activities including MEC construction support and MEC hazard determinations;
   - Geophysical surveys or verifications for munitions response projects
   - Storage, handling and detonation of explosives;
   - Controlled Detonation Chamber (CDC) operations.

3. Authority to self-perform elements of munitions response projects is delegated by the ESBG President to the Munitions Response Services Director, with the following conditions:

   - MR Services Director approval, to self perform, prior to or during the Go/No Go phase of the opportunity.
   - Project specific approval by the ESBG President, prior to the execution of work.

- ESBG HSSE Director or designee approval of Work/Accident Prevention Plan (APP) or Site Safety and Health Plans (SSHP) for munitions response self-performance projects.
- Risk procedure completion including the development of a project risk register with approval by the MR Ops Services.

C. INPUTS

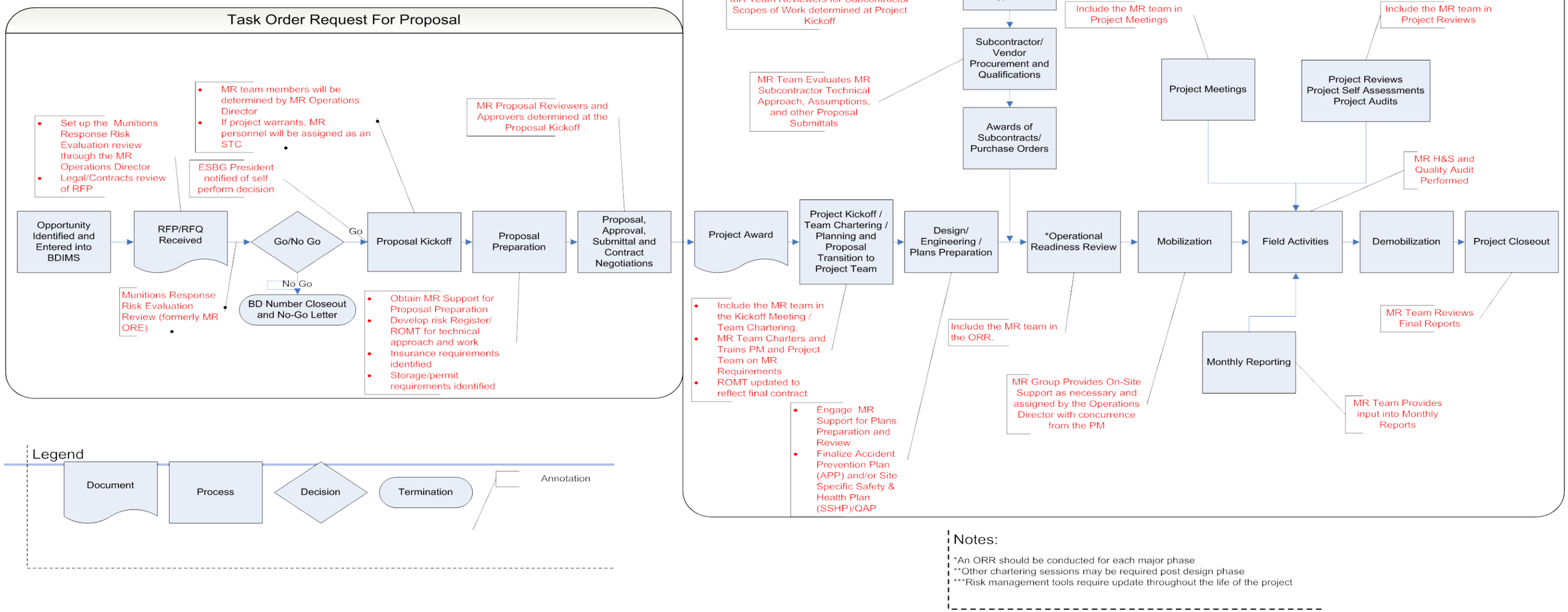
1. Policy 304 – Enterprise Risk Policy
2. Policy 306 – Construction Labor Hiring and Legal Entry Selection Policy
3. HSE 610, Explosives Usage and Munitions Response
4. ES-S07-0205-G– ESBG Self-performance Guidance Work Instruction
5. ES-S07-0105-P - ESBG Approval Authority
6. ES-P02-0502-P – Operational Readiness Review (ORR)
7. ES-S01-03.501-P - Surface Clearance and Subsurface Excavation of MEC
8. ES-S01-03.502-P - Explosive Demolition Operations
9. ES-S01-03.503-P - Material Potentially Presenting an Explosive Hazard
10. ES-S01-02.504-P - Munitions Response Safety Risk Evaluation
11. ES-S07-0102-P – ESBG Risk Management Procedure

D. DEFINITIONS (Refer to Glossary)

See Attachment 1 - (Explosives Usage and Munitions Response (MR) Standard of Practice HSE&Q-610; Attachment 3: Glossary, Acronyms, and Abbreviations).

E. FLOWCHART

PROJECT LIFE CYCLE with MR Component



F. DETAILS

Compliance with the applicable governing laws and regulations is the responsibility of the Project Manager. The Project Manager will contact the MR Services Director, MR Operations Director, or in his absence the MR Safety/Quality Manager or the Munitions Response Community of Practice Director for assistance and support.

Self-performance of clearance, excavation, and detonation of munitions & explosives of concern (MEC), processing of MPPEH and/or the operation of construction-related equipment related to construction tasks (e.g. water truck, backhoe, dozer, track hoe, dump truck, screen-all, etc.) on a munitions response project requires the following steps:

1. Development of a risk assessment (risk register, ROMT) and approval by the MR Services Director, unless otherwise required to be approved by the BG President by another policy.
2. Completion and approval of a Munitions Response Safety Risk Evaluation, (formerly known as MR ORE), ES-S01-02.504-P Munitions Response Safety Risk Evaluation and approval by the Munitions Response Safety Manager.
3. Development of Accident Prevention Plan (APP) and/or Site Specific Safety & Health Plan (SSHP) and approval by the Munitions Response Safety Manager and the ESBG Health, Safety, Security, and Environment Director or designee.
4. Development of a Quality Control Plan and approval by the Munitions Response Quality Manager.
5. Review of insurance requirements by CH2M HILL Risk & Insurance Department.
6. Review of contractual provisions by the ESBG Sector Contracts Manager and/or Legal Council.
7. Confirmation that the proper storage, licenses, or other statutory issues have been addressed.
8. Notification of the ESBG President prior to starting field operations by the Munitions Response Services Director.
9. Execution of work needs to take into evaluation all associated risk elements. Specifically, but is not limited to, the following compliance and related requirements/company policies:
    - Davis Bacon Act (Certified Payrolls) (federal construction contracts only)
    - Service Contract Act (federal only)
    - General Liability insurance requirements (to include rental equipment)
    - Competent operator certifications/other H&S requirements/training

- Policy 306 – Construction Labor Hiring and Legal Entity Selection compliance (e.g. Labor hiring, entity selection, union considerations and subcontracting strategy)
- Workers Comp Insurance requirements
- Daily cost tracking/ project controls approach

G. OUTPUTS

1. ESBG President Approval
2. Approved MR Technical Risk Evaluation (formerly MR ORE)
3. Approved MR Project risk assessment/Management Plan
4. Accident Prevention Plan (APP) and/or Site Specific Safety & Health Plan (SSHP)
5. Quality Control Plan
6. Approval documented in the work flow tool

H. TOOLS AND SOFTWARE TO BE USED

1. MR Technical Risk Evaluation (formerly known as MR ORE), ES-S01-02.504-F1 Munitions Response Safety Risk Evaluation Form

2. ES-S07-0102-F3 - Risk Opportunity Management Tool (ROMT)

I. APPLICABLE ATTACHMENTS

1. Definitions

ATTACHMENT 1:

Definitions

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 boostering 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 materiel.

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.

Munitions Documented Explosive Hazard (MDEH): MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH. (The MDEH characterization only addresses the explosives safety status of the material.

Munitions Documented As Safe (MDAS): MPPEH that has been assessed and documented as not presenting an explosive hazard and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

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 Potentially Presenting and Explosive Hazard (MPPEH): Material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (e.g., gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions.

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.

Rev. No.	Effective Date	Revision Description	Procedure Owner Approval	Process Owner Approval
001	8.22.11	Original Issue	John Bowles	Andy Strickland
002	6/18/12	Revised procedure number or template	Jim Greeley	Andy Strickland

A. PURPOSE

This Environmental Services Business Group (ESBG) Standard Operating Procedure (SOP) outlines the requirements for CH2M HILL Munitions Response (MR) personnel when performing surface clearance and/or subsurface excavation operations, to reduce explosive hazards resulting from Munitions and Explosives of Concern (MEC).

B. SCOPE

1. This SOP is to be used during MR projects directly performed by CH2M HILL UXO Technicians engaged in surface clearance and/or subsurface excavation operations. The objectives of such operations typically include detection, reacquisition or location, identification and disposal of MEC or munitions debris. Subsurface excavation operations include those that are conducted manually and with Earth-Moving Equipment (EME).

2. This SOP does not include processes and requirements associated with explosive demolition of MEC or the evaluation processes related to Material Potentially Presenting an Explosive Hazard (MPPEH). These procedures are addressed in ES-S01-502-P, Explosive Demolition Operations and ES-S01-503-P, Material Potentially Presenting an Explosive Hazard (MPPEH) Processing.. It is also intended that the procedures included herein apply specifically to land-based MR operations. For marine or underwater environment MR activities see procedure ES-S01-505-P. There are also data management requirements associated with the surface clearance and subsurface excavation of MEC, MPPEH and MD which are outlined in ES-S01-506-P Munitions Response Site Information Management System (MRSIMS).

C. INPUTS

1. ES-S01-02.501-P Munitions Response Project Self Performance

2. ES-S01-03.502-P, Explosive Demolition Operations

3. ES-S01-03.503-P, Material Potentially Presenting an Explosive Hazard (MPPEH) Processing

4. ES-S01-02.504-P, Munitions Response Safety Risk Evaluation

5. SOP HSE 307, Excavation and Trenching Safety

6. There are also many other references that guide the general requirements within this SOP. Due to the inherent and hazardous nature of military munitions, most of these references are issued under the cognizance of the U.S. Department of Defense through administration of its Military Munitions Response Program (MMRP) and the Component Services that execute the MMRP. While some of these references will be cited later in this SOP, it is the obligation of all CH2M HILL MR personnel to stay apprised of such requirements and their revisions. Additionally, surface clearance and subsurface excavation of MEC operations conducted for DoD projects will strictly comply with all requirements articulated in approved Explosives Site Plans (ESP) or Explosives Safety Submissions (ESS) and Project Managers will ensure ESPs/ESSs are amended appropriately whenever necessary.

7. As a provider of worldwide MR Services it is important to note that other countries administer similar programs and that their guidance, while generally very similar, is unique and we must understand and comply with this guidance. Where specific requirements may differ and matters of explosives safety are concerned, we will observe those requirements providing the highest degree of safety to our personnel.

D. DEFINITIONS

Note: Definitions other than those provided below may apply for MR work performed outside U.S. jurisdictions. Check contractual references to ensure correct definitions are applied.

- **Material Documented as Safe (MDAS).** Material that has been assessed and documented as not presenting an explosive hazard and for which the chain-of-custody has been established and maintained. This material is no longer considered MPPEH per DoD Instruction 4140.62 (see References).
- **Material Documented as an Explosive Hazard (MDEH).** MPPEH that cannot be documented as MDAS that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain-of custody has been established and maintained. This material is no longer considered to be MPPEH per DoD Instruction 4140.62 (see References). (The MDEH characterization only addresses the explosives safety status of the material.)

- **Munitions and Explosives of Concern (MEC).** This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 U.S.C. 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.
- **Material Potentially Presenting an Explosive Hazard (MPPEH).** Material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (e.g., gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions per DoD Instruction 4140.62 (see References).
- **Munitions Debris (MD).** A military munition or components thereof that do not contain explosives or pyrotechnics. Examples include practice munitions without spotting charges, inert training munitions, expended ejection munitions, and fragments of exploded/destroyed military munitions that do not contain explosives or pyrotechnics.

E. FLOWCHART

None

F. DETAILS

1. General Roles and Responsibilities

1.1. **MR Operations Director :** Ensures CH2M HILL MR personnel shall be qualified in accordance with DDESB Technical Paper (TP) 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel and are certified to perform the job assigned and that certifications are current. Prior to MR operations, The MR Operations Director will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs. The MR Operations Director implements a personnel qualification and certification program for MR personnel consistent with the requirements for UXO personnel at various levels of responsibility as specified in DDESB TP 18.

1.2. **Project Manager (PM):** Provides the project leadership and direction to ensure that the project is performed within the scope, schedule and budget, ensures quality, risk management, safety and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

1.3. **MR HSSE Manager:** Assists and advises the MR and project staff to plan, staff, and execute the MR safety program. Audits and evaluates MR field projects and safety programs to verify that HSSE requirements and practices are implemented and effective.

1.4. **Senior UXO Supervisors and Unexploded Ordnance Technicians III or II:** Supervise the operational resources necessary to implement, and accomplish the procedures and requirements set forth within the Work, Health, Safety, Quality and Accident Prevention Plans of MR projects. They are required on all MR projects, and authorized to stop work at anytime to prevent accidents, remedy unsafe conditions, stop an unsafe act, or question the safety of a process or procedure or observe non-conformance to this SOP and/or plans. UXO Team Leaders shall also be responsible for recording data in MRSIMS and their log books. The SUXOS shall ensure Explosives Safety Quantity Distances (ESQD) are properly determined and enforced, as well as brief MR and project-essential personnel on communications, security, emergency/medical response, evacuation, rally points using project instructions and plans. This person shall inform personnel to prevent disclosure of classified work, site observations, or information.

1.5. **Unexploded Ordnance Quality Control Specialist (UXOQCS):** Assists with the implementation of this SOP. Reports to the Munitions Response Quality Control Manager. Monitors conformance to this SOP and Work, Health, Safety, Quality, and Accident Prevention Plans. This individual ensures that quality control processes and procedures are executed in accordance with the Quality Control Plan (QCP) and or project instructions.

1.6. **Unexploded Ordnance Safety Officer (UXOSO) and/or UXOQCS** (may be a dual-hatted position for small or unique projects when specifically approved during the Munitions Response Technical Risk Evaluation (MRTRE), is required on each project covered in the scope of this SOP and reports to t**h**e Munitions Response Health, Safety and Quality Manager). The UXOSO provides a Daily Site Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to

determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel. Responsible to implement health and safety/ activity hazard analysis, accident prevention plan requirements, assist the SUXOS to provide daily tailgate safety briefing, and enact emergency contingency plans as identified in plans.

1.7. **Earth Moving Equipment (EME) Operator:** Authorized as essential personnel to support mechanical excavations. Shall have a letter from the employing organization stating competence to operate assigned equipment. EME operators may be a non-UXO Qualified Person who is obligated to follow prescribed guidance within this SOP, Work, Health and Safety, Quality and Accident Prevention Plans and is under the direct supervision of a UXO Technician. CH2M HILL EME operators shall follow the requirements of Enterprise SOP 306, Earthmoving Equipment, which includes evaluation and approval from an authorized CH2M HILL earthmoving equipment operator evaluation designated person. Evaluations shall be conducted only by designated persons on file with the ESBG HSSE Director. Only EME operators with an evaluation form and test on file with the ESBG HSSE Director shall operate EME.

2. **Surface Clearance.** A surface clearance is a visual clearance of MEC, MPPEH and MD from a specified geographic surface by qualified UXO Technicians. Surface clearances may also be aided by handheld detectors in vegetated areas where visibility of the surface is reduced. These clearances are frequently performed in advance of digital geophysical mapping surveys to reduce the number of resultant target anomalies. They also serve to reduce the risks associated with explosive hazards and, thereby, eliminate the need to provide UXO Technician escorts to non-UXO qualified individuals such as geophysicists or site visitors. Surface clearances frequently employ a grid-based approach to define the boundary of the geographic area to be cleared. MEC and MPPEH items that are deemed unacceptable to move are flagged for subsequent disposal operations. Extreme care will be taken during surface clearances to avoid moving or otherwise disturbing items which are assumed to be MEC or MPPEH until determined acceptable or safe to move by UXO Technicians Level II or above. MEC, MPPEH and MD items that are acceptable to move are usually collected and placed in a designated corner of the grid to await further evaluation and processing. Surface clearances are typically coordinated by a SUXOS and conducted by a UXO Tech Level III UXO Team Leader who leads a team of UXO Tech Level IIs and Is. CH2M HILL teams will consist of a minimum of two people, and are usually comprised of four or six UXO Techs led by a Team Leader. A UXOQCS will perform an independent evaluation of the surface clearance in accordance with the QCP. All will be supported by the observations and advice provided by the UXOSO using the Work Plan and Site Specific Health & Safety Plan.

3. **Subsurface Excavation.**

3.1. Prior to the start of excavation operations the Project Manager, SUXOS or UXOSO will establish an exclusion zone (EZ) based upon a determination of the ESQD requirements associated with the Munition with the Greatest Fragment Distance (MGFD) as outlined within the ESS and Work Plan, both of which are required to be on site.

3.2. Only the minimum number of project-essential personnel, consistent with safe and effective operations, will be in the established EZ during anomaly excavation operations. Minimum composition of the excavation or dig team shall be two UXO Technicians, one of whom must be a UXO Technician II. The dig team will work under the direct supervision of a UXO Technician III. Direct supervision for the purposes of this paragraph means that the UXO Technician III will be physically located at the location where intrusive operations are being conducted and team members can promptly obtain his/her attention or assistance.

3.3. PPE and safety equipment will be readily available and emergency communications established prior to the commencement of excavation operations. Personnel will be trained on their role/duties, operator hand signals, and emergency actions as assigned by the UXO Technician III.

3.4. Ensure the area to be excavated is free of non-explosive buried hazards such as utilities or HTRW (Hazardous, Toxic, or Radiological Waste). If such hazards are present, ensure the crews are aware of the hazards, there locations and proper precautions have been established. Where underground utilities may be encountered, Enterprise SOP 219, Underground Utility Locates shall be followed.

3.5. A subsurface excavation is usually conducted subsequent to the identification of target anomalies derived through the processing of geophysical data collected during the digital geophysical mapping (DGM) phase of the munitions response project. Target anomalies are provided to the SUXOS who, in turn, distributes them to designated UXO Team Leaders for reacquisition and excavation. However, if no digital geophysical survey was conducted, the SUXOS will assign UXO Team Leaders to specific grids to conducted "mag, flag & dig" operations. In these operations, UXO Techs use handheld detection equipment to locate anomalies within the lanes of a grid. The anomalies are flagged and subsequently excavated to determine if the source of the anomaly was MEC, MPPEH, MD or other metallic debris. "Mag, flag & dig" operations are the exception rather than the rule and most subsurface excavations are to determine whether target anomalies are MEC, MPPEH, MD or other metallic debris. It should be noted that the benefit of the DGM approach is to significantly reduce the number of excavations to only those anomalies having geophysical properties associated with MEC, MPPEH or MD.

3.6. Subsurface excavations are conducted to explore the results of geophysical sensors by excavating and identifying the source of selected metallic anomalies and subsequently disposing of those items determined to be MEC, MPPEH and MD. Subsurface excavations are also completed using a grid-based approach to define the boundary of the geographic area to be cleared. MEC and MPPEH items that are deemed unacceptable to move are flagged for subsequent disposal operations. MEC, MPPEH and MD items that are acceptable to move are usually collected and placed in a designated corner of the grid to await further evaluation and processing. Subsurface excavations are typically coordinated by a SUXOS and conducted by a UXO Tech Level III UXO Team Leader who leads a team of UXO Tech Level IIs and Is. Teams are usually comprised of four or six UXO Techs led by a Team Leader. A UXOQCS will independently perform subsurface excavations in accordance with the QCP. All will be supported by the observations and advice provided by the UXOSO using the Work Plan and Site Specific Health & Safety Plan.

3.7. Anomaly excavation operations will be executed by UXO-qualified personnel under the direct supervision of a UXO Technician III. The excavation team will not dig directly down to the item but, rather, will dig to the side to avoid striking the item with digging implements. Extreme care will be taken during anomaly excavation to avoid striking, moving or otherwise disturbing items which are assumed to be MEC or MPPEH until determined acceptable or safe to move by UXO Technicians Level II or above.

3.8. Anomalies deeper than two to three feet should be assisted by mechanical excavation of buffer layers of confining soils by EME such as a backhoe or track excavator. Mechanical excavation should be performed by specifically –qualified and authorized personnel in accordance with Enterprise SOP HSE 306. All excavations will be conducted in accordance with Enterprise SOP HSE 307, Excavation and Trenching Safety. Additional safety procedures including daily inspections, step downs, shoring, or confined space considerations and the placement of spoils may be required. The UXOSO will monitor mechanical excavations and will prescribe additional safety procedures as required by ESS, ESP, Site-Specific HS Plan, APP, and or Work Plan. If an excavation is deeper than four feet or presents a cave-in hazard a "Competent Person" must be on site. Shoring or sloping may be necessary. Contact the UXOSO who will assess the requirements for a professional engineer; requesting the advice of others within CH2M HILL's Safety organization as necessary.

G. TOOLS

1. Shovels
2. Buckets

3. Hand Trowels
4. Measuring Tape or Calipers
5. Digital Cameras
6. Geophysical Instruments

H. OUTPUTS

Data collected regarding MEC, MPPEH and MD encountered during surface clearance and subsurface excavation operations will be recorded in MRSIMS and reported in accordance with project planning documents or other specific requirements.

I. ATTACHMENTS

None

J. REFERENCES

- DoD Instruction 4140.62, "Management and Disposition of Material Potentially Presenting an Explosive Hazard," November 5, 2008;
- DOD 6055.09-M, Ammunition and Explosives Safety Standards, August 2010;
- DDESB TP-18 Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, December 2004
- DA 385-64, Ammunition and Explosive Safety Standards, August 2008;
- DA Engineering Manual (EM) 385-1-97 Explosives, Health and Safety, September 2008;

Rev. No.	Effective Date	Revision Description	Procedure Owner Approval	Process Owner Approval
001	8.22.11	Original Issue	John Bowles	Andy Strickland

A. PURPOSE

This Environmental Services Business Group (ESBG) Standard Operating Procedure (SOP) outlines the requirements for CH2M HILL Munitions Response (MR) personnel when performing explosive demolition operations to reduce explosive hazards resulting from Munitions and Explosives of Concern (MEC).

B. SCOPE

1. This procedure is to be used during MR projects directly performed by CH2M HILL UXO Technicians engaged in explosive demolition operations. The objectives of such operations include explosive disposal of MEC/Material Documented as an Explosive Hazard (MDEH) or explosively demilitarizing or disfiguring munitions that have retained the shape of an intact munition to preclude reuse or confusion.

2. This SOP does not include processes and requirements associated with surface clearance or subsurface excavation or the evaluation processes related to MPPEH. The procedure for handling MPPEH is ES-S01-503-P, Material Potentially Presenting an Explosive Hazard (MPPEH) Processing. It is also intended that the procedures included herein apply specifically to land-based MR operations. Please see ES-S01-505-P, Munitions Response in Marine and Underwater Environments, for activities performed in a marine or underwater environment. There are also data management requirements associated with explosive demolition operations which are addressed by ES-S01-506-P, Munitions Response Site Information Management System (MRSIMS).

C. INPUTS

1. ES-S01-500-P Munitions Response Self Performance Policy

2. ES-S01-501-P, Surface Clearance and Subsurface Excavation of MEC

3. ES-S01-503-P, Material Potentially Presenting an Explosive Hazard (MPPEH) Processing

4. ES-S01-505-P, Munitions Response in Marine and Underwater Environments

5. ES-S01-504-P, Munitions Response Technical Risk Evaluation

6. ES-S01-506-P, Munitions Response Site Information Management System (MRSIMS).

7. SOP HSE 307, Excavation and Trenching Safety

8. HSE 601, Explosive Usage and Munitions Response

9. There are also many other references that guide the general requirements within this SOP. Due to the inherent and hazardous nature of military munitions, most of these references are issued under the cognizance of the U.S. Department of Defense through administration of its Military Munitions Response Program (MMRP) and the Component Services that execute the MMRP. While some of these references will be cited later in this SOP, it is the obligation of all CH2M HILL MR personnel to stay apprised of such requirements and their revisions. Additionally, demolition operations conducted for DoD projects will strictly comply with all requirements articulated in approved Explosives Site Plans (ESP) or Explosives Safety Submissions (ESS) and Project Managers will ensure ESPs/ESSs are amended appropriately whenever necessary.

