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FINAL SAMPLING AND ANALYSIS PLAN FOR MUNITIONS RESPONSE PROGRAM LIMITED SITE INSPECTIONS AT FOURTEEN MUNITIONS RESPONSE PROGRAM SITES VOLUME 2 OF 2 APPENDIX A NAS KEY WEST FL

08/30/2010

TETRA TECH NUS

Final
Sampling and Analysis Plan
for
Munitions Response Program
Limited Site Inspections at Fourteen Munitions Response Program Sites

Naval Air Station Key West
Key West, Florida

Naval Facilities Engineering Command
NAS Jacksonville

Contract Number N62470-08-D-1001

Contract Task Order JM39

August 2010

Volume II of II
Appendix A

SAP Worksheet #1 – Title and Approval Page

(UFP-QAPP Manual Section 2.1)

SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)

FOR

MUNITIONS RESPONSE PROGRAM
LIMITED SITE INSPECTIONS AT FLEMING KEY DREDGE SPOIL AREA
AND TRUMBO POINT TEMPORARY STAGING AREA
MUNITIONS OF EXPLOSIVE CONCERN
(DETECTOR-AIDED SURFACE SURVEY)
INVESTIGATION
NAVAL AIR STATION KEY WEST
KEY WEST, FLORIDA

AUGUST 2010

Prepared for:
Naval Facilities Engineering Command Southeast
Naval Air Station Jacksonville, Building 903
Jacksonville, Florida 32212

Prepared by:
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Prepared under:
Comprehensive Long-Term Environmental Action Navy
CLEAN Contract No. N62470-08-D-1001
Contract Task Order JM39

Review Signatures:

Michelle Coffman
Project Manager
Tetra Tech NUS, Inc.
Michelle Coffman Date: 8/30/10

Tom Johnston
Quality Assurance Manager
Tetra Tech NUS, Inc.
Tom Johnston Date: 8/30/10

Approval Signatures:

Dana Hayworth
Navy Remedial Project Manager
NAVFAC SE
HAYWORTH.DANA.R.1264108450 Digitally signed by HAYWORTH.DANA.R.1264108450 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=HAYWORTH.DANA.R.1264108450 Date: 2010.08.31 14:04:19 -04'00'
Date:

Michael Green
NAVFAC QAO
NAVFAC LANT
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: 2010.08.31 14:04:19 -04'00'
Date:

Tracie Bolaños
Florida Department of Environmental Protection
Tracie Bolaños Date: August 31, 2010

EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) addresses Munitions and Explosives of Concern (MEC) Site Inspections (SIs) at the following two munitions sites located at Naval Air Station (NAS) Key West, Key West, Florida. The two sites are the Dredge Spoil Area, Fleming Key and the Trumbo Point Temporary Staging Area. **Figure ES-1** shows the locations of the sites addressed in this SI and **Figure ES-2** presents a location map of NAS Key West. These sites are briefly described below.

Dredge Spoil Area, Fleming Key

The Dredge Spoil Area, Fleming Key is a 42-acre site located on Fleming Key. Fleming Key is located north of the City of Key West in Monroe County, Florida. Fleming Key was originally created as a dredge spoil island prior to World War II and was used as a munitions storage area as early as 1942. This area was used for munitions storage in the past and nine closed magazines remain at the site. The dredge spoils placed at the site in 2004 through 2005 comprise a majority of the site. These spoils consist of an approximately 27-acre relatively flat, well-compacted mound that is 10 feet higher than the surrounding spoils used to form Fleming Key.

Trumbo Point Temporary Staging Area

The Trumbo Point Temporary Staging Area consists of approximately 1 acre located in the western portion of Trumbo Point Annex. Trumbo Point Annex is located north of the City of Key West in Monroe County, Florida. The majority of the site was filled using dredge spoils to create a staging area. This area consists of a relatively flat, well-compacted area that is at a similar elevation to the surrounding areas. A smaller area immediately east of the site, but not included within the fence surrounding the site, appears to have been filled with the same material as the rest of the parking lot. A depressional area is located on the west side of the site for storm water retention and a drainage ditch/swale is located along the southern site boundary that conveys storm water runoff from the surrounding area to the depression. There are no structures located at the site.

The initial phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, the Preliminary Assessment (PA) is currently being finalized. The PA identified the two MEC sites, Dredge Spoil Area, Fleming Key, and Trumbo Point Temporary Staging Area, for further investigation for MEC.

The primary objective of this SI is to determine whether further response actions or remedial investigations (RIs) are appropriate for either of the MEC sites identified in the PA to restore the sites to an acceptable environmental condition. The SI considers the background information provided in the PA and collects supplemental site-specific environmental data to determine types and rough orders of magnitude quantities of MEC present.

This SAP describes the MEC investigation and is designed to be "stand alone" in regards to the technical details of the MEC investigation. The MEC SAP has been prepared in accordance with Department of Defense (DoD) requirements for developing SAPs for the management of environmental data collection and use, as described in the UFP for Quality Assurance Project Plans (UFP-QAPP or UFP-SAP). DoD has issued a series of 37 worksheets, which are to be utilized in the development of UFP-SAPs.

The UFP-SAP worksheets were developed for the collection and evaluation of chemical concentration data in environmental media. These worksheets were not designed for the collection of geophysical data. The Navy Munitions Response Program (MRP) Workgroup has modified the UFP-SAP worksheets to be applicable to MEC investigations. These modified worksheets have been used in the preparation of this MEC SAP, and include 28 of the 37 worksheets, those not applicable are marked as NA.

The information provided in the worksheets was based on the results of several project scoping meetings including an NAS Key West Partnering Meeting. Attendees included representatives of the Navy, Florida Department of Environmental Protection (FDEP), and Tetra Tech NUS, Inc. (Tetra Tech) (see **Worksheet #9** for attendees). **Worksheet #10** contains summaries of the site-specific Conceptual Site Models (CSMs) for the two sites and the problem statement. The CSMs were used as the basis for the development of the project specific data quality objectives (DQOs), which are contained in **Worksheet #11**. The remainder of the worksheets describe the data collection and data evaluation procedures including quality requirements specific to the detector-aided surface survey investigations.

ACRONYMS

bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHSO	Company Health and Safety Officer
CLEAN	Comprehensive Long-Term Environmental Action Navy
CSM	Conceptual Site Model
CTO	Contract Task Order
CWM	Chemical warfare material
DERP	Defense Environmental Restoration Program
DID	Data item description
DoD	Department of Defense
DPT	Direct push technology
DQO	Data quality objective
FDEP	Florida Department of Environmental Protection
EOD	Explosive Ordnance Disposal
EP	Engineering Pamphlet
ES	Executive Summary
ESO	Explosives Safety Officer
ESS	Explosives Safety Submission
ESTCP	Environmental Security Technology Certification Program
FDEP	Florida Department of Environmental Protection
FOL	Field Operations Leader
FTMR	Field Task Modification Request
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
GPS	Global Positioning System
GSV	Geophysical System Verification
HASP	Health and Safety Plan
HDOP	Horizontal Dilution of Precision
HSM	Health and Safety Manager
HTRW	Hazardous, toxic, and radiological waste
ID	Identification
INRMP	Integrated Natural Resources Management Plan

IR	Installation Restoration
IRP	Installation Restoration Program
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MD	Munitions Debris
MEC	Munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRP	Munitions Response Program
NA	Not Applicable
NAD	North American Datum
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NFA	No Further Action
NOSSA	Naval Ordnance Safety and Security Activity
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PAH	Polyaromatic Hydrocarbon
PM	Project Manager
POC	Point of Contact
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI	Remedial Investigation
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SI	Site Inspection
SE	Southeast
SOP	Standard Operating Procedure
SSO	Site Safety Officer
SUXOS	Senior UXO Supervisor
TAV	Technical Assistance Visit
TBD	To be determined

Tetra Tech	Tetra Tech NUS, Inc.
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
UXOQC	UXO Quality Control
UXOQCS	UXO Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
WWI	World War I
WWII	World War II
XRF	X-ray flourescence

SAP Worksheets

List of Figures

Attachments

SAP Worksheet #2 – SAP Identifying Information

(UFP-QAPP Manual Section 2.2.4)

Site Name/Number:	**Naval Air Station (NAS) Key West, Key West, Florida**
Contractor Name:	**Tetra Tech NUS, Inc. (Tetra Tech)**
Contract Number:	**N62470-08-D-1001**
Contract Title:	**Comprehensive Long-Term Environmental Action Navy (CLEAN)**
Work Assignment Number:	**Contract Task Order (CTO) JM39**

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans* (UFP-QAPP) (USEPA, 2005) and the United States Environmental Protection Agency (USEPA) *Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (USEPA, 2002).
2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).
3. This SAP is a project-specific SAP.
4. List dates of scoping sessions that were held:

Scoping Session	Date
Internal Scoping Meeting	July 2, 2010
Site Visit	July 7 & 8, 2010
Partnering Meeting	July 13 - 15, 2010

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

Document Title	Date
Preliminary Assessment	2010

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

   Naval Facilities Engineering Command Southeast (NAVFAC SE) – Property Owner
   Florida Department of Environmental Protection (FDEP) – Regulatory Oversight
   USEPA – Regulatory Stakeholder

7. Lead organization

   NAVFAC SE

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

   Not Applicable (NA), as there are no exclusions.

UFP-QAPP Worksheet #	Required Information	Included or Excluded
A. Project Management		
Documentation		
1	Title and Approval Page	NA
2	Table of Contents SAP Identifying Information	NA
3	Distribution List	NA
4	Project Personnel Sign-Off Sheet	NA
Project Organization		
5	Project Organizational Chart	NA
6	Communication Pathways	NA
7	Personnel Responsibilities and Qualifications Table	NA
8	Special Personnel Training Requirements Table	NA
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	NA
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	NA
11	Site-Specific Project Quality Objectives	NA
12	Measurement Performance Criteria Table	NA
13	Sources of Secondary Use Data and Information Secondary Use of Data Criteria and Limitations Table	NA
14	Summary of Project Tasks	NA
15	Reference Limits and Evaluation Table	Not used – No samples are proposed for collection/analysis during the munitions and explosives of concern (MEC) detector-aided surface survey/investigation.
16	Project Schedule/Timeline Table	NA
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	NA
18	Sampling Locations and Methods/Standard Operating Procedure (SOP) Requirements Table Sample Location Map(s)	NA
19	Analytical Methods/SOP Requirements Table	Not used – No samples are proposed for collection/analysis during the MEC detector-aided surface survey/investigation.
20	Field Quality Control (QC) Sample Summary Table	NA
21	Project Sampling SOP References Table Sampling SOPs	NA
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	NA

UFP-QAPP Worksheet #	Required Information	Included or Excluded
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	Not used – No samples are proposed for collection/analysis during the MEC detector-aided surface survey/investigation.
24	Analytical Instrument Calibration Table	Not used – No analytical instrument calibration data will be required to support MEC detector-aided surface survey/investigation.
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Not used – No analytical instrument equipment maintenance, testing, or inspections will be required to support MEC detector-aided surface survey/investigation.
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	Not used – No analytical sample handling system will be required to support MEC detector-aided surface survey/investigation.
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	Not used – No samples are proposed for collection/analysis during the MEC detector-aided surface survey/investigation.
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	Not used – No analytical laboratory QC sampling will be required to support MEC detector-aided surface survey/investigation.
Data Management Tasks		
29	Project Documents and Records Table	NA
30	Analytical Services Table Analytical and Data Management SOPs	Not used – No analytical services will be required to support MEC detector-aided surface survey/investigation.
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	NA
32	Assessment Findings and Corrective Action Responses Table	NA
33	Quality Assurance (QA) Management Reports Table	NA
D. Data Review		
34	Verification (Step I) Process Table	NA
35	Validation (Steps IIa and IIb) Process Table	NA
36	Validation (Steps IIa and IIb) Summary Table	NA
37	Usability Assessment	NA

SAP Worksheet #3 – Distribution List

(UFP-QAPP Manual Section 2.3.1)

Name of SAP Recipient	Title/Role	Organization	Telephone Number (Optional)	E-Mail or Mailing Address	Document Control Number (Optional)
Dana Hayworth	NAVFAC SE Munitions Response Program (MRP) Lead/Alternate Remedial Project Manager (RPM)/ Manages Project Activities for Navy	NAVFAC SE	(904) 542-6417	dana.hayworth@navy.mil	NA
Robert Courtright	NAS Key West Point of Contact (POC)/ Environmental Program Manager	NAS Key West	(305) 293-2881	robert.courtright@navy.mil	NA
Mike Green (electronic upload)	NAVFAC MRP Senior Technical Advisor/Reviews SAP and QA Documentation for Navy	NAVFAC Atlantic	(757) 322-8108	mike.green@navy.mil	NA
Tracie Bolaños	FDEP RPM/ Provides State Regulator Input	FDEP	(850) 245-8998	tracie.bolanos@dep.state.fl.us	NA
Bonnie Capito (cover letter only)	Librarian	NAVFAC Atlantic	(757) 322-4785	bonnie.capito@navy.mil	NA

Name of SAP Recipient	Title/Role	Organization	Telephone Number (Optional)	E-Mail or Mailing Address	Document Control Number (Optional)
John Trepanowski (distribution letter only)	Tetra Tech Program Manager/Manages Navy Initiatives	Tetra Tech	(610) 382-1532	john.trepanowski@tetratech.com	NA
Garth Glenn (distribution letter only)	Deputy Program Manager/Manages Program Activities	Tetra Tech	(757) 461-3926	garth.glenn@tetratech.com	NA
Chuck Bryan	Tetra Tech NAS Key West Activities Coordinator/ Oversees Project Activities	Tetra Tech	(803) 641-4943	chuck.bryan@tetratech.com	NA
Michelle Coffman	Tetra Tech Project Manager (PM)/ Manages Project Activities	Tetra Tech	(412) 921-8549	michelle.coffman@tetratech.com	NA
Ralph Brooks	Unexploded Ordnance (UXO)/MEC Manager /Manages Corporate MEC Hazards and Risks	Tetra Tech	(770) 413-0965	ralph.brooks@tetratech.com	NA
Matt Soltis (Health and Safety Plan [HASP] Only)	Health and Safety Manager (HSM)/ Manages Corporate Health and Safety Program	Tetra Tech	(412) 921-8912	matt.soltis@tetratech.com	NA

Name of SAP Recipient	Title/Role	Organization	Telephone Number (Optional)	E-Mail or Mailing Address	Document Control Number (Optional)
Tom Johnston	Quality Assurance Manager (QAM)/ Reviews plan, QA for Tetra Tech	Tetra Tech	(412) 921-8615	tom.johnston@tetratech.com	NA
Glenn Wagner (Final Only)	Administrative Record	Tetra Tech	(412) 320-2211	glenn.wagner@tetratech.com	NA
Other Field Personnel To Be Determined (TBD)	Senior UXO Supervisor (SUXOS), UXO Safety/QC, MEC Field Personnel	Tetra Tech	TBD	TBD	NA

SAP Worksheet #4 – Project Personnel Sign-Off Sheet

(UFP-QAPP Manual Section 2.3.2)

Certification that project personnel have read the text will be obtained by one of the following three methods as applicable:

1. In the case of regulatory agency personnel with oversight authority approval letters or e-mails will constitute verification that applicable sections of the SAP have been reviewed. Copies of regulatory agency approval letters/e-mails will be retained in the project files and are listed in **Worksheet #29** as project records.

2. E-mails will be sent to Navy, Tetra Tech, and subcontractor project personnel whom will be requested to verify by e-mail that they have read the applicable SAP/sections and the date on which they were reviewed. Copies of the verification e-mail will be included in the project fields and identified in **Worksheet #29**.

A copy of the signed **Worksheet #4** will be retained in the project files as a project document in **Worksheet #29**.

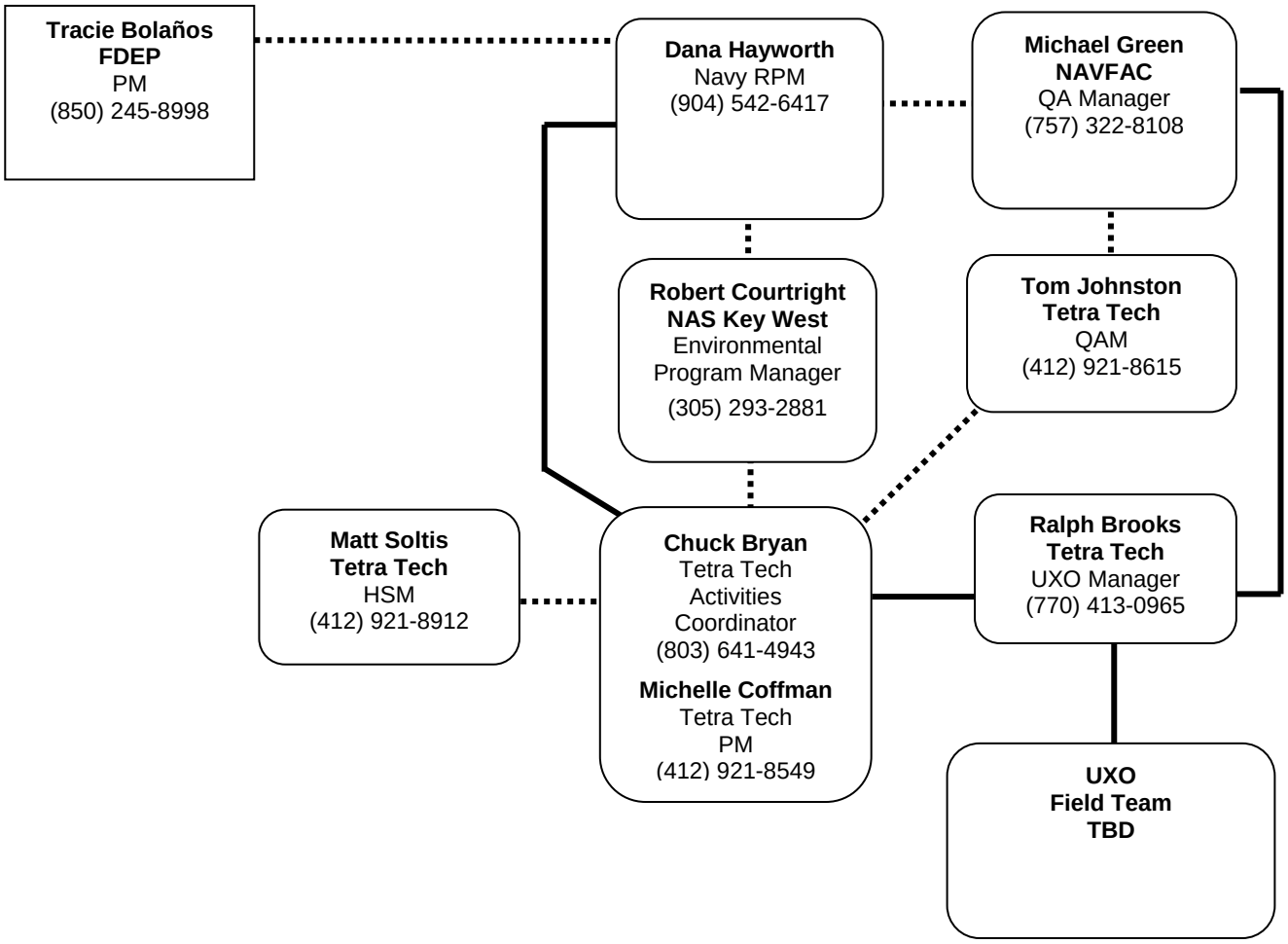
Name	Organization/Title/Role	Telephone Number (optional)	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Navy and Regulator Project Team Personnel					
Dana Hayworth	Navy, RPM/Manages Project Activities for the Navy	(904) 542-6417	See **Worksheet #1** for signature	All	
Michael Green	NAVFAC MRP Senior Technical Advisor/Reviews SAP and QA Documentation for Navy	(757) 322-8108	See **Worksheet #1** for signature	All	

Name	Organization/Title/Role	Telephone Number (optional)	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Robert Courtright	Environmental Program Manager/Facility POC	(305) 293-2881		All	
Tracie Bolaños	FDEP RPM/Provides Regulator Input	(850) 245-8998	See **Worksheet #1** for signature	All	
Tetra Tech Project Team Personnel					
Chuck Bryan	Tetra Tech, NAS Key West Activities Coordinator/Oversees Project Activities	(803) 641-4943			
Michelle Coffman	Tetra Tech, PM/Manages Project Activities	(412) 921-8549	See **Worksheet #1** for signature	All	
Ralph Brooks	Tetra Tech UXO/MEC Manager	(770) 413-0965		All	
TBD	Tetra Tech SUXOS	TBD		All	
TBD	Tetra Tech UXO Safety/QC	TBD		All	
Matt Soltis	Tetra Tech HSM	(412) 921-8912		HASP **Worksheet #17**	
Tom Johnston	Tetra Tech QAM	(412) 921-8615	See **Worksheet #1** for signature	All	

SAP Worksheet #5 – Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1)

Lines of Authority ——— ..... Lines of Communication



SAP Worksheet #6 – Communication Pathways

(UFP-QAPP Manual Section 2.4.2)

Communication Driver	Responsible Person Affiliation	Name	Phone Number and/or E-Mail	Procedure
MEC encountered	Tetra Tech Field Staff	TBD		Within 30 minutes, Tetra Tech UXO Technicians will verbally notify field staff, secure the area, and contact Tetra Tech UXO Manager and NAS Key West POC for munitions (or alternate).
	Tetra Tech UXO Staff	TBD		
	Tetra Tech UXO Manager	Ralph Brooks	(770) 413-0965	Tetra Tech UXO Manager will verbally inform Tetra Tech PM on the same day.
	Tetra Tech PM	Michelle Coffman	(412) 921-8549	Tetra Tech PM will verbally inform Navy RPM and the NAS Key West Explosive Safety Specialist on the same day.
	Navy RPM	Dana Hayworth	(904) 542-6417	Navy RPM will inform Naval Ordnance Safety and Security Activity (NOSSA) on the same day as informed.
	NAS Key West POC	Robert Courtright	(305) 293-2881	The NAS Key West Explosive Safety Specialist or designee will make base emergency notifications on the same day.
	NAS Key West Explosive Safety Specialist	Edward Donohue	(305) 797-4412	

Communication Driver	Responsible Person Affiliation	Name	Phone Number and/or E-Mail	Procedure
Field issues that require changes in field tasks	Tetra Tech Field Staff Navy RPM Tetra Tech UXO Manager Tetra Tech PM	TBD Dana Hayworth Ralph Brooks Michelle Coffman	TBD (904) 542-6417 (770) 413-0965 (412) 921-8549	Tetra Tech Field Staff will inform Tetra Tech PM on the day the issue is discovered; Tetra Tech PM will inform Navy RPM within 1 business day; if warranted, Navy RPM will issue scope change approval [verbally or via electronic mail (e-mail)]; scope change to be implemented before work is executed. Changes will be documented via a Field Task Modification Request (FTMR) form within 2 days of identifying the need for change.
SAP amendments	Tetra Tech PM Navy RPM	Michelle Coffman Dana Hayworth	(412) 921-8549 (904) 542-6417	Tetra Tech PM will send scope change to Navy RPM via e-mail within 1 business day of recognizing a need for change.
Field work schedule changes	Tetra Tech PM Navy RPM Tetra Tech Field Staff	Michelle Coffman Dana Hayworth TBD	(412) 921-8549 (904) 542-6417 TBD	Verbally inform Navy on the day that schedule change is known and document via schedule impact letter as soon as impact is realized.

Communication Driver	Responsible Person Affiliation	Name	Phone Number and/or E-Mail	Procedure
Field issues that require changes in scope of field work	Tetra Tech Field Staff Tetra Tech UXO Manager Tetra Tech PM Navy RPM	TBD Ralph Brooks Michelle Coffman Dana Hayworth	TBD (770) 413-0965 (412) 921-8549 (904) 542-6417	Tetra Tech Field Staff or UXO Manager will inform (verbally or via e-mail) the Tetra Tech PM on the day that the issue is discovered. Tetra Tech PM will inform the Navy RPM. Navy RPM will issue scope change if warranted; scope change to be implemented before work is executed Document change on FTMR Form within 2 days.
Recommendation to stop work and initiate work upon corrective action	Tetra Tech PM Tetra Tech UXO Manager Tetra Tech Field Staff Tetra Tech QAM Tetra Tech HSM Navy RPM NAS Key West POC	Michelle Coffman Ralph Brooks TBD Tom Johnston Matt Soltis Dana Hayworth Robert Courtright	(412) 921-8549 (770) 413-0965 TBD (412) 921-8615 (412) 921-8912 (904) 542-6417 (305) 293-2881	Within 1 hour, the responsible party will (verbally or via e-mail) inform subcontractors, the Navy RPM, NAS Key West POC, Tetra Tech PM, Tetra Tech Field Staff, Tetra Tech QAM, Tetra Tech Project Chemist, and Tetra Tech HSM.

Communication Driver	Responsible Person Affiliation	Name	Phone Number and/or E-Mail	Procedure
Corrective action for field program	Tetra Tech QAM	Tom Johnston	(412) 921-8615	Tetra Tech QAM will notify Tetra Tech PM within 1 day that the corrective action has been completed. The Tetra Tech PM will then notify the Navy RPM within 1 day.

Note: Communications between partnering team members will follow the Communication Loop developed during the July 13 – 15, 2010, Partnering Meeting.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

(UFP-QAPP Manual Section 2.4.3)

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
John Trepanowski	Program Manager	Tetra Tech	Oversees CLEAN Program.	Available on request
Michelle Coffman	PM	Tetra Tech	Oversees project, financial, schedule, and technical day-to-day management of the project. • Ensures timely resolution of project-related technical, quality, and safety questions associated with Tetra Tech operations. • Functions as the primary Tetra Tech interface with the Navy RPM, NAS Key West, Tetra Tech field and office personnel. • Ensures that Tetra Tech health and safety issues related to this project are communicated effectively to all personnel and off-site laboratories. • Monitors and evaluates any Tetra Tech subcontractor performance. • Coordinates and oversees work performed by Tetra Tech field and office technical staff (including data validation, data interpretation, and report preparation). • Coordinates and oversees maintenance of all Tetra Tech project records. • Coordinates and oversees review of Tetra Tech project deliverables. • Prepares and issues final Tetra Tech deliverables to the Navy.	Available on request
Dana Hayworth	RPM	NAVFAC SE	Oversees project scoping, data review, and evaluation.	Available on request

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
Robert Courtright	NAS Key West POC	NAS Key West	Reports field activities to the Navy RPM, participates in scoping, data review, and evaluation.	Available on request
Ralph Brooks	UXO Manager	Tetra Tech	Oversees selection of qualified UXO personnel, establishes overall QC program for UXO activities, addresses UXO-related issues as identified by field personnel.	Graduate, Navy Explosive Ordnance Disposal (EOD) School - Indian Head, 26 years of military EOD experience
TBD	SUXOS	Tetra Tech	Provides anomaly avoidance services. • Supervises the conduct of all onsite UXO-related operations. • Prepares daily reports of field activities. • Conducts daily site safety briefings. • Escorts on-site UXO personnel in suspect MEC areas. • Determines location and identification of suspect MEC. • Conducts detector-aided surface sweep.	Graduate, Military EOD School, Minimum 8 years UXO experience
TBD	UXO Safety/QC	Tetra Tech	Provides anomaly avoidance services. • Ensures initial site-specific training is delivered for all field personnel before field activities begin and that all safety control measures have been established. • Ensures all UXO-specific certifications are filed onsite and are available for Navy inspection. • Enforces personnel limits and safety exclusion zones. Provides field QC. • Conducts, documents, and reports safety inspections. • Conducts QC audits. • Identifies, documents, and reports corrective actions.	Experience in all phases of munitions response actions or range clearance activities, 8 years of experience

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
TBD	Site Safety Officer (SSO)	Tetra Tech	The SSO will be responsible for training and monitoring site conditions. The SSO reports to the Company Health and Safety Officer (CHSO) and indirectly to the UXO Manager, and PM. Details of the SSO's responsibilities are presented in the HASP and include: • Controlling specific health and safety-related field operations such as personnel decontamination, monitoring of worker heat or cold stress, and distribution of safety equipment. • Conducting and documenting a daily health and safety briefing each day while on site. • Assuring that field personnel comply with all procedures established in the HASP. • Identifying an assistant SSO in his/her absence. • Terminating work if an imminent safety hazard, emergency situation, or other potentially dangerous situation is encountered. • Assuring the availability and condition of health and safety monitoring equipment. • Coordinating with the UXO Manager and PM to institute and document any necessary HASP modifications. • Ensuring that facility personnel and subcontractors are adequately advised and kept clear of potentially contaminated materials.	
Matt Soltis	HSM	Tetra Tech	Oversees CLEAN Program Health and Safety Program • Provides technical advice to the Tetra Tech PM on matters of health and safety. • Oversees the development and review of the HASP. • Conducts health and safety audits. • Prepares health and safety reports for management.	B.S., Industrial Safety Sciences, 24 years environmental experience

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
Tom Johnston	QAM	Tetra Tech	Reviews QAPP, oversees preparation of laboratory scope, coordinates with laboratory, and data quality review. Ensures quality aspects of the CLEAN program. • Develops, maintains, and monitors QA policies and procedures. • Provides training to Tetra Tech staff in QA/QC policies and procedures. • Conducts systems and performance audits to monitor compliance with environmental regulations, contractual requirements, QAPP requirements, and corporate policies and procedures. • Audits project records. • Monitors subcontractor quality controls and records. • Assists in the development of corrective action plans and ensuring correction of non-conformances reported in internal or external audits. • Ensures that this SAP meets Tetra Tech, Navy, and FDEP requirements. • Oversees the responsibilities of the Tetra Tech Project QA/QC Advisor. • Prepares QA reports for management.	Available on request

SAP Worksheet #8 – Special Personnel Training Requirements Table

(UFP-QAPP Manual Section 2.4.4)

Project Function	Specialized Training by Title or Description of Course	Training Provide/ Verifier	Training Date	Personnel/ Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Project Operations	Site Orientation, Ethics Training, and UXO Avoidance	SUXOS	Upon arrival at NAS Key West	All personnel	Tetra Tech and Subcontractors	Documentation of special training requirements will be maintained on site. After the field investigation is complete, special training documentation will be maintained in the permanent project file.
	Accident Prevention and First Aid	SSO				
	Overview of Project Plans	SUXOS				
	29 Code of Federal Regulations (CFR)1910.120 Training	Vendor	Prior to arrival at NAS Key West	All field personnel		
Munitions Response	MEC Safety Training	UXO Safety Officer (UXOSO), SUXOS	Training will have been received prior to participation in field activities	Personnel entering exclusion zone		
Grid Layout, Surface Survey	Use of hand-held global positioning system (GPS)	UXO Team Leaders, UXOQC, SUXOS		UXO Team		
MEC Data Collection	Surface Survey and MEC Management and Accountability SOPs	SUXOS		UXO Team		

SAP Worksheet #9 -- Project Scoping Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1)

Project Name: NAS Key West MRP Sites Projected Date(s): July through September 2010 Project Manager: Michelle Coffman	Site Name: Naval Air Station (NAS) Key West Site Location: NAS Key West, Florida

Date of Session: July 2, 2010
Scoping Session Purpose: Internal Planning Meeting

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Michelle Coffman	PM	Tetra Tech	412.921.8549	michelle.coffman@tetratech.com	Provides project management support
Chuck Bryan	Activity Coordinator	Tetra Tech	803.641.4943	chuck.bryan@tetratech.com	Provides oversight and coordinated activities at NAS Key West
Ralph Basinski	MRP Coordinator	Tetra Tech	412.921.8308	ralph.basinski@tetratech.com	Provides technical lead on MRP activities
Gary Braganza	Field Operations Leader (FOL)	Tetra Tech	561.302.4137	gary.braganza@tetratech.com	Directs field operations
Peggy Churchill	Environmental Scientist	Tetra Tech	321.636.6470 x1300	peggy.churchill@tetratech.com	Data Quality Objective (DQO) Facilitator, provides technical support
Kelly Carper	Chemist	Tetra Tech	412.921.7273	kelly.carper@tetratech.com	Provides technical support, coordinates activities with laboratory
Matt Neet	Geographic Information System (GIS)	Tetra Tech	803.641.4958	matt.neet@tetratech.com	Provides GIS support and coordination

Project Name: NAS Key West MRP Sites Projected Date(s): July through September 2010 Project Manager: Michelle Coffman	Site Name: Naval Air Station (NAS) Key West Site Location: NAS Key West, Florida

Date of Session: July 2, 2010
Scoping Session Purpose: Internal Planning Meeting

Jim Rossi	Unexploded Ordnance (UXO)	Tetra Tech	770.413.0965	james.rossi@tetratech.com	Provides UXO support and coordination

Discussion

Michele Coffman provided an overview of the general project scope and identified key Tetra Tech roles and staffing needs. Chuck Bryan provided an overview of Key West requirements and potential logistical issues.

Topics discussed during the conference call included items such as: schedule; support for field work and SAP preparation; NAS Key West procedures; figure preparation; Installation Restoration (IR) sites near MRP sites/IR sites that overlay MRP sites; background documents and information; subcontractor information; and laboratory procedures and analysis.

Technical leads and assignments for preparation of each of the worksheets within both the MC and MEC SAPs were made.