10. As a provider of worldwide MR Services it is important to note that other countries administer similar programs and that their guidance, while generally very similar, is unique and we must understand and comply with this guidance. Where specific requirements may differ and matters of explosives safety are concerned, we will observe those requirements providing the highest degree of safety to our personnel.

D. DEFINITIONS

Note: Definitions other than those provided below may apply for MR work performed outside U.S. jurisdictions. Check contractual references to ensure correct definitions are applied.

- **Material Documented as Safe (MDAS).** Material that has been assessed and documented as not presenting an explosive hazard and for which the chain-of-custody has been established and maintained. This material is no longer considered MPPEH per DoD Instruction 4140.62 (see References).
- **Material Documented as an Explosive Hazard (MDEH).** MPPEH that cannot be documented as MDAS that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain-of custody has been established and maintained. This material is no longer considered to be MPPEH per DoD Instruction 4140.62 (see References). (The MDEH characterization only addresses the explosives safety status of the material.)
- **Munitions and Explosives of Concern (MEC).** This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means:

(A) Unexploded ordnance (UXO), as defined in 10 U.S.C. 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

- **Material Potentially Presenting an Explosive Hazard (MPPEH).** Material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (e.g., gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions per DoD Instruction 4140.62 (see References).
- **Munitions Debris (MD).** A military munition or components thereof that do not contain explosives or pyrotechnics. Examples include practice munitions without spotting charges, inert training munitions, expended ejection munitions, and fragments of exploded/destroyed military munitions that do not contain explosives or pyrotechnics.

E. FLOWCHART

None

F. DETAILS

1. General Roles and Responsibilities

1.1. **MR Operations Director :** Ensures CH2M HILL MR personnel shall be qualified in accordance with DDESB Technical Paper (TP) 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel and are certified to perform the job assigned and that certifications are current. Prior to MR operations, the MR Operations Director will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs. The MR Operations Director will maintain a personnel qualification and certification program for MR personnel consistent with the requirements for UXO personnel at various levels of responsibility as specified in DDESB TP 18.

1.2. **Project Manager (PM):** Provides the project leadership and direction to ensure that the project is performed within the scope, schedule and budget, ensures quality, risk management, safety and contract compliance. The PM will ensure

that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work. The PM will integrate MR staff for technical planning, field project execution, document reviews and to anticipate and resolve any technical MR issues relevant to project execution and delivery.

1.3. **MR HSSE Manager:** Assists and advises the MR and project staff to plan, staff, and execute the MR safety program. Audits and evaluates MR field projects and safety programs to verify that HSSE requirements and practices are implemented and effective.

1.4. **Senior UXO Supervisors and Unexploded Ordnance Technicians III or II:** Supervise the operational resources necessary to implement, and accomplish the procedures and requirements set forth within the Work, Health, Safety, Quality and Accident Prevention Plans of MR projects. They are required on all MR projects, and authorized to stop work at anytime to prevent accidents, remedy unsafe conditions, stop an unsafe act, or question the safety of a process or procedure or observe non-conformance to this SOP and/or plans. UXO Team Leaders shall also be responsible for recording data in MRSIMS and their log books. The SUXOS shall ensure Explosives Safety Quantity Distances (ESQD) are properly determined and enforced, as well as brief MR and project-essential personnel on communications, security, emergency/medical response, evacuation, rally points using project instructions and plans. This person shall inform personnel to prevent disclosure of classified work, site observations, or information.

1.5. **Unexploded Ordnance Quality Control Specialist (UXOQCS):** Assists with the implementation of this SOP. Reports to the Munitions Response Quality Control Manager. Monitors conformance to this SOP and Work, Health, Safety, Quality, and Accident Prevention Plans. This individual ensures that quality control processes and procedures are executed in accordance with the Quality Control Plan (QCP) and or project instructions.

1.6. **Unexploded Ordnance Safety Officer (UXOSO) and/or UXOQCS** (may be a dual-hatted position for small or unique projects when specifically approved during the Munitions Response Technical Risk Evaluation (MRTRE), is required on each project covered in the scope of this SOP and reports to t**h**e Munitions Response Health, Safety and Quality Manager). The UXOSO provides a Daily Site Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel. Responsible to implement health and safety/ activity hazard analysis, accident

prevention plan requirements, assist the SUXOS to provide daily tailgate safety briefing, and enact emergency contingency plans as identified in plans.

1.7. **Earth Moving Equipment (EME) Operator:** Authorized as essential personnel to support mechanical excavations. Shall have a letter from the employing organization stating competence to operate assigned equipment. EME operators may be a non-UXO Qualified Person who is obligated to follow prescribed guidance within this SOP, Work, Health and Safety, Quality and Accident Prevention Plans and is under the direct supervision of a UXO Technician. CH2M HILL EME operators shall follow the requirements of Enterprise SOP 306, Earthmoving Equipment, which includes evaluation and approval from an authorized CH2M HILL earthmoving equipment operator evaluation designated person. Evaluations shall be conducted only by designated persons on file with the ESBG HSSE Director. Only EME operators with an evaluation form and test on file with the ESBG HSSE Director shall operate EME.

2. **Explosive Demolition Operations.**

As a general rule, all UXO and discarded military munitions (DMM) will be blown in place (BIP) within established explosives safety quantity distance (ESQD) arcs as defined in an approved Explosives Site Plan (ESP)/Explosives Site Submission (ESS). This is the safest method to effect final disposition of munitions. Engineering controls may be required based on site-specific conditions. If authorized by the SUXOS and not inconsistent with the ESP/ESS, UXO and DMM may be moved within the grid found for consolidated demolition shots. Whenever a separate demolition area is established within the Munitions Response Area (MRA) or Munitions Response Site (MRS) for recovered MEC, the provisions of the approved ESP/ESS apply.

Unless specific provisions are in place to store MEC/MPPEH deemed safe or acceptable to move, all MEC will be destroyed daily unless circumstances such as unexpected weather storms, unavailability of donor explosives, etc. preclude their destruction. If a MEC item cannot be destroyed on the day of discovery and storage is not planned, then the item will be secured and guarded until destruction can be accomplished. Under no circumstances will MEC be left unsecured overnight.

Only UXO-qualified personnel will perform UXO procedures. A minimum of three personnel will be used for explosive demolition operations. All personnel engaged in explosive demolition operations will be thoroughly trained and capable of recognizing the specific hazards of the procedures being performed.

Prior to any action being performed on an ordnance item, all fuzing will be positively identified, if it is possible to safely do so, without disturbing the ordnance item. This identification will consist of fuze type by function and condition (armed or unarmed) and the physical state/condition of the fuze, i.e., burned, broken, parts exposed/sheared, etc.

If the decision is made to consolidate the MEC that is acceptable to move, the following two conditions must be met:

a. The MEC cannot be left unattended or unsecured in the grid overnight.

b. If the MEC is to be secured within a magazine pending disposal, the magazine must be sited for this use in the project ESP/ESS.

2.1 Procedures for Demolition of Multiple Rounds (Consolidated Shots) on MEC.

c. The minimum separation distance for all personnel will be the greater of the overpressure distance or the appropriate fragment range as determined by the maximum fragment range or the mitigated fragment range.

d. Overpressure Distance. The allowable overpressure distance will be determined as the scaled distance, K328, based on the total net explosive weight (NEW) of all munitions plus the initiating explosives.

e. Fragment Criteria:

(1) Maximum Fragment Range. The maximum fragmentation characteristics shall be computed IAW DDESB TP 16. The maximum fragment range shall be computed using these fragmentation characteristics with a trajectory analysis such as the computer software TRAJ. The maximum fragment range shall be the maximum fragmentation distance computed for the munition with the greatest fragmentation distance (MGFD) for a MEC area at a site, and this shall be the maximum fragment range for a consolidated shot.

(2) Fragment Mitigation. Fragment mitigation may be provided by an appropriate DDESB approved engineering control. Typical engineering controls for intentional detonation include tamping, sandbags, and water mitigation. The design of such an engineering control shall be based on the maximum fragmentation characteristics of the MGFD. The NEW used for the design of the engineering control shall be the total NEW of all munitions plus the initiating explosives. Engineering controls not already approved by DDESB may be submitted (along with appropriate technical data) as part of a site-specific explosive safety submission for use at that site. Engineering controls will not be put into use until approved by DDESB and specific applications verified by the appropriate agency.

f. Initiation. The consolidated shot shall be initiated in such a manner that detonation of all munitions is simultaneous.

2.2 MEC Disposal Operations

All disposal operations will be conducted IAW TM 60A-1-1- 31, EP 1110-1-17, and the unnumbered U.S. Army Engineering and Support Center, Huntsville (USAESCH), publication

entitled "Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites".

As a general rule, all disposal operations will be accomplished by electrical means to ensure maximum safety. There are exceptions to this requirement in situations where static electricity or EMR hazards are present. Unintentional detonations can occur because of these induced currents (or lightning). The following precautions from DA Pam 385-64 are to be followed:

a. Premature detonation of electric blasting caps by induced current from radio frequency signals is possible. Refer to guidance documents for minimum safe distance with respect to transmitter power and indication of distance beyond which it is safe to conduct electric blasting even under the most adverse conditions.
b. Lightning is a hazard with respect to both electric and non-electric blasting caps. A direct hit or a nearby miss is almost certain to initiate either type of cap or other sensitive explosive elements such as caps in delay detonators. Lightning strikes, even at distant locations, may cause extremely high local earth currents that may initiate electrical firing circuits. Effects of remote lightning strikes are multiplied by their proximity to conducting elements such as those found in buildings, fences, railroads, bridges, streams, and underground cables or conduits. The only safe procedure is to suspend all blasting activities when an electrical storm approaches to within 10 miles of the project location.
c. Electric power lines also pose a hazard with respect to electric initiating systems. It is recommended that any disposal operation closer than 155 meters (517 feet) to electric power lines be done with a non-electric system.
d. The only acceptable disposal method is the one stated in the appropriate TM 60 Series manual for specific ordnance types. Any commercial explosives being used will be equivalent to the military explosive required for the disposal operation.
e. If justified by the situation, protective measures to reduce shock, blast overpressure, and fragmentation will be taken.
f. MSDs for personnel during MEC disposal operations will be IAW the distance provided by the ESS/ESP.
g. During open detonation operations, personnel will be located away from lifting lugs, strong backs, base plates, etc.
h. Once disposal operations are completed, a thorough search of the immediate area will be conducted with a magnetometer to ensure that a complete disposal was accomplished.
i. Inert ordnance will not be disposed of as scrap until the internal fillers/voids have been exposed and unconfined.

2.3 Engineering Controls for Intentional Detonations.

The most common engineering controls used during intentional detonations are either soil cover or sandbags.

a. Soil Cover. If soil is proposed to be used over a MEC item to be detonated, one of several computerized models may be used to determine the required thickness of soil cover necessary for the intentional detonation of MEC. The Buried Explosion Module (BEM) is one such computerized model. The methodology used in the BEM is documented in DDESB TP 16 and an EXCEL spreadsheet is available with DDESB TP 16 on the DDESB Secure Website.

b. Sandbags. Sandbags may be used for MEC no larger than 155 mm. If sandbags are proposed to be used as an engineering control to mitigate the fragmentation and overpressures generated during an intentional MEC detonation, the PDT should refer to HNC-ED-CS-S-98-7 and the Fragmentation Characteristics Database with DDESB TP 16.

c. Barricades. There are a number of approved barricades that may be used for the mitigation of fragments, such as the open front barricade, enclosed barricade, and the miniature open front barricade. A comparison, siting, and selection procedure for various barricades can be found in HNC-ED-CS-S-96-8,Revision 1.

d. Water Barriers. In some instances it may be necessary to use water as a mitigating agent for the control of blast effect and fragment containment resulting from the intentional detonation of munitions. HNC-ED-CS-S-00-3 contains the requirements necessary when using water as a mitigating agent. Munition specific requirements are available in the Fragmentation Characteristics Database with DDESB TP 16.

e. Controlled Detonation Chambers. Another engineering control that may be proposed for the intentional detonation of MEC is a Controlled Detonation Chamber (CDC). CDCs are designed to capture all fragmentation from the detonated MEC and will be approved by DDESB for the intentional detonation of MEC.

G. TOOLS

a. One handheld radio per SUXOS, UXOSO, ECP's (staffed) and DS.

b. One 4x4, emergency response/personnel transport vehicle.

c. Galvanometer (when using MK 186 RFD).

d. One Blasting Tool kit. One handheld radio per person. or cell phone

e. Cell Phone (must have minimum of three bar tower reception)

f. One collection vehicle.

g. Collection containers as required.

h. EZ Signs (one for each road to be blocked).

i. Marking flags, tape, engineer ribbon, poles and/or stakes.

j. Plastic Pin Flags. Multiple colors

k. Multicolor marking ribbons and spray paint.

l. One fire extinguisher per vehicle moving MPPEH (BC)

H. OUTPUTS

Data collected regarding MEC and MDEH disposed of by explosive demolition operations will be recorded in MRSIMS and reported in accordance with project planning documents or other specific requirements.

I. ATTACHMENTS

None

J. REFERENCES

- OSHA General Industry Standards 29 CFR 1910
- OSHA Construction Standards 29 CFR 1926
- DOD 6055.09-M, Ammunition and Explosives Safety Standards, August 2010;
- DOD 4145.26-M Contractors Safety Manual for Ammunition and Explosives August, 1997
- Technical Manual 60A-1-1-31 Explosive Ordnance Disposal Procedures
- USN NAVSEA OP 5Volume 1; Ammunition and Explosives Safety Ashore, July 2009;
- USAF Manual 91-201 Explosive Safety Standards November 2008
- Department of the Army (DA) Pamphlet 385-64 Ammunition and Explosives Safety Standards October, 8, 2008
- Field Manual (FM) 21-16, Unexploded Ordnance (UXO) Procedures August, 1994
- Engineering Manual (EM) 1110-1-4009 Military Munitions Response Actions, June, 2007
- Engineering Pamphlet (EP) 1110-1-18 Military Munitions Response Process, April 2006
- Engineering Manual (EM) 385-1-97 Explosives, Safety and Health Requirements Manual September 2008;
- DDESB TP-18 Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, December 2004
- DoD Instruction 4140.62, "Management and Disposition of Material Potentially Presenting an Explosive Hazard," November 5, 2008;

Rev. No.	Effective Date	Revision Description	Procedure Owner Approval	Process Owner Approval
001	8.22.11	Original Issue	John Bowles	Andy Strickland
002	6/18/12	Revised procedure number and template	Jim Greeley	Andy Strickland

A. PURPOSE

This Procedure outlines the requirements for CH2M HILL Munitions Response (MR) personnel when processing Material Potentially Presenting an Explosive Hazard (MPPEH).

B. SCOPE

1. This procedure is to be used during MR projects directly performed by CH2M HILL UXO Technicians engaged in MPPEH processing. The objectives of such operations typically include inspection, re-inspection, verification, and certification of MPPEH into either Material Documented as Safe (MDAS) or Material Documented as an Explosive Hazard (MDEH).

2. This SOP does not include processes and requirements associated with surface clearance or subsurface excavation of MEC or explosive demolition operations of MEC/MDEH. The procedure for handling MEC/MDEH is ES-S01-501-P, Subsurface Clearance and Subsurface Excavation of MEC. It is also intended that the procedures included herein apply specifically to land-based MR operations. Please see Please see ES-S01-505-P, Munitions Response in Marine and Underwater Environments, for activities performed in a marine or underwater environment. There are also data management requirements associated with explosive demolition operations which are addressed by ES-S01-506-P, Munitions Response Site Information Management System (MRSIMS).

C. INPUTS

1. ES-S01-02.501-P Munitions Response Self Performance Policy
2. ES-S01-03.501-P Surface Clearance and Subsurface Excavation of MEC
3. ES-S01-03.502-P Explosive Demolition Operations
4. ES-S01-02.504-P Munitions Response Safety Risk Evaluation
5. SOP HSE 307, Excavation and Trenching Safety
6. HSE 601, Explosive Usage and Munitions Response
7. There are also many other references that guide the general requirements within this SOP. Due to the inherent and hazardous nature of military munitions, most of these references are issued under the cognizance of the U.S. Department of Defense through administration of its Military Munitions Response Program (MMRP) and the Component Services that execute the MMRP. While some of these references will be cited later in this SOP, it is the obligation of all CH2M HILL MR personnel to stay apprised of such requirements and their revisions. Additionally, MPPEH processing conducted for DoD projects will strictly comply with all requirements articulated in approved Explosives Site Plans (ESP) or Explosives Safety Submissions (ESS) and Project Managers will ensure ESPs/ESSs are amended appropriately whenever necessary.
8. As a provider of worldwide MR Services it is important to note that other countries administer similar programs and that their guidance, while generally very similar, is unique and we're contractually bound to understand and comply with this guidance. Where specific requirements may differ and matters of explosives safety are concerned, it is the policy of the Enterprise in the delivery of MR Services to observe those requirements providing the highest degree of safety to our personnel. For example, in Canada the government currently has material documented as safe (MDAS) shipped to a government-managed storage facility pending future disposal.

D. DEFINITIONS

Note: Definitions other than those provided below may apply for MR work performed outside U.S. jurisdictions. Check contractual references to ensure correct definitions are applied.

- **Material Document as Safe (MDAS).** Material that has been assessed and documented as not presenting an explosive hazard and for which the chain-of-custody has been established and maintained. This material is no longer considered MPPEH per DoD Instruction 4140.62 (see References).
- **Material Documented as an Explosive Hazard (MDEH).** MPPEH that cannot be documented as MDAS that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain-of custody has been established and maintained. This material is no longer considered to be MPPEH per DoD Instruction 4140.62 (see References). (The MDEH characterization only addresses the explosives safety status of the material.)
- **Munitions and Explosives of Concern (MEC).** This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 U.S.C. 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.
- **Material Potentially Presenting an Explosive Hazard (MPPEH).** Material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (e.g., gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions per DoD Instruction 4140.62 (see References).
- **Munitions Debris (MD).** A military munition or components thereof that do not contain explosives or pyrotechnics. Examples include practice munitions without spotting charges, inert training munitions, expended ejection munitions, and fragments

of exploded/destroyed military munitions that do not contain explosives or pyrotechnics.

E. FLOWCHART

None

F. DETAILS

1. General Roles and Responsibilities

1.1. **MR Operations Director :** Ensures CH2M HILL MR personnel shall be qualified in accordance with DDESB Technical Paper (TP) 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel and are certified to perform the job assigned and that certifications are current. Prior to MR operations, the MR Operations Director will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs. The MR Operations Director will maintain a personnel qualification and certification program for MR personnel consistent with the requirements for UXO personnel at various levels of responsibility as specified in DDESB TP 18.

1.2. **Project Manager (PM):** Provides the project leadership and direction to ensure that the project is performed within the scope, schedule and budget, ensures quality, risk management, safety and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work. The PM will integrate MR staff for technical planning, field project execution, document reviews and to anticipate and resolve any technical MR issues relevant to project execution and delivery. **Senior UXO Supervisors and Unexploded Ordnance Technicians III or II:** Supervise the operational resources necessary to implement, and accomplish the procedures and requirements set forth within the Work, Health, Safety, Quality and Accident Prevention Plans of MR projects. They are required on all MR projects, and authorized to stop work at anytime to prevent accidents, remedy unsafe conditions, stop an unsafe act, or question the safety of a

process or procedure or observe non-conformance to this SOP and/or plans. UXO Team Leaders shall also be responsible for recording data in MRSIMS and their log books. The SUXOS shall ensure Explosives Safety Quantity Distances (ESQD) are properly determined and enforced, as well as brief MR and project-essential personnel on communications, security, emergency/medical response, evacuation, rally points using project instructions and plans. This person shall inform personnel to prevent disclosure of classified work, site observations, or information.

1.3. **MR HSSE Manager:** Assists and advises the MR and project staff to plan, staff, and execute the MR safety program. Audits and evaluates MR field projects and safety programs to verify that HSSE requirements and practices are implemented and effective.

1.4. **Unexploded Ordnance Quality Control Specialist (UXOQCS):** Assists with the implementation of this SOP. Reports to the Munitions Response Quality Control Manager. Monitors conformance to this SOP and Work, Health, Safety, Quality, and Accident Prevention Plans. This individual ensures that quality control processes and procedures are executed in accordance with the Quality Control Plan (QCP) and or project instructions.

1.5. **Unexploded Ordnance Safety Officer (UXOSO) and/or UXOQCS** (may be a dual-hatted position for small or unique projects when specifically approved during the Munitions Response Technical Risk Evaluation (MRTRE), is required on each project covered in the scope of this SOP and reports to t**h**e Munitions Response Health, Safety and Quality Manager). The UXOSO provides a Daily Site Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel. Responsible to implement health and safety/ activity hazard analysis, accident prevention plan requirements, assist the SUXOS to provide daily tailgate safety briefing, and enact emergency contingency plans as identified in plans.

2. **MPPEH Processing.**

The objective of these procedures is to ensure that a complete visual inspection of the exterior and interior surfaces of all recovered MPPEH is conducted by qualified personnel in accordance with applicable DoD regulations to ensure they are accurately categorized as either "material documented as safe (MDAS)" or "material documented as an explosive hazard (MDEH)." It should be noted that MPPEH as discussed within this SOP is understood to be material determined to be safe or acceptable to move. As the material potentially presents an explosive hazard, it is to be handled with extreme care and not subjected to heat, shock or friction during the evaluation process.

2.1 Personnel Specific Duties and Responsibilities

Unexploded Ordnance (UXO) Sweep Personnel will only mark suspected items and will not be allowed to perform any assessment of a suspect item to determine its status.

Unexploded Ordnance (UXO) Tech I can tentatively identify a located item as MPPEH, followed by a required confirmation by a UXO Tech II or III.

UXO Technician II will:

a. Perform a 100% inspection of each item as it is recovered and determine the following:
   (1) Whether the item is a UXO, DMM, munitions debris or range-related debris;
   (2) Whether the item contains explosives hazards or other dangerous fillers;
   (3) Whether the item requires disposal by detonation (MDEH);
   (4) Whether the item requires demilitarization (demil) for disfigurement or to vent/expose potential dangerous fillers;
   (5) Whether the item requires draining of engine fluids, illuminating dials and other visible liquid hazardous, toxic or radiological waste (HTRW) materials.

b. Segregate items requiring demil or venting procedures from those items ready for documentation as MDAS.

c. Items determined to contain explosive hazards or other dangerous fillers will be processed IAW applicable procedures and in compliance with ESP/ESS requirements.

UXO Technician III will:

a. Perform a 100% re-inspection of all recovered items to determine if free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials and other visible liquid HTRW materials.

b. Supervise disposal of items found to contain explosive hazards or other dangerous fillers and venting/demil procedures using demolition procedures established in the ES-S01-01-502P Explosive Demolition Operations.

c. Supervise the consolidation of MPPEH for containerization and sealing. Munitions Debris and Range-related Debris will be segregated.

UXO Quality Control Specialist (UXOQCS) will:

a. Conduct daily audits of the procedures used by UXO teams and individuals for processing MPPEH.

b. Perform and document random sampling (by pieces, volume or area) of all MPPEH collected from the various teams to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials are identified as munitions debris or range-related debris as required for completion of the Requisition and Turn-in Document, DD Form 1348-1A.

UXO Safety Officer (UXOSO) will:

a. Ensure the specific procedures and responsibilities for processing MPPEH for documentation as munitions debris or range- related debris specified in the WP are being followed.

b. All procedures for processing MPPEH are being performed safely and consistent with applicable regulations.

Senior UXO Supervisor (SUXOS) will:

a. Be responsible for ensuring work and QC plans specify the procedures and responsibilities for processing MPPEH for final disposition as munitions debris or range-related debris.

b. Ensure a requisition and turn-in document, DD Form 1348- 1A is completed for all munitions debris and range-related debris to be transferred for final disposition.

c. Perform random checks to satisfy that the munitions debris and range -related debris

is free from explosive hazards necessary to complete the Form, DD 1348-1A.

d. Certify all munitions debris and range-related debris as free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials.

e. Be responsible for ensuring that inspected debris is secured in a closed, labeled and sealed container and documented as follows:

(1) The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification that will start with USACE, AFCEE, NAVFAC or other client identifier followed by installation name, contractor's name and sequential numerical identifier (e.g. NAVFAC/Installation Name/Contractor's Name/0001/Seal's unique identification) and continue sequentially.