Project Name: NAS Key West MRP Sites Projected Date(s): July through September 2010 Project Manager: Michelle Coffman	Site Name: Naval Air Station (NAS) Key West Site Location: NAS Key West, Florida

Date of Session: July 7 and 8, 2010
Scoping Session Purpose: Site Visit and Initial Scoping Meeting

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Dana Hayworth	Navy RPM	NAVFAC SE	904.542.6417	dana.hayworth@navy.mil	Manages Project Activities for the Navy
Robert Courtright	NAS Key West IRP Manager/ Environmental Coordinator	NAS Key West	305.293.2881	robert.courtright@navy.mil	NAS Key West POC
Kenneth Bowers	Navy QA Officer (QAO)/ Chemist	NAVFAC LANT	757.322.8341	kenneth.a.bowers@ navy.mil	Provides technical support and oversight
Michelle Coffman	PM	Tetra Tech	412.921.8549	michelle.coffman@tetratech.com	Provides project management support
Chuck Bryan	Activity Coordinator	Tetra Tech	803.641.4943	chuck.bryan@tetratech.com	Provides oversight and coordinated activities at NAS Key West
Ralph Basinski	MRP Coordinator	Tetra Tech	412.921.8308	ralph.basinski@tetratech.com	Provides technical lead on MRP activities
Gary Braganza	FOL	Tetra Tech	561.302.4137	gary.braganza@tetratech.com	Directs field operations
Peggy Churchill	Environmental Scientist	Tetra Tech	321.636.6470 x1300	peggy.churchill@tetratech.com	DQO Facilitator, provides technical support

Discussion

Team members visited all of the MRP sites identified for further investigation during this SI. On Day 1, sites at Boca Chica Field, North Boca Chica, Sigsbee Annex, Trumbo Point Annex pistol range and skeet range, Trumbo Point Temporary Staging Area, and the Pistol Range on Fleming Key were visited. Also on Day one, team members visited the public works department and the NAS Key West map room. Ms. Carrie Backlund, Environmental Division, Natural Resources Manager, met the team at the North Boca Chica sites to discuss ecologically sensitive areas that may lie within the MRP site boundaries. Several of the MRP sites appear to lie within sensitive areas at NAS Key West and Natural Resources Department will need to approve these locations before sampling can take place.

On Day 2, the Dredge Spoil Area at Fleming Key and the Rifle Range at Truman Annex were visited. Mr. Edward Donohue met with team members at the Fleming Key Dredge Spoil Area. Mr. Donohue discussed the history of the Dredge Spoil Area on Fleming Key and the Trumbo Point Temporary Staging Area. He showed team members the areas within the Dredge Spoil Area at Fleming Key where munitions related debris, as well as other metallic debris, had been located. He also discussed other water/underwater MEC/munitions sites at NAS Key West, some of which are still active, and informed the team that live rounds had been found in the Fleming Key cut on the bottom of the waterway when divers were preparing to work on bridge supports. Team members discussed with Mr. Donohue the planned MEC investigation at the Dredge Spoil Area on Fleming Key and the Trumbo Point Temporary Staging Area.

A conference call was held during the afternoon of July 8 with Ms. Susan Burtnett, Malcolm Pirnie Task Leader, to discuss the PA. Ms. Burtnett discussed each of the sites with the team and also sent/provided Malcolm Pirnie's locational data, figures, archival search files, etc., from the PA.

Following the conference call, team members discussed each of the MRP sites and key decisions as follows:

<u>General Discussion</u>

- Surface soil (0- to 6-inchs and 6- to 24-inches) and possibly sediment samples will be collected during the SI.

- All surface soil and, if collected, sediment samples will be collected at discrete sample locations.

- The majority of the surface soil samples will be collected via direct push technology (DPT). Select sample locations may be able to be sampled via disposable trowel.

- If sediment samples are collected, they will be collected via disposable trowel.

- Samples will only be collected to cap rock, if cap rock is at the surface, then no samples will be collected in those locations.

- Any samples located within ecologically sensitive areas will need to be approved by the NAS Key West Natural Resources Department.

- Samples at range firing points/firing lines will be analyzed for lead and nitroglycerin.

- PAH analysis will be performed at select skeet and trap ranges.

- All soil samples collected within range fans and at berms will be screened using x-ray fluorescence (XRF), samples collected at firing points will not be field screened.

- Sample results will be screened to human health criteria during the SI.

- Based on discussions with the NAS Key West Explosives Safety Specialist concerning identification of MEC within the Fleming Key cut (bottom of waterway), no investigations will be performed during this SI at the near shore underwater sites.

<u>Dredge Spoil Area, Fleming Key</u>

- Visual and detector-aided surface surveys will be conducted using a Schonstedt and/or White's along transects spaced approximately 50 feet apart across the site.

- If suspect MEC, material potentially presenting an explosive hazard (MPPEH), or munitions related debris is encountered, its location will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location system.

- UXO technicians will make a qualitative estimate of the amount of shallow subsurface items detected during detector-aided surveying on a subset of the transects.

Trumbo Point Temporary Staging Area

- Visual and detector-aided surface surveys will be conducted using a Schonstedt and/or White's along transects spaced approximately 25 feet apart across the entire 1 acre site.

- If suspect MEC, MPPEH, or munitions related debris is encountered, its location will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location system.

- UXO technicians will make a qualitative estimate of the amount of shallow subsurface items detected during surveying on a subset of the transects.

Boca Chica Field Sites

- Most of the former ranges in this area are covered with concrete, under the tarmac and/or runways.

- Samples may be collected from within the drainage ditches that run between the tarmac and Taxiway A, and the area located west southwest of the tarmac.

- The sampling planned in the area to the west southwest of the tarmac will need to be approved by the NAS Key West Natural Resources Department.

- PAH analysis will not be performed here due to the proximity of the airfield. There is a current source of PAHs coming from the airfield due to active flight operations.

North Boca Chica Sites

- Samples will be collected at both former ranges in this area.

- All proposed sample locations on land will need to be approved by the NAS Key West Natural Resources Department. Sediment samples may be collected at the Skeet Range if this area has not been dredged.

- Additionally, a Formerly Used Defense Site (FUDS) site is located in the northern portion of the area where the former ranges were located, need to find the boundary of the FUDs site.

Marine Rifle Range at Sigsbee Annex

- When the range was in use, the area was land. The surface water impoundment was created after the range was used, and the area was likely dredged to create the surface water impoundment. It is unknown at this time where the dredge material was placed.

- The berm was removed to create the surface water impoundment.

- Samples may be collected at the firing line.

Trumbo Point Annex Pistol Range and Skeet Range

- The area of the pistol range and skeet range is currently base housing. A former base housing area was recently torn down and a newer housing area is currently under construction at this location.

- The area has been heavily disturbed since its use as a range. Any evidence of former ranges is no longer present.

- The skeet range shotfall would have gone out over the water; however, this area has been dredged and whatever may have been there is now gone.

- No samples will be collected at either site during the SI.

Rifle Range at Truman Annex

- Shooting at this range was directed toward the current landfill, the impact points would have been in IR 1 (landfill). There is data from sampling at IR 1.

- Samples will not be collected from within the landfill.

- There appears to be several firing lines associated with this range, a 50-yard bunker, 200-yard bunker, 300-yard bunker, and a 500-yard bunker.

- May be able to sample at firing points not covered by buildings and/or pavement.

Pistol Range at Fleming Key

- Site is heavily vegetated.
- .45-caliber casings/lead bullets/slugs were noted on the roadway which runs through the site.
- Firing was towards the water, the western border of the site was the edge of the land at the time the range was in use.
- Surface soil samples will be collected for lead analysis.

Project Name: NAS Key West MRP Sites Projected Date(s): July through September 2010 Project Manager: Michelle Coffman	Site Name: Naval Air Station (NAS) Key West Site Location: NAS Key West, Florida

Date of Session: July 13-15, 2010
Scoping Session Purpose: NAS Key West Partnering Meeting/DQO Facilitation

Name	Title	Affiliation	Phone #	E-mail Address	Project Role

NAS Key West Partnering Meeting Minutes will be included in the SI Report to document participants, discussions, and consensus decisions made during the partnering meeting including the decision that one SI Report will be submitted and any comments will be addressed during future investigations at the MRP sites. The consensus decision associated with the MRP SI that is documented in the Partnering Meeting minutes is presented below.

Consensus Items
4) Site-specific soil and/or groundwater chemical data will be collected at all MRP (MC) sites. In addition, site specific historical data and information will be collected for all sites regarding any activities which would have resulted in the movement /disturbance of environmental media from locations originally present during range activities. The site specific information will be used to make recommendations for future actions.

Discussions conducted during the partnering meeting concerning the field investigation resulted in the following changes to the initial scoping meeting items:

- In sensitive habitat areas, as identified by NAS Key West Natural Resources personnel, soil samples will be collected via hand auger, DPT techniques will not be used in these areas.

- Samples will be collected at both the Trumbo Point Pistol Range and the Trumbo Point Skeet Range.

- Select metals analysis will include antimony, arsenic, copper, lead, and zinc.

- Sediment samples will be collected either via ponar dredge or trowel at the North Boca Chica Skeet Range, Trumbo Point Skeet Range, Sigsbee Annex Rifle Range, and the Fleming Key Pistol Range.

- Background samples will be collected at the Boca Chica Airfield for PAH analysis. Samples collected from within the skeet range site boundary at the Boca Chica Airfield will be analyzed for PAHs.

SAP Worksheet #10 – Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

10.1 INTRODUCTION

There are two military ranges/sites that are the subject of this MEC UFP-SAP. One is located on Fleming Key, and one is located at Trumbo Annex (**Figure ES-1**). General information for NAS Key West, Fleming Key, and Trumbo Annex is discussed below.

NAS Key West

NAS Key West is located in the Florida Keys, between the Gulf of Mexico and the Atlantic Ocean in Monroe County, Florida (**Figure ES-2**). The first naval base was constructed in Key West in 1823 to combat piracy in South Florida. Expansion of the base occurred in stages, between 1823 and 1917 and coincided with periods of military activity during the Mexican War, the Spanish-American War, and World War I (WWI). When the war ended the based was decommissioned and many buildings were destroyed, although the land remained property of the U.S. government. At the onset of World War II (WWII), the base was re-opened to support naval destroyers and patrol bomber aircraft. On 15 December 1940, the seaplane base was designated as a Naval Air Station. The NAS Key West complex comprises 6,249 acres of land distributed over fourteen properties that include: Demolition Key, Fleming Key, Truman Annex, Trumbo Point Annex, Peary Court Annex, Sigsbee Park Annex, Navy Branch Health Clinic - Key West, Boca Chica Field, North Boca Chica, Geiger Key, Big Coppitt Key, Rockland Key, Navy Computer and Telecommunications Station - Saddlebunch Key, and Battery HM-40 - Key Largo Site. The installation's present-day mission is to provide pilot training facilities and services, as well as access to airspace and training ranges for tactical aviation squadrons. The two MC UFP-SAP sites being investigated at the NAS Key West include: Dredge Spoil Area, Fleming Key and Trumbo Point Temporary Staging Area. Trumbo Point Temporary Staging Area was originally identified as the United States Coast Guard (USCG) Parking Lot, Trumbo Annex in the PA but the designation was changed by the project team during the 13 July 2010 partnering team meeting.

Information for the NAS Key West area related to climate, topography, geology, soil and vegetation types, hydrology, hydrogeology, cultural and natural resources, and threatened, endangered, and protected species that is relevant to the CSM for each site is presented below. Other supporting background information is included in the Preliminary Assessment (PA) (Malcolm Pirnie, 2010).

Two main hydrogeologic units underlie the site. These units are the Biscayne Aquifer (i.e., the surficial aquifer) and the Floridian Aquifer. The Biscayne Aquifer is considered one of the most productive and permeable aquifers in the world. However, the freshwater below the lower Florida Keys is subject to salt water intrusion due to the permeability of the Key Largo limestone formation, which underlies the less porous Miami oolite formation that forms the base layer of the islands. Due to the salt water intrusion, the Biscayne Aquifer at NAS Key West is only available for nonpotable use. The average aquifer depth is 5 feet below the center and western half of the island of Key West (INRMP, 2008).

NAS Key West is within the Florida Bay-Florida Keys Watershed. Approximately 53 percent of the annual rainfall occurs from June to October, during hurricane season. Due to the porosity of the limestone substrate, most rainfall on the Florida Keys percolates into the limestone rather than running off. The amount of rain that does become overland runoff is carried to tidal waters via overland flow or storm drains (INRMP, 2008).

Dredge Spoil Area, Fleming Key

The Dredge Spoil Area, Fleming Key is a 42-acre site located on Fleming Key. Fleming Key is located north of the City of Key West in Monroe County, Florida. Fleming Key was originally created as a dredge spoil island prior to WWII and was used as a munitions storage area as early as 1942. This area was used for munitions storage in the past and nine closed magazines remain at the site. The dredge spoils placed at the site in 2004 through 2005 comprise a majority of the site. These spoils consist of a 37-acre, relatively flat, well-compacted mound that is approximately 10 feet higher than the surrounding spoils used to form Fleming Key. The location of the Dredge Spoil Area is presented on **Figures ES-1** and **ES-2** respectively.

Trumbo Point Temporary Staging Area

The Trumbo Point Temporary Staging Area consists of approximately 1 acre located in the western portion of Trumbo Point Annex. Trumbo Point Annex is located north of the City of Key West in Monroe County, Florida. The majority of the site was filled using dredge spoils to create a parking area. The parking area consists of a relatively flat, well-compacted area that is at a similar elevation to the surrounding areas. A smaller area, not included within the fence surrounding the site, appears to have been filled with the same material as the rest of the parking lot. A depressed area is located on the west side of the site for storm water retention, and a drainage ditch/swale is located along the southern boundary that conveys storm water runoff from the surrounding area. There are no structures located at

the site. The general location of the Trumbo Point Temporary Staging Area is presented on **Figures ES-1** and **ES-2** respectively.

10.2 PROBLEM DEFINITION

10.2.1 Dredge Spoil Area, Fleming Key

Fleming Key comprises 264 acres and is one of the 14 properties associated with NAS Key West. It is located less than 1 mile north of the City of Key West and is bordered to the north, east, and west by the Gulf of Mexico. A narrow channel and Trumbo Point Annex, another one of the 14 Navy properties, are located directly south of Fleming Key. Fleming Key was originally created as a dredge spoil island in the early 1940s using spoils from areas adjacent to the west and northeast of Fleming Key. It was then used as a magazine area (munitions storage area), beginning as early as 1942.

The Dredge Spoil Area comprises approximately 42 acres and is located in the center portion of Fleming Key (**Figure 10-1**). The site is bordered to the north and south by other portions of Fleming Key and to the east and west by the Gulf of Mexico. In 2003, the Department of the Army and the FDEP issued permits to NAS Key West for the maintenance dredging of 1,000,000 cubic yards from 465.4 acres of submerged bottom in the existing federal channel (Key West Harbor entrance channel), harbor (Truman Annex harbor), and the adjacent turning basin (FDEP, 2003). The portion of the dredged material not approved for ocean disposal, estimated at 400,000 cubic yards, was transported to a designated upland placement site. This upland placement site consisted of 27 acres on Fleming Key. The Dredge Spoil Area includes the entire upland placement site.

Prior to placement of the material at the site, the nine magazines located in the immediate area were inspected, verified empty, and closed. A turtle screen was reportedly used during dredging to limit the size of items transported through the dredging equipment. The dredge material that could not be placed at the off-shore disposal site was off-loaded from a barge onto trucks at Wharf F-389 and was transported to the Dredge Spoil Area (upland placement site) where it was spread with heavy-equipment to dry. After drying, the material was used as fill. During the dredging, two munitions items were reportedly encountered. These included a 7.2-inch Hedgehog rocket and a 76mm artillery projectile (ceremonial round). These items were destroyed in place by EOD personnel in August 2004. Information obtained during discussions with NAS Key West personnel indicate that these items were likely removed from the barge and transported separately to the site rather than deposited with the dredge materials.

In 2008, NAS Key West initiated the planning, scoping, and contractor procurement process to use the dredge materials as fill for airfield improvements. Correspondence from the Naval Ordnance Safety and

Security Activity (NOSSA) to NAS Key West, dated 27 May 2008 regarding the review of an Explosives Safety Submission (ESS) determination request, indicates that there is a reported presence of MEC in the dredge material at the Dredge Spoil Area. As such, NOSSA determined that an ESS was required for any excavation, movement, or screening of the dredge spoils. Furthermore, NOSSA determined that executing a munitions response in accordance with an approved ESS was required. NOSSA also noted that on-call EOD construction support is not appropriate for any excavation, movement, or screening of the dredge spoils because the "discovered presence of MEC at the site and the origins of the dredge material suggest greater potential (for) MEC contamination than would be acceptable for a low determination" (i.e., "…when the probability of encountering MEC is low; that is, encountering MEC is possible, but not probable").