(2) The container will be closed in such a manner that a seal must be broken in order to open the container. A seal will bear the same unique identification number as the container or the container will be clearly marked with the seal's identification if different from the container.

(3) A documented description of the container will be provided by the contractor with the following information for each container; contents, weight of container; location where munitions or range- related debris was obtained; name of contractor, names of certifying and verifying individuals; unique container identification; and seal identification, if required. The contractor in a separate section of the final report will also provide these documents.

2.2 Munitions Debris (MD) Certification and Verification

MPPEH will be properly inspected IAW the procedures in paragraph 2.1 above. Only personnel who are qualified UXO personnel will perform these inspections. The SUXOS will certify the debris is free of explosive hazards and the Ordnance and Explosives Safety Specialist (OESS) or Navy Technical Representative (NTR) will verify the MPPEH inspection process has been followed. If an OESS/NTR is not on-site, the UXOQCS, or a similarly trained and authorized individual can be delegated to verify the MPPEH process.

DD form 1348-1A will be used as certification/verification documentation. All DD 1348-1A must clearly show the typed or printed names of the contractor's SUXOS and the

OESS/NTR, organization, signature, and contractor's home office and field office phone number(s) of the persons certifying and verifying the debris as free of explosive hazards.

Local directives and agreements may supplement these procedures. Coordination with the local concerns will identify any desired or requested supplementation to these procedures.

In addition to the data elements required and any locally agreed to directives, the DD 1348-1A must clearly indicate the following for scrap metal:

a. Basic material content (Type of metal; e.g., steel or mixed);

b. Estimated weight;

c. Unique identification of each of the containers and seals stated as being turned over;

d. Location where munitions debris or range-related debris was obtained;

e. Seal identification, if different from the unique identification of the sealed container;

The following certification/verification will be entered on each DD 1348-1A for turnover of munitions debris or range- related debris and will be signed by the SUXOS and the USACE OESS. This statement will be used on any ranges where Range Related Debris is being processed along with munitions debris:

"This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials."

The following certification/verification will be entered on each 1348-1A for turnover of munitions debris and will be signed by the SUXOS on properties where only munitions debris is being processed:

"This certifies that material listed has been 100 percent properly inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials."

2.3 Maintaining the Chain of Custody and Final Disposition

The chain of custody and final disposition of the certified and verified materials will be maintained. The certified and verified material will only be released to an organization that will:

a. Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.
b. Send notification and supporting documentation to the sealed container-generating contractor documenting the seal containers have been smelted and are now only identifiable by their basic content.
c. This document will be incorporated by the contractor into the final report as documentation for supporting the final disposition of munitions debris and range-related debris.
d. If the chain of custody is broken, the affected MPPEH must undergo a second 100 percent inspection, a second 100 percent re-inspection, and be documented to verify its explosives safety status (identified as either munitions debris or range related debris).
e. Material that has been documented as safe in no longer considered MPPEH as long as the chain of custody remains intact. A legible copy of inspection, re-inspection, and documentation must accompany the material through final disposition and be maintained for a period of three (3) years thereafter.

G. TOOLS

1. Cellular
2. Magnetometer capable of monitoring to a depth of two-feet below ground surface for ferrous items
3. All metals detector capable of monitoring to a depth of 6-inches below ground surface for non-ferrous items
4. Multi colors of marking flags, ribbon, and tape
5. Batteries

6. First –Aid Kit (25 person)
7. Water
8. Camera/Tape Measure/Ruler/Calipers/Paper Pencil
9. Hand tools, (hammer, general purpose tools, etc.)

H. OUTPUTS

Data collected regarding MPPEH processing operations will be recorded in MRSIMS and reported in accordance with project planning documents or other specific requirements.

I. ATTACHMENTS

None

J. REFERENCES

- DoD Instruction 4140.62, "Management and Disposition of Material Potentially Presenting an Explosive Hazard," November 5, 2008;
- DOD 6055.09-M, Ammunition and Explosives Safety Standards, August 2010;
- DDESB TP-18 Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, December 2004
- DA Engineering Manual (EM) 385-1-97 Explosives, Safety and Health Requirements Manual, September 2008;

CH2M HILL Environmental Services Business Group	Revision: 004 Effective Date: 6/18/12	Number: ES-S01-02.504-P
Process: S01 - Health, Safety, Security and Environment	Procedure Owner: MR Operations Director	Page: 1 of 5
Procedure: Munitions Response Safety Risk Evaluation		

Rev. No.	Effective Date	Revision Description	Procedure Owner Approval	Process Owner Approval
001	8.30.11	Original Issue	John Bowles	Andy Strickland
002	9.6.11	Revision clarifies the Role of the MR safety Manager and the MR Operations Director related to the execution of the MRTRE	John Bowles	Andy Strickland
003	10.4.11	Alignment with HSE Policy 610 focusing the evaluation on munitions response Safety risks, changing the process and form title to the Safety Risk Evaluation (SRE)	John Bowles	Andy Strickland
004	6/18/12	Revised procedure number and template	Jim Greeley	Andy Strickland

A. PURPOSE

The purpose of this procedure is to outline the Environmental Business Group's Munitions Response (MR) Safety Risk Evaluation (SRE) process. The procedure serves as a safety risk identification, assessment, mitigation planning tool, and is scheduled and implemented prior to undertaking munitions response work.

B. SCOPE

1. This procedure applies to all ESBG Munitions Response and Controlled Detonation Chamber projects. The procedure starts at the identification or proposal phase of a munitions response project.

2. The previously reviewed assessment is to be updated and re-implemented with any additional scope of work change from the initial scope of work and evaluation.

3. Procedure ends when all munitions response risk have been quantified and project risks no longer exist

C. INPUTS

1. ES-S01-02.501-P Munitions Response Project Self Performance
2. ES-S01-03.501-P, Surface Clearance and Subsurface Excavation of MEC
3. ES-S01-03.502-P, Explosive Demolition Operations
4. ES-S01-03.503-P, Material Potentially Presenting an Explosive Hazard (MPPEH) Processing
5. ES-S01-02.504-P, Munitions Response Safety Risk Evaluation
6. ES-S07–0101-P, ESBG Risk Management Policy
7. ES-S07-0102-P, ESBG Risk Management Program/Project Procedure
8. ES-S07-0103-P, ESBG Risk Portfolio Management
9. ES-S07-0103-WI, ESBG Risk Color Code Instruction
10. Policy 304, Enterprise Risk Policy
11. SOP HSE 307, Excavation and Trenching Safety
12. HSSE 610 – Munitions Response Standards of Practice
13. There are also many other references that guide the general requirements within this SOP. Due to the inherent and hazardous nature of military munitions, most of these references are issued under the cognizance of the U.S. Department of Defense through administration of its Military Munitions Response Program (MMRP) and the Component Services that execute the MMRP.
14. As a provider of worldwide MR Services it is important to note that other countries administer similar programs and that their guidance, while generally very similar, is unique and we're contractually bound to understand and comply with this guidance.

Where specific requirements may differ and matters of explosives safety are concerned, it is the policy of the Enterprise in the delivery of MR Services to observe those requirements providing the highest degree of safety to our personnel. For example, in Canada the government currently has material documented as safe (MDAS) shipped to a government-managed storage facility pending future disposal.

D. DEFINITIONS (SEE GLOSSARY)

E. FLOWCHART

None

F. DETAILS

The Munitions Response SRE must be conducted as a part of the Go/No Go decision and for any change to the project scope of work during execution. The Munitions Response SRE form must be filled out and reviewed during the MR risk review.

1. **Complete Munitions Response SRE Form, ES-S01-02.504-F1**
   Project Manager
   a. Project Manager assembles the project team to answer all questions on the Munitions Response SRE Form and draws upon the RFP statement of work and engages other functional groups as appropriate, (e.g. Contracts/Legal for contract risk, enterprise Security, etc.)

2. **Schedule the Munitions Response SRE Meeting**
   Project Manager
   a. Meeting should be scheduled in advance of the Go/No Go meeting so risk information can be captured in the Go/No Go presentation.

3. **Conduct the Munitions Response SRE Meeting**
   ESBG MR Safety Manager

   Required Attendees: MR Director/MR Operations Director/Project Manager/or their designees. For projects involving Chemical Agents or Chemical Warfare

Material the HSSE Director and/or HSSE Federal Manager or designee will also be required attendees.

Optional Attendees:
Program Manager/Risk Manager/HSSE Director and/or HSSE Federal/Commercial Manager/ Sector Quality Manager/Sector Delivery staff/Munitions Response Market Director

a) Project members evaluate and present the information regarding the individual risk categories for discussion regarding the identification of risk, and the approach to mitigate for project implementation.
b) Throughout the meeting, action items will be captured and assigned to a specific individual and schedule for completion, it is the PMs responsibility to ensure that all action items have been addressed
c) ESBG MR Safety Manager conducts the Munitions Response SRE using the Munitions Response SRE Form which identifies and documents the explosive safety risks and required mitigation measures. Form is adjusted as necessary. The MR Safety Manager makes a determination that the project as described meets acceptable risk criteria for safety.
d) MR Operations Director carries the project forward for a Go/No Go decision. Any changes to the scope of work related to safety or risk mitigation measures, requires revisiting the Munitions Response SRE with the MR Safety Manager and other affected parties.
e) Munitions Response SRE Form is adjusted as necessary form is retained in the project file.

Note: Any changes to the scope of work related to safety or risk mitigation measures require revisiting the MRSRE with the MR Safety Manager and other affected parties.

4. Risk Mitigation Planning and Risk Register Implementation

a. Upon a Go decision via the ESBG Approval Matrix (ES-P01-02.01-P), identified risks from the SRE Meeting will be captured on the project risk

register or ROMT for mitigation planning, safety approach development and project cost estimating.

b. Subsequent risk reviews of the risk register/ROMT will be conducted throughout the proposal development process to refine the risk approach.
c. Upon project award the risk register/ROMT will be maintained and updated monthly through project reviews and adjusted for changes in the scope of work.

G. TOOLS

1. ES-S01-02.504-F1, Munitions Response Safety Risk Evaluation Form
2. ES-S07-0102-F1 ESBG Risk Register
3. ES-S07-0102-F3 Risk Opportunity Management Tool (ROMT)

H. OUTPUTS

Completed ES-S01-02.504-F1, Munitions Response Safety Risk Evaluation Form
Completed ROMT or ES-S07-0102-F2 Risk Management Template

I. ATTACHMENTS

None

J. REFERENCES

None

STANDARD OPERATING PROCEDURE
EM61-MK2 SET UP AND USE FOR REACQUIRE AND POST INTRUSIVE CHECKS

1.0 Equipment

- 1.1 EM61 Coil Assembly
- 1.2 EM61 Wheel Assemblies
- 1.3 EM61-MK2 Handle Assembly
- 1.4 GPS Tripod (if needed)
- 1.5 Custom Lower Coil GPS Tripod Mounts (if needed)
- 1.6 EM61-MK2 Back Pack
- 1.7 EM61-MK2 Cables
  - 1.7.1 Lower coil to Upper coil cable And Shorting Plug
  - 1.7.2 Lower coil to Back Pack cable
  - 1.7.3 Back Pack to Data Logger cable
  - 1.7.4 Data Logger to PC cable and PCMCIA Memory Card
  - 1.7.5 Battery Chargers & cables
    - 1.7.5.1 Back Pack Battery Charger & cable
    - 1.7.5.2 Data Logger Battery Charger & cable
    - 1.7.5.3 Power Inverter to charge from vehicle
- 1.8 EM61-MK2 Static Check Bar with Spike Target
- 1.9 EM61-MK2 Operating Manuals
  - 1.9.1 EM61-MK2 Operating Manual
  - 1.9.2 DAT61MK2 Computer Program Manual
  - 1.9.3 EM61-MK2 Software
    - 1.9.3.1 Data Logger Software
      - 1.9.3.1.1 EM61MK2A V1.37
    - 1.9.3.2 PC Software
      - 1.9.3.2.1 DAT61MK2 for Windows V1.35
      - 1.9.3.2.2 Backup Data Logger software
- 1.10 Tape Measures & Line Markers (line, flags, spray paint, or cones)
- 1.11 Log Book or PDA

2.0 Charge all batteries

- 2.1 EM61-MK2 Back Pack Batteries – up to 14 hours for fully discharged battery
- 2.2 EM61-MK2 Data Logger Batteries – up to 14 hours for fully discharged battery
- 2.3 PDA Batteries

3.0 Set Up EM61-MK2

- 3.1 Assemble coil, wheel, and handle assemblies
- 3.2 Connect wheel encoder cable to lower coil – tape it in place with electrical tape (do not use duct tape)
- 3.3 Connect lower to upper coil or install shorting plug to bottom coil (usually use bottom coil only with shorting plug)
- 3.4 Connect lower coil to backpack
- 3.5 Set a freshly charged battery into the backpack
- 3.6 Connect backpack to Data Logger COM1 port
- 3.7 Adjust backpack shoulder and waist straps for good fit
- 3.8 Tape cables to handle, leaving enough slack for turning

4.0 EM61-MK2 Operation

- 4.1 Set the EM61-MK2 Mode Switch to:

4.1.1 4 – for logging four (4) bottom coil time gates
4.1.2 D – for logging three (3) bottom coil time gates and one (1) top coil time gate – typically not used

4.2 Set the Master/Slave Switch to M for single sensor operation
4.3 Push In the Circuit Breaker on the EM61-MK2 backpack and warm up for at least 5 minutes – backpack sensor noise should start and LED should be on.
4.4 Push the ON/OFF button to turn on the Data Logger
4.4.1 Set Antenna Coil Size (e.g. Standard 1 x .5 m)
4.4.2 Set Up Logger
4.4.2.1 Date
4.4.2.2 Time
4.4.2.3 Units (e.g. feet)
4.4.2.4 COM port (e.g. COM1)
4.4.2.5 Audio
4.4.2.6 Pause Key: (e.g. Alt F1 or any key)
4.4.2.7 Display (e.g. Text or Graphic)
4.5 Monitor/Null Coil – After 5 minute warm-up, null EM61-MK2 – all channels should be close to 0 +/- 1
4.6 Static Check:
4.6.1 Look for a "quiet area" where the EM61-MK2 data doesn't change more than 3mV on channel 1
4.6.2 Null coil = all channels should be 0 +/-1mV
4.6.3 Observe all 4 channels for about 1 minute. Values should not change by more than +/- 2.5 mV
4.6.4 Place Static Check Bar with Spike Target (screw or bolt) on coil. Mark location so you can put it in the same place, same orientation each morning. Write the spike responses for all 4 channels in the log book and observe that they stay constant for about 1 minute.
4.6.5 Remove static check bar and observe that all 4 channels return to 0 +/- 2.5mV for about 1 minute.
4.6.6 Sensor is ready for reacq. Note that you may need to null the coil periodically. Write spike response values for all 4 channels on the static check bar to compare to next day's check. Daily responses for each channel should not vary by more than +/- 20%. If they do, check the location and orientation of the Static Check Bar.
4.7 If refining, move to first marked flag and push/pull the EM61-MK2 over the flag in at least 2 different directions while observing the displayed values. Center the coil over the peak response and log peak response and any location offset (e.g. 6" NE) in logbook or PDA. Move flag to center of coil for intrusive team. Continue to next flag.
4.8 To check intrusive holes or spoils piles, push/pull the EM61-MK2 over the hole or spoils pile in at least 2 different directions while observing the displayed values. Insure that the EM61-MK2 values confirm that the project background value (e.g. <2.5mV on the EM61-MK2 channel, or channels, used to select anomalies) is not exceeded. Log peak response in logbook or PDA. Holes or spoils piles with signatures above the project background requirements will need to be reinvestigated.

5.0 EM61-MK2 Training/Certification

5.1 All personnel using the EM61-MK2 for confirming anomaly resolution will demonstrate that they can follow this SOP at a local test strip with at least one inert seed item buried horizontal at a depth 11 times its diameter. The UXOQC and team leaders will document each operator's performance at this test strip located in a clean (metal free) area that is convenient to the work site in their log books to insure each operator is fully trained and certified.

STANDARD OPERATING PROCEDURE
OPS-03 – DEMOLITION/DISPOSAL OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the conduct of demolition/disposal operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA Environmental, Inc. (USA) site personnel, including contractor and subcontractor personnel, involved in the conduct of UXO/MEC demolition/disposal operations on a UXO/MEC contaminated site. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with approved project plans and applicable referenced regulations. Consult the documents listed in Section 12.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager (PM) will be responsible for ensuring the availability of the resources needed to implement this SOP, and will also ensure that this SOP is incorporated into plans, procedures, and training for sites where this SOP is to be implemented.

3.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will be responsible for assuring that adequate safety measures and housekeeping are performed during all phases of site operations, to include demolition activities, and will visit site demolition locations, as deemed necessary, to ensure that demolition operations are carried out in a safe, clean, efficient, and economic manner. The demolition activities will then be conducted under the direct control of the SUXOS, who will have the responsibility of supervising all demolition operations within the area.

The SUXOS will be responsible for training all on-site UXO personnel regarding the nature of the materials handled, the hazards involved, and the precautions necessary. The SUXOS will also ensure that the Daily Operational Log, Ordnance Accountability Log, USA Demolition Shot Records, and inventory records are properly filled out and accurately depict the demolition events and demolition material consumption for each day's operations. The SUXOS will be present during all demolition operations or designate a competent, qualified person to be in charge during any absences.

3.3 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) for the site is responsible for ensuring that all demolition operations are being conducted in a safe and healthful manner, and is required to be present during all MEC demolition operations. The UXOSO will ensure the compliance of the demolition team with the above referenced documents that are applicable to the particular task being performed.

3.4 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQCS) is responsible for ensuring the completeness of demolition operations records and for weekly inspection of the Ordnance Accountability Log, the Daily Operational Log, the USA Demolition Shot Record, and the inventory of MEC and demolition material.

The UXOQCS, assisted by demolition team personnel, will inspect each demolition pit and an area of appropriate radius after each demolition shot, in accordance with the approved explosive siting plan, to ensure that there are no kick-outs, hazardous UXO/MEC components, or other hazardous items. In addition, the pit may be checked with a magnetometer and large metal fragments, and any hazardous debris, will be removed on a per use basis in accordance with the SOW. Any UXO/MEC discovered during the QC check will be properly disposed of using the demolition procedures in the WP. Extreme caution must be exercised when handling UXO/MEC, which has been exposed to the forces of detonation. Personnel must adhere to acceptable safe practices and procedures when determining the condition of munitions and fuzes that have not been consumed in the disposal process.

4.0 GENERAL OPERATIONAL AND SAFETY PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in operations on UXO/MEC-contaminated sites will be familiar with the potential safety and health hazards associated with the conduct of demolition/disposal operations, and with the work practices and control techniques used to reduce or eliminate these hazards. During demolition operations, the general safety provisions listed below will be followed by all demolition personnel, at all times. Noncompliance with the general safety provisions listed below will result in disciplinary action, which may include termination of employment.

All safety regulations applicable to demolition range activities and demolition and MEC materials involved will be complied with.

- Demolition of any kind is prohibited without an approved siting plan.
- The quantity of MEC to be destroyed will be determined by the range limit, fragmentation and K-Factor distance calculations.
- In the event of an electrical storm, dust storm, or other hazardous meteorological conditions, immediate action will be taken to cease all demolition range operations and evacuate the area.
- In the event of a fire, which does not include explosives or energetic material, put out the fire using the firefighting equipment located at the site; if unable to do so, notify the fire department and evacuate the area. If injuries are involved, remove the victims from danger, administer first aid, and seek medical attention.
- The UXOSO is responsible for reporting all injuries and accidents that occur.
- Personnel will not tamper with any safety devices or protective equipment.
- Any defect or unusual condition noted that is not covered by this SOP will be reported immediately to the SUXOS or UXOSO for evaluation and/or correction.
- Methods of demolition will be conducted in accordance with this SOP and approved changes or revisions thereafter.
- Adequate fire protection and first aid equipment will be provided at all times.
- All personnel engaged in the destruction of MEC will wear clothing made of natural fiber, close-weave clothes, such as cotton. Synthetic material such as nylon is not authorized unless treated with anti-static material.
- Care will be taken to minimize exposure to the smallest number of personnel, for the shortest time, to the least amount of hazard, consistent with safe and efficient operations.
- Work locations will be maintained in a neat and orderly condition.
- All hand tools will be maintained in a good state of repair.
- Each heavy equipment and/or vehicle operator will have a valid operator's permit or license for the equipment being operated.

- Equipment and other lifting devices designed and used for lifting will have the load rating and date of next inspection marked on them. The load rating will not be exceeded and the equipment will not be used without a current inspection date.
- Leather or leather-palmed gloves will be worn when handling wooden boxes, munitions, or UXO/MEC.
- Lifting and carrying require care. Improper methods cause unnecessary strains. Observe the following preliminaries before attempting to lift or carry:
  - When lifting, keep your arms and back as straight as possible, bend your knees and lift with your leg muscles.
  - Be sure you have good footing and hold, and lift with a smooth, even motion.
- The demolition range will be provided with two forms of communication, capable of contacting appropriate personnel or agencies (i.e., medical response, Quick Response Force (QRF).
- Motor vehicles and material handling equipment (MHE) used for transporting MEC or demolition materials must meet the following requirements:
  - Exhaust systems will be kept in good mechanical repair at all times.
  - Lighting systems will be an integral part of the vehicle.
  - One Class 10B:C rated, portable fire extinguisher will, if possible, be mounted on the vehicle outside of the cab on the driver's side, and one Class 10B:C fire extinguisher will be mounted inside the cab.
  - Wheels of carriers must be chocked and brakes set during loading and unloading.
  - No demolition material or MEC will be loaded into or unloaded from motor vehicles while their motors are running.
- Motor vehicles and MHE used to transport demolition material and MEC will be inspected prior to use to determine that:
  - Fire extinguishers are filled and in good working order.
  - Electrical wiring is in good condition and properly attached.
  - Fuel tank and piping are secure and not leaking.
  - Brakes, steering, and safety equipment are in good condition.
  - The exhaust system is not exposed to accumulations of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.
- Employees are required to wear leather, or rubber, gloves when handling demolition materials. The type of glove worn is dependent on the type of demolition material.
- A red warning flag, such as an “Active Range Flag” or a wind sock, will be displayed at the entrance to the demolition range during demolition operations when required by local authority. If applicable, the entrance gate will be locked when demolition work is in process.
- Unless otherwise directed or authorized by the explosives siting plan, all demolition shots will be tamped with an appropriate amount of earth/dirt.
- An observer will be stationed at a location where there is a good view of the air and surface approaches to the demolition range, before material is detonated. It will be the responsibility of the observer to order the SUXOS to suspend firing if any aircraft, vehicles, or personnel are sighted approaching the general demolition area.

- Two-way radios will not be operated in close proximity of the demolition range while the pit is primed or during the priming process. Radio transmissions and explosives will be separated by a minimum of 50 ft.
- No demolition operation will be left unattended during the active portion of the operation (i.e., during the burn or once any explosives or UXO/MEC are brought to the range).
- A minimum radius (approximately 50 feet) around the demolition pit will be cleared of dry grass, leaves, and other extraneous combustible materials around the demolition pit area.
- No demolition activities will be conducted if there is less than a 2,000-ft ceiling or if wind velocity is in excess of 20 mph.
- Demolition shots must be fired during daylight hours (minimum time for sunrise and sunset is determined by the firing procedure used (i.e., electric, non-electric, shock tube 30/60/60).
- Notification of the local authorities will be made in accordance with the site requirements.
- No more than two persons will ride in a truck transporting demolition material or MEC, and no person will be allowed to ride in the trailer/bed.
- Vehicles will not be refueled when carrying demolition material or MEC, and must be 100 ft from magazines or trailers containing such items before refueling.
- All explosive vehicles will be cleaned of visible explosive and other contamination, before releasing the vehicles for other tasks.
- Prior to conducting any other task, personnel will wash their faces and hands after handling demolition material or MEC.
- Demolition pits will be spaced a safe distance apart, with no more than 10 pits prepared for a series of shots at any one time.

5.0 SPECIAL REQUIREMENTS FOR DEMOLITION ACTIVITIES

The following safety and operational requirements will be met during demolition range operations. Any deviations from this procedure will be allowed only after receipt of written approval from the PM and the client. Failure to adhere to the requirements and procedures listed in the paragraphs below could result in serious injury or death; therefore, complete compliance with these requirements and procedures will be strictly enforced.

5.1 GENERAL REQUIREMENTS

The general demolition range requirements listed below will be followed at all times:

- The CEHNC "Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Munitions and Explosives of Concern (MEC) Sites," will be followed when destroying multiple munitions by detonation on site. This document will be present on site during site operations.
- White Phosphorus and propellant will be disposed of only in an approved manner and following the guidance for maximum temperature exposure (90 degrees Fahrenheit).
- Material awaiting destruction will be stored at not less than intra-line distance, based on the largest quantity involved, from adjacent explosive materials and from explosives being destroyed. The material will be protected against accidental ignition or explosion from fragments, grass fires, burning embers, or detonating impulses originating in materials being destroyed.
- UXO/MEC or bulk explosives to be destroyed by detonation should be detonated in a pit not less than 3 ft deep and covered with earth which protrudes not less than 2 ft above existing ground level. Requirements may be found in the explosives siting plan. The components should be

placed on their sides or in a position to expose the largest area to the influence of the demolition material. The demolition material should be placed in direct contact with the item to be detonated and held in place by tape or earth packed over the demolition materials. The total quantity to be destroyed below ground at one time will not exceed the range limit.

- Detonations will be counted to ensure detonation of all pits. After each series of detonations, a search will be made of the surrounding area for UXO/MEC. Items such as lumps of explosives or unfuzed ammunition may be picked up and prepared for the next shot. Fuzed ammunition, or items that may have internally damaged components, will be detonated in place, if possible.
- Prevailing weather condition information can be obtained from the local weather service, or other acceptable source and the data logged in the Demolition Shot Log before each shot or round of shots.
- All shots will be dual primed.
- Whenever possible, during excavation of the demolition pits contour the ground so that runoff water is channeled away from the pits. If demolition operations are discontinued for more than two weeks, the pits should be backfilled until operations resume.
- Upon completion of the project, all disturbed demolition areas will be thoroughly inspected for UXO/MEC. Depending upon contract requirements, the site may have to be backfilled and leveled. If necessary, this will be coordinated with the contractor representative.
- Prior to and after each shot, the USA Demolition Shot Record is to be filled out by the SUXOS with all applicable information. This record will be kept with the Ordnance Accountability Log and reflect each shot.

5.2 ELECTRIC DETONATOR USE

The following requirements are necessary when using electric detonators and blasting circuits:

- Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents, and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges of which they form a part. Radios will not be operated while the pit is primed or during the priming process.
- The shunt will not be removed from the leg wires of the detonator until the continuity check of the detonator is to be performed.
- When uncoiling, or straightening, the detonator leg wires, keep the explosive end of the detonator pointing away from the body and away from other personnel. When straightening the leg wires, do not hold the detonator itself; rather, hold the detonator leg wires approximately 1 in. from the detonator body. Straighten the leg wires by hand; do not throw or wave the wires through the air to loosen them.
- Prior to use, the detonators will be tested for continuity. To conduct the test, place the detonators in a pre-bored hole in the ground or place them in a sand bag, and walk facing away from the detonators and stretch the wires to their full length, being sure to not pull the detonators from the hole or sand bag. With the leg wires stretched to their fullest length, test the continuity of the detonators one at a time by un-shunting the leg wires and attaching them to the galvanometer and checking for continuity. After the test, re-shunt the wires by twisting the two ends together. Repeat this process for each detonator until all detonators have been tested. This process will be accomplished at least 50 ft from and downwind of any MEC or demolition materials and out of the demolition range personnel and vehicle traffic flow pattern. In addition, all personnel on the demolition range will be alerted prior to the test being conducted.

NOTE: When testing the detonator, prior to connecting the detonator to the firing circuit, the leg wires of the detonator must be shunted by twisting the bare ends of the wires together immediately after testing. The wires will remain short circuited until time to connect them to the firing line or Remote Firing Device (RFD) Receiver.

- At the power source end of the blasting circuit, the ends of the wires will be shorted or twisted together (shunted) at all times, except when actually testing the circuit or firing the charge. The connection between the detonator and the circuit firing wires must not be made, unless the power ends of the firing wires are shorted and grounded or the firing panel is off and locked.
- The firing line will be checked using pre-arranged hand signals or through the use of two-way radios, if the demolition pit is not visible from the firing point. If radios are used, communication will be accomplished a minimum of 50 ft from the demolition pit and detonators. The firing line will be checked for electrical continuity in both the open and closed positions, and will be closed/shunted after the check is completed.
- UXO/MEC to be detonated will be placed in the demolition pit and the demolition material placed/attached in such a manner as to ensure the total detonation of the UXO/MEC. Once the UXO/MEC and demolition material are in place and the shot has been tamped, the detonators will be connected to the det cord. Prior to handling any detonators that are connected to the firing line or RDF, personnel will ensure that they are grounded. The detonators will then be carried to the demolition pit with the end of the detonators pointed away from the individual. The detonators are then connected to the detonation cord, Non-El, etc., ensuring that the detonator is not covered with tamping material to allow for ease of recovery/investigation in the event of a misfire.
- Prior to making connections to the blasting machine or RFD Transmitter, the entire firing circuit will be tested for electrical continuity and ohms resistance, or transmitting power (as applicable), to ensure the blasting machine or RFD Transmitter (distance) has the capacity to initiate the shot.
- The individual assigned to make the connections at the blasting machine or panel will not complete the circuit at the blasting machine or panel, and will not give the signal for detonation, until satisfied that all personnel in the vicinity have been evacuated to a safe distance. When in use, the blasting machine, or its actuating device, will be in the blaster's possession at all times. When using the panel, the switch must be locked in the open position until ready to fire, and the single key must be in the blaster's possession.
- Prior to initiating a demolition shot(s), a warning will be given; the type and duration of such warning will be determined by the prevailing conditions at the demolition range. At a minimum, this should be an audible signal using a siren, air horn, or megaphone, which is sounded for a duration of one minute, five minutes prior to the shot and again one minute prior to the shot.

5.3 NON-EL USE (SHOCK TUBE)

The following requirements are necessary when using NON-EL (Shock Tube) systems:

- After cutting a piece of shock tube, either immediately tie a tight overhand knot in one or both cut ends or splice one exposed end and tie of the other.
- Always use a sharp knife or razor blade to cut shock tube so as to prevent the tube from being pinched or otherwise obstructed.
- Always cut shock tube squarely across and make sure the cut is clean.
- Use only the splicing tubes provided by the manufacturer to make splices.
- Every splice in the shock tube reduces the reliability of the priming system; therefore keep the number of splices to a minimum.

- Always dispose of all short, cut-off pieces in accordance with local laws as they relate to flammable material.

The shock tube system is a thin plastic tube of extruded polymer with a layer of Pentaerythritol Tetranitrate (PETN) coated on its interior surface. The PETN propagates a shock wave, which is normally contained within the plastic tubing. The shock tube offers the controlled instantaneous action of electric initiation without the risk of premature initiation of the detonator by radio transmissions, high-tension power lines, or static electricity discharge. The NON-EL system uses detonators in the bunch blocks and in the detonator assembly, which are to be handled in accordance with approved procedures.

The high reliability of the shock tube initiating system is due to the fact that all of the components are sealed and, unlike standard non-electric priming components, cannot be easily degraded by moisture. Cutting the shock tube makes the open end vulnerable to moisture and foreign contamination; therefore, care must be taken to prevent moisture and foreign matter from getting in the exposed ends of the shock tubes.

5.3.1 Shock Tube Demolition Procedures

WARNING
Although the detonation along the shock tube is normally contained within the plastic tubing, burns may occur if the shock tube is held.

5.3.2 Shock Tube Assembly

- Spool out the desired length of shock tube from firing point to demolition site and cut it off with a sharp knife or razor blade. Weight down the loose end of trunk line.
- Immediately seal off the shock tube remaining on the spool by tying a tight overhand knot in the cut-off end or use a push-over sealer.
- Using a sharp knife or razor, cut the sealed end off the detonator assembly.
- Push one of the shock tube ends to be spliced firmly into one of the pre-cut splicing tubes provided by the manufacturer at least ¼ inch. Push the other shock tube end firmly into the other end of the splicing tube at least ¼ inch. Secure splice with tape if needed.

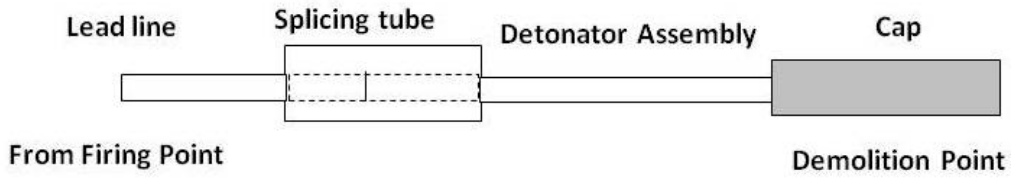


Figure 1

5.3.3 Firing Assembly Setup

1) If there are multiple items to be destroyed using bunch block(s) supplied by the manufacturer, lay out lead lines at demo site to the shot(s) and secure the bunch block with a sandbag, or some other item which will keep it from moving.

NOTE: No more than six leads may be used from any one bunch block.

2) If the detonator assembly has not been attached yet, then, using the splicing tube, splice the detonator assembly to the shock tube branch line as explained in the splicing instructions above.

3) If this is a non-tamped shot, place the detonator assembly into the demolition material. If the shot is to be tamped, then prepare the demolition material with a detonating cord lead long enough to stick out of the tamping at least 1 ft.

4) Tape the detonator assembly with cap to the detonating cord lead as shown in Figure 2.

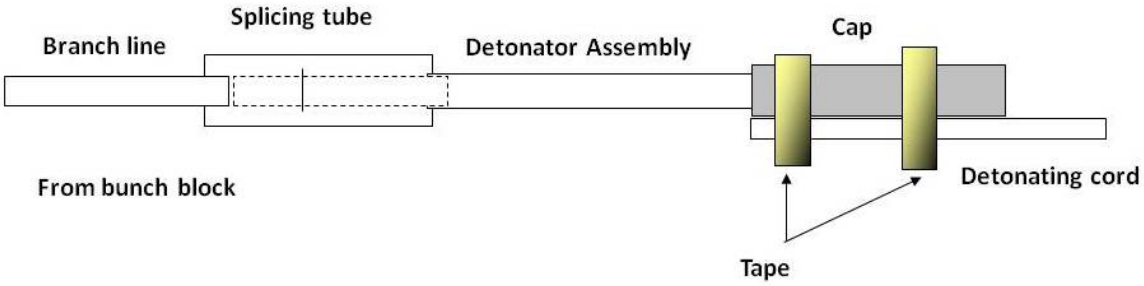


Figure 2

5) Return to the firing position.

6) Cut off the sealed end of shock tube, proceed to the directions listed in Step 7. If you are using a previously cut piece of shock tube, using a sharp knife or razor blade cut approximately 18 inches from the previously cut end, whether or not it was knotted in accordance with the above guidance.

7) Insert a primer into the firing device and connect the shock tube lead line to the firing device ensuring that the shock tube is properly seated in the firing device.

8) Take cover.

9) Signal **"Fire in the hole"** three times and initiate charge.

10) Observe a 5-minute wait time after the detonation.

11) Remain in designated safe area until Demolition Supervisor announces **"All Clear."**

5.4 DETONATING CORD USE

The following procedures are required when using detonating cord (det cord):

- Det cord should be cut using approved crimpers, and only the amount required should be removed from inventory.
- When cutting det cord, the task should be performed outside the magazine.
- For ease of inventory control, remove det cord only in 1-ft increments.
- Det cord should not be placed in clothing pockets or around the neck, arm, or waist, and should be transported to the demolition location in either an approved “day box”, original container, or a cloth satchel, depending upon the magazine location and proximity to the demolition area.
- Det cord should be placed at least 50 ft away from detonators and demolition materials until ready for use. To ensure consistent safe handling, each classification of demolition material will be separated by at least 25 ft until ready for use.
- When ready to “tie in” either the det cord to demolition materials, or det cord to detonator, the det cord will be connected to the demolition material and secured to the UXO/MEC. The cord is then strung out of the hole and secured in place with soil, or filled sandbags, being sure to leave a minimum of 6 ft of det cord exposed outside the hole.

- Once the hole is filled, make a loop in the det cord large enough to accommodate the detonator, place the detonator in the loop, and secure it with tape. The detonator's explosive end will face down the det cord toward the demolition material or parallel to the main line.
- In all cases, ensure that there is a minimum of 6 ft of det cord extending out of the hole to allow for ease of detonator attachment and detonator inspection/replacement should a misfire occur.
- If the det cord detonators are electric, they will be checked, tied in to the firing line, and shunted prior to being taped to the loop. If the det cord detonators are non-electric, the time/safety fuse will be prepared with the igniter in place prior to taping the detonators to the det cord loop. If the det cord detonators are Non-El, simply tape the detonators into the loop as described above.
- In the event that a time/safety fuse is used, an igniter is not available, and a field expedient initiation system is used (i.e., matches), do not split the safety fuse until the detonator is taped into the det cord loop.

5.5 TIME/SAFETY FUSE USE

The following procedures are required when using a time/safety fuse:

- Prior to each daily use, the burn rate for the time/safety fuse must be tested to ensure the accurate determination of the length of time/safety fuse needed to achieve the minimum burn time of five minutes needed to conduct demolition operations.
- To ensure both ends of the time/safety fuse are moisture free, use approved crimpers to cut 6 inches off the end of the time/safety fuse roll, and place the 6 inch piece in the time/safety fuse container.
- If quantity allows, accurately measure and cut off a 6-ft-long piece of the time/safety fuse from the roll.
- Take the 6 ft section out of the magazine, and attach a fuse igniter.
- In a safe location, removed from demolition materials and UXO/MEC, ignite the time/safety fuse, measure the burn time from the point of initiation to the "spit" at the end, and record the burn time in the SUXOS's Log.
- To measure the burn time, use a watch with a second hand or chronograph.
- To calculate the burn rate in seconds per foot, divide the total burn time (in seconds) by the length (in feet) of the test fuse.
- When using time/safety fuse for demolition operations, the minimum amount of fuse to be used for each shot will be the amount needed to permit a minimum burn time of five minutes.

5.6 DEMOLITION RANGE INSPECTION SCHEDULE

The schedule for the demolition range inspection will be followed when demolition operations are being conducted. This inspection will be conducted by the UXOSO or UXOQCS and will be documented in the Site Safety or QC Log. If any deficiencies are noted, demolition operations will be suspended and the deficiency reported to the SUXOS. Once the deficiencies are corrected, demolition operations may be resumed.

6.0 METEOROLOGICAL CONDITIONS

In order to control the effects of demolition operations and to ensure the safety of site personnel, the following meteorological limitations and requirements will apply to demolition operations:

- Demolition operations will not be conducted during electrical storms or thunderstorms.

- No demolition operations will be conducted if the surface wind speed is greater than 20 miles per hour.
- Demolition operations will not be conducted during periods of visibility of less than one mile caused by, but not limited to, dense fog, blowing snow, rain, sand storms, or dust storms.
- Demolition will not be carried out on extremely cloudy days, defined as overcast (more than 80% cloud cover) with a ceiling of less than 2,000 ft.
- Demolition operations will not be initiated until an appropriate time after sunrise, and will be secured at an appropriate time prior to sunset (see Section 4.0).

7.0 PRE-DEMOLITION/DISPOSAL PROCEDURES

7.1 PRE-DEMO/DISPOSAL OPERATIONAL BRIEFING

It is the belief of USA that the success of any operation is dependent upon a thorough brief, covering all phases of the task, which is presented to all affected personnel. The SUXOS will brief all personnel involved in range operations in the following areas:

- Type of UXO/MEC being destroyed
- Type, placement, and quantity of demolition material being used
- Method of initiation (electric, non-electric, or NON-EL)
- Means of transporting and packaging MEC
- Route to the disposal site
- Equipment being used (i.e., galvanometer, blasting machine, firing wire, etc.)
- Misfire procedures
- Post-shot clean-up of range.

7.2 PRE-DEMO/DISPOSAL SAFETY BRIEFING

The USA SUXOS, Team Leader, or UXOSO will conduct a safety brief for all personnel involved in range operations in the following areas:

- Care and handling of explosive materials
- Personal hygiene
- Two man rule, and approved exceptions
- Personnel roles and responsibilities
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards on the range
- Calling a safety stop for hazardous conditions
- Location of emergency shelter (if available)
- Parking area for vehicles (vehicles must be positioned for immediate departure, with the keys in the ignition
- Location of range emergency vehicle

- Location of the assigned paramedic
- Wind direction (to assess potential toxic fumes)
- Locations of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal
- Demolition schedule.

7.3 TASK ASSIGNMENTS

Individuals with assigned tasks will report the completion of the task to the SUXOS. The types of tasks that may be required are:

- Contact local military authorities and fire response personnel, and get air clearance, as required.
- Contact hospital/emergency response/medevac personnel, if applicable.
- Secure all access roads to the range area.
- Visually check range for any unauthorized personnel.
- Check firing wire for continuity and shunt.
- Prepare designated pits as required.
- Check continuity of detonators.
- Check time/safety fuse and its burn rate.
- Designate a custodian of the blasting machine, fuse igniters, or Non-El initiator.
- Secure detonators in a safe location.
- Place UXO/MEC in pit, and place charge in desired location.

7.4 PREPARING EXPLOSIVE CHARGE FOR INITIATION

To prepare the explosive charge for initiation, the procedures listed below will be followed:

- Ensure firing wire is shunted.
- Connect detonator to the firing wire.
- Isolate or insulate all connections.
- Prime the demolition charge.
- Place demolition charge on UXO/MEC.
- Depart to firing point (if using non-electric firing system, obtain head count, pull igniters, and depart to designated safe area).
- Obtain a head count.
- Give one minute warning signal, using a bullhorn or siren, five minutes prior to detonation, and again at one minute prior to detonation.
- Check the firing circuit.

- Signal **"fire in the hole"** three times (or an equivalent warning), and take cover.
- If using electric firing system, connect firing wires to blasting machine, and initiate charge.
- Remove firing wires from blasting machine and shunt or turn off RFD Transmitter.
- Remain in designated safe area until SUXOS announces **"All Clear."** This will occur after a post-shot waiting period of 5 minutes and the SUXOS has inspected the pit(s).

8.0 POST DEMOLITION/DISPOSAL PROCEDURES

Do not approach a smoking hole or allow personnel out of the designated safe area until cleared to do so, and follow the procedures listed below:

- After the **"All Clear"** signal, check pit for low orders or kick outs.
- Examine pit, and remove any large fragmentation, as needed.
- Back fill hole, as necessary.
- Police all equipment.
- Notify military authorities, fire department, etc., that the operation is complete.

9.0 MISFIRE PROCEDURES

A thorough check of all equipment, firing wire, and detonators will prevent most misfires. However, if a misfire does occur, the procedures outlined below will be followed.

9.1 ELECTRIC MISFIRES

To prevent electric misfires, one technician will be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution, and the responsible technician will investigate and correct the situation, using the steps outlined below:

- Check firing line and blasting machine connections, and make a second initiation attempt.
- If unsuccessful, disconnect and connect to another blasting machine (if available), and attempt to initiate a charge.
- If unsuccessful, commence a 30-minute wait period.
- After the maximum delay predicted for any part of the shot has passed, the designated technician will proceed down range to inspect the firing system, and a safety observer must watch from a protected area.
- Disconnect and shunt the detonator wires, connect a new detonator to the firing circuit, check the replacement detonator for continuity, and prime the charge without disturbing the original detonator.
- Follow normal procedures for effecting initiation of the charge.

9.2 NON-ELECTRIC MISFIRES

Working on a non-electric misfire is the most hazardous of all operations. Occasionally, despite all painstaking efforts, a misfire will occur. Investigation and corrective action should be undertaken only by the technician who placed the charge, using the following procedure:

- If charge fails to detonate at the determined time, initiate a 60-minute wait period plus the time of the safety fuse, i.e., 5-minute safety fuse plus 60 minutes for a total of 65 minutes.

- After the wait period has expired, a designated technician will proceed down range to inspect the firing system. A safety observer must watch from a protected area.
- Prime the shot with a new non-electric firing system, and install a new fuse igniter.
- Follow normal procedures for initiation of the charge.

9.3 NON-EL MISFIRE

The use of a shock tube for blast initiation can present misfires, which require the following actions:

- If charge fails to detonate, it could be the result of the shock tube not firing. Visually inspect the shock tube; if it is not discolored (i.e., slightly black), it has not fired.
- If it has not fired, cut a 1 ft piece off the end of the tube, re-insert the tube into the firing device, and attempt to fire again.
- If the device still does not fire, wait 60 minutes and proceed down range to replace the shock tube per the instructions outlined below.
- If the tube is slightly black, then a "Black Tube" misfire has occurred, and the shock tube will have to be replaced, after observing a 60-minute wait time. When replacing the shock tube, be sure to remove the tube with the detonator in place. Without removing the detonator from the end of the tube, dispose of by demolition.

9.4 DETONATING CORD MISFIRE

USA uses det cord to tie in multiple demolition shots, and to ensure that electric detonators are not buried. Since det cord initiation will be either electrical or non-electrical, the procedures presented in Paragraphs9.1, 9.2, or 9.3, as appropriate to the type of detonator used, will be used to clear a det cord misfire. In addition, the following will be conducted:

- If there is no problem with the initiating system, wait the prescribed amount of time, and inspect the initiator to the cord connection to ensure it is properly connected. If it was a bad connection, simply attach a new initiator, and follow the appropriate procedures in Paragraph 9.0.
- If the initiator detonated and the cord did not, inspect the cord to ensure that it is det cord and not time fuze. Also, check to ensure that there is PETN in the cord at the connection to the initiator.
- It may be necessary to uncover the det cord and replace it. This must be accomplished carefully, to ensure that the demolition charge and the MEC item are not disturbed.

10.0 RECORD KEEPING REQUIREMENT

To document the demolition operations procedures and the completeness of the demolition of MEC, the following record keeping requirements will be met:

- USA (as directed) will obtain and maintain all required permits.
- The SUXOS will ensure the accurate completion of the logs, and the SUXOS and UXOQCS will monitor the entries in the log for completeness, accuracy, and compliance with meteorological conditions.
- The SUXOS will enter the appropriate data on the Ordnance Accountability Log and the Demolition Shot Record, to reflect the MEC destroyed, and will complete the appropriate information on the Explosives Accountability Log (a.k.a. the Magazine Data Card) which indicates the demolition materials used to destroy the MEC.
- The quantities of MEC recovered must also be the quantities of MEC destroyed or disposed.

- USA will retain a permanent file of all demolition records, including permits; magazine data cards; training and inspection records; waste manifests, if applicable; and operating logs.
- Copies of ATF License and any required permits must be on hand.

11.0 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following safety measures and personal protective equipment (PPE) will be used in preventing or reducing exposure to the hazards associated with UXO/MEC demolition/disposal operations. These requirements will be implemented unless superseded by site-specific requirements stated in the SSHP.

- Hard hats are required only when working around heavy equipment or when an overhead or head impact hazard exists.
- Steel toe/shank boots are not required during surface/subsurface location of anomalies, unless a serious toe hazard exists, whereupon a fiber safety toe will be used.
- Safety glasses will be required whenever an eye hazard exists, for example, when working around flying dirt/debris, using hand tools, etc. Safety glasses will provide protection from impact hazards and, if necessary, ultraviolet radiation (i.e., sunlight).
- Positive means will be required to secure the PPE and prevent it from falling and causing an accidental detonation.

12.0 REGULATORY REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of UXO demolition/disposal operations:

- USA Corporate Safety and Health Program
- OSHA General Industry Standards, 29 CFR 1910
- OSHA Construction Standards, 29 CFR 1926
- DDESB TP-16, Methodology for Calculation of Fragmentation Characteristics
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards
- AR 385-64, U.S. Army Explosives Safety Program
- AR 385-10, Army Safety Program
- DA PAM 385-64, U.S. Army Explosives Safety Program
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- Applicable TM 60 Series Publications
- AR 190-11, Physical Security of Arms, Ammunition, and Explosives
- ATF 5400.7, Alcohol, Tobacco, and Firearms Explosives Laws and Regulations
- DOT, 49 CFR, Parts 100 to 199, Transportation (applicable sections)
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections).
- AR 385-40 w/ USACE Supplement 1, Accident Reporting & Records

- Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, EP 385-1-95a
- USACE EM 385-1-1, Safety and Health Requirements Manual

STANDARD OPERATING PROCEDURE – OPS-04
DGM ANOMALY INVESTIGATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide USA Environmental, Inc. (USAE) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of digital geophysical mapping (DGM) anomaly investigation operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USAE site personnel, including contractor and subcontractor personnel, involved in the conduct of DGM operations on a UXO/MEC contaminated site. The following USAE policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USAE SOPs, the USAE Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 5.0 of this SOP for additional compliance issues.