During a Technical Assistance Visit (TAV) conducted by NOSSA on 10 and 11 February 2009, munitions items were reportedly observed on the ground surface of the Dredge Spoil Area. These items included 20mm expended cartridge casings and .50 caliber expended cartridge casings. Non-munitions related metal debris was also observed at the site and included a gas cylinder. Based on the observations made during the TAV, NOSSA documented that the dredge materials contain MEC and Material Potentially Presenting an Explosive Hazard MPPEH (NOSSA, 2009). NOSSA determined that munitions response under the Navy MRP was required.

10.2.1.1 Site Visits

A limited visual survey of the Dredge Spoil Area was conducted on 6 November 2009 and 10 November 2009 as part of the PA. The spoil material comprising the majority of the Dredge Spoil Area can be described as a large (approximately 27 acres), relatively flat, well-compacted mound. The spoil material is approximately 10 feet higher than the surrounding spoils used to form Fleming Key in the 1940s. Vegetation, including Australian pines, small shrubs, and grasses, cover much of the ground surface at the site. During the limited visual survey, the team observed 20mm and .30 caliber, .50 caliber, and .762 caliber expended cartridge casings on the ground surface at the Dredge Spoil Area. In addition, non-munitions related metal debris (e.g., dredge piping, valves, and the gas cylinder) was also observed on the ground surface at the site. MEC and MPPEH were not observed during the site reconnaissance.

10.2.1.2 MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence, Known MEC Areas, Suspected MEC Areas, and Areas Not Expected to Contain MEC, to indicate that MEC are

known or are suspected to be at the site. The MEC presence is discussed below. **Figure 10-1** illustrates the munitions characterization of the Dredge Spoil Area.

Based on observations made during the limited visual survey and information obtained during the record review and data collection process, there is no evidence of MEC on site. Thus, there are no known MEC areas associated with the Dredge Spoil Area.

According to information obtained during the record review and data collection process, the Dredge Spoil Area is a suspected MEC area. A 7.2-inch Hedgehog rocket and 76mm projectile were screened and removed from dredge spoils prior to placement of the spoils at the site. No subsurface investigations have been conducted to verify the presence or absence of MEC or MPPEH in the stockpiled dredge material.

According to historical documents and information obtained during the data collection process, there are no areas of the Dredge Spoil Area not suspected to contain MEC.

No penetration depths are associated with the munitions types identified at the Dredge Spoil Area because the munitions were not fired at the site. Placement of dredge spoils potentially containing munitions and subsequent grading of the site may have resulted in deposition of munitions debris (MD) and possibly MEC or MEPPH throughout the entire depth of the dredge spoils (estimated at 10 feet).

10.2.2 Trumbo Point Temporary Staging Area

Trumbo Point Annex, which includes 135 acres, is one of the 14 properties associated with NAS Key West. It is located adjacent to and immediately north of the City of Key West. Trumbo Point Annex is bordered to the north by Fleming Key (another one of the 14 Navy properties), to the east and south by Key West, and to the west by the Gulf of Mexico. Trumbo Point Annex is utilized by the Navy for military housing, administration and office buildings, and a petroleum bulk fuel storage tank area, as well as by the USCG for administrative and pier facilities.

The Trumbo Point Temporary Staging Area comprises approximately 1 acre located in the western portion of Trumbo Point Annex. The site is bordered to the north and east by an above ground storage bulk fuel tank farm, to the south by a USCG administrative building, and to the west by Mustin Street and USCG pier facilities (**Figure 10-2**). The area where the Trumbo Point Temporary Staging Area is located was filled and graded in 2008 or 2009, using dredge spoils taken from the Dredge Spoil Area at Fleming Key to create a relatively flat, level area for use by USCG personnel as a vehicle parking lot.

Correspondence from NAS Key West to the USCG dated 3 March 2009 conveyed the findings of the NOSSA TAV, which was conducted on 10 and 11 February 2009. Based on observations made during the TAV at the Dredge Spoil Area, the dredge material was found to contain MEC and MPPEH. Because the same material was used to create (fill) the Trumbo Point Temporary Staging Area, the parking lot was closed from further use. During the TAV at the Trumbo Point Temporary Staging Area, one 20mm expended cartridge casing was observed at the parking lot. Following the TAV, vehicles and equipment from the parking lot were removed and the area was fenced to prohibit entry. NOSSA determined that munitions response under the Navy MRP was required for the Trumbo Point Temporary Staging Area; the PA currently being completed is the first step in this process. The former footprint of the Trumbo Point Fuel Farm overlaps the Trumbo Point Temporary Staging Area site and extends well beyond the site to the north and east. The Trumbo Point Fuel Farm, formerly a large above ground bulk fuel storage tank farm, has been used as a fuel storage and distribution point since 1942. In recent years, the majority of the above ground bulk fuel storage tanks, including Tank D-3 that was located where the Trumbo Point Temporary Staging Area is now situated, have been removed. Currently, only three above ground bulk fuel storage tanks remain at the farm. Fuel releases occurred at the fuel storage and distribution facility in 1981 and 1995. Investigation and cleanup of these releases under the IR Program at NAS Key West has been on-going since 1985.

10.2.2.1 Site Visits

A limited visual survey of the Trumbo Point Temporary Staging Area was conducted on 10 November 2009 as part of the PA. The parking lot consists of a relatively flat, well-compacted area that is at a similar elevation to the areas surrounding the site with limited vegetation. A smaller area immediately east of the site, but not included within the fence surrounding the site, appears to have been filled with the same material as the rest of the parking lot. A depressed area is located on the west side of the site for storm water retention. A drainage ditch/swale is also located along the southern site boundary to convey storm water runoff from the surrounding area. These two areas are heavily vegetated with small bushes and grasses. There are no structures, vehicles, or equipment at the site. During the Osage and Malcolm Pirnie site visit, the team observed one 20mm expended cartridge casings on the ground surface in the western portion of the site (in the same area where a 20mm casing was reported during the TAV site visit). In addition, non-munitions related metal debris (e.g., small diameter piping) was also observed on the ground surface at the site. MEC and MPPEH were not observed during the limited visual survey of the site. The locations of the 20mm expended cartridge casing and relevant site features were recorded using a hand-held GPS unit.

10.2.2.2 MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence. These are, Known MEC Areas, Suspected MEC Areas, and Areas Not Expected to Contain MEC, to indicate that MEC are known or are suspected to be at the site. The MEC presence is discussed below. **Figure 10-2** illustrates the munitions characterization of the Trumbo Point Temporary Staging Area.

According to the site visit and information obtained during the record review and data collection process, there is no evidence of MEC on site. Thus, there are no known MEC areas associated with this site.

According to information obtained during the data collection process, the Trumbo Point Temporary Staging Area is a suspected MEC area. The dredge spoils used as fill material may contain MEC, MPPEH, and/or MD based on data obtained regarding the Dredge Spoil Area at Fleming Key. No subsurface investigations have been conducted at the Dredge Spoil Area to verify the presence or absence of MEC, or MPPEH, in the stockpiled dredge material.

According to historical documents and information obtained during the data collection process, there are no areas of the Trumbo Point Temporary Staging Area not suspected to contain MEC.

No penetration depths are associated with the munitions types identified at the Trumbo Point Temporary Staging Area because the munitions were not fired at the site. Placement of dredge spoils potentially containing munitions (for use as fill) and subsequent grading of the site may have resulted in deposition of MD and possibly MEC or MPPEH throughout the entire depth of the dredge spoils (estimated at 5 feet).

10.3 CONCEPTUAL SITE MODEL

The conceptual site models (CSMs) for both the Dredge Spoils area and the Trumbo Point Temporary Staging Area are essentially the same since both contain the same Dredge Spoil material and include the same MEC of concern. The similar components of the CSM are described below.

10.3.1 Potential or Known Contaminant Sources

Dredge Spoil Area

Based on observations made during the limited visual survey and information obtained during the data collection process, there is no evidence of MEC on site. Thus, there are no known MEC areas associated with the Dredge Spoil Area. According to information obtained during the data collection

process, the Dredge Spoil Area is a suspected MEC area. A 7.2-inch Hedgehog rocket and 76mm projectile were screened and removed from dredge spoils prior to placement of the spoils at the site. No subsurface investigations have been conducted to verify the presence or absence of MEC or MPPEH in the stockpiled dredge material. This area is not suspected to contain chemical warfare material filled munitions, electrically fuzed munitions, or depleted uranium associated munitions.

Trumbo Point Temporary Staging Area

Based on observations made during the limited visual survey and information obtained during the data collection process, there is no evidence of MEC on site. Thus, there are no known MEC areas associated with the Trumbo Point Temporary Staging Area. According to information obtained during the data collection process, the Trumbo Point Temporary Staging Area is a suspected MEC area. The dredge spoils used as fill material may contain MEC, MPPEH, and/or MD based on data obtained regarding the Dredge Spoil Area at Fleming Key. No subsurface investigations have been conducted at the Dredge Spoil Area to verify the presence or absence of MEC or MPPEH in the stockpiled dredge material.

10.3.2 Contaminant Migration Pathways

MEC migration may occur naturally due to erosion, or through human activities, such as maintenance (e.g., vegetation removal), grading, or removal of the dredge spoils from the site. Future construction, maintenance, excavation, or other site work could also serve as a migration/release mechanism. No penetration depths are associated with the munitions types identified at the Dredge Spoil Area and Trumbo Point Temporary Staging Area because the munitions were not fired at the site. Placement of dredge spoils potentially containing munitions (for use as fill) and subsequent grading of the site may have resulted in deposition of MD and possibly MEC or MPPEH throughout the entire depth of the dredge spoils (estimated at 5 to 10 feet).

10.3.3 MEC Exposure Evaluation

MEC may be present on the ground surface of the Dredge Spoil Area (i.e., on the surface of the stockpiled dredge spoils) based on observations made during previous site visits (i.e., EOD response, TAV conducted by NOSSA). During the limited visual survey conducted by Osage/Malcolm Pirnie, MEC was not observed on the ground surface. Given the history of the site, MEC presence cannot be confirmed or verified without further investigation. As such, exposure pathways for MEC on the surface via direct contact (e.g., touching or stepping on MEC) are potentially complete for human and ecological receptors.

No MEC or evidence of MEC has been observed on the ground surface of the Trumbo Point Temporary Staging Area, including during both the NOSSA TAV and Osage and Malcolm Pirnie PA site visits in 2009. Additionally, no findings of MEC or EOD incidences have been reported for the site. While MEC has not been observed during visual surveys of the ground surface, no investigations beyond these surveys have been conducted to determine if MEC is present on the ground surface or in the subsurface (i.e., within the dredge spoils used as fill). If present, it is possible for subsurface MEC to migrate to the surface naturally by erosion or through human activity by re-deposition (e.g., maintenance of vegetation or excavation of the fill material). As such, exposure pathways via direct contact for MEC at the surface (e.g., touching or stepping on MEC) are potentially complete for human and ecological receptors.

MEC may be present in the subsurface at the Dredge Spoil Area and Trumbo Point Temporary Staging Area. No investigations have been conducted to determine if MEC is present in the subsurface (i.e., within the dredge spoils used as fill). Therefore, exposure pathways are potentially complete for Navy personnel and contractors who may be exposed to subsurface MEC during intrusive activities, such as underground utilities maintenance or intrusive environmental investigations. Visitors, trespassers, and ecological receptors could also come in contact with subsurface MEC if digging, or in the case of ecological receptor burrowing, at the site. Exposure pathways are also potentially complete for these receptors.

10.4 PROBLEM STATEMENT

As a result of historical site activities, MEC may exist at the Dredge Spoil Area and Trumbo Point Temporary Staging Area. Facility personnel, contractors, and visitors could potentially be exposed to an explosive hazard from MEC at the site. Potentially complete exposure pathways have been identified. Currently, no studies have been conducted to determine if MEC may be present at the Dredge Spoil Area and Trumbo Point Temporary Staging Area. Conducting an SI will facilitate characterization of the site and aid in determining a basis for decision on No Further Action (NFA) or an Remedial Investigation (RI) to conduct intrusive investigations to determine if MEC is present.

SAP Worksheet #11- Project Quality Objectives/Systematic Planning Process Statements for the Dredge Spoils Area, Fleming Key, and the Trumbo Point Temporary Staging Area

11.1 STUDY GOALS (STEP 2)

Determine whether MEC or MPPEH are present in conditions, quantities, or concentrations that present an immediate human health hazard and require an immediate action. If such quantities are present, then initiate an appropriate remedial response. Otherwise, take no immediate action.

If surface MEC/MPPEH, or MD is located on the surface, or subsurface anomalies indicate their potential presence in the subsurface, then return to the site during the RI for further investigation of potential MEC and MC. If no surface MEC/MPPEH or MD are present, and no anomalies indicate the potential presence of subsurface MEC/MPPEH or MD, then no further investigation of the site is required.

11.2 INFORMATION INPUTS (STEP 3)

1. UXO Detector-Aided Surface Surveys: Data must be gathered from detector-aided surface surveys that will be performed over representative transects of the site. To do this UXO Technicians will use hand-held metal detectors such as a White's Spectrum XLT All Metals Detector or Schonstedt GA-52Cx to locate metallic items on the surface. Items located on the surface must be visually examined to determine whether they are suspect MEC, MPPEH, MD, or non-MD, and all associated data must be recorded in field logbooks and on an MEC tracking form. Locations of representative shallow subsurface anomalies detected during the UXO surface surveys must be flagged and used to determine whether any suspect MEC may be present in the subsurface. Non-MD will be moved to the side of selected transects to reduce clutter and enhance the ability to detect near surface anomalies.

2. In clear areas where there is no interference with signal reception, GPS data will be gathered to map the UXO surface survey areas and any suspect MEC/MPPEH locations. In areas where the use of a GPS unit is precluded, locations manual measurement of suspected / MEC / MPPEH locations will be established using a tape measure and compass measurements from a known location(s).

11.3 DEFINE THE BOUNDARIES OF THE STUDY (STEP 4)

The study area population of interest is dredge spoils that have the potential to contain MEC. The boundary of this Dredge Spoil Area is defined by the extent of dredge spoils that have been placed over

the 42 acre site. There are approximately 8 feet of dredge spoils placed on approximately 27 acres of the Fleming Key surface. The horizontal boundary, shown on **Figure 17-1**, includes the entire placement area including areas where the spoils are known to have slumped when initially placed.

Some of the dredge spoils from the Dredge Spoils Area were removed and used as fill at the Trumbo Point Temporary Staging Area. The perimeter of the site is fenced; therefore, the horizontal site boundary is defined by the fenced perimeter. The horizontal boundary is shown on **Figure 17-2**.

The Dredge Spoil Area and the Trumbo Point Temporary Staging Area are both suspected MEC areas. All detector-aided surface survey work will be accomplished by UXO technicians who will ensure that MEC and MPPEH avoidance techniques are practiced.

11.4 DEVELOP THE ANALYTIC APPROACH (STEP 5)

The following decision rules will be utilized for decision making purposes during the SI.

If surface MEC/MPPEH, or MD indicates the presence of MEC/MPPEH located on the surface or subsurface anomalies indicate their potential presence in the subsurface, then return to the site during the RI for further investigation of potential MEC/MPPEH and MD. If no surface MEC/MPPEH or MD are present, and no anomalies indicate the potential presence of subsurface MEC/MPPEH or MD, then no further investigation of the site for MEC is required.

11.5 SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA (STEP 6)

The Dredge Spoil Area and the Trumbo Point Temporary Staging Area will be investigated for the presence of MEC/MPPEH and MD. The project team will use the results of the detector aided survey to verify that all proposed data were collected, that the data meets the quality specifications and the overall data quality is sufficient to support the attainment of project objectives. This will involve a review of the survey results by the Project Team to determine if they are representative of suspect MEC.

11.6 DEVELOP THE PLAN FOR OBTAINING DATA (STEP 7)

The sampling plan and rationale for this investigation is presented in **Worksheet #17**.

SAP Worksheet #12 -- Measurement Performance Criteria Table

(UFP-QAPP Manual Section 2.6.2)

Definable Feature of Work Data Type	Geophysical Anomaly Measurement Data Quality Indicator	QC Sample and/or Activity to Assess Measurement Performance	Measurement Performance Criteria	Frequency
Site Preparation (including mobilization)	Completeness	Verify that approved project plans are reviewed and signed Verify that equipment needed is on site Verify that communications needed are on site and working Verify emergency services Verify site-specific training	Approved project plans reviewed and signed All equipment needed is on site Communications checked Emergency services checked Site-specific training completed	Once
Site Survey	Accuracy	Verify that site boundaries have been established Verify that survey transects have been established	Site boundaries have been established Survey transects have been established in accordance with the MRP **SOP 05**	Once
Vegetation Management	Completeness	Verify that vegetation has been removed in accordance with MRP **SOP 06**	Vegetation cut to > 6 inches and < 12 inches	As needed

Definable Feature of Work Data Type	Geophysical Anomaly Measurement Data Quality Indicator	QC Sample and/or Activity to Assess Measurement Performance	Measurement Performance Criteria	Frequency
UXO Detector-Aided Surface Survey – Transect	Precision	Resurvey transect to perform a direct comparison to field data collected during detector-aided surface survey	Detect all metallic (both ferrous and nonferrous) objects 20mm or larger on surface	Resurvey 25% of first four transects and after any failure, then 10% of remaining transects after four transects in a row pass QC. If any transect does not pass QC, UXO team will resurvey entire transect and another QC check will be performed.
		Blind seeds items	Discover and record all blind seeds placed in transects.	Blind seed items will be placed on the surface into the duff, or if duff is not present, covered with duff from another location, at locations within each transect prior to surface survey operations. At least one blind seed item, and no more than six, will be placed in each daily lot of work. If any transect does not pass QC, UXO team will resurvey entire transect and another QC check will be performed.