3.0 INTRUSIVE INVESTIGATION OPERATIONS

All intrusive operations at MEC sites will be under the supervision of UXO qualified personnel. Non-UXO qualified personnel will not be allowed in the exclusion zone (EZ) during intrusive operations. The EZ will encompass an area large enough to protect personnel from fragmentation by an unplanned detonation. In addition, if non-UXO qualified personnel require access to the EZ, all work will stop while they are in the EZ. During operations, USAE personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will only be handled by qualified UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is the munition with the greatest fragmentation distance (MGFD), as stated in the Work Plan.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and/or unsafe acts will be immediately reported to the UXO Safety Officer (UXOSO).
- Failure to comply with safety rules/procedures may result in termination of employment.

3.1 DETECTION AND REMOVAL PROCEDURES

3.1.1 GRID LAYOUT

A registered Land Surveyor will survey each of the clearance areas, accompanied by a UXO escort. Surveying activities will consist of locating clearance area boundaries, establishing permanent survey monuments, and establishing grids for geophysical investigation activities within the clearance areas.

Grids will be laid out by the survey team in the approximate size of 100 feet (ft) x 100 ft or 200 ft x 200 ft, depending on the terrain. These grids will be geophysical surveyed and the data gathered and evaluated to determine which anomalies will be selected for intrusive investigation. Dig sheets will be developed that prioritize the anomalies. These prioritized anomalies will be re-acquired to an exact location using the highly accurate Real Time Kinematic-Differential Global Positioning System (RTK-DGPS) and a Schonstedt GA-52CX magnetometer.

3.1.2 INTRUSIVE INVESTIGATION OF ANOMALIES

3.1.2.1 Intrusive Teams

Intrusive investigation teams usually consist of a Team Leader (UXO Technician III) and at least one UXO Technician II or I. During Intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. Only qualified UXO technicians will perform UXO operations, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC, explosives or explosive items
- Disposal, including movement, transportation, and final disposal of MEC

The UXO Team will be assigned a set of anomalies. Using the Dig Sheets provided, the dig team(s) will excavate each of the selected target anomalies. Site-specific conditions (e.g., a larger ordnance item found than was anticipated) may warrant modification of the EZ/MSD and removal procedures described herein. As necessary, any changes will be prepared and submitted separately for approval prior to initiation of further activities on site.

3.1.2.2 Manual Excavations

Excavations for individual anomalies will be conducted using Schonstedt GA-52CX (ferrous metal) and/or White's XLT or Minelab's Explorer II (all metals) detector to assist the team in determining the location and orientation of the target item. The personnel excavating an anomaly shall initially remove no more than a 6-inch layer of soil at the location of the anomaly. A visual and electronic search of the excavation shall then be made. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located. Excavations on individual anomalies greater than 4 ft below the ground surface (bgs) will not be made without prior approval of the U.S. Army Corps of Engineers (USACE) OE Safety Specialist.

3.1.2.3 Mechanical Handling Equipment

Mechanical handling equipment (MHE) may be used to excavate large anomalies (e.g., pits) or those deeper than 4 ft bgs if required (e.g., to confirm the anomaly is not a MEC). Any decision to use mechanized equipment to excavate these anomalies will be made by the Senior UXO Supervisor (SUXOS) and the USACE OE Safety Specialist. Excavations will proceed slowly to ensure the MHE does

not broach the item. If the excavated material is considered to be an MEC, it shall be uncovered sufficiently by hand to obtain a positive identification of the item. If the item is identified as UXO/MEC, a determination will subsequently be made as to whether it is fuzed or not.

While excavating with MHE, a UXO technician will be stationed in a position that is out of the reach of the excavation equipment but affords a view of the excavation site. This observer will ensure that the next lift is visually free of UXO. The excavated material will be placed onto the ground within a screening area that has been surface swept and the boundaries recorded. The soil spoils will be spread across the screening area using the excavator bucket. The excavated material will be screened for range related debris, material potentially presenting an explosive hazard (MPPEH), munitions debris (MD), and UXO/MEC items. UXO technicians will recover all pieces of munitions debris or range related debris and any ordnance items. After screening, the soil spoils will be stockpiled to the side of the screening area.

3.1.2.4 Disposal Pits

Excavations for disposal pits using MHE will be performed in a similar manner as specified in Section 3.1.3.2. However, because individual anomalies cannot be discerned within the disposal pits, material from the disposal pit will be excavated carefully in 2-foot lifts.

3.2 ANOMALY EXCAVATION REPORTING

The MEC Subcontractor will excavate and identify the sources of the reacquired anomalies in the field. Data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MD, MPPEH, MEC, and UXO)
- Description (e.g., “20mm projectile, MK105 practice bomb, 40mm hand grenade” and “base, coupling, firing device”)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Approximate inclination (per Figure 1-1)
- Approximate orientation (Azimuth per Figure 1-1)
- Approximate distance from flag
- Approximate orientation from flag
- Found in a pit?
- Piece of fragmentation?
    - Initial disposition (e.g., left in place or removed to scrap pile)

- Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

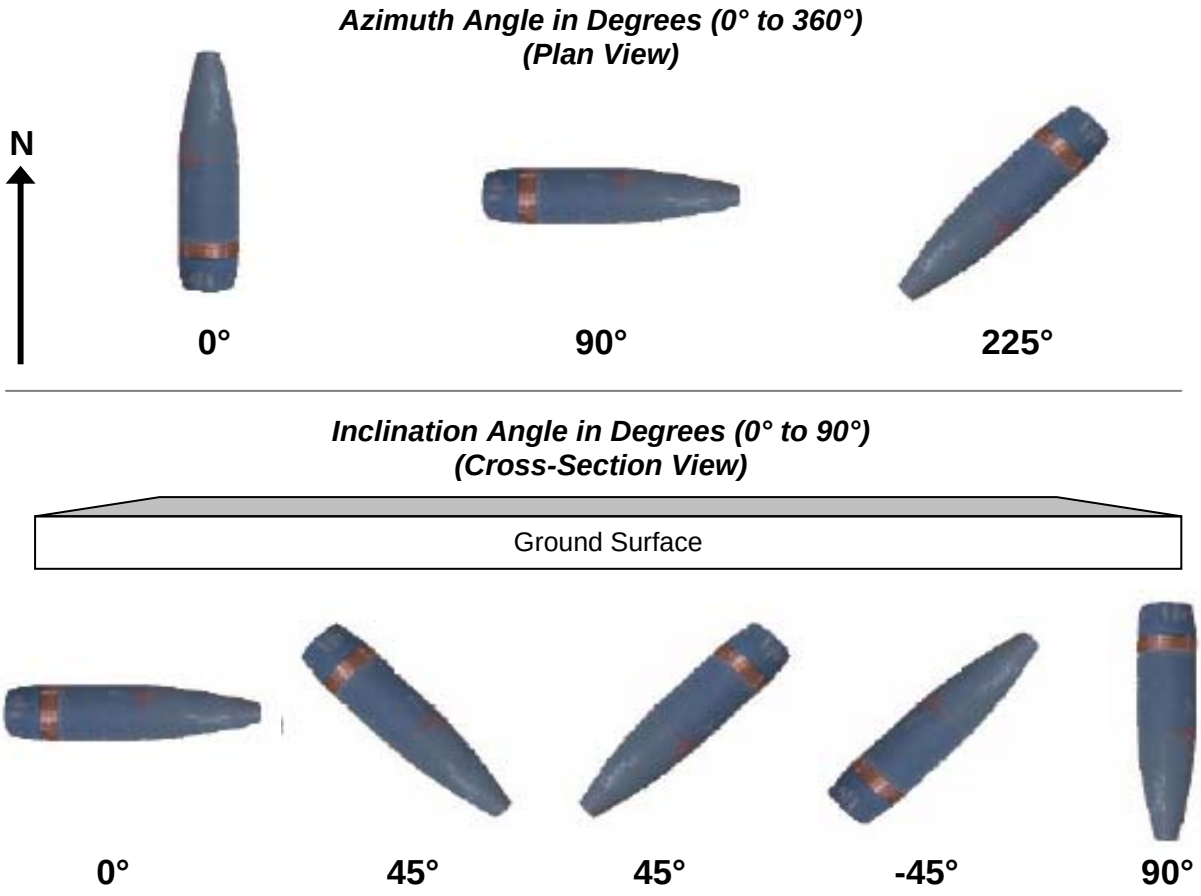


Figure 1-1: Azimuth and Inclination Examples

4.0 DISPOSAL OPERATIONS

Fuzed UXO/MEC items will be blown in place (BIP), and un-fuzed UXO/MEC items will be consolidated whenever possible in accordance with USACE Engineer Pamphlet (EP) 1110-1-17, *Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects*, dated 16 July 1999, Appendix D. In no case shall the SUXOS authorize or undertake destruction of UXO/MEC when there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage. The USACE OE Safety Specialist will be consulted for guidance in the event that there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage.

5.0 REFERENCES

- USACE Safety Considerations for UXO/MEC
- USAE Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards

- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications

STANDARD OPERATING PROCEDURE AND CHECKLISTS – OPS-05
DIGITAL GEOPHYSICAL MAPPING

1.0 CHECKLIST FOR GEOPHYSICAL TEST STRIP LOCATION AND DESIGN

Project Name: _____

Project Location: _____

USACE POC: _____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
Objectives			
a. Have survey objectives been determined, clarified, and documented?	____	____	____
b. Has EM-1110-1-4009 been consulted to ensure that all objectives mentioned therein will be met?	____	____	____
c. Will the prove-out be available during the project for the evaluation of suspected instrument malfunctions?	____	____	____
d. Will the prove-out be available during the project for the evaluation of new equipment and operators?	____	____	____
e. Is the contractor prepared to demonstrate target reacquisition techniques in the prove-out area?	____	____	____
Site Selection			
1. Has the proposed prove-out site been evaluated for the following criteria:			
• Easy access for project personnel?	____	____	____
• Restricted access for non-project personnel?	____	____	____
2. Is the prove-out located in close proximity to the survey area?	____	____	____
3. Does the prove-out have geophysical noise conditions similar to those expected in the survey area?	____	____	____
4. Does the prove-out have terrain and vegetation conditions similar to those of the survey area?	____	____	____
5. Has a backup prove-out site been identified?	____	____	____
Site Preparation			
6. Has surface clearance been performed?	____	____	____
7. Have the following steps been executed in preparing three areas within the prove-out:			

Site Preparation (continued)	Y	N	N/A
• Geophysically map entire area prior to burial?	____	____	____
• Remove non geologic sources of anomalous response from two-thirds of the area? (optimal situation)	____	____	____

Seeding Test Strip

8. Have all available sources been consulted to determine appropriate seeded items and orientations?	____	____	____
9. Have DQO's been established and documented?	____	____	____
10. Have appropriate burial depths been determined for the seeded items?	____	____	____
11. Have the DQO's been consulted to determine the number of seeded items?	____	____	____
12. Have the seeded items been spaced a minimum of 3 meters apart?	____	____	____
13. Has a list been made to document the range of burial depths for different MEC items?	____	____	____
14. Have the following steps been taken to ensure accurate locations for the seeded items:	____	____	____
• Specify location requirements in x,y,z?	____	____	____
• Measure depth to top and center of mass of each object?	____	____	____
• Have thorough notes been taken on each item's burial?	____	____	____
• GPS or a land surveyor employed to record the position of each item?	____	____	____

Seeding Survey Areas

15. Have items been seeded near the boundaries of the survey areas?	____	____	____
16. Has a list been made of number and type of items buried, the range burial depths for different MEC items, and percentage of area seeded?	____	____	____
17. Will target threshold be reevaluated based on results of seeded items in the survey areas?	____	____	____
18. Have the positional accuracy standards used during the prove-out been applied to seeded items in the survey areas?	____	____	____

2.0 CHECKLIST FOR OUT OF BOX EQUIPMENT TESTS

Project Name: _____

Project Location: _____

USACE POC: _____

Equipment Source: _____

Equipment Serial Numbers: _____

_____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
1. Has the equipment been inventoried and inspected for damage or wear?			
2. Has the cable shake test been performed? (Replace any faulty components if necessary)	____	____	____
3. Has the instrument (EM only) been nulled?	____	____	____
4. Has a nearby, noise-free site been selected for static background and static response tests?	____	____	____
5. Have the following instrument function tests been successfully performed:	____	____	____
• Static background test demonstrating <20% deviation in response for at least 3 minutes?	____	____	____

Background values: TG1_____, TG2_____, TG3_____, TG4_____

• Instrument response test demonstrating <20% deviation in response from test to test?	____	____	____

Response values: TG1_____, TG2_____, TG3_____, TG4_____

3.0 CHECKLIST FOR INITIAL INSTRUMENT TESTS

Project Name: _____

Project Location: _____

USACE POC: _____

Equipment Source: _____

Equipment Serial Numbers: _____

_____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
6. Has the six-line test been utilized to evaluate the following factors:			
• Heading effects?	____	____	____
• Repeatability of the response amplitude?	____	____	____
• Positional accuracy?	____	____	____
• Latency?	____	____	____
7. If magnetics data are to be collected, have the following steps been taken in the performance of the azimuthal test:	____	____	____
• Selected an area free of geophysical noise?	____	____	____
• Fixed sensor head position?	____	____	____
• Marked four cardinal directions on ground?	____	____	____
• Collected data using a variety of sensor head orientations?	____	____	____
8. If magnetics data is to be collected, has the octant test been performed and documented?	____	____	____
9. Has the optimum sensor height for each instrument been determined?	____	____	____
10. Has the pull-away test been performed and successfully demonstrated no influence for navigational or towing equipment?	____	____	____

4.0 CHECKLIST FOR DAILY INSTRUMENT QC CHECKS

Project Name: _____

Project Location: _____

USACE POC: _____

Equipment Source: _____

Equipment Serial Numbers: _____

_____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
1. Has the cable shake test been performed? (Replace faulty components if necessary)	____	____	____
2. Has instrument (EM only) been nulled?	____	____	____
3. Has a static background test been performed and demonstrated <20% deviation in response over at least 3 minutes:			
• Start of day?	____	____	____

Background values: TG1_____, TG2_____, TG3_____, TG4_____

• End of day?	____	____	____

Background values: TG1_____, TG2_____, TG3_____, TG4_____

4. Has instrument response test been performed and demonstrated <20% deviation in response from test to test:			
• Start of day?	____	____	____

Response values: TG1_____, TG2_____, TG3_____, TG4_____

• End of day?	____	____	____

Response values: TG1_____, TG2_____, TG3_____, TG4_____

5. Has the operator been thoroughly examined with the geophysical instrument for any sources of response that may not be readily apparent?	____	____	____
6. Has the repeat data or "clover-leaf" tests been utilized to evaluate the following factors:			
• Repeatability of response amplitude?	____	____	____
• Proper Lag Correction Applied?	____	____	____
• Positional accuracy?	____	____	____

Has there been an equipment or DQO metric failure?

Document any failure:

Document any corrective action (repair/retest)

Has corrective action solved failure?

5.0 SURVEY AREA REPORT FORM

☐ QC checked by _____ Date: _____

☐ QA checked by _____ Date: _____

Project Name: _____

Project Location: _____

Geophysical Contractor: _____

Design Center POC: _____

Project Geophysicist: _____

Site Geophysicist: _____

Prove-out Area ID: _____ **Date:** _____

Field Team: _____

Survey Type: ☐Grid ☐Meandering Path ☐Transect ☐Other _____

Coordinate System: ☐UTM ☐State Plane NAD _____ ☐Local ☐Other _____ **Unit of Measure:** ☐ meters☐ feet

Sketch of Survey Area: **Approx. Scale:** _____ **North Arrow:** _____

Terrain:

☐Level ☐Moderate Slope ☐Steep ☐Rolling ☐Ruts ☐Gullies ☐Rocky ☐Swampy ☐Dangerous

Tree Cover: **Tree Height:** ____☐None ☐Light ☐Medium ☐Thick

Brush: ☐None ☐Light ☐Medium ☐Thick

Weather: ☐Sunny ☐Cloudy ☐Drizzle ☐Rain ☐Thunderstorms ☐Hail ☐Fog ☐Humid ☐Snow

Grid Corner Coordinates: Start End File Name UTM/State Plane Local

Battery Voltage: _____ _____

SW _____, _____ _____, _____ **Static Background Value:** _____ _____ _____, _____

NW _____, _____ _____, _____

Static Response Value: _____ _____ _____, _____

NE _____, _____ _____, _____

SE _____, _____ _____, _____

Instrument Clock Drift: _____

Raw Data File Name: _____

Repeat Data File Name: _____

Geophysical Instrumentation: _____

Serial Number: _____

Sensor Separation (if applicable)**:** _____

Source (rental agency, contractor, etc.)**:** _____

Base Station: _____ **Source:** _____ **Serial Number:** _____

Navigation Method: _____ **Source:** _____ **Serial Number:** _____

Additional Comments:

_____

_____

_____

6.0 CHECKLIST FOR DATA STORAGE AND TRANSFER

Project Name: _____

Project Location: _____

USACE POC: _____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
a. Has the transfer medium been approved by USACE?	____	____	____
b. Are all files in USACE approved formats?	____	____	____
c. Have all of the following been included in the transfer packet:			
• "Readme" file detailing contents?	____	____	____
• Raw data files?	____	____	____
• Edited data files?	____	____	____
• GPS positioning files (if separate)?	____	____	____
• Completed geophysical maps?	____	____	____
• Prioritized target lists?	____	____	____
• Data File Log / Spreadsheet of Delivered Data Files with Dates Sent?	____	____	____
d. Have the required number of copies, per USACE, been included in the transfer packet?	____	____	____

7.0 CHECKLIST FOR FIELD EDITING

Project Name: _____

Project Location: _____

USACE POC: _____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
1. Have the following items been evaluated for correctness and edited if necessary:			
• Line numbers?	____	____	____
• Start and end points?	____	____	____
• Line direction?	____	____	____
• Fiducial locations?	____	____	____
2. Has the data been examined in profile and evaluated for geophysical noise? Enter background noise value and compare with Test Strip background:_____ vs. _____	____	____	____
3. Has the data been examined for the presence of drop-outs and spikes?	____	____	____
4. Has the presence of metal on the operator been eliminated as a possible source of geophysical noise?	____	____	____
5. Has the edited data been converted to the appropriate .xyz format?	____	____	____
6. If using magnetics, have the following steps been taken:			
• Examined base station data for any problems?	____	____	____
• Performed diurnal correction to field magnetometer data?	____	____	____
7. Has the positional data been evaluated for accuracy and completeness?	____	____	____

8.0 CHECKLIST FOR DATA PROCESSING

			FILENAMES:
Site:		Raw:	
Location:		Edited:	
Contractor:		Processed:	
Sector:		Contour Map:	
Grid:		Target List:	
Processor(s):		Target Map:	

	Y	N	N/A
Preprocessing			
1. Coordinate Conversion			
PROJECTED COORDINATE SYSTEM _____	____	____	____
2. Removal of Drift and Leveling	____	____	____
Record Corrections:			
3. Removal of Heading	____	____	____
Record Corrections:			
4. Lag and Offset	____	____	____
Record Corrections:			
Processing			
5. Initial Gridding	____	____	____
Record Parameters:			
6. Calculation of 3D Analytic Signal	____	____	____
7. Digital Filtering and Enhancement			
❑ Low Pass			
❑ High Pass			
❑ Non Linear	____	____	____
❑ 3x3 Convolution			
❑ Difference			
❑ Other _____			
8. Threshold Selection			
Threshold value _____	____	____	____
9. Anomaly Selection			
Number of targets _____	____	____	____

DGPS AND EM61-MK2 SOP

NMEA GGA and GSA strings are used as inputs to the Geonics EM61-MK2 data logger to position sensor data in DGM operations. For applications in wooded areas or wherever RTK DGPS does not provide sufficient coverage AND the acceptable sensor positioning accuracy is less than normal (e.g. to support reconnaissance operations), Trimble's GeoExplorer 2005 (GeoXH or equivalent) can be configured to output the required NMEA position strings. The ability to tailor the output strings in necessary, because the default output of all NMEA strings clogs up the EM61-MK2 data logger too severely.

1. Attach GeoXH, or equivalent to EM61-MK2 handle,
2. Mount external antenna over EM61-MK2 coil center,
3. Attach the serial clip to get access to the GeoXH, or equivalent, COM1 port;
4. Turn ON the GPS and once it boots, Tap START, SETTINGS, and then the CONNECTIONS tab;
5. Open *GPS CONNECT*;
6. COM2 NMEA (GPS CONNECT) should be routed to COM1 and COM3 & COM4 should be (Available). Note the very bottom message "NMEA output on COM1 at 9600-8-1-N." You're good to go;
    a. If this is not the case, tap Setup;
        i. Set NMEA Output to External – COM1:
        ii. Using the tool wrench next to the NMEA Output:
        iii. Set Port Configuration to Custom (top menu option);
        iv. Set Baud Rate to 9600;
        v. Set Data Bits to 8;
        vi. Set Stop Bits to 1; and
        vii. Set Parity to None;
        viii. Tap OK.
    b. Check that TSIP is set to Internal – COM3; and
    c. Real-Time is set to None;
    d. Tap OK;
    e. The bottom message should read "NMEA output on COM1 at 9600-8-1-N";

NOTE: GPS Connector needs to stay running, so *DO NOT tap OK*, simply tap the Windows Flag, Programs, and open GPS Controller.

7. For Surveys in wooded areas, set the precision slide all the way *left* for maximum productivity;
8. Tap the wrench to open GPS Settings;
    a. GPS Receiver Port should be set to COM3: TSIP Serial Port;
    b. The precision slider should be all the way left;
    c. Max PDOP: should be 20;
    d. Min SNR: should be 33.0 (scroll down);
    e. Min Elevation: should be 5 degrees;
    f. Velocity Filter: should be Auto;
    g. NMEA Output: Should be On;
    h. Tap the wrench next to NMEA Output:
        i. Output Interval: should be 1s;
        ii. Baud Rate: should be 9600;
        iii. Data Bits: should be 8;
        iv. Stop Bits: should be 1;
        v. Parity: should be None;
        vi. Only the GGA box needs to be checked. Adding additional NMEA stings will only slow the EM61-MK2 data logger down. Scroll down to verify;

vii. Tap OK.

i. Tap OK.

9. In the upper left hand corner of the frame, open the menu and select "Real-time." On the next bar down, click on the menu and select "Summary."

    a. If everything is working correctly you should notice the following categories and their respective status:
        i. Integrated SBAS: In Use;
        ii. System: ;
        iii. Satellite ID: ;
        iv. SNR: _._ dB;
        v. Last correction: .
10. **If under "Summary" the categories above do not appear,** the settings are incorrect. Go back to the upper left hand menu (in GPS Correct) and select "Setup". Click on "Real-Time Settings" and choose:
    a. Choice 1: Integrated SBAS;
    b. Choice 2: Use uncorrected GPS;
    c. Real Time Age Limit: 4 min.
11. Verify the NMEA GGA output is being accepted by the EM61-MK2 data logger and periodically check DGPS status and number of satellites.
12. Periodically monitor GPS Controller for position accuracy, including number of satellites, PDOP, and Differential status.

Rover DGPS Equipment

1. Rover DGPS receiver with integrated and external antenna box
2. Rover Antenna telescoping range pole – in tripod box
3. Rover charger – in yellow box Rover serial cable – in yellow box (DB9 to DB9)
4. Rover Range Pole Bracket – in yellow box

Support Equipment

1. Battery chargers and data transfer link to PC – in yellow boxes
2. VAC power cable for chargers – in yellow box
3. Serial data transfer cable – in yellow box
4. Laptop PC with Trimble Geomatics Office software

Rover DGPS set up for Reacquisition:

1. Charge rover DGPS
2. Setup Telescoping Range Pole and attach Rover external antenna
3. Attach Rover bracket to range pole and Rover DGPS to bracket
4. Power ON the receiver and start TerraSync
5. Select Stakeout for Reacquisition
6. Select points from list or from map
7. Add all points, if necessary
8. Select anomaly point [e.g. A1-12842]
9. Follow rover guidance to anomaly location.
10. Extend range pole above tree canopy, if necessary
11. When delta values fall below 2m, mark location with flag labeled with the point name. Verify point reacquired with flag label
12. Measure location and accept to mark anomaly as reacquired
13. Select next point … etc.
14. When done, exit TerraSync and power down the rover DGPS
15. Remove DGPS from Range Pole
16. Store Rover
17. Store Range Pole
18. Charge Rover batteries overnight

Rover DGPS Position Reoccupation QC Test:

1. Position rover DGPS antenna over a known location
2. Verify rover position Differential
3. Record Easting (X), and Northing (Y) location
4. Compare measured location to known location
5. If location offset exceeds 2m, combined,
    a. Check satellite planning software

EM61-MK2 Setup:

1. Assemble coil assemblies
2. Attach wheels and handle (or stretcher)
3. Attach rover GPS antenna mount and mount rover GPS
4. connect upper coil to lower coil connector or attach shorting plug for bottom coil only
5. Attach battery to backpack
6. Connect coil cable to backpack
7. Connect data cable to backpack and Data Logger COM1
8. Connect GPS to EM Data Logger COM2
9. Move to an electromagnetically clean area
    a. Set the EM61-MK2 Mode Switch to:
        i. 4 – for logging four (4) bottom coil time gates
    b. Set the Master/Slave Switch to M for single sensor operation
    c. Push In the Circuit Breaker on the EM61-MK2 backpack and warm up for at least 5 minutes.
    d. Turn on Rover GPS
    e. Push the ON/OFF button to turn on the Data Logger
        i. Set Antenna Coil Size (e.g. Standard 1 x .5 m)
        ii. Set Up Logger
            1. Date
            2. Time
            3. Units (e.g. feet)
            4. COM port (e.g. COM1)
            5. Audio
            6. Pause Key: (e.g. Alt F1 or any key)
            7. Display (e.g. Text or Graphic)
        iii. Set GPS Port
            1. GPS Input: (Enabled)
            2. COM Port (COM2)
            3. Baud Rate: (9600)
            4. Parity: (No)
            5. Data Bits: 8
            6. Stop Bits: 1
            7. Can monitor GPS data in terminal mode (F3)
        iv. Set Output Port – Not used unless logging data to external PC
    f. Monitor/Null Coils – After 5 minute warm-up, null EM61-MK2 – all channels should be close to 0 +/- 1
    g. Acquire Data:
        i. Create File (F1 for default name, F3, Enter, F1 for other file name)
        ii. Survey Setup
            1. Mode: Auto
            2. Wheel Inc: N/A
            3. Reading/s: 10.00 or 16
            4. Surv Line: (e.g. 0)
            5. Line Incr: (e.g. 1 for instrument checks or 2.5 for survey)
            6. Sequence: (e.g. Alternate)
            7. Direction: (e.g. North
            8. Start Stn: (e.g. 0)
            9. Stn Incr: (e.g. Positive)
        iii. LOG DATA
            1. Wait for data display (0 to 100% internal calibration)
            2. Observe time gate values

3. Observe DGPS input (observe toggle bar and correction status for letter D, letter A is unusable GPS)
4. Enter to log data– System is ready to log data. Move to start of survey line.

h. When coil is centered over start point, press ENTER again. Display will show "logging" on the top display line. Observe coil readings. Observe Station Number (STN). Note any unusual recordings on Field Survey Sheet.

i. Walk along survey line slowly (about 2 to 3.5 miles per hour). Periodically observe Data Logger display. Note any unusual recordings, any deviations from the survey line, or any observed metal objects. Escort should log these observations and marks the outer coil edge with marking paint or plastic pin flags to insure sensor overlap on a return transect.

(If fiducial marks are available, press thumb button when coil is centered over mark for 1 second)

j. Press Pause Key (e.g. Any Key) when coil is centered over the line end to stop logging EM61-MK2 data.

(If in the Auto mode, simply continue to next line and keep moving until survey session is complete or manually set new lines with the F1 key)

k. When survey is complete, press F5 then the letter Y to exit logging. Enter a new file name to continue surveying, or return to main menu to transfer data.

l. Data Transfer using a cable:
   i. Turn OFF the Data Logger by holding the ON/OFF key
   ii. Disconnect Data Logger from EM61-MK2 backpack.
   iii. Change EM61-MK2 Backpack battery, if required
   iv. Connect Data Logger to Field Lap Top PC
   v. Power PC
   vi. Run DAT61MK2
   vii. Select "Data Transfer"
   viii. Verify serial port settings (COM1, Baud Rate: Auto)
   ix. Run the Data Logger program File Manager
      1. Upload Files.
   x. Select "List Files" and select the file names. (Check the Field Survey Form).
   xi. Select "Download" and observe PC and Data Logger to monitor data transfer status. Log any transfer problems on Field Survey Sheet.
   xii. Data Transfer using Memory Card:
      1. Exit DAT61 program to DOS c: prompt
      2. Use up arrow to find (or type) copy *.r61 d:
      3. Hit enter (files get copied from c: to Memory Card)
      4. Turn data logger OFF and eject Memory Card
      5. Insert Memory Card into PC and copy files to appropriate folder
      6. In DAT61 for Windows, convert all files from raw to ASCII (from *.r61 to *.m61)

m. Combine EM and GPS data in EM61MK2 using the "GPS Positioning" tool (or position with line and marker data).
   i. Select input file name
   ii. Enter output file name and location, enter file name on Survey Sheet.
   iii. Select the channels to position (e.g. STD D or STD 4 (all 4 bottom coil time gates))
   iv. Set the GPS Time Gap (e.g. 3 seconds)
   v. Select file format (e.g. Geosoft)
   vi. Set the GPS System (e.g. Geodetic or UTM)
   vii. Set Units to meters
   viii. Set GPS corrections to Raw GPS or Differential RTK

ix. Click “Apply” to export GPS integrated ASCII data file
n. From the File tool, select “Open XYZ File” and select the one just created. Display should show the survey tracks.
o. Data is ready for Processing and Analysis.

10. Data Management in Data Logger
    a. Once data transfer is complete and data has been positioned, exported (*.xyz file), and processed successfully, clear the data logger memory
        i. From the Main Menu, select “File Manager”
        ii. Select “Delete File”
            1. Scroll to select a file to be deleted
            2. Hit F1 key to delete
            3. Hit the “Y” key to confirm delete

File should have been removed from list

Daily EM61 Static Check

1. Setup as above
2. In a quiet area, log static EM61 background data for 1 minute (observe meter readings near 0, +/- 2-3 mV)
3. Press Enter to Pause and increment line (F1)
4. Place a “know object (e.g. a Standard Static Test Bar with steel bolt)” on the coil and log data (Enter) for 1 minute (observe meter readings #> 0, +/- 2-3 mV)
5. Press Enter to Pause, remove target, and increment line (F1)
6. Log static background data (Enter) for 1 more minute (observe meter readings near 0 +/- 2-3 mV)
7. Press Enter to Pause, and increment line
8. Log static data for 30 seconds while all system cables are shaken (observe meter readings near 0 +/- 2-3 mV – no jumps or spikes),
9. Press Enter to Pause, and increment line
10. Log static data for 30 seconds while operator kicks towards coil, twists left/right, and bends up/down (observe meter readings near 0 +/- 2-3 mV).
11. QC checks:
    a. Look for near zero readings during lines 0, 2, 3, and 4 – re-null coil or replace battery as necessary
    b. Check for consistent target readings +/-20% on line 1 from previous readings. Replace battery as necessary

Daily Latency Check

1. Setup as above
2. Find a quiet area at least 50 feet long
3. Place a known object in the center of this line (e.g. 2” Tow Ball)
4. Acquire line 0 from start (0,0) to end (0,50) directly over the object (0,25)
5. Increment the line number and acquire line 1 from end (0,50) to start (0,0) directly over the object (0,25)
6. Use this data to help determine data processing latency parameter needed to get the peak to line up in both directions.

EM Reacquisition

1. Setup as above
2. Position coil (push and pull) over flagged location in several directions while monitoring the display (e.g. SUM Channel).
3. Try to match or exceed the reported mV value on the Dig Sheet within 5 to 7m of each flag along cleared and marked transect
4. Move the flag to coil center over refined peak location
5. Log reacquired mV peak on Dig Sheet. If necessary, log refined location offset distance and direction on Dig List
6. Move to next flag

PC – Pathfinder Office, or equivalent

1. New Project
2. Enter new project name (e.g. Luis Pena)
3. Make sure Template: is using project coordinate system and units
4. Set Coordinate System correctly (e.g. US State Plane 1983, Colorado Central 0502, NAD 1983, Geoid (none) … click Finish … click Apply … click OK
5. Import points, select Custom [format] … select Name, East, North, Elevation … OK
6. Find *.csv file to load (e.g. My Documents/DRI/DRI_Sector_D.csv). Points should load and be displayed. Verify!

GPS Data Transfer from PC to Rover DGPS

1. Run Trimble Pathfinder Office, or equivalent, software on PC
2. Open Project and verify project coordinate system and units (e.g. Luis Pena, UTM, 19N, meters)
3. Import or verify target waypoints are shown
4. Connect Rover DGPS to PC (USB or Serial) a power ON Rover (machines should connect thru ActiveSync)
5. Export target waypoints to rover DGPS
6. Verify on rover DGPS:
7. Select the job
8. Select Review current job and verify points and point order. You can also map the points for the job

1. Charge all GPS and EM61-MK2 batteries overnight.

9.0 WEEKLY DGM QC REPORT:

Project Name: _____

Report Week: _____

9.1 INSTRUMENT LATENCY TEST

Metric is no zig-zag or chevron effects visible.

Describe latency correction performed _____

Document critical latency correction parameter(s) _____

Attach a representative data image map for each survey day documenting proper latency correction.

9.2 INSTRUMENT NOISE

Metric based on approved GPO results (e.g. < +/- 1.3 mV on time gate 1).

Report the weekly summary of all static background noise levels from each static test.

Report the dynamic noise levels for each survey file.

9.3 INSTRUMENT RESPONSE TEST RESULTS

Metric +/- 20 % from day to day.

Report the weekly summary of all static instrument response tests.

9.4 MAGNETOMETER HEADING CORRECTION

If used, magnetometer data will be corrected for heading errors such that there is no visible heading affects in the data displayed at the amplitude range used for detection and analysis.

Describe magnetometer heading correction performed _____

Document specific heading correction values _____

Attach a representative data image map for each survey day documenting proper heading correction.

9.5 DATA LEVELING AND/OR FILTERING

Metric is leveling and/or filtering utilities do not adversely alter the nature of the original measured response by more than 5%.

Describe data leveling and/or filtering used _____

Document critical leveling and/or filtering parameters used _____

Attach example of data profile before and after leveling and/or filtering

9.6 REOCCUPATION ACCURACY

Metric is not to exceed +/- 2m from a known location.

Describe the reoccupation point _____

Record the known location X = _____, Y = _____

Summarize the location offsets from each reoccupation test.

9.7 DATA SAMPLING DENSITY

Metric is along-track density will not exceed 0.5 feet.

Use Oasis QC tools to assess data sampling density.

Check if all data sets pass metric _____.

Attach QC maps to document any failures.

9.8 ACROSS-TRACK LINE SPACING FOR GRIDS

Metric is 90% of line spacing will not exceed 2.5 feet.

Use Oasis QC tools to assess the across-track line spacing for each grid survey.

Check if all data sets pass metric _____.

Attach QC maps to document any failures.

9.9 DYNAMIC REPEATABILITY

Dynamic DGM detection metric for grids is: Test item characteristics (peak response and size) repeatable with allowable variation of +/-25%.

Dynamic DGM detection metric for transects is: Test item in test strip anomaly characteristics (peak response and size) repeatable with allowable variation +/-25%.

Dynamic DGM positioning metric for grids is: Position offset of test item target <=35cm + ½ line spacing (e.g. <=2.4 ft for 2.5 ft line spacing) or <=50cm + ½ line spacing (e.g. <=2.9 ft for 2.5 ft line spacing) for fiducially positioned data.

Dynamic DGM positioning metric for transects is: Test item position offset <=2m.

Dynamic Analog detection repeatability metric is: Repeat a segment transect and show extra flags not greater than the greater of 20% or 8 flags, or within range of adjacent segment.

9.10 REACQUISITION ACCURACY

Metric is not to exceed 2 meters from to refined location.

Document all refined location offsets on dig list

Include updated dig list with this report

9.11 REFINED LOCATION ACCURACY

Metric is not to exceed 30 cm from refined location.

Document all discovered location offsets from refined location on Dig List

Include updated dig list with this report.

9.12 DGM FALSE NEGATIVES

Metric is no false negatives.

Document all false negative discoveries

Provide failure ID and photograph (attached to this report)

Provide failure location X = _____, Y = _____

Document corrective action taken _____

9.13 INTRUSIVE ANOMALY RESOLUTION

Metric is for all intrusive results resolved with DGM data.

UXOQCS and Project Geophysicist will initial all dig results

Each discrepancy and final resolution will be documented

Final weekly dig list is attached to this report

Site Geophysicist Signature and Date _____

UXOSO/UXOQCS Signature and Date _____

OPS 13- MPPEH MANAGEMENT

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide procedures that ensure that interior and exterior of all recovered MPPEH is inspected to determine what explosive hazard, if any exist, requiring further treatment before shipping off site for final treatment. These procedures are general in nature and may be refined with the concurrence of the Senior UXO Supervisor (SUXOS) to adapt to specific site conditions and circumstances.

2.0 SCOPE

These procedures will be conducted in accordance with the Work Plan, the Site Health and Safety Plan (SHSP) and the Explosives Safety Submission (ESS). This SOP provides the MPPEH management process that describes the inspection, storage, certification/verification procedures, and the chain of custody requirements for materials documented as safe (MDAS) slated for shipment to an authorized recycler. Specific requirements for personnel, training, equipment/material, surface search, and documentation are found in the Work Plan (WP).

3.0 INSPECTION PROCESS

All recovered MPPEH items will undergo a 100% inspection and an independent 100% re-inspection to determine and document whether it is safe (MDAS) or whether it is known to have or is suspected of having an explosive hazard [material documented as an explosive hazard (MDEH)]. The sequence of events in the inspection process is summarized in Figure 1. A Material Inspection and Release Form (Attachment 2) will be completed to document the two 100% inspections performed on all recovered materials.

A UXOTII (a UXOTI can tentatively identify items, however, a UXOTII or UXOTIII must confirm the identification) will perform a 100% inspection of each item as it is recovered and determine:

- If the item is MDAS, requiring no additional treatment prior to containerizing for off-site shipment
- If the item is MDEH that requires additional treatment (demilitarization, i.e. detonation or venting to expose a dangerous filler)
- If item is range related debris that may require draining fluids or removal of visible liquid hazardous, toxic or radiological waste (HTRW) materials.

A UXOTIII will:

- Conduct a 100% re-inspection of all recovered items to determine the proper classification as MDAS, MDEH or an item containing other dangerous fillers or HTRW constituents.
- Supervise the segregation of items by category to ensure no co-mingling of MDAS and MDEH or HTRW items.

The UXOQCS will:

- Conduct daily audits of UXO Teams performing the MPPEH inspection process and will conduct and document random sampling of all processed MDAS, MDEH and HTRW items to ensure no co-mingling occurs.

The UXOSO will:

- Ensure specific procedures and responsibilities for processing MPPEH for certification as MDAS MDEH or range-related debris outlined in the WP and this SOP are being followed
- Ensure all procedures for processing are being performed safely and consistent with applicable regulations.

The SUXOS will:

- Perform random checks to determine that the munitions debris and range-related debris are free from explosive hazards necessary to complete the appropriate Requisition and Turn-in Document, DD Form 1348-1A (see Attachment 1)
- Ensure that a DD Form 1348-1A is completed for all MDAS and range-related debris to be transferred for final disposition
- Ensure the WP, QC Plan and this SOP outline the procedures and responsibilities for processing MPPEH for final disposition as MDAS or range-related debris
- Certify all MDAS and range-related debris with one of the following statements as applicable –

  "This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluid, illuminating dials and other visible liquid HTRW materials."[1]

  "This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials."[2]

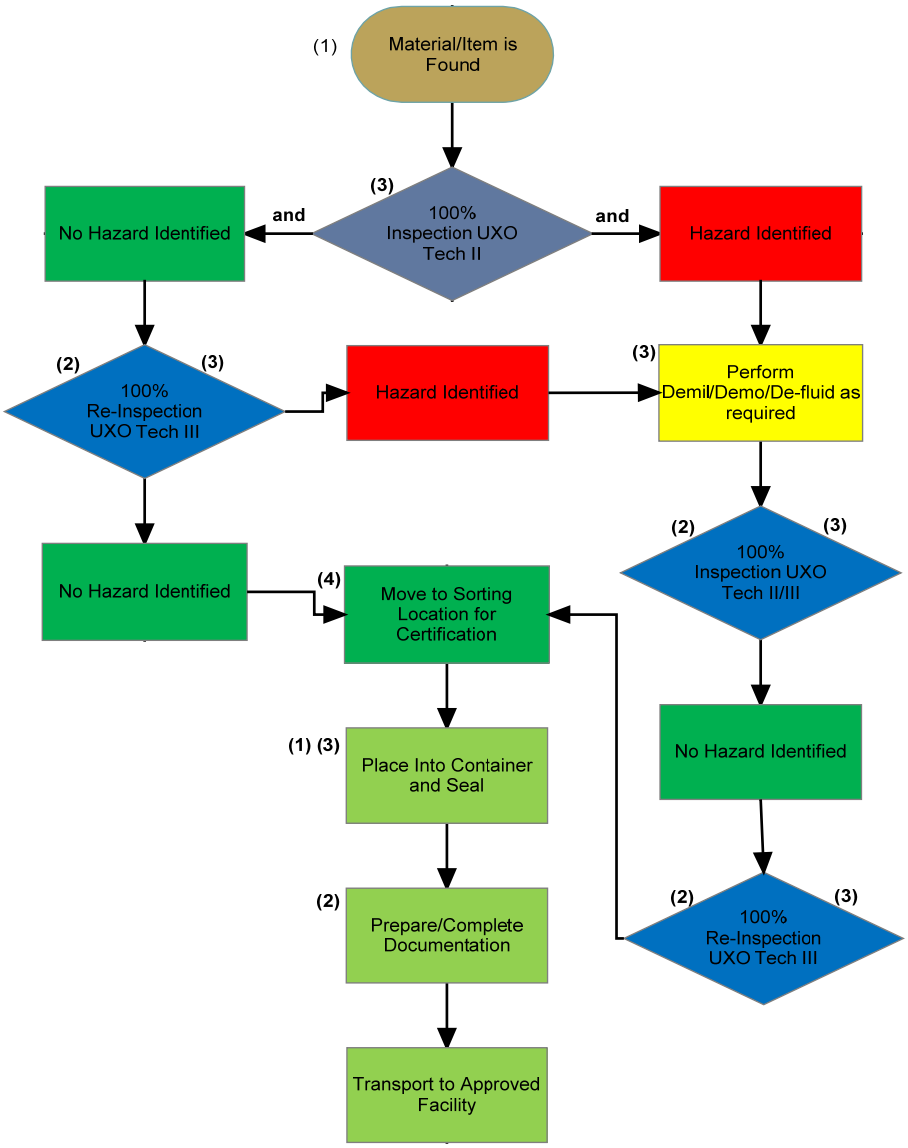
- Ensure that inspected debris is secured in sealed and labeled containers.

This space is intentionally left blank.

[1] This statement will be used on any ranges where range-related debris is being processed along with munitions debris

[2] This statement will be used for properties where only munitions debris is being processed

Figure 1: MPPEH INSPECTION PROCESS



Notes:

During performance of the steps within the MPPEH Inspection Process, Notes 1 - 4 below are utilized to ensure supervision and compliance requirements are met.

(1) The UXOQCS will conduct daily audits of procedures used by UXO teams for MPPEH processing

(2) The UXOQCS will perform random sampling of recovered material/items and documents for accuracy/completeness

(3) The UXOSO will observe procedures to ensure compliance with the approved plans and safety measures

(4) The SUXOS will perform random checks to satisfy that the munitions debris and range-related debris is free from explosive hazards necessary to complete DD Form 1348-1A

4.0 MDAS CONTAINERIZATION

MDAS is placed in closed containers that will be sequentially number and:

- Closed in such a manner that the applied seal will be broken if the container is opened
- Clearly labeled with USA Environmental, Inc., the installation/project name, the sequence number (e.g. 0001), and the container's unique seal identification, see Attachment 3 for detailed requirements for completing the label

5.0 MDAS CERTIFICATION AND VERIFICATION

The SUXOS will certify the MDAS by preparing and signing the DD Form 1348-1A for all shipments of recovered materials as discussed in Section 3 above. The designated government representative will verify the shipments if available, otherwise the shipment verification is delegated to the UXOQCS.

The 1348-1A will contain the appropriate statement as mentioned in Section 3 and prepared to provide the required information as shown in Attachment 1.

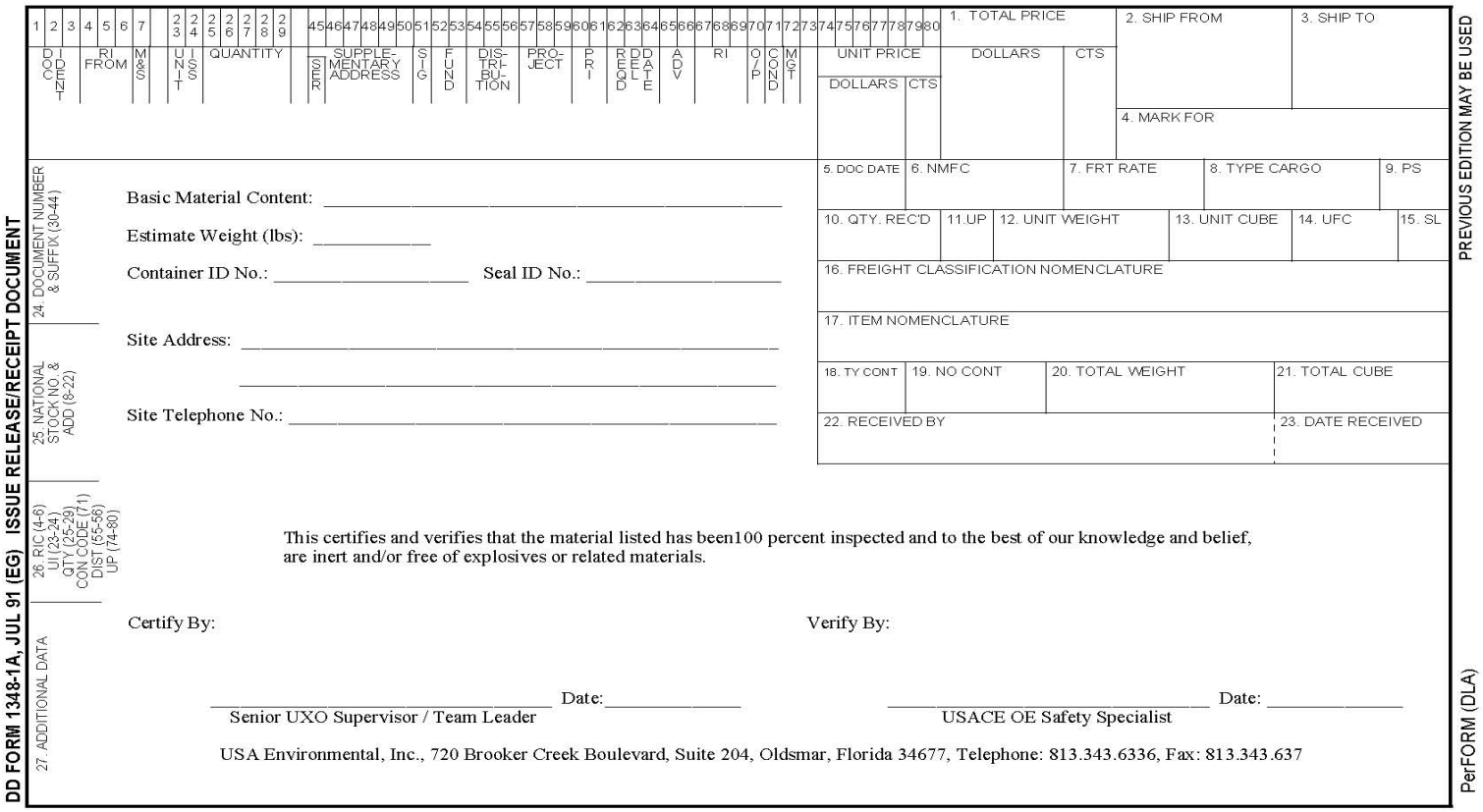
6.0 MAINTAINING THE CHAIN OF CUSTODY

The chain of custody must remain intact until the MDAS is released from DOD control that is received and signed for by the qualified receiver to further manage and process the material in accordance with DOD Instruction 4140.62. The qualified receiver will:

- Receive the unopened labeled containers
- Review and concur with the supporting documents
- Sign the 1348-1A and provide on company letterhead stating the contents of the sealed containers will not be sold, traded or otherwise given to another party prior to smelting and are only identifiable by their basic contents
- Send the supporting documentation and notification to USA that the MDAS in the sealed containers has been smelted and is only identifiable by its basic content.