Definable Feature of Work Data Type	Geophysical Anomaly Measurement Data Quality Indicator	QC Sample and/or Activity to Assess Measurement Performance	Measurement Performance Criteria	Frequency
GPS Positional Data	Real-Time Accuracy	Horizontal Dilution of Precision (HDOP) and number of satellites	HDOP < 3, number of satellites at least four	Ongoing
	Accuracy	GPS positioning - comparison with two known locations	Sub-meter	At the beginning and end of each day
Demobilization	Completeness	Verify that sites have been restored and all equipment is inspected, packaged, and shipped to appropriate location	Temporary markers removed and Instrument Verification Strip (IVS) seed holes are filled. All equipment is off-site and has arrived at the appropriate location	Once at the end of field operations
Site-Specific Final Report Preparation and Approval	Completeness	QC of MEC Tracking Log and Daily Field Reports	Ground Surface: Quantitative tabulation of MEC items discovered during the site inspection (SI) is included in the MEC Tracking Log Shallow Subsurface: Semi-quantitative tabulation of anomalies for each transect segment Daily Field Reports are complete and accurate MEC Hazard Assessment complete	Once at the end of field operations prior to demobilization

Explanations for the criteria listed above area contained in **Worksheet #22**.

SAP Worksheet #13 -- Secondary Data Criteria and Limitations Table

(UFP-QAPP Manual Section 2.7)

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation /collection dates)	How Data Will Be Used	Limitations on Data Use
Preliminary Assessment	Malcolm Pirnie / Preliminary Draft Preliminary Assessment for the Dredge Spoil Area, Fleming Key, United States Coast Guard Parking Lot, Trumbo Point Annex, Naval Air Station Key West, Florida, 2010	Malcolm Pirnie	Basis for UFP-SAP, Site Histories, and CSMs	The information is qualitative and no quantitative (site-specific nature and extent of contamination) information is available. The information was used to establish the field work program and identify areas most likely to be contaminated.

SAP Worksheet #14 -- Summary of Project Tasks

(UFP-QAPP Manual Section 2.8.1)

Implementation of the MEC investigation has been divided into definable features of work, and the tasks required to complete each definable feature of work have been identified. Procedures for these tasks, including recording data, forms and checklists, data generation, QC checks, data management, and information management, are defined in the SOPs for the project indexed in **Worksheet #21**.

Definable Feature of Work	Tasks
Site Preparation (including mobilization)	• Prepare Project Plan (SAP review, geographic information system (GIS) setup, review documentation and data management procedures, approve SAP and subcontractors, and schedule confirmed) • Verify personnel qualifications • Coordinate with local authorities and establish communication logistics • Set up administrative offices • Equipment setup and checkout • Remove surface non-munitions related debris, as applicable • Initial orientation and training (including Safety and Emergency Response) • Install IVS
Site Survey	• Survey site boundaries with GPS or conventional means • Survey transect endpoints with GPS or conventional means
Vegetation Management	• Check equipment for proper height • Complete UXO Escort and MEC avoidance • As necessary, cut vegetation to proper height
Detector-Aided Survey	• Detector-aided survey to locate MEC/MPPEH on ground surface and characterize the extent of anomalies (none, low, medium, or high) that could be in the shallow subsurface MEC/MPPEH • Record location (GPS and photograph) of MEC/MPPEH on the ground surface • UXO Escort duties
GPS Positional Data	• Twice daily (at the beginning and end of each day) comparison with two known locations • Continually monitor HDOP parameters
Demobilization	• Remove temporary survey markers • Verify site restoration • Complete all field forms • Close out field logbooks • Return equipment • Provide all field documentation (verify requirements established in the SAP) • Remove IVS

Definable Feature of Work	Tasks
Site-Specific Final Report Preparation and Approval	• Close out MEC tracking log • Collect all documentation from field activities • Prepare site-specific final report • Receive approval of site-specific final report

SAP Worksheet #15 – Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

☑ **Worksheet Not Applicable**

This worksheet applies to chemical analysis and reporting, and is not applicable to this UFP-SAP for MEC surveys/investigations.

SAP Worksheet #16 -- Project Schedule/Timeline Table

(UFP-QAPP Manual Section 2.8.2)

Activity	Organization	Dates (MM/YY)	
		Anticipated Date(s) of Initiation	Anticipated Date of Completion
Prepare Rough Draft SI Work Plan and Appendices	Tetra Tech	07/10	07/10
Submit Draft SI Work Plan and Appendices	Tetra Tech	--	07/10
Navy and Regulator Review	Navy and FDEP	07/10	07/10
Receive Comments/Comment Resolution	Tetra Tech	07/10	07/10
Prepare Final SI Work Plan and Appendices	Tetra Tech	07/10	07/10
Submit Final SI Work Plan and Appendices	Tetra Tech	--	07/10
Field Investigation	Tetra Tech	07/10	08/10
Laboratory Analysis	Empirical Laboratories	08/10	08/10
Data Validation	Tetra Tech	08/10	08/10
Database Entry	Tetra Tech	08/10	08/10
Prepare SI Report	Tetra Tech	07/10	09/10
Submit Final SI Report	Tetra Tech	--	09/10

SAP Worksheet #17 -- Project Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

SAMPLING DESIGN AND RATIONALE

This section describes in detail the approach, methods, and operational procedures Tetra Tech will use to conduct UXO detector-aided surface surveys to identify surface and shallow subsurface anomalies potentially related to MEC. The data collected will be used to evaluate suspected anomalies in the approximately 5-foot-wide lanes associated with each transect in the survey area. Specifically, this SAP worksheet documents the site-specific application of geophysical sensors, navigation equipment, data analysis, data management, and associated equipment and personnel in a manner capable of meeting the site-specific project performance goals as presented in **Worksheet #11**.

Definable Feature of Work	SOP	Supporting Document(s)
Site Preparation (including mobilization)	**MRP SOP 01, MRP SOP 03**	UFP-SAP
Site Survey	**MRP SOP 05**	UFP-SAP
Vegetation Management	**MRP SOP 06**	UFP-SAP
UXO Detector-Aided Surface Survey – Transects	**MRP SOP 01, MRP SOP 02, MRP SOP 03, MRP SOP 05**	UFP-SAP
GPS Positional Data	**MRP SOP 05**	UFP-SAP
Demobilization	NA	UFP-SAP
Site-Specific Final Report Preparation and Approval	NA	UFP-SAP

SITE PREPARATION (Including Mobilization)

Mobilization, Set-up, and Preliminary Activities

Tetra Tech will schedule the arrival of its workforce in a manner that is most effective and designed to allow immediate productivity. All personnel mobilized to the site will meet the Occupational Safety and Health Administration (OSHA) training and medical surveillance requirements specified in the HASP. The UXO Technicians will have the appropriate level of training and experience as stated in DDESB TP-18. As part of the mobilization process, site-specific training for all on-site personnel will be performed, and each person will sign **Worksheet #4**. The purpose of this training is to ensure that personnel fully understand the operational procedures and methods to be used at NAS Key West, to include individual duties and responsibilities, and all safety and environmental concerns associated with these MEC operations. The

training will include, but is not limited to, a review of this MEC UFP-SAP and the HASP/Accident Prevention Plan (APP). Any personnel arriving at the site after this initial training session will be trained when they arrive and will sign **Worksheet #4**. Training will be conducted by a UXO Technician III.

Project equipment for the UXO survey will come from Tetra Tech sources and local leases/purchases. All equipment, regardless of source, will be checked to ensure its completeness and operational readiness. Any equipment found damaged or defective will be returned to the point of origin, and a replacement will be secured. All instruments and equipment that require routine maintenance and/or calibration will be checked initially upon arrival and then prior to use each day, if needed to support that days operations. This system of checks ensures that the equipment is functioning properly. If an equipment check indicates that any piece of equipment is not operating correctly and field repair cannot be made, the equipment will be tagged and removed from service, and a request for replacement equipment will be placed immediately. Replacement equipment will meet the same specifications for accuracy and precision as the equipment removed from service.

Site Accessibility and Traffic Control

NAS Key West is a controlled area accessible only through guarded access gates.

Safety requires that an active exclusion zone be established at the sites and maintained before any MEC activities occur due to the potential of encountering explosively configured/fuzed munitions. For this project, the exclusion zone will be established at a minimum of 200 feet from the edge of the MEC investigation area. If non-site personnel or non-essential non-UXO personnel enter an exclusion zone, all MEC operations will cease until the exclusion zone is re-established.

Both routine and emergency response actions dictate the need for prevention of unauthorized site access and for the protection of vital records and equipment. All equipment will be brought to a designated secure location each day.

Site Security

Site security will be maintained to ensure that non-essential personnel do not access the exclusion zone during the UXO detector-aided surface surveys or other UXO avoidance operations at the sites. Barricades will be positioned on access routes a minimum of 200 feet from the edge of the investigation site, as permitted by NAS Key West. Notification procedures will be posted on the barricades to ensure

that non-essential personnel notify the team working in the area prior to entering the area during active operations. Barricades will be removed when operations stop for the day.

Out-of-Box Tests

The following out-of-box tests will be conducted prior to the commencement of SI field work and at the start of each day of surveying:

- Inventory and inspection of all equipment to be used during that day's activities to confirm that all components are present and in good condition.
- Assembling and powering up the equipment.

Governing Regulations/Guidance and Explosive Safety Submission Determination

The work planned for this SI does not require an ESS because MEC avoidance measures will be practiced during the investigations. No MEC or MPPEH will be moved or disturbed during this phase of the project. An ESS Determination Request was prepared describing the general operations planned at the site. NOSSA reviewed the request and issued an ESS Determination for the planned operations allowing the activities using UXO avoidance procedures (see **Attachment 2**).

MEC activities will be performed in accordance with all local, state, and federal regulations and will include all applicable Department of Defense (DoD) requirements, including those in Engineer Pamphlet (EP) -75-1-2 [United States Army Corps of Engineers (USACE), 2004] and Military Munitions Response Program (MMRP) Data Item Description (DID) 09-005 USACE, 2009). Activities involving work in areas potentially containing MEC hazards will be conducted in full compliance with the Department of the Navy, NOSSA, and DoD requirements regarding personnel, equipment, and procedures. Navy requirements include OP-5 and NOSSAINST.8020.15B

This SI is being conducted as part of the Defense Environmental Restoration Program (DERP) MMRP. The SI will be performed in accordance with CERCLA Sections 104 and 121.

The sites where surveys will be conducted may contain live munitions and caution should always be exercised while working on these sites.

SITE SURVEY

Survey transect locations described in the UFP-SAP will be established in the field and are predetermined as per **Figure 17-1** and **Figure 17-2**. The UXO team will establish the transects using hand-held GPS units or, if GPS signal reception is inadequate, using a compass, tape measure, or survey wheel from a known location. Survey equipment (such as transit or total station), or GPS will be used to establish the known transect locations. Highly visible temporary markings (e.g., plastic flagging, pin flags, etc.) will be used to mark locations of transects for vegetation management and surveying.

VEGETATION MANAGEMENT

It is anticipated that some vegetation management will be required prior to performing detector-aided surface surveys. Brush and grass can present impediments to positioning the metal detectors in close proximity to the ground surface. The degree of brush/vegetation management will be determined by site conditions at the time of fieldwork and will be accomplished in accordance with Tetra Tech MRP **SOP 06** (Vegetation Management at MEC Sites). The following are the types of equipment/techniques that may be used:

- Hand-held brush cutters (string or blade) will be used to cut light vegetation and small grassy areas.
- Chain saws will be used in heavier brush areas and to cut small trees up to 2 inches in diameter.
- Mechanized equipment will be used to remove brush and grasses.
- Brush/vegetation debris will be left on site at the edge of the area cleared.

Brush cutting/vegetation management operations will be conducted by the UXO team.

UXO DETECTOR-AIDED SURFACE SURVEY - TRANSECT

During the initial setup of the site and prior to bringing non-UXO personnel or mechanized equipment on site, the UXO team will survey the surface in the area of interest and flag all suspect MEC/MPPEH for avoidance. After all suspect MEC/MPPEH have been flagged for UXO avoidance, the SUXOS will allow non-UXO personnel and mechanized equipment on site in cleared areas.

UXO DETECTOR-AIDED SURFACE SURVEYS AND POSITIONING

Data will be collected along survey transects. Transects will be spaced at 50 foot intervals within the Dredge Spoils Area (see **Figure 17-1**), and at 25 foot intervals within the Trumbo Point Temporary Staging Area (see **Figure 17-2**). The UXO team will establish a coordinate system for the detector-aided surface

surveys by creating a labeled system of survey stakes. Detector-aided surface surveys will be performed along the proposed survey lines to establish approximately 5-foot-wide transect lanes. Detector-aided survey operations will be conducted in accordance with Tetra Tech MRP **SOP 01** (UXO Detector-Aided Surface Surveys). MEC/MPPEH will be managed in accordance with Tetra Tech MRP **SOP 02** (MEC Management and Accountability).

Detector-aided surveys will be used to locate surface items of concern (MEC/MPPEH). Semi-quantitative information on anomalies in the shallow subsurface that could be indicative of MEC/MPPEH will also be collected in limited areas within the southern, central, and northern portions of the Dredge Spoils Area (see **Figure 17-1**).

Surface MEC/MPPEH: Locations of surface items will be recorded using a GPS and/or compass/tape measure from a known location. The location information will be stored in the GPS or entered into the field log. If poor satellite reception in an area prohibits GPS use, data will not be collected until more satellites are available and the accuracy criteria are met, or an alternative positioning technique will be employed (e.g., tape-measured grid or total stationing).

Data will be provided in the SI Report and will consist of tables reporting the UXO survey results in North American Datum (NAD) 83 Florida State Plane coordinates in US survey feet and plots of the results on plans or aerial maps for the MRP area. A summary of methods used and a discussion of the survey results will also be included in the SI Report. Descriptive data will be recorded in the UXO team logbook, and a copy of these data will be provided in the report.

Subsurface Anomalies: In limited areas specifically designated for subsurface anomaly evaluation within the Dredge Spoils Area (see **Figure 17-1**), the field team will evaluate and record the number of subsurface anomalies as none, low (1 to 5), medium (5 to 20), or high (greater than 20). Data will be recorded in the UXO team logbook and will be tracked on the subsurface anomaly tracking table located in Tetra Tech MRP **SOP 03** (Geophysical Surveys). A copy of this data will be provided in the SI Report and will also be mapped.

UXO Escort Operations

All activities involving work in areas potentially containing MEC hazards will be conducted in full compliance with this UFP-SAP regarding personnel, equipment, and procedures as follows:

1. If any MEC/MPPEH is encountered, the item will be avoided. The UXO Escort will not attempt to identify the type or condition of the ordnance. MEC avoidance procedures will be practiced at all times.

2. The UXO Escort will clearly mark any area with visible ordnance or MEC/MPPEH, and the area will be avoided. Visible MEC/MPPEH will be noted on the field log sheets or in the field logbook. The UXO Escort will report the MEC/MPPEH to the UXO Team Leader.

3. No ordnance, munitions, explosives, or ordnance-related materials will be moved, removed, or disposed during UXO Escort duties.

4. The UXO Escort will conduct UXO avoidance surveys for all proposed survey stake locations using a White's all metals-detector or equivalent to check for possible MEC/MPPEH. If an anomaly is encountered, or if the UXO Technician suspects the presence of MEC/MPPEH, the proposed stake location will be relocated to an area free of concerns/anomalies.

UXO Detector-Aided Surface Survey Instrumentation, Methods, and Standards

The Schonstedt GA-52Cx or equivalent will be used as the primary survey instrument to conduct the surveys. In addition to the Schonstedt, a White's Spectrum XLT all-metals detector or equivalent will be used in surface survey areas to assist in the location of metal targets with little or no ferrous content. Because ferrous and nonferrous ordnance may be present at the site, this is the best combination of technology for the operation based on industry standards.

The detection capabilities of the instruments to be used by the UXO Team during detector-aided surface surveys are limited by the size and orientation of the target and soil characteristics of the work area. These instruments provide an audio signal for response, but do not store data. The Schonstedt GA-52Cx magnetic locator (magnetic gradiometer) does not need to be calibrated. The White's all-metals detector requires setup to establish the sensitivity setting for UXO detection. To ensure that each detector is operating properly, the operator turns on the instrument and slowly moves the locator towards metal. As the probe advances toward the target, the audio signal will increase. Failure to detect the object is reason to reject the instrument.