If the chain of custody is broken at any time during shipment, the contents of the affected container will revert to MPPEH and will require a second 100% inspection and a 100% re-inspection, be documented as certified and verified as MDAS by qualified USA personnel.

ATTACHMENT 1.
DD FORM 1348-1A EXAMPLES



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

1 2 3 4 5 6 7	23	24	25	26	27	28	29	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
DOCUMENT IDENTIFIER	RI FROM	M&S	UNIT	ISS	QUANTITY			SUPPLEMENTARY ADDRESS
SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQUIRED DELIVERY DATE	ADV	RI
RI	O/P	COND	MGT	UNIT PRICE DOLLARS	UNIT PRICE CTS	DOLLARS	CTS	1. TOTAL PRICE
2. SHIP FROM	3. SHIP TO	4. MARK FOR						
5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS				
10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL			
16. FREIGHT CLASSIFICATION NOMENCLATURE								
17. ITEM NOMENCLATURE								
18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE					
22. RECEIVED BY			23. DATE RECEIVED					

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content: _____

Estimate Weight (lbs): _____

Container ID No.: _____ Seal ID No.: _____

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address: _____

_____

Site Telephone No.: _____

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

27. ADDITIONAL DATA

Certify By:

_____ Date:_____
Senior UXO Supervisor / Team Leader

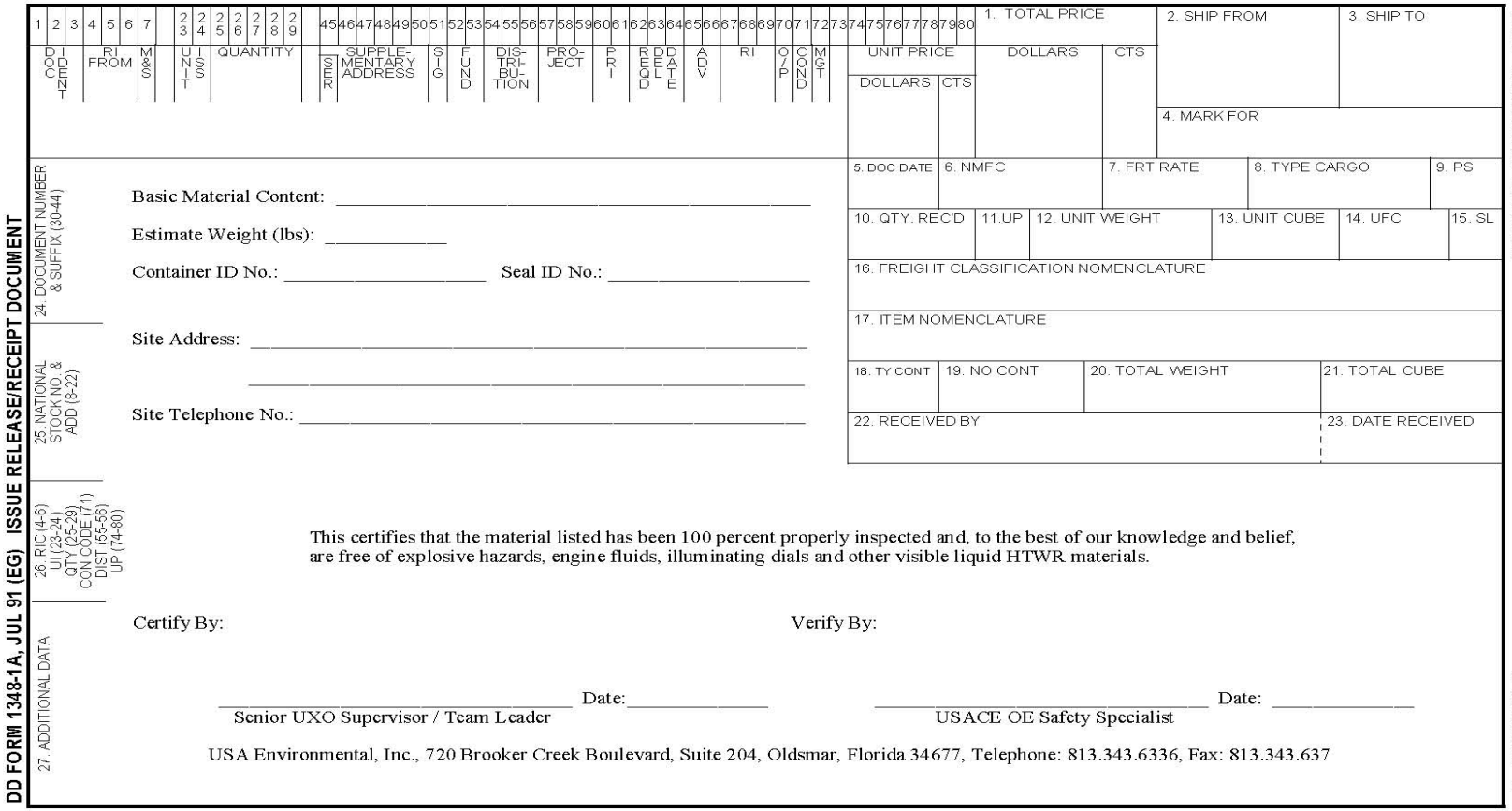
Verify By:

_____ Date: _____
USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

Reset

DD Form 1348-1A: FOR USE FOR PROPERTIES WHERE ONLY MUNITIONS DEBRIS IS BEING PROCESSED



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

1 2 3 4 5 6 7 | 23 24 25 26 27 28 29 | 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

OD CONT	RI FROM	M&S	UNIT ISS	QUANTITY	SER	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQD	DDATE	ADV	RI	O/P	COND	MGT

1. TOTAL PRICE			2. SHIP FROM	3. SHIP TO
UNIT PRICE		DOLLARS	CTS	4. MARK FOR
DOLLARS	CTS			

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

27. ADDITIONAL DATA

Basic Material Content: _____

Estimate Weight (lbs): _____

Container ID No.: _____ Seal ID No.: _____

Site Address: _____

_____

Site Telephone No.: _____

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTWR materials.

Certify By: Verify By:

_____ Date:_____ _____ Date: _____

Senior UXO Supervisor / Team Leader USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

Reset

DD Form 1348-1A: FOR USE WHERE RANGE-RELATED DEBRIS IS PROCESSED WITH MUNITIONS DEBRIS

ATTACHMENT 2.
MATERIAL INSPECTION AND RELEASE FORM

USA 100% MATERIAL INSPECTION AND RELEASE FORM

Project:							Document Date:
Location:							Document Number:
Container Number:	Seal #:	Initials 1st:	Initials 2nd:	Reseal #:	Initials 1st:	Initials 2nd:	Comments:

The above listed containers have received two separate 100% inspections to ensure proper classification of material.
A copy of this form is to accompany the listed containers to final disposition and be retained for a period of 3 years.
This form is used to document the inspections performed by two UXO qualified personnel, one of whom must be a Technician III or higher.
This form is not to be used in place of other required documents for the transportation and/or accountibilty of material.

Name of First 100% Inspector:	Title:	Date:
Name of Second 100% Re-Inspector:	Title:	Date:

ATTACHMENT 3.
NON-HAZARDOUS WASTE (CONTAINER LABEL)

NON-HAZARDOUS WASTE

Solid Waste Excluded From Regulation Under 40 CFR 261.4 (b)

SHIPPER: USA Environmental, Inc.

PROJECT ADDRESS / LOCATION:

CITY, STATE, ZIP:

PROJECT CONTACT AND TELEPHONE NUMBER:

USACE IDENTIFIER / INSTALLATION NAME OR CONTRACT #:

UNIQUE CONTAINER # (i.e., 0001 of 0001): of

UNIQUE SEAL IDENTIFICATION #:

Date:	Seal Number:	1st Initials:	2nd Initials:	Comments:

☐ **DD Form 1348-1A** ☐ **100% Material Inspection and Release Form**

NOTE: See DD Form 1348-1A For Additional Information.
Check box(s) if DD Form 1348-1A and/or the 100% Inspection Form will accompany this shipment.

CONTACT INFORMATION: **USA Environmental, Inc.**
720 Brooker Creek Blvd., Suite 204
Oldsmar, FL. 34677
(813) 343-6336

CONTAINER LABEL

STANDARD OPERATING PROCEDURE – OPS-14
MEC ANALOG DETECTION AND REMOVAL ACTIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USAE) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of analog detection and removal actions (mag and dig) at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USAE site personnel, including contractor and subcontractor personnel, involved in the conduct of analog detection and removal actions (mag and dig) on a UXO/MEC contaminated site. The following USAE policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USAE SOPs, the USAE Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 7.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager is responsible for ensuring availability of resources to safely and effectively implement this SOP.

3.2 SITE MANAGER

The Site Manager is responsible for incorporating this SOP in plans, procedures, and training. In addition, he is responsible for oversight and supervision of field personnel, and ensuring compliance with this SOP.

3.3 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) ensures that all mag and dig activities are conducted in a safe manner, in accordance with the approved Work Plan, the SSHP, this SOP, and all applicable regulatory guidance. The UXOSO's duties shall include, but are not limited to: analyzing UXO explosives operational risk, hazards, and safety requirements; establishing and ensuring compliance with all site-specific safety requirements for UXO and explosives operations; enforcing personnel limits and safety exclusion zones (EZ) for UXO clearance operations; and all activities associated with UXO and explosives transportation, storage, and destruction.

3.4 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQCS) ensures compliance with the project Quality Control (QC) Plan and performs analog QC checks of completed grids in accordance with the Work Plan.

4.0 OPERATIONS

4.1 ANALOG DETECTION AND REMOVAL ACTIONS

All analog detection and removal (mag and dig) activities at MEC sites will be under the supervision of UXO qualified personnel. Non-UXO qualified personnel will not be allowed in the EZ during intrusive operations. If access is required by non-UXO qualified personnel, all work will stop while they are in the EZ. During operations, USAE personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will only be handled by qualified UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is fragmentation distance of the munition with the greatest fragmentation distance (MGFD), as stated in the Work Plan.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.).
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and/or unsafe acts will be immediately reported to the UXOSO.
- Failure to comply with safety rules/procedures may result in termination of employment.

4.2 GRID LAYOUT

A registered land surveyor will survey each of the clearance areas, accompanied by a UXO escort. Surveying activities will consist of locating clearance area boundaries, establishing permanent survey monuments, and establishing grids for geophysical investigation activities within the clearance areas.

Depending on the method selected and approved by the customer, the site layout and search grids will be established using a Global Positioning System (GPS), licensed surveyor, or compass and measuring tape. Survey crews will be escorted in the field by a UXO Technician II or above who will provide UXO avoidance including checking the intended survey stake locations with a magnetometer prior to driving stakes into the ground. This will prevent driving stakes into buried MEC.

4.3 ANALOG SWEEP PROCEDURES

Intrusive investigation team(s) will consist of a Team Leader (UXO Technician III) and UXO Technicians II/I. During intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. UXO operations will only be performed by qualified UXO Technicians, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC/UXO, explosives, or explosive items
- Disposal, including movement, transportation, and final disposal of MEC

Analog detector sweeps (i.e., mag and dig) are particularly effective in areas where vegetation and terrain limit the use of larger digital systems. Also, mag and dig approaches should be used when there is insufficient difference between UXO at the site and other metallic fragments and debris, such that digital discrimination is ineffective or cost prohibitive.

Initially, individual search lanes will be established approximately 5 feet (ft) wide. Each lane will be surveyed using a Schonstedt GA-52CX and/or White's XLT magnetometer. The operation will begin at one end of each lane and move in a forward direction toward the opposing baseline. During the forward movement the technician moves the magnetometer back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer are performed at a pace that ensures the entire lane is searched and that the instrument is able to appropriately respond to subsurface anomalies. When a subsurface anomaly or metallic surface object is encountered, the UXO Technician halts and investigates the anomaly at that time. Throughout this operation the team leader closely monitors the team's individual performance to ensure these procedures are being performed correctly.

4.4 SURFACE UXO

Upon encountering a surface MEC it will be identified by two UXO Technicians and marked in accordance with the approved Work Plan for future disposition. If detonation cannot be arranged the same day as the MEC is identified, a guard will be posted during the non-working hours to ensure the item is not disturbed.

4.5 SUBSURFACE ANOMALIES

4.5.1 MANUAL EXCAVATIONS

Subsurface anomalies will be investigated by UXO-qualified personnel as they are identified during the sweep. All identified anomalies within the grid will be intrusively investigated. Excavations for individual anomalies will be conducted using the Schonstedt GA-52CX and/or White's XLT magnetometers to assist the team in determining the location and orientation of the target item. The UXO Technicians excavating anomalies shall initially remove no more than a 6-inch layer of soil along side the location of the anomaly, being careful not to impact the anomalous feature. The UXO Technician will conduct a visual and electronic search of the excavation to further pin point the anomaly source as needed. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located. Excavations on individual anomalies greater than 4 ft below the ground surface (bgs) will not be made without prior approval of the U.S. Army Corps of Engineers (USACE) OE Safety Specialist.

4.5.2 MECHANICAL HANDLING EQUIPMENT

Mechanical Handling Equipment (MHE) may be used to excavate large anomalies (e.g., pits) or those deeper than 4 ft bgs if required (e.g., to confirm the anomaly is not a MEC). Any decision to use MHE to excavate these anomalies will be made by the SUXOS and the USACE OE Safety Specialist (see SOP OPS-06, Excavation and Trenching for detailed MHE procedures). The excavation will proceed slowly to ensure the item is not broached by the MHE. If the excavated material is considered to be a MEC, it shall be uncovered sufficiently by hand to obtain a positive identification of the item. If the item is identified as UXO/MEC, a determination will subsequently be made as to whether it is fuzed or not.

While excavating with MHE, a UXO Technician will be stationed in a position that is out of the reach of the excavation equipment but affords a view of the excavation site. This observer will ensure that the next lift is visually free of UXO. The excavated material will be placed onto the ground within a screening area that has been surface swept and the boundaries recorded. The soil spoils will be spread across the screening area using the excavator bucket. The excavated material will be screened for range related debris, munitions debris, and UXO/MEC items. UXO technicians will recover all pieces of munitions debris or range related debris and any ordnance items. After screening, the soil spoils will be stockpiled to the side of the screening area.

5.0 RECORD KEEPING

The team leader will maintain a field logbook, which at a minimum will contain a record of the following:

- Weather
- Instrument details and serial number
- Team Personnel
- Grids worked
- Start and stop times
- MEC/UXO items encountered

The data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MD, MPPEH, UXO, and non-MEC Scrap)
- Description (e.g., “projo, 20-mm, practice, MK105” and “base, coupling, firing device”)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Found in a pit?
- Piece of frag?
- Initial disposition (e.g., left in place and removed to scrap pile)
- Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

6.0 DISPOSAL OPERATIONS

Fuzed UXO/MEC items will be blown in place (BIP), and un-fuzed UXO/MEC items will be consolidated whenever possible in accordance with USACE Engineer Pamphlet 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects, dated 16 July 1999, Appendix D. In no case shall the SUXOS authorize or undertake destruction of UXO/MEC when there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage. The USACE OE Safety Specialist will be consulted for guidance in the event that there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage.

7.0 REFERENCES

- USACE Safety Considerations for UXO

- USAE Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications

Appendix B
Pre-RI Reconnaissance Anomaly Selection Process and Reacquisition Procedures

Pre-RI Reconnaissance Anomaly Selection Process and Reacquisition Procedures

To meet the pre-RI reconnaissance objective, a limited intrusive investigation, consisting of 2 days of activities (1 day at each site), will be performed. A sample of the anomalies identified during the 2012 DGM survey (CH2M HILL, 2012) will be selected to represent various amplitudes of anomalies. While not a statistical sampling, investigation of the selected sample will result in a general understanding of the types of metal in the subsurface at the site. The objectives of the pre-RI reconnaissance anomaly selection are:

1. Identify up to 100 anomalies from each DBT site for intrusive investigation (2 days [1 day at each DBT]).
2. Select anomalies using random and biased sorting. Biased sorting will select the highest mV readings and good spatial distribution.

DGM Survey Activities

A DGM survey was conducted in June 2012 by NAEVA Geophysics using electromagnetic metal detectors. The DGM survey characterized the density and extent of subsurface geophysical anomalies (some of which may represent MEC) within the DBT areas. The DGM survey was conducted along the 30 transects, with 15 transects in the North DBT area and 15 transects in the South DBT area. A total of 518 anomalies were identified above a target threshold of 3 millivolts (slightly higher than the background geophysical response) —145 anomalies in the North DBT area and 373 anomalies in the South DBTs.

Data collection was accomplished using an EM61-MK2 metal detector with fiducial positioning and then projected to NAD83, UTM Zone 18N, meters. The anomalies were changed back into Local XY coordinates in order to reacquire along the transects.

The data were delivered in two separate groups, transects 1-15 (Northern DBT) and 16-30 (Southern DBT), these are being treated separately for selection purposes.

Random Anomaly Generation

A random number was generated and assigned to each anomaly. The random number was then sorted lowest to highest and the first 90 were selected. These anomalies were then sorted by mV value to ensure there was a sampling from a range of values. They were then plotted to ensure there was a good spatial distribution. Ten more biased anomalies representing the highest mV readings and good spatial distribution were selected to fill in the distribution.

Reacquire Process

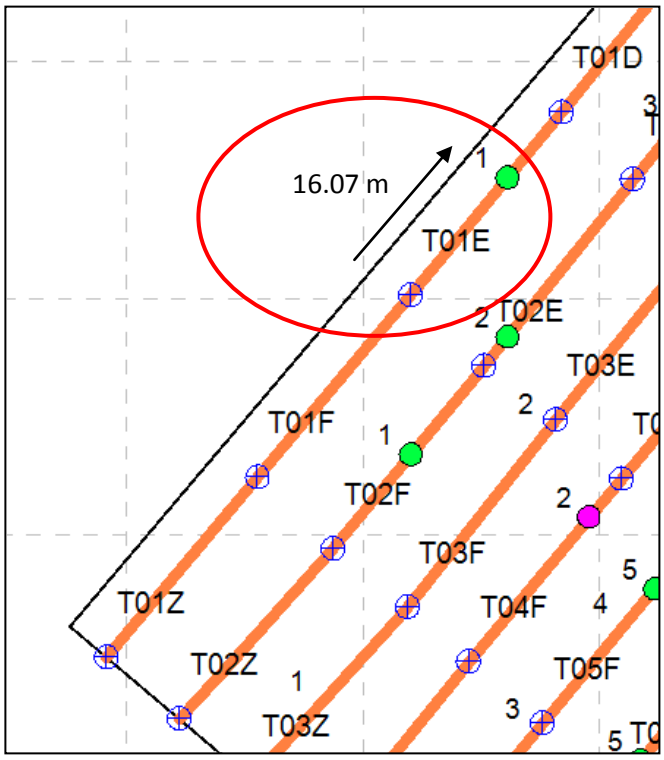
Transect stakes were laid out in a grid beginning in the northeast corner and spaced 25 meters apart. The grid stakes are labeled with a transect number and a letter, A, B, C, D, E, F and Z, where T001A would be in the far northeast corner and T001Z would be in the far southeast corner.

Because the DGM survey was collected from the SE corner moving northeast, the transect distances are from the Z-end moving toward the A-end. X_Local is the transect number, and Y_Local is the distance downline. The anomalies will be reacquired from the nearest stake to the southwest. Therefore, the anomaly locations are presented as distances from the nearest stake from the southwest. North and South DBT target anomaly locations are presented in Tables B1 and B2, respectively, and also shown on Figures B1 and B2, respectively.

Example for T001-001

Anomaly ID	X_Local	Y_Local	mV	Nearest Stake to the Southwest	Stake Distance Moving Northeast (meters)	Distance From Stake Moving Northeast (meters)
T001-00001	1	66.07	5.05	T01E	50	16.07

Stake T01E is 50 meters north of T01Z. Attaching a tape measure on T01E, T001-001 will be 16.07 meters up the line.



References

CH2M HILL 2012. *Geophysical Investigation Results and Proposed Pre-Remedial Investigation Reconnaissance and Remedial Investigation Approach Technical Memorandum, Former Dive Bombing Targets - NALF Fentress Naval Air Station Oceana, Virginia.* November.

TABLE B1

Target Anomalies - North DBT

NALF Fenttress - NAS Oceana

Virginia Beach, Virginia

Anomaly ID	X_UTM	Y_UTM	Biased	Random	mV	Nearest Stake to the Southwest	Stake Distance Moving North (meters)	Distance From Stake Moving North (meters)
T001-00001	398590.20	4062037.80		87.00	5.1	T01E	50	16.07
T001-00002	398616.20	4062068.80		8.00	11.1	T01C	100	6.57
T002-00001	398580.00	4062008.60		79.00	11.7	T02F	25	12.87
T002-00002	398590.20	4062021.00		3.00	11.7	T02F	25	28.93
T002-00003	398608.00	4062043.40		37.00	6.6	T02D	75	7.36
T002-00004	398614.80	4062051.60	1	137.00	24.0	T02D	75	17.93
T002-00006	398630.80	4062070.00		71.00	30.8	T02C	100	17.23
T004-00001	398574.60	4061972.40		56.00	2.9	T04Z	0	6.07
T004-00002	398598.80	4062002.00	1	93.00	3.1	T04F	25	19.71
T005-00001	398580.60	4061964.00		43.00	5.9	T05Z	0	3.49
T005-00005	398605.80	4061994.40		59.00	3.4	T05F	25	18.51
T005-00006	398612.40	4062002.40		72.00	10.8	T05E	50	3.87
T005-00007	398624.00	4062016.20		44.00	4.9	T05E	50	21.76
T005-00010	398672.00	4062072.00	1	127.00	6.4	T05B	125	19.95
T006-00002	398591.90	4061961.70		75.00	1553	T06Z	0	9.17
T006-00003	398595.50	4061966.00		16.00	9.4	T06Z	0	14.88
T006-00005	398604.20	4061976.30		26.00	120	T06F	25	3.60
T006-00006	398618.00	4061993.30		84.00	9.1	T06E	50	0.55
T006-00007	398631.10	4062008.10		88.00	59.3	T06E	50	20.24
T006-00008	398644.80	4062024.90		24.00	3.4	T06D	75	16.78
T006-00009	398669.90	4062055.20		21.00	3.6	T06B	125	5.77
T006-00010	398671.20	4062056.70		6.00	19.1	T06B	125	7.78
T006-00011	398681.10	4062067.50		25.00	4.3	T06B	125	22.41
T007-00001	398621.40	4061982.40	1	116.00	46.7	T07F	25	18.84
T007-00002	398632.80	4061995.40		50.00	8.6	T07E	50	11.20
T007-00003	398639.00	4062002.40		60.00	32.6	T07E	50	20.56
T007-00004	398640.60	4062004.20		52.00	3.0	T07E	50	22.96
T007-00005	398642.00	4062005.80		19.00	4.3	T07D	75	0.09
T007-00006	398647.60	4062012.00		64.00	11.0	T07D	75	8.36
T007-00007	398649.80	4062014.40		7.00	10.5	T07D	75	11.64
T007-00008	398674.00	4062044.00		17.00	4.4	T07C	100	24.91
T007-00010	398682.20	4062053.40		89.00	6.9	T07B	125	12.29
T007-00011	398687.00	4062058.80		45.00	58.2	T07B	125	19.53
T008-00002	398606.80	4061948.80		69.00	76.0	T08Z	0	8.66
T008-00003	398607.60	4061949.80		55.00	25.7	T08Z	0	9.98
T008-00004	398635.50	4061983.50		9.00	2.6	T08E	50	3.88
T008-00005	398637.40	4061985.60		54.00	4.4	T08E	50	6.73
T008-00006	398640.20	4061988.80		28.00	3.8	T08E	50	10.89
T008-00008	398646.70	4061996.30		41.00	2.5	T08E	50	20.76
T008-00009	398649.80	4061999.80		49.00	11.7	T08D	75	0.38
T008-00010	398653.40	4062003.80		78.00	37.4	T08D	75	5.78
T008-00013	398668.40	4062021.40		4.00	9.2	T08C	100	3.94
T008-00014	398671.40	4062025.00		10.00	4.3	T08C	100	8.61
T008-00015	398685.00	4062041.30		34.00	2.5	T08B	125	4.88
T009-00001	398612.40	4061939.60		77.00	5.3	T09Z	0	5.30
T009-00002	398618.60	4061947.20	1	99.00	6989	T09Z	0	15.11
T009-00003	398636.20	4061967.40		46.00	4.1	T09F	25	16.96
T009-00004	398637.80	4061969.20		76.00	3.8	T09F	25	19.41
T009-00005	398646.80	4061979.60		20.00	4.3	T09E	50	8.24
T009-00006	398648.30	4061981.40		85.00	2.7	T09E	50	10.56
T009-00008	398655.00	4061989.20		53.00	41.9	T09E	50	20.93
T009-00009	398661.40	4061996.80		2.00	139	T09D	75	5.86
T009-00012	398670.00	4062007.20	1	136.00	26.5	T09D	75	19.24
T009-00015	398678.20	4062016.80		86.00	10.6	T09C	100	6.89
T009-00016	398682.60	4062022.00		65.00	4.3	T09C	100	13.79
T009-00018	398700.40	4062043.20		22.00	5.6	T09B	125	16.38
T009-00019	398702.00	4062045.40		27.00	21.7	T09B	125	19.08
T010-00002	398649.40	4061968.00		18.00	15.9	T10E	50	0.90
T010-00004	398658.40	4061978.60		80.00	9.6	T10E	50	14.89
T010-00005	398662.40	4061983.60		33.00	33.8	T10E	50	21.30

TABLE B1

Target Anomalies - North DBT

NALF Fenttress - NAS Oceana

Virginia Beach, Virginia

Anomaly ID	X_UTM	Y_UTM	Biased	Random	mV	Nearest Stake to the Southwest	Stake Distance Moving North (meters)	Distance From Stake Moving North (meters)
T010-00007	398670.60	4061992.80		1.00	3895	T10D	75	8.51
T010-00008	398673.60	4061996.40		47.00	3.3	T10D	75	13.26
T010-00009	398675.60	4061998.60		90.00	17.4	T10D	75	16.22
T010-00010	398676.60	4061999.80		48.00	13.7	T10D	75	17.74
T010-00012	398686.40	4062010.80		66.00	4.4	T10C	100	7.46
T010-00014	398704.00	4062031.40		68.00	2.7	T10B	125	9.60
T010-00015	398710.80	4062040.20		23.00	5.2	T10B	125	20.70
T011-00001	398643.60	4061945.20		14.00	6.8	T11F	25	4.73
T011-00002	398645.90	4061947.90		5.00	2.9	T11F	25	8.30
T011-00003	398651.00	4061953.80		57.00	5.6	T11F	25	16.16
T011-00004	398657.60	4061961.60	1	118.00	12.2	T11E	50	1.43
T011-00005	398660.00	4061964.60		11.00	7.1	T11E	50	5.27
T011-00006	398674.60	4061982.20		51.00	20.1	T11D	75	3.18
T011-00008	398683.00	4061992.60		81.00	13.7	T11D	75	16.61
T011-00009	398689.20	4062000.40		73.00	2.9	T11C	100	1.50
T011-00010	398695.00	4062007.00		62.00	4.1	T11C	100	10.21
T011-00013	398706.00	4062019.60		38.00	11.3	T11B	125	1.81
T012-00001	398645.20	4061932.00	1	102.00	165	T12Z	0	20.69
T012-00002	398666.20	4061957.60		15.00	3.4	T12E	50	3.67
T012-00004	398672.80	4061965.20		58.00	18.3	T12E	50	13.71
T012-00005	398679.80	4061973.20		61.00	8.4	T12E	50	24.32
T012-00006	398696.60	4061991.80		29.00	10.2	T12D	75	24.29
T012-00009	398709.00	4062007.40	1	123.00	5.3	T12C	100	19.33
T012-00011	398714.20	4062014.00		67.00	46.8	T12B	125	2.80
T012-00013	398723.40	4062024.60		31.00	3.4	T12B	125	16.89
T013-00002	398686.40	4061965.40		70.00	3.6	T13E	50	22.64
T013-00005	398704.10	4061987.00		35.00	5.7	T13C	100	0.57
T013-00006	398705.00	4061988.00		36.00	5.6	T13C	100	1.92
T013-00007	398716.00	4062000.80		32.00	7.0	T13C	100	18.77
T013-00008	398721.80	4062007.60		63.00	154	T13B	125	2.85
T013-00009	398728.20	4062014.80		82.00	26.4	T13B	125	12.46
T013-00010	398733.40	4062020.80		12.00	10.2	T13B	125	20.46
T014-00001	398659.60	4061918.20		13.00	2.7	T14Z	0	19.32
T014-00003	398677.60	4061940.00	1	134.00	2.9	T14F	25	22.58
T014-00006	398715.20	4061981.70	1	108.00	2.8	T14C	100	3.76
T014-00008	398726.20	4061996.00		39.00	3.7	T14C	100	21.71
T014-00009	398733.60	4062005.20		42.00	4.3	T14B	125	8.54
T015-00001	398684.50	4061931.90		83.00	2.6	T15F	25	20.69
T015-00002	398696.20	4061945.80		74.00	10.7	T15E	50	13.81
T015-00003	398724.20	4061980.00		40.00	14.2	T15C	100	8.05
T015-00004	398746.00	4062005.20		30.00	3.5	T15B	125	16.58

Note: Biased 1 value reresents highest mV readings and good spatial distribution.

TABLE B2

Target Anomalies - South DBT

NALF Fenttress - NAS Oceana

Virginia Beach, Virginia

Anomaly ID	X_UTM	Y_UTM	Biased	Random	mV	Nearest Stake to the South	Stake Distance Moving North (meters)	Distance from Nearest Stake Moving North (meters)
T016-00007	398443.0	4061776.6		44	8.93	T16D	75	7.22
T017-00003	398415.8	4061731.0	1	133	3.60	T17F	25	4.76
T017-00004	398427.2	4061742.6		49	10.51	T17F	25	21.10
T017-00009	398478.6	4061804.0	1	216	115.18	T17B	125	1.60
T018-00002	398414.0	4061712.4		54	3.04	T18Z	0	14.54
T019-00002	398435.2	4061723.2	1	365	37.73	T19F	25	11.36
T019-00003	398445.0	4061734.4		13	18.21	T19E	50	1.46
T019-00005	398451.0	4061740.6		40	14.33	T19E	50	10.15
T019-00008	398473.0	4061765.4		33	4.98	T19D	75	18.29
T019-00011	398499.2	4061797.4		22	46.87	T19B	125	9.87
T020-00002	398431.6	4061701.6		29	9.70	T20Z	0	17.59
T020-00004	398446.4	4061719.0		67	4.08	T20F	25	15.37
T020-00007	398451.4	4061724.8		84	31.62	T20F	25	23.05
T020-00013	398460.0	4061736.2		36	33.17	T20E	50	12.39
T020-00020	398472.4	4061751.4		52	29.61	T20D	75	7.05
T020-00025	398484.2	4061764.0		81	5.47	T20D	75	24.47
T021-00002	398452.8	4061711.4		69	2.91	T21F	25	13.62
T021-00003	398453.8	4061712.6		71	4.93	T21F	25	15.26
T021-00004	398455.0	4061714.2		80	7.70	T21F	25	17.14
T021-00009	398467.0	4061728.2		51	16.83	T21E	50	10.87
T021-00011	398474.0	4061736.0		57	17.40	T21E	50	21.44
T021-00012	398475.4	4061737.6		64	32.39	T21E	50	23.62
T021-00017	398485.2	4061748.8		78	44.81	T21D	75	13.47
T021-00021	398509.6	4061779.2	1	129	104.85	T21B	125	2.66
T021-00023	398520.8	4061792.0		47	14.61	T21B	125	19.68
T022-00009	398475.2	4061723.0		1	45.31	T22E	50	11.83
T022-00011	398478.0	4061726.6		11	8.43	T22E	50	16.46
T022-00018	398490.0	4061740.2		18	33.64	T22D	75	9.76
T022-00024	398500.8	4061752.0		88	27.34	T22C	100	0.86
T022-00026	398504.2	4061756.2		76	48.97	T22C	100	6.33
T023-00001	398460.6	4061688.4		85	26.50	T23F	25	1.00
T023-00007	398482.8	4061714.8		83	68.67	T23E	50	10.73
T023-00008	398484.2	4061716.6		45	71.02	T23E	50	13.01
T023-00009	398485.6	4061718.2		25	38.11	T23E	50	15.18
T023-00015	398496.8	4061731.8		3	35.27	T23D	75	7.93
T023-00018	398499.4	4061735.0		24	17.18	T23D	75	12.11
T023-00022	398504.6	4061741.6		16	3.35	T23D	75	20.56
T023-00025	398509.4	4061747.6		28	18.43	T23C	100	3.33
T023-00028	398514.4	4061754.2		27	13.68	T23C	100	11.56
T023-00029	398516.0	4061756.5		87	33.29	T23C	100	14.33
T023-00030	398517.8	4061759.0		30	32.97	T23C	100	17.44
T023-00034	398532.2	4061775.2		50	97.77	T23B	125	14.21
T023-00035	398539.4	4061782.8		42	20.02	T23B	125	24.79
T024-00007	398490.6	4061708.6		21	64.84	T24F	25	36.09
T024-00008	398493.4	4061712.2		31	22.59	T24F	25	40.69
T024-00010	398495.4	4061714.8		86	81.86	T24F	25	44.04
T024-00012	398498.4	4061718.4		14	9.50	T24F	25	48.75
T024-00018	398511.2	4061735.6		53	149.09	T24D	75	20.10
T024-00019	398513.2	4061738.2		48	144.34	T24D	75	23.40
T024-00023	398523.2	4061749.0		20	31.42	T24C	100	13.22
T024-00025	398529.6	4061755.6		19	9.57	T24C	100	22.54
T024-00027	398541.2	4061769.4		61	4.81	T24B	125	15.57
T024-00029	398545.6	4061774.6		72	149.93	T24B	125	22.42
T025-00006	398498.0	4061703.0	1	117	17.08	T25E	50	11.45
T025-00009	398502.4	4061708.0	1	206	25.93	T25E	50	18.17
T025-00019	398518	4061726		43	21.38	T25E	25	42.16
T025-00023	398523.4	4061732.2		56	100.16	T25C	100	0.43
T025-00025	398526.2	4061735.8		77	13.59	T25C	100	5.04
T025-00028	398531.6	4061742.6		62	182.95	T25C	100	13.84
T025-00029	398534	4061745.6		75	10.58	T25C	100	17.7
T025-00030	398537	4061749.5		70	5.84	T25C	100	22.64
T025-00033	398542.6	4061756.2		23	7.77	T25B	125	6.47

TABLE B2

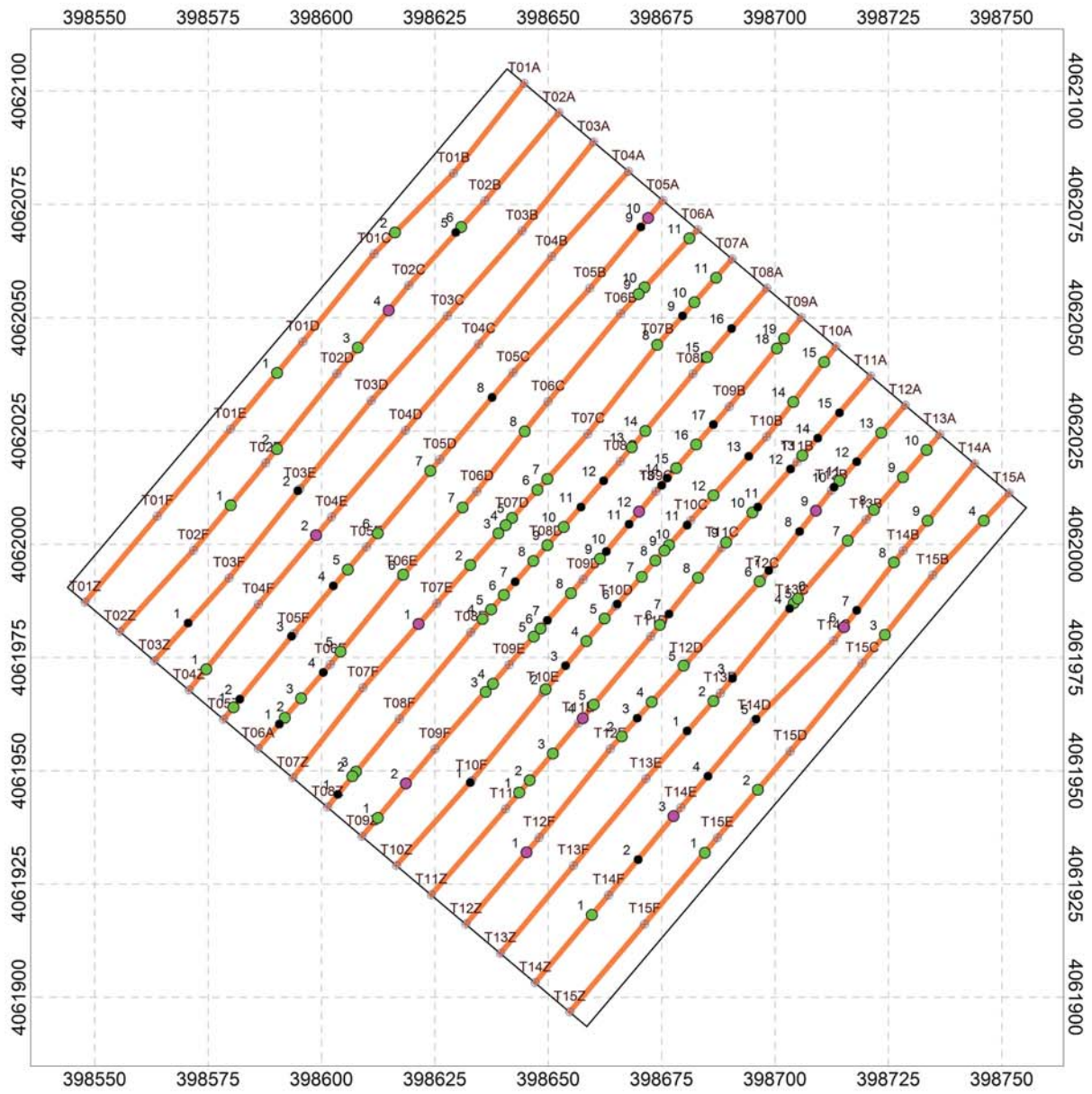
Target Anomalies - South DBT

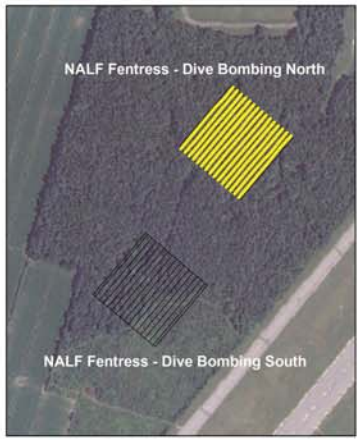
NALF Fenttress - NAS Oceana

Virginia Beach, Virginia

Anomaly ID	X_UTM	Y_UTM	Biased	Random	mV	Nearest Stake to the South	Stake Distance Moving North (meters)	Distance from Nearest Stake Moving North (meters)
T025-00034	398544.2	4061758		17	13.74	T25B	125	8.78
T026-00003	398501.2	4061690.8		7	43.17	T26Z	50	54.06
T026-00004	398502.4	4061692.2		6	4.29	T26Z	50	55.98
T026-00010	398514.4	4061707.4		38	90.60	T26D	75	0.63
T026-00011	398516.8	4061710.0		65	54.91	T26D	75	4.17
T026-00012	398518.0	4061711.6		55	18.15	T26D	75	6.15
T026-00014	398519.6	4061713.4		12	69.10	T26D	75	8.65
T026-00015	398520.2	4061714.2		68	66.47	T26D	75	9.58
T026-00018	398524.8	4061719.6		32	178.99	T26D	75	16.77
T026-00022	398530.2	4061726.2		66	13.21	T26C	100	0.46
T026-00024	398534.2	4061730.4		90	58.41	T26C	100	6.22
T026-00026	398537.4	4061734.0		35	15.63	T26C	100	11.06
T026-00028	398543.6	4061740.8		58	76.75	T26C	100	20.28
T026-00030	398547.0	4061744.6		79	28.23	T26B	125	0.42
T026-00031	398548.0	4061745.8		37	52.75	T26B	125	2.00
T027-00001	398478.8	4061649.6		39	53.18	T27Z	0	8.62
T027-00005	398501.2	4061676.6		9	30.93	T27F	25	18.36
T027-00014	398528.8	4061709.0	1	174	32.71	T27D	75	11.20
T027-00025	398549.8	4061732.4		73	25.88	T27C	100	17.76
T027-00029	398559.2	4061743.4		4	8.10	T27B	125	7.35
T027-00032	398568.6	4061755.4		46	45.08	T27B	125	22.65
T028-00013	398537.2	4061703.2		34	36.55	T28D	75	12.34
T028-00018	398546.2	4061713.4	1	242	145.29	T28C	100	1.06
T028-00022	398553.4	4061722.8	1	316	65.36	T28C	100	12.87
T028-00026	398559.8	4061731.2		15	25.67	T28C	100	23.52
T028-00031	398568.4	4061740.8	1	166	31.16	T28B	125	11.42
T029-00001	398514.8	4061661.4		63	33.27	T29F	25	15.70
T029-00003	398521.0	4061668.8		5	20.41	T29E	50	0.35
T029-00005	398529.0	4061678.6		59	4.78	T29E	50	13.08
T029-00007	398535.8	4061687.0		89	13.04	T29E	50	23.96
T029-00017	398560.8	4061715.8		60	118.40	T29C	100	12.28
T029-00022	398571.8	4061728.6		2	11.38	T29B	125	4.18
T029-00024	398576.4	4061733.8		82	13.61	T29B	125	11.23
T030-00006	398553.2	4061689.6		26	45.54	T30D	75	12.33
T030-00009	398561.6	4061699.2		74	6.10	T30C	100	0.11
T030-00014	398568.8	4061707.8		41	598.46	T30C	100	11.29
T030-00019	398578.4	4061719.6		8	53.05	T30B	125	1.51
T030-00023	398585.4	4061728.4	1	262	9.28	T30B	125	12.82
T030-00025	398589.6	4061733.6		10	6.53	T30B	125	19.50

Note: Biased 1 value reresents highest mV readings and good spatial distribution.





Legend

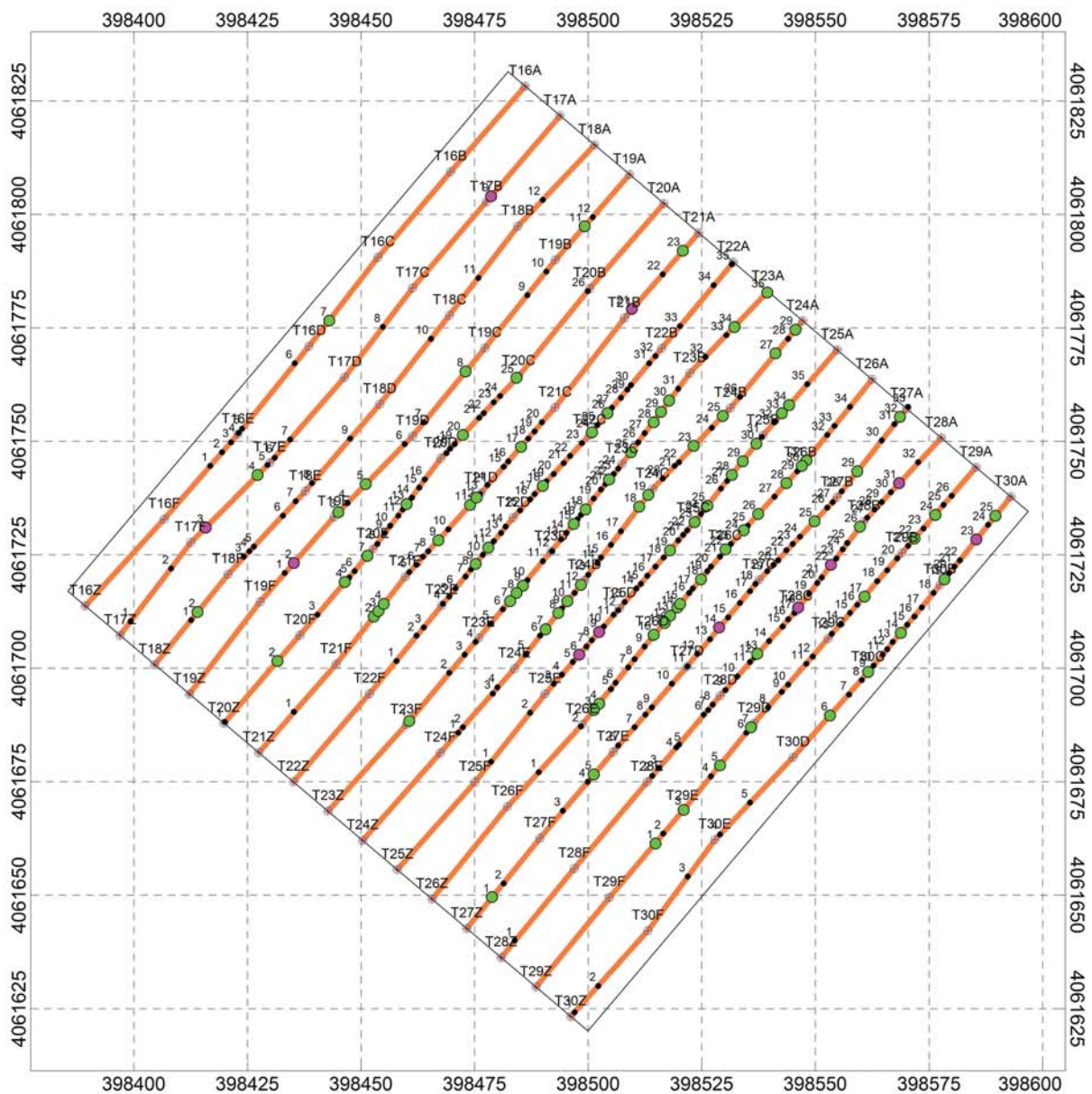
- North DBT Boundary
- Not Selected
- Randomly Selections
- Biased Selections
- T01Z Transect Stake Locations

25 0 25 50

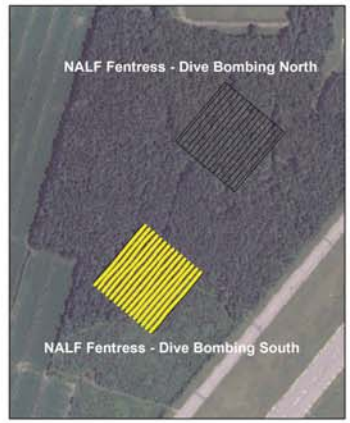
(meters)

NAD83 / UTM zone 18N

FIGURE C1 - Anomaly Selections for Pre-RI Intrusive Investigation
Block T015 - Transects T001 through T015 NALF Fentress Former Dive Bombing Targets- North Target Area Virginia Beach, Virginia
Date of Survey: April 16, 2012 Date of Map Creation: January 9, 2013
Map Approver: V Rystrom



CH2MHILL



Legend

- South DBT Boundary
- Not Selected
- Random Selections
- Biased Selections
- T16Z Transect Stake Locations

25 0 25 50

(meters)

NAD83 / UTM zone 18N

FIGURE C2 - Anomaly Selections for Pre-RI Intrusive Investigation
Block T030 - Transects T016 through T030 NALF Fentress Former Dive Bombing Targets- South Target Area Virginia Beach, Virginia
Date of Survey: April 17, 2012 Date of Map Creation: January 9, 2013
Map Approver: V Rystrom

Appendix B
Health and Safety Plan

Health and Safety Plan submitted under separate cover