The standard setting for the Schonstedt magnetic locator instrument is 2; setting the instrument to 3 or 4 will make it more sensitive and setting the instrument to 1 will make it less sensitive. The Schonstedt instrument will not detect nonferrous munitions such as those made of copper, brass, or aluminum.

Standard settings for the White's Spectrum XLT when used during MEC surveying operations are included in Tetra Tech MRP **SOP 01** (UXO Detector-Aided Surface Surveys).

A Geophysical System Verification (GSV) will be performed to provide rigorous QC/QA of the geophysical survey performance. The GSV was developed by the Environmental Security Technology Certification Program (ESTCP) specifically for UXO work. The GSV is comprised of two main processes. The first is an IVS, and the second is a blind seed in the production area. The IVS and blind seed items will be placed in locations free from anomalies.

The IVS will be seeded using Industry Standard Objects (ISOs). Each seed item will be labeled with a unique identifier, photographed, and located using GPS.

The following seed items will be placed 10 feet apart in a horizontal orientation on the ground surface and covered by a tarp, as described in MRP SOP 01:

Item and Burial Depth	Burial Depth
Small ISO (1-inch diameter 4-inch long pipe) (1)	ground surface
Small ISO (1-inch diameter 4-inch long aluminum pipe) (2)	ground surface
Medium ISO (2-inch diameter 8-inch long pipe) (1)	ground surface
Medium ISO (2-inch diameter 8-inch long aluminum pipe) (2)	ground surface

1 Used to test ability to detect ferrous items
2 Used to test ability to detect nonferrous items

Blind seeds will be used to confirm the completeness of the detector-aided surface survey MEC/MPPEH investigation techniques. Blind seeds will be ISOs that will be placed within the survey area by the UXOQCS to test their detection with the survey instrument. Items will be labeled with a unique identifier, placed within the survey transect, and a GPS location will be taken for the seeded item. Upon discovery of a blind seed item, the UXO Team will record the item's identifier, photograph the seed item, and capture the GPS location of the seed item. The ISOs will be placed at a minimum frequency of one per 5,000 linear feet of transects in the Dredge Spoils Area and one per 500 linear feet of transects in the Trumbo Point Temporary Staging Area.

Discovery of Chemical Warfare Material

Potential exposure to Chemical Warfare Material (CWM) on this site is not anticipated. In the event that CWM is located or suspected, Tetra Tech personnel will evacuate the area immediately in an upwind direction from the CWM, secure the site, and request assistance from the Navy RPM or designated POC.

Upon discovery of suspect CWM, the responsible UXO Technician III will:

Ensure that all personnel are clear of the area
Maintain security of the area until relieved

After the area is clear and secured, the responsible UXO Technician III will:

Notify the Tetra Tech UXO Manager
Notify the Navy POC
Stop all field operations
Assemble the crew at a designated assembly point
Stand by to provide assistance as required

If directed, UXO personnel will take emergency non-invasive actions such as covering the item with plastic sheeting or placing sandbags around the item. In the event that hazardous, toxic, or radiological waste (HTRW) is encountered on site, the work site will be evacuated until the Project HSM, with concurrence of the Navy POC, identifies and implements appropriate protective measures.

Suspect MEC/MPPEH

If suspect MEC/MPPEH is encountered, the location of each will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location system. The UXO team will attempt to determine its condition without moving or disturbing the item. Each item will be marked with flagging tape and assigned a unique number starting with the transect identification (ID) label followed by the item number. All available information about the item will be recorded in the logbook, including location, identification, item number, and whether the item is suspect MEC or MPPEH. A digital photograph will be taken of each item. The UXO team will not move or otherwise disturb the item in an attempt to collect information. After all available information is recorded and the item is determined not to be MEC, the UXO team will resume the detector-aided surface survey.

Every effort will be made to identify each suspect MEC/MPPEH item encountered; however, under no circumstances will any suspect MEC/MPPEH be moved in an attempt to make a definitive identification. Munitions will be visually examined for markings and other external features such as shape, size, and external fittings. If MEC/MPPEH are encountered, the Navy RPM, NAS Key West Explosive Safety Specialist, and Tetra Tech UXO Manager will be notified immediately, and work within the exclusion zone for the identified MEC/MPPEH will temporarily stop. Proper notifications and the request for response to the MEC/MPPEH item will be coordinated through the Navy RPM, NAS Key West Explosive Safety Specialist, and Tetra Tech UXO Manager. Work within the exclusion zone for the MEC item will resume after the removal/treatment of the item has occurred or upon notification by the Tetra Tech UXO Manager.

Only UXO-qualified personnel will perform MEC identification procedures. As an exception, a UXO Technician I may assist in the performance of MEC identification procedures when under the supervision of a UXO Technician III or higher. All personnel engaged in field operations will be thoroughly trained and capable of recognizing the specific hazards of the procedures being performed. To ensure that these procedures are performed to standards, all field personnel will be under the direct supervision of a UXO Technician III or higher. All suspect MEC items will be recorded following the requirements of this UFP-SAP, the site-specific HASP, applicable ordnance operations procedural safety guidelines, and industry-accepted safe work practices and procedures.

MEC Disposal

In the event that MEC that poses an immediate threat to operations is discovered, UXO personnel will mark the item and avoidance procedures will be followed. The Navy POC will be notified and Military EOD will be contacted for treatment. All site operations will stop, and the UXO Team will maintain security of the item until relieved by Military EOD or per instructions from the Navy POC (for example, the SUXOS may be directed to transfer security to NAS Key West Security).

Anomaly Avoidance

Anomaly avoidance will be performed by UXO Technicians for site workers by locating potentially hazardous anomalies (whether identified by visual means or through detector-aided surface surveys).

Global Positioning System Positional Data

A sub-meter-accuracy GPS (e.g., Trimble GeoXM or GeoXH) unit will be used to collect positional data during this SI. The GPS survey will utilize third order monumentation. Select monuments or markers will be identified by the Navy POC and will be visited at the start of each day and toward the end of each day.

The GPS data will be used to accurately record the positions of surface suspect MEC, MPPEH, and other munitions-related debris. Additionally, the GPS will be used to establish UXO detector-aided surface survey transect end points. Tetra Tech will load site boundaries, transect end point locations, known cultural/terrain features that may affect surveys and background maps into the GPS prior to deployment. GPS data collected during the SI will be stored in the GPS and downloaded to a personal computer daily or as soon as possible. Data will also be manually entered into a field log as it is collected. Once downloaded from the GPS unit, the data will then be uploaded to the MRP Data Repository website located at http://www.ttnus.com/MrpRepository/Login.aspx for processing by Tetra Tech GIS personnel.

If GPS accuracy is not sub-meter for detector-aided surveys, data will not be collected until more satellites are available and the accuracy criteria specified in **Worksheet #12** are met or an alternative positioning technique will be employed (e.g., compass and tape measure, fiducials, or total stationing).

GPS positional data will be collected in accordance with Tetra Tech MRP **SOP 05** (Global Positioning System).

DEMOBILIZATION

When fieldwork is complete, the site will be restored and temporary survey markers will be removed. All field forms and field logbooks will be completed, field documentation will be provided to recipients, and equipment will be returned to providers. Personnel will demobilize with approval of the Tetra Tech UXO Manager and PM.

SITE-SPECIFIC FINAL REPORT PREPARATION AND APPROVAL

Team Decision Points

No MC sampling is currently planned for the site. The results of the detector-aided surface surveys will be evaluated to provide guidance in decisions regarding the necessity and scope and extent of continued SI of the site or a recommendation to move forward with an RI (see **Worksheet #11**).

- Any MEC, suspect MEC, or MPPEH discovered on site will be brought to the attention of the Navy RPM, NAS Key West Explosive Safety Specialist, and Tetra Tech (UXO Manager, and PM).

- Any unanticipated findings that warrant modification of the UFP-SAP will be brought to the attention of those individuals stated above and the stakeholders listed in **Worksheets #3** and **#4**.

An SI Report will be prepared summarizing the investigation and will contain summaries of the site background, personnel utilized, objectives and scope, equipment, description of survey activities, results and discussion of the project data. The report will contain noted munitions-related discoveries, site photographs, field notes, checklists, and QC data.

SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Sampling Location/ID Number	Exclusion Areas	Matrix	Approximate Depth (bgs)	Survey Methodology	Degree of Investigation	SOP Name(1)
Dredge Spoils Area	None	Ground surface and shallow subsurface soil	0 to 2 feet bgs, depending on target MEC size	Magnetic locator All-metals detector	50-Foot spaced transects running north-south throughout designated survey area (see **Figure 17-1**). Surface survey transects will be approximately 5 feet wide. Semi-quantitative information on anomalies in the shallow subsurface will be collected in limited areas within the southern, central, and northern portions of the Dredge Spoils Area (see **Figure 17-1**).	**MRP SOP 01** **MRP SOP 02** **MRP SOP 03** **MRP SOP 05** **MRP SOP 06**
Trumbo Point Temporary Staging Area	None	Ground surface	Surface Only	Magnetic locator All-metals detector	25-Foot spaced transects running north-south throughout designated survey area (see **Figure 17-2**). Surface surveys transects will be approximately 5 feet wide.	**MRP SOP 01** **MRP SOP 02** **MRP SOP 03** **MRP SOP 05** **MRP SOP 06**

1 SOPs can be found in **Attachment 1**

SAP Worksheet #19 -- Analytical SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

☑ **Worksheet Not Applicable**

No laboratory samples are proposed for collection/analysis during this MEC survey/investigation.

SAP Worksheet #20 -- Field Quality Control Sample Summary Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	QC Survey Requirements	Field Duplicates/Repeat Data Collection	Sample	Quality Control
Ground Surface	Detector-aided surface survey	Resurvey 25% of first four transects and after any failure, then 10% of remaining transects after four transects in a row pass QC. If any transect does not pass QC, UXO team will resurvey entire transect and another QC check will be performed.	Not applicable	Detect all metallic debris 20mm or larger on surface; non-detection of metallic objects would result in failure of QC.	Resurvey transects to perform a direct comparison to field data collected during detector-aided surface survey.
Ground Surface	Detector-aided surface survey	Blind seed items will be used during the detector-aided surface survey process as an additional QC check. Blind seed items will be placed at the surface, into the duff or if duff is not present, covered with duff from another location, at locations along the transects prior to the start of the detector-aided surface survey. At least one blind seed item, and no more than six, will be placed in each estimated daily lot of work. If a blind seed item is missed, that lot of work will be rejected and reworked.	Not applicable	Detect, recover, and record all blind seed items; non-detection of a blind seed item would result in failure of QC.	Check UXO team logbooks for data showing ID number and location of recovered blind seed item and perform a direct comparison to the QC as seeded log.

Matrix	Analytical Group	QC Survey Requirements	Field Duplicates/Repeat Data Collection	Sample	Quality Control
Shallow Subsurface Soil	Detector-aided surface survey	IVS survey at the beginning and end of each day or after extended breaks.	Not applicable	Survey over ISOs buried in the IVS plot	IVS survey will be conducted at the beginning and end of each day or after extended breaks to verify that the survey technique is operating properly by comparison of the instrument's anomalous response to standardized buried items that have related empirically established instrument response curves.

SAP Worksheet #21 – Project SOP References Table

(UFP-QAPP Manual Section 3.1.2)

Reference Number	Title	Originating Organization of SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
MRP SOP 01	UXO Detector-Aided Surface Surveys	Tetra Tech	Magnetic detector All-metals detector	N	Describes detector-aided surface surveys
MRP SOP 02	MEC Management and Accountability	Tetra Tech	GPS Digital camera	Y (addition of site-specific contact information)	Describes actions to be taken if suspect MEC are encountered
MRP SOP 03	Geophysical Survey	Tetra Tech	Magnetic detectors All-metals detectors	Y (addition of subsurface anomaly tracking table and information)	Describes IVS requirements
MRP SOP 05	GPS	Tetra Tech	GPS	N	Describes usage of hand-held GPS units and MRP data repository website
MRP SOP 06	Vegetation Management at MEC Sites	Tetra Tech	Hand-held brush cutters, mowers, chain saws, brush hog, wood chipper	N	Describes brush cutting and vegetation clearance activities to take place at MEC sites

SOPs are contained in **Attachment 1**.

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

(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
GPS	Positioning	Daily	Accuracy: sub-meter HDOP < 3, number of satellites at least four	Wait for better signal, replace unit, or choose alternate location technique	UXO Technician	**MRP SOP 05**	None
Magnetic Locator	Operational	Beginning and end of day and after battery change	Operating properly, detect ferrous ISO	Replace battery, replace instrument	UXO Technician	**MRP SOP 01** **MRP SOP 03**	None
All-Metal Detector	Calibration	Beginning and end of day	Operating properly, Detect ferrous and non-ferrous ISO	Recalibrate, replace instrument	UXO Technician	**MRP SOP 01** **MRP SOP 03**	None

22.1 REGULAR TESTS FOR GEOPHYSICAL SURVEYING EQUIPMENT

Equipment/Electronics Warm-Up. This test minimizes sensor drift caused by thermal stabilization. Most instruments need a few minutes to warm up before data collection begins. All manufacturer instructions will be followed, or if none are given, data readings will be observed until they stabilize. Acceptance Criterion: Equipment Specific (typically 5 minutes). This test will be conducted each time the unit is started.

Record Instrument Settings. The purpose of recording instrument settings is to document the sensitivity setting for qualitative subsurface expected performance. This information will be used to interpret high subsurface anomaly areas as opposed to low subsurface anomaly areas. Acceptance Criterion: In accordance with MRP **SOP 01** (UXO Detector-Aided Surface Surveys). This test will be conducted at the beginning and end of each day and after a battery change is made.

Personnel Test. This test ensures that survey personnel have removed all potential interference sources (metal) from their bodies. Common interference sources are ballpoint pens, steel-toed boots, or large metallic belt buckles, which can produce anomalies signatures similar to investigation targets. This test will be conducted at the beginning of each day if the operator is wearing metallic items that could interfere with equipment operation.

Static Spike (or Standard Response) Test. This test determines response and repeatability of the instrument to a standard test item (typically an ISO). Improper instrument function and faulty equipment are potential causes of inconsistent non-repeatable readings. This test will be conducted at the beginning and end of each day and after battery changes.

GPS Positioning. The GPS will be tested at the start of the project and daily, once at the beginning and once towards the end of each day, by surveying two survey control points and comparing the GPS coordinates to the documented coordinates for the control points. Acceptance Criterion: Sub-meter. GPS survey instruments should also be closely monitored during field acquisition by using HDOP criteria, or as a minimum, the number of satellite signals being received. HDOP should normally be less than three to obtain high-quality results, and at least four satellites should also indicate high-quality results.

Interferences Test. This test is to determine if the sensors are interfered with by other survey support equipment such as the vehicle, boat, motor, etc. This test will result in no, or minimal, interference to the instrumentation towards detecting targets. The test will be performed before the geophysical survey begins and after an equipment configuration change is made.

22.2 DATA COLLECTION VARIABLES FOR GEOPHYSICAL SURVEYING EQUIPMENT

The same equipment and procedures will be used for the IVS (**Worksheet #12**) and geophysical survey. In addition, only personnel who have been tested on the IVS will perform the geophysical surveys. Multiple surveys using the planned geophysical instruments will be performed. Some elements of data collection are subject to modification and evaluation. Data collection variables subject to modification and optimization may include, but not necessarily be limited to, instrument setting selections, measurement interval along survey lines, and transect line spacing.

22.3 GEOPHYSICAL AND POSITIONING INSTRUMENTS

The detection depth of the metal detectors to be used by the UXO team during detector-aided surveys is limited by the size and orientation of the target and the characteristics of the soil in the work area. These instruments provide an audio signal for response but do not store data. The magnetic locator (magnetic gradiometer) does not need to be calibrated, but the all-metals detector requires field calibration. The operator turns on the instrument and slowly moves the locator toward metal to ensure that the detector is operating properly. The audio signal will increase as the probe advances toward the target. Failure to detect the object is reason to reject the instrument. The detector will be checked at the beginning and end of each day and after any battery change. UXO Technicians will also conduct a minimum of two checks during daily operations.

The normal setting for the Schonstedt magnetic locator instrument is 2; setting the instrument to 3 or 4 will make it more sensitive, and setting the instrument to 1 will make it less sensitive. The Schonstedt instrument will not detect non-ferrous munitions such as ones made of copper, brass, or aluminum. The normal settings for the White's all-metals detector are presented in MRP **SOP 01** (UXO Detector-Aided Surface Surveys).

During the surface surveys, all-metals detectors such as the White's Spectrum XLT or equivalent will be used if visual observations show that non-ferrous metal suspect MEC is present. The all-metals detector will either be used in place of, or in conjunction with, the magnetic locator.

Tetra Tech will use a sub-meter-accuracy GPS unit where possible during data collection to provide precise location coordinates for the data collected. The anticipated tree cover at some of the survey areas may dictate that only certain transects in open locations (no or limited tree cover) are located using a GPS, and the remainder of the transect will be tied to these locations. If the GPS accuracy is not sub-meter, data will not be collected until more satellites are available and the accuracy criteria are met, or surveying with alternate positioning techniques will be employed.

22.4 QUALITY ASSURANCE/QUALITY CONTROL

Operational and test procedures will conform to the manufacturers' standard instructions. QC of the instruments' data will be achieved daily by field testing, consisting of checking the detectors and navigation system against a known target to ensure that they are operating properly. All instruments and equipment used to gather and generate field data will be operated in such a manner that accuracy and reproducibility of the results are consistent with the manufacturers' specifications. Repair or replacement records will be filed and maintained by the UXO Quality Control Specialist (UXOQCS) and may be subject to audit by the Tetra Tech QAM.

SAP Worksheet #23 -- Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1)

☑ **Worksheet Not Applicable**

No project sampling is proposed for this SI to support MEC surveys/investigations (See Worksheet #21 for project SOPs).

SAP Worksheet #24 -- Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

☑ **Worksheet Not Applicable**

No analytical instrument calibration data will be required for this SI to support MEC surveys/investigations (See Worksheet #22 for equipment calibrations).

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

(UFP-QAPP Manual Section 3.2.3)

☑ **Worksheet Not Applicable**

No analytical instrument equipment maintenance, testing, or inspections will be required for this SI to support MEC surveys/investigations. Field instrumentation maintenance, testing, and inspection for equipment are presented in Worksheet #22.

SAP Worksheet #26 -- Sample Handling System

(UFP-QAPP Manual Appendix A)

☑ **Worksheet Not Applicable**

This worksheet is not applicable because no samples will be handled.

SAP Worksheet #27 – Sample Custody Requirements Table

(UFP-QAPP Manual Section 3.3.3)

☑ **Worksheet Not Applicable**

No samples are proposed for collection/analysis and no MPPEH will be handled during this SI.

SAP Worksheet #28 -- Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)

☑ **Worksheet Not Applicable**

No analytical laboratory QC sampling will be required for this SI to support MEC surveys/investigations.

SAP Worksheet #29 -- Project Documents and Records Table

(UFP-QAPP Manual Section 3.5.1)

Document/Record	Generator	Definable Feature of Work	Frequency of Completion	Location/Where Maintained
Project Personnel Sign-off Record	PM	Mobilization/Site Preparation	One time	UFP-SAP/SI Report, Project File
ESS Determination	UXO Manager	Mobilization/Site Preparation	One time	UFP-SAP/ SI Report, Project File
Field Checklists	Field UXO Personnel	UXO Detector-Aided Surface Survey	Field collection days	UFP-SAP/ SI Report, Project File
MEC Accountability Log	SUXOS	UXO Detector-Aided Surface Survey	As needed	**MRP SOP 01, MRP SOP 02**/ SI Report, Project File
Daily Reports	SUXOS	UXO Detector-Aided Surface Survey	Field collection days	UFP-SAP/Project File
Medical and OSHA Clearance Letter	HSM and PM	Mobilization/Site Preparation	As needed	HASP/Project File
Daily Safety Meeting Sign-In	UXOSO	UXO Detector-Aided Surface Survey	Daily	HASP/Project File
Medical Data Sheet	SUXOS	Mobilization/Site Preparation	As needed	HASP/Project File
Surface Survey Grid Map	SUXOS	UXO Detector-Aided Surface Survey Site Survey	Field collection days	UFP-SAP/SI Report, Project File
Detector-Aided Surface Survey Data	UXO Personnel	UXO Detector-Aided Surface Survey Site Survey	Field collection days	**MRP SOP 01/**Field Logbooks, SI Report, Project File
Field Notes (detailing equipment and procedure)	Field UXO	UXO Detector-Aided Surface Survey	Field collection days	**MRP SOP 01**/SI Report, Project File

Document/Record	Generator	Definable Feature of Work	Frequency of Completion	Location/Where Maintained
Assessment Findings and Corrective Actions	Various (see **Worksheet #31**)	All	As needed	UFP-SAP/SI Report
QC Surveillance Report	UXOQCS	UXO Detector-Aided Surface Survey	UXOQCS - Minimum of once per phase for each definable feature of work	UFP-SAP/ QC Logbook, Project File
Daily QC Report	UXOQCS	UXO Detector-Aided Surface Survey	Daily	UFP-SAP/QC Logbook, SI Report, Project File
Photographs (may be included in report)	UXO Field Personnel	UXO Detector-Aided Surface Survey	As needed	**MRP SOP 01, MRP SOP 02**/SI Report, Project File
FTMR Forms	SUXOS	UXO Detector-Aided Surface Survey	As needed	UFP-SAP/ SI Report, Project File
Field Audit Checklist (if an audit is conducted)	PM	UXO Detector-Aided Surface Survey	As needed	UFP-SAP/Project File
SI Report	Tetra Tech Personnel	All	One time	UFP-SAP/Project File, Long-term third party professional document storage firm utilized

SAP Worksheet #30 -- Analytical Services Table

(UFP-QAPP Manual Section 3.5.2.3)

☑ **Worksheet Not Applicable**

No analytical services will be required for this SI to support MEC surveys/investigations.

SAP Worksheet #31 -- Planned Project Assessments Table

(UFP-QAPP Manual Section 4.1.1)

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of Corrective Actions[(1)]** (title and organizational affiliation)
Personnel Qualifications	One time for all field personnel	Internal	Tetra Tech	UXOQCS	SUXOS	UXO Manager	QAM PM
Accident/ Incident Reporting	Per event	Internal	Tetra Tech	SSO	Project Health and Safety Officer	HSM PM	HSM
Preventive Maintenance	Daily	Internal	Tetra Tech	UXOQCS	SUXOS	UXO Manager	PM
Communications Equipment Inspection	Daily	Internal	Tetra Tech	UXO Team Leader	SUXOS	SUXOS	UXO Manager PM
Safety Inspections	Daily (inspection) Weekly (formal surveillance)	Internal	Tetra Tech	SSO	SUXOS	SUXOS	UXO Manager PM
Brush Cutting and Vegetation Management	As needed to support operations	Internal	Tetra Tech	SUXOS	UXO Team Leader	UXO Team Leader	PM
IVS - Assessment	Twice Daily	Internal	Tetra Tech	SUXOS	UXO Team Leader	UXO Team Leader	PM

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of Corrective Actions[(1)]** (title and organizational affiliation)
Detector-Aided Surface Survey	25% of First four transects or after any failure; 10% thereafter	Internal	Tetra Tech	UXOQCS	SUXOS	SUXOS	UXO Manager PM
Surveying and Mapping Operations	Initial, then weekly	Internal	Tetra Tech	UXOQCS	SUXOS	SUXOS	UXO Manager
UXO/MEC Accountability	Weekly	Internal	Tetra Tech	UXOQCS	SUXOS	SUXOS	UXO Manager PM
Visitor Briefing	Initial, then as needed to support operations	Internal	Tetra Tech	Project Health and Safety Officer	SSO	SSO	HSM
Site-Specific Training	Once at start of fieldwork and at start of each definable feature of work	Internal	Tetra Tech	SUXOS UXO Manager PM	As designated by PM	As designated by PM	PM

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions[(1)]** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of Corrective Actions[(1)]** (title and organizational affiliation)
Hazard Assessment – Risk Analysis	At start of each definable feature of work, then as needed to support operations	Internal	Tetra Tech	Project Health and Safety Officer UXOSO	UXOSO SUXOS	UXOSO SUXOS	HSM
Field Work Systems Audit	One per contract year	Internal	Tetra Tech	QAM	UXO Manager PM	QAM UXO Manager	QAM PM

1 Tetra Tech personnel unless otherwise noted.

SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses

(UFP-QAPP Manual Section 4.1.2)

Assessment Type	**Nature of Deficiencies Documentation**	**Individual(s) Notified of Findings** (name, title, organization)	**Time Frame of Notification**	**Nature of Corrective Action Response Documentation**	**Individual(s) Receiving Corrective Action Response** (name, title, organization)	**Time Frame for Response**
Personnel Qualifications	E-mail	Michelle Coffman – PM, Tetra Tech	Immediately upon discovery	E-mail	Michelle Coffman – PM, Tetra Tech	Prior to initiation of task
Accident/Incident Reporting	Accident/Incident Report Form	Michelle Coffman – PM, Tetra Tech Matt Soltis – HSM, Tetra Tech	Immediately	Dependent on accident/incident	Michelle Coffman – PM, Tetra Tech Ralph Brooks - UXO Manager, Tetra Tech Matt Soltis – HSM, Tetra Tech	Within 24 hours
Preventive Maintenance	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Communications Equipment Inspection	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours

Assessment Type	**Nature of Deficiencies Documentation**	**Individual(s) Notified of Findings** (name, title, organization)	**Time Frame of Notification**	**Nature of Corrective Action Response Documentation**	**Individual(s) Receiving Corrective Action Response** (name, title, organization)	**Time Frame for Response**
Safety Inspections	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Brush Cutting and Vegetation Management	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	E-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
IVS - Assessment	Oral	SUXOS – TBD Michelle Coffman – PM, Tetra Tech	Within 24 hours	E-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Detector-Aided Surface Survey	QC Checklist	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 1 business day of assessment	Updated QC Checklist	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Surveying and Mapping Operations	E-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	Updated E-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours

Assessment Type	**Nature of Deficiencies Documentation**	**Individual(s) Notified of Findings** (name, title, organization)	**Time Frame of Notification**	**Nature of Corrective Action Response Documentation**	**Individual(s) Receiving Corrective Action Response** (name, title, organization)	**Time Frame for Response**
UXO/MEC Accountability	Field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours	Updated field forms	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Visitor Briefing	E-mail	SUXOS – TBD Michelle Coffman – PM, Tetra Tech	Within 24 hours	Updated e-mail	SUXOS – TBD Michelle Coffman – PM, Tetra Tech	Within 24 hours
Site-Specific Training	E-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Upon completion of training	Updated e-mail	Ralph Brooks - UXO Manager, Tetra Tech Michelle Coffman – PM, Tetra Tech	Within 24 hours
Hazard Assessment – Risk Analysis	E-mail	Michelle Coffman – PM, Tetra Tech Matt Soltis – HSM, Tetra Tech	Within 24 hours	Updated e-mail	Michelle Coffman – PM, Tetra Tech Matt Soltis – HSM, Tetra Tech	Within 24 hours
Field Work Systems Audit	Letter Report	Michelle Coffman – PM, Tetra Tech Tom Johnston – QAM, Tetra Tech	Within 5 business days of assessment	Letter Report	Michelle Coffman – PM, Tetra Tech Tom Johnston – QAM, Tetra Tech	Within 10 business days of receipt

SAP Worksheet #33 -- QA Management Reports Table

(UFP QAPP Manual Section 4.2)

Type of Report	**Frequency** (daily, weekly monthly, quarterly, annually, etc.)	**Projected Delivery Date(s)**	**Person(s) Responsible for Report Preparation** (title and organizational affiliation)	**Report Recipient(s)** (title and organizational affiliation)
Project monthly progress report	Monthly (written) for duration of the project	Monthly	PM Tetra Tech	Navy RPM NAVFAC
Daily QC Report (Detector-Aided Survey)	Daily (e-mail)	TBD	UXOQCS Tetra Tech	PM Tetra Tech UXO Manager Tetra Tech
QC Meeting Minutes	Twice per month during project performance	TBD	UXO Manager Tetra Tech	PM Tetra Tech
Rework Items List	Twice per month during project performance Daily for UXO work	TBD	UXOQCS Tetra Tech	PM Tetra Tech
Project QC Report	Internal draft, draft, and final (Appendix to MEC SI Report)	TBD	PM Tetra Tech	Navy RPM, NAVFAC SE

This worksheet will be modified to include the project delivery dates after fieldwork is scheduled.

SAP Worksheet #34 -- Verification (Step I) Process Table - Preparatory and Initial Inspection

(UFP-QAPP Manual Section 5.2.1)

A preparatory-phase inspection will be performed prior to beginning each definable feature of work. The purpose of this inspection is to review applicable specifications and verify that the necessary resources, conditions, and controls are in place and compliant before the start of work activities. An initial-phase inspection will be performed at the beginning of each definable feature of work. The purpose of this inspection is to observe/review the application of procedures to ensure their adequacy, to ensure that adequate resources are applied to the activity, and that a clear understanding exists as to the QC requirements of the definable feature of work. The responsible person will inspect the relevant items from the checklist in the appropriate SOP.

Definable Feature of Work	**Description**	**Responsible for Verification** (name, organization)
Site Preparation (including mobilization)	Project readiness review to be performed by Tetra Tech PM and Navy RPM, including UFP-SAP review.	Michelle Coffman – PM, Tetra Tech Dana Hayworth - Navy RPM, NAVFAC SE
	Prior to field crew(s) mobilizing to the field for on-site data collection, the Tetra Tech PM will review resumes and training records, including those for UXO field personnel, to ensure that all required training and experience requirements identified in **Worksheet #7** have been completed for each crew member.	Ralph Brooks – UXO Manager, Tetra Tech
	Review of mobilization and site preparation activities such as equipment setup and checkout, installation of IVS, and grid survey and layout.	Michelle Coffman – PM, Tetra Tech Ralph Brooks – UXO Manager, Tetra Tech
	Review of **MRP SOP 01** (UXO Detector-Aided Surface Surveys) and **MRP SOP 02** (MEC Management and Accountability), which document methodology to be utilized during surveys and QC procedures.	Ralph Brooks, - UXO Manager, Tetra Tech TBD – SUXOS TBD – UXOQCS

Definable Feature of Work	Description	Responsible for Verification (name, organization)
Site Preparation (including mobilization)	Prior to surface survey crews initiating on-site investigations, the UXO Manager will review the results of the IVS to verify that performance criteria have been satisfactorily attained per **Worksheet #12**. The Tetra Tech PM will review the recommendations of the UXO Manager and provide final approval.	Michelle Coffman – PM, Tetra Tech Ralph Brooks – UXO Manager, Tetra Tech
Site Survey	Prior to the start of field work, the site boundaries will be established. Prior to the start of the detector-aided surveys, the transects will be established.	TBD – SUXOS TBD – SUXOS
Vegetation Management	Brush clearing and vegetation management will be conducted in accordance with **MRP SOP 06** (Vegetation Management at MEC Sites).	Preparatory: Ralph Brooks – UXO Manager, Tetra Tech Initial Inspection: TBD - UXOQCS
UXO Detector-Aided Surface Survey	Review of **MRP SOP 01** (UXO Detector-Aided Surface Surveys) and **MRP SOP 02** (MEC Management and Accountability), which include procedures for data collection and transcription. The SUXOS will verify that the data collected during the first lot of field work contain all the elements required by the scope of work and do not contain questionable data or error points.	Ralph Brooks - UXO Manager, Tetra Tech TBD – SUXOS
	Review of **MRP SOP 05** (Global Positioning System), which documents procedures to be utilized in the collection of GPS positional data. The SUXOS will verify that the UXO detector-aided data collected during the first lot of field work contain all the elements required by the scope of work and do not contain questionable data or error points.	Ralph Brooks – UXO Manager, Tetra Tech

Definable Feature of Work	Description	Responsible for Verification (name, organization)
IVS	Prior to collection of data at IVS, review **MRP SOP 03** (Geophysical Survey).	Ralph Brooks – UXO Manager, Tetra Tech
GPS Positional Data	Prior to start of data collection, comparison with two known locations.	TBD – SUXOS
Demobilization	Review of demobilization activities such as completion of field forms, return of equipment, and, forwarding of all field documentation to the PM.	Michelle Coffman – PM, Tetra Tech Ralph Brooks – UXO Manager, Tetra Tech
Site-Specific Final Report Preparation and Approval	Verify that all data and documentation have been acquired for report preparation.	Tetra Tech

SAP Worksheet #35 -- Validation (Steps IIa and II b) Process Table

(UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Follow-up QC inspections are conducted to ensure that procedures are being correctly performed, that no changed conditions exist that may affect the quality of work, and that lessons learned are being applied as identified. The responsible individual will inspect the relevant follow-up items from the checklist in the appropriate SOP at least as often as specified in this worksheet. **Worksheet #32** describes actions to be taken in the event that nonconforming conditions are observed during the QC inspections.

Definable Feature of Work	**Frequency of Inspection**	**Supporting QC Document(s)**	**Responsible for Validation** (name, organization)
Site Preparation (including mobilization)	NA/Upon completion of SI field work	No follow-up required. Verify that the UFP-SAP was implemented and carried out as written and that any deviations are documented.	Michelle Coffman – PM, Tetra Tech Dana Hayworth - Navy RPM, NAVFAC SE
Site Survey	Daily	Checklist and field logbooks that document equipment utilization and progress.	TBD – SUXOS, Tetra Tech
Vegetation Management	Daily	Checklists and field logbooks that document equipment utilized and progress.	TBD – SUXOS, Tetra Tech Ralph Brooks - UXO Manager, Tetra Tech
UXO Detector-Aided Surface Survey	Once per week activity is conducted	Checklists and field logbooks that document equipment utilized and progress.	Michelle Coffman – PM, Tetra Tech
	Minimum of once per day surveys are conducted or more frequently as necessary	Checklists and field forms that document equipment utilized, grids/transects surveyed, and grids/transects checked for QC purposes.	Ralph Brooks - UXO Manager, Tetra Tech TBD – SUXOS, Tetra Tech TBD – UXOQCS, Tetra Tech

Definable Feature of Work	Frequency of Inspection	Supporting QC Document(s)	Responsible for Validation (name, organization)
	As needed, prior to data entry	Prior to entering data (field forms and electronic data) from the detector-aided surface surveys into the permanent project database, the UXO Manager or designated representative will review the field forms to ensure that all required information is provided as required by **MRP SOP 01** (Detector-Aided Surface Survey) and **MRP SOP 02** (MEC Management and Accountability). Verify that all data have been transferred correctly and completely during collection. Ensure that data are downloaded and backed up at least once per day to prevent accidental loss of data/field efforts.	Ralph Brooks - UXO Manager, Tetra Tech TBD – SUXOS, Tetra Tech
IVS	Once for each team	Review data results of IVS.	Ralph Brooks - UXO Manager, Tetra Tech
GPS Positional Data	Daily	See **MRP SOP 05** (Global Positioning System) and Follow-Up Report.	Ralph Brooks - UXO Manager, Tetra Tech TBD – SUXOS, Tetra Tech
Demobilization	Once upon completion of each phase of project/site activities	Verify that all demobilization activities, as applicable to the phase of work, have been completed.	Michelle Coffman – PM, Tetra Tech Ralph Brooks - UXO Manager, Tetra Tech
Site-Specific Final Report Preparation and Approval	Once upon completion of the project/site activities	Verify that all activities have been documented and reported, as applicable to each phase of work, have been included in the report.	Michelle Coffman – PM, Tetra Tech Dana Hayworth - Navy RPM, NAVFAC SE

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

(UFP-QAPP Manual Section 5.2.2.1)

Step IIa/IIb[(1)]	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and organization)
IIa	Surface Soil	Detector-Aided Surface Survey	a) Satisfactory rechecks of 25% of first four transects by the UXOQCS, or SUXOS if no UXOQCS. b) Satisfactory rechecks of 10% of the transects by the UXOQCS, or SUXOS if no UXOQCS, after achievement of satisfactory rechecks on four transects in a row. c) Satisfactory location and recording of blind seed items placed on surface along transects.	TBD UXOQCS Tetra Tech TBD UXOQCS Tetra Tech TBD UXOQCS Tetra Tech
IIa	Subsurface Soil	Detector-Aided Subsurface Survey	a) Satisfactory rechecks of 25% of first four transects by the UXOQCS, or SUXOS if no UXOQCS. b) Satisfactory rechecks of 10% of the transects by the UXOQCS, or SUXOS if no UXOQCS, after achievement of satisfactory rechecks on four grids/transects in a row c) Achievement of goals established for the IVS.	TBD UXOQCS Tetra Tech TBD UXOQCS Tetra Tech TBD UXOQCS Tetra Tech

1 IIa = compliance with methods, procedures, and contracts (see Table 10, page 117, UFP-QAPP manual, V.1 March 2005).
IIb not applicable for MEC investigations.

SAP Worksheet #37 -- Usability Assessment

(UFP-QAPP Manual Section 5.2.3)

Data Usability Assessment

The usability of the data directly affects whether project objectives can be achieved. The characteristics described below will be evaluated at a minimum. The results of these evaluations will be included in the project report. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound technical assessments of these data characteristics.

Certification of Proper Operation of Detection and Positioning Systems

The Tetra Tech UXO Manager, or designee, acting on behalf of the Project Team, will prepare a table listing planned calibration and QC checks, their occurrence, and results (acceptable or not acceptable) for each type of metal detector and positioning system equipment used on the project. Data collected by any improperly operating equipment will be identified. A determination will be made as to whether the affected data adversely impacted the ability to meet project objectives. If the project objectives have been adversely impacted, the Tetra Tech PM will consult with the Navy RPM and other Project Team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions.

Qualification/Certification of Survey Team

The Tetra Tech UXO Manager, acting on behalf of the Project Team, will prepare a table listing each member of the detector-aided surface survey team, required certifications and training, and required demonstrations of competency. Any deviations will be identified. Data collected by team members not meeting the required training and demonstrations of competency will be identified. A determination will be made as to whether affected data impacted the ability to meet project objectives. If the project objectives have been adversely impacted, the Tetra Tech PM will consult with the Navy RPM and other Project Team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions.

Coverage of Areas to be Investigated

The UXO Manager, or designee, acting on behalf of the Tetra Tech PM and Project Team, will determine whether data were collected in all areas planned to be investigated. Data gaps will be identified. The Tetra Tech PM will consult with the Project Team to determine the extent to which it is necessary to fill these data gaps during future investigations.

Identify the personnel responsible for performing the usability assessment:

The Tetra Tech PM and UXO Manager will be responsible for conducting the listed data usability assessments. The data usability assessment will be reviewed with the Navy RPM and FDEP. The review will take place either in a face-to-face meeting or a teleconference, depending on the extent of identified deficiencies. If no significant deficiencies are identified, the data usability assessment will simply be documented in the project report and reviewed during the normal document review cycle.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented:

Written documentation will support the non-compliance, estimated, or rejected data results. The project report will identify and describe the data usability limitations and suggest resurveying or other corrective actions, if necessary.

Usability Checklist Table			
Phase of Work	**Item to be Checked/Verified**	**Verified (Yes or No)**	**Comments or Deviations**
Pre-Survey	Qualification of survey team evaluated		
	Personnel reviewed and signed-off on relevant SAP section(s)		
Survey	QC evaluation of survey equipment (tests and checklists satisfactorily completed)		
	Conformance to SAP requirements and procedures for all survey work and rework (including documentation requirements), and all deficiencies documented		
	Coverage of areas to be investigated fulfilled and located within accuracy levels required for the SI		
	Interpretation and summary of data satisfies SAP requirements and conformance with data processing flowchart (**Worksheet #17**)		

REFERENCES

CH2MHILL, June 2008. Site Visit Report, NAS Key West – Fleming Key.

DoN, September 2009. Naval Sea Systems Command OP 5, Volume 1, Seventh Revision, Ammunition and Explosives Safety Ashore.

FDEP, 2003

INRMP, 2008 Naval Facilities Engineering Command Southeast. 2008. Integrated Natural Resources Management Plan for Naval Air Station Key West, Florida.

NOSSA, February 2009. Report of Naval Ordnance Safety and Security Activity Technical Assistance Visit at Naval Air Station, Key West, Florida.

NOSSA, January 2009. Naval Ordnance Safety and Security Activity Instruction 8020.15B.

Osage Of Virgina Inc. and Malcolm Pirnie Inc., April 2010. Preliminary Draft, Preliminary Assessment for the Dredge Spoil Area, Fleming Key and United States Coast Guard Parking Lot, Trumbo Point Annex, Naval Air Station Key West, Florida.

Osage Of Virgina Inc. and Malcolm Pirnie Inc., January 2010. Preliminary Assessment Site Visit/Data Collection Summary Report, Navy Munitions Response Program, Naval Air Station, Key West, Florida.

USACE, August, 2004. EP-75-1-2, Munitions and Explosives of Concern (MEC) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities.

USACE, August, 2009. MMRP-09-005, Accident Prevention Plan.

USEPA, 2002.

Legend

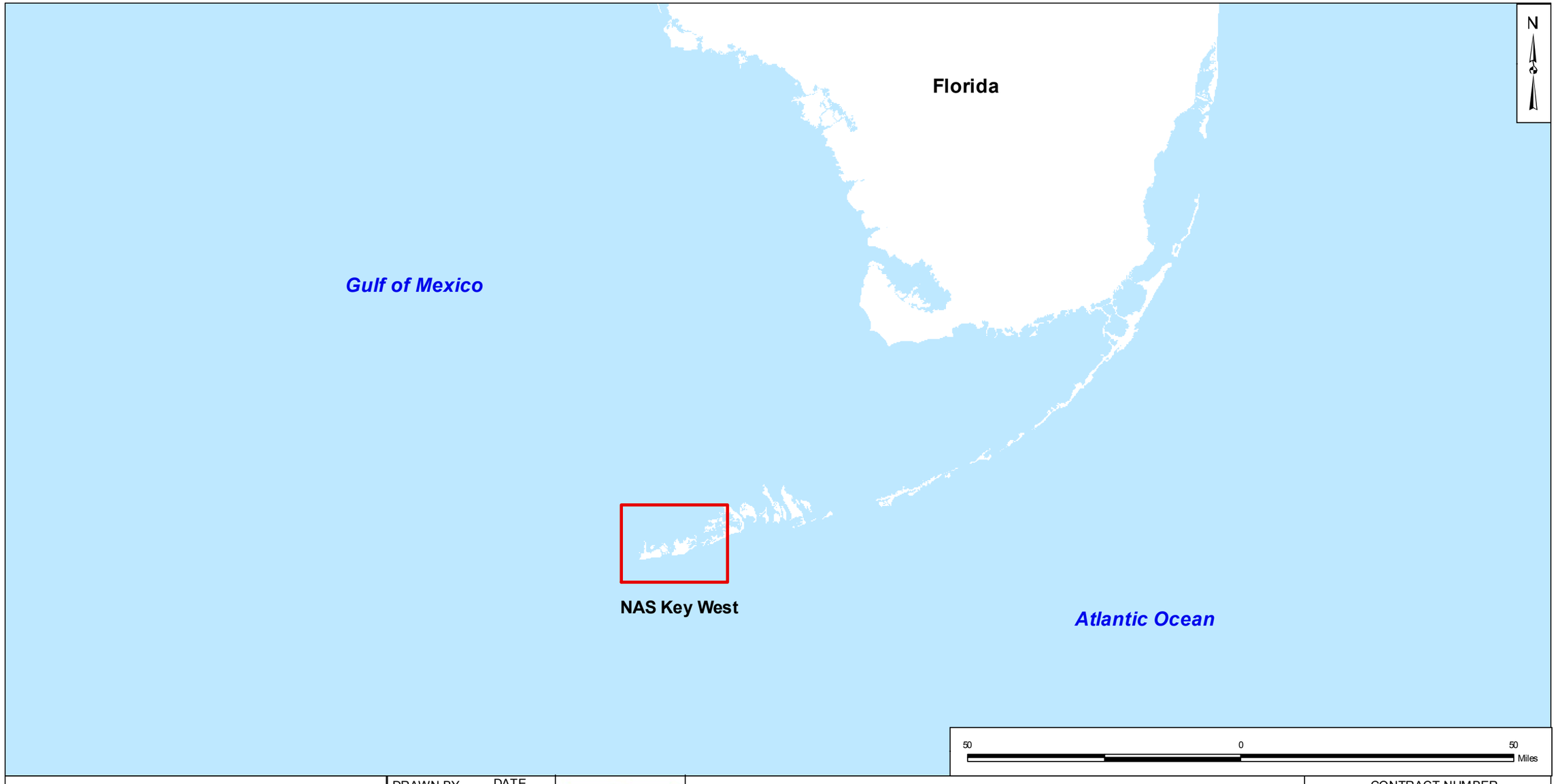
Site Boundary

DRAWN BY	DATE
MJN	07-16-10
CHECKED BY	DATE
MC	07-16-10
COST/SCHEDULE AREA	
SCALE	
AS NOTED	

NAVFAC

SITE LOCATIONS MAP
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER	
CTO-JM39	
APPROVED BY	DATE
MC	07-16-10
APPROVED BY	DATE
___	___
FIGURE NO.	REV
ES-1	1



Legend

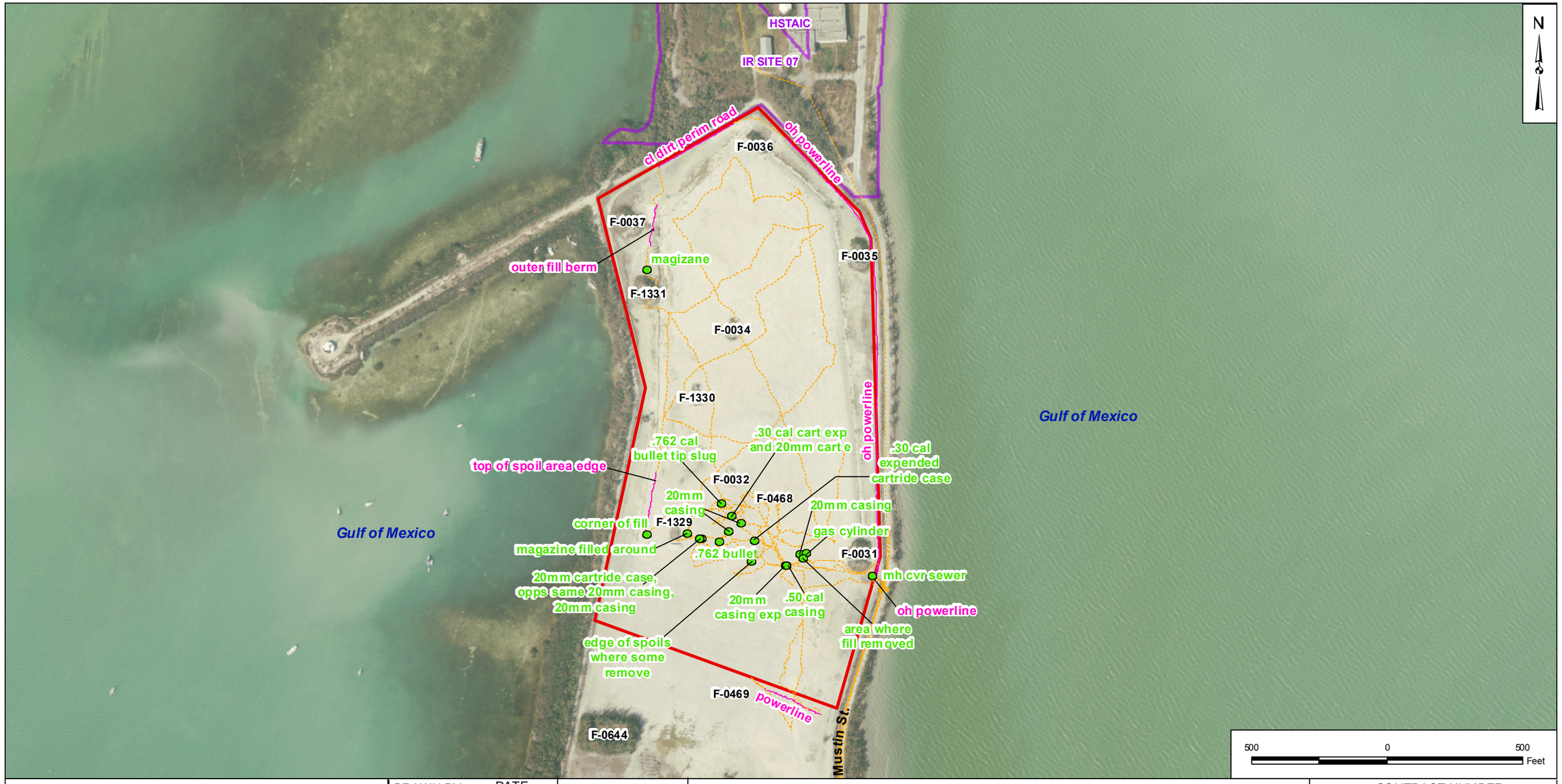
NAS Key West Overall Location

DRAWN BY MJN	DATE 07-19-10
CHECKED BY MC	DATE 07-19-10
COST/SCHEDULE AREA	
SCALE AS NOTED	

NAVFAC

FACILITY LOCATION MAP
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER CTO-JM39	
APPROVED BY MC	DATE 07-19-10
APPROVED BY ___	DATE ___
FIGURE NO. ES-2	REV 1



Legend

- GPS Points
- Site Boundary
- Tracked GPS Position
- BRAC, IR, & SWMU Sites
- GPS Line

DRAWN BY MJN	DATE 07-16-10
CHECKED BY MC	DATE 07-16-10
COST/SCHEDULE AREA	
SCALE AS NOTED	

NAVFAC

DREDGE SPOIL AREA, FLEMING KEY
PRELIMINARY ASSESSMENT SITE VISIT RESULTS
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER CTO-JM39	
APPROVED BY MC	DATE 07-16-10
APPROVED BY ___	DATE ___
FIGURE NO. 10-1	REV 1

Legend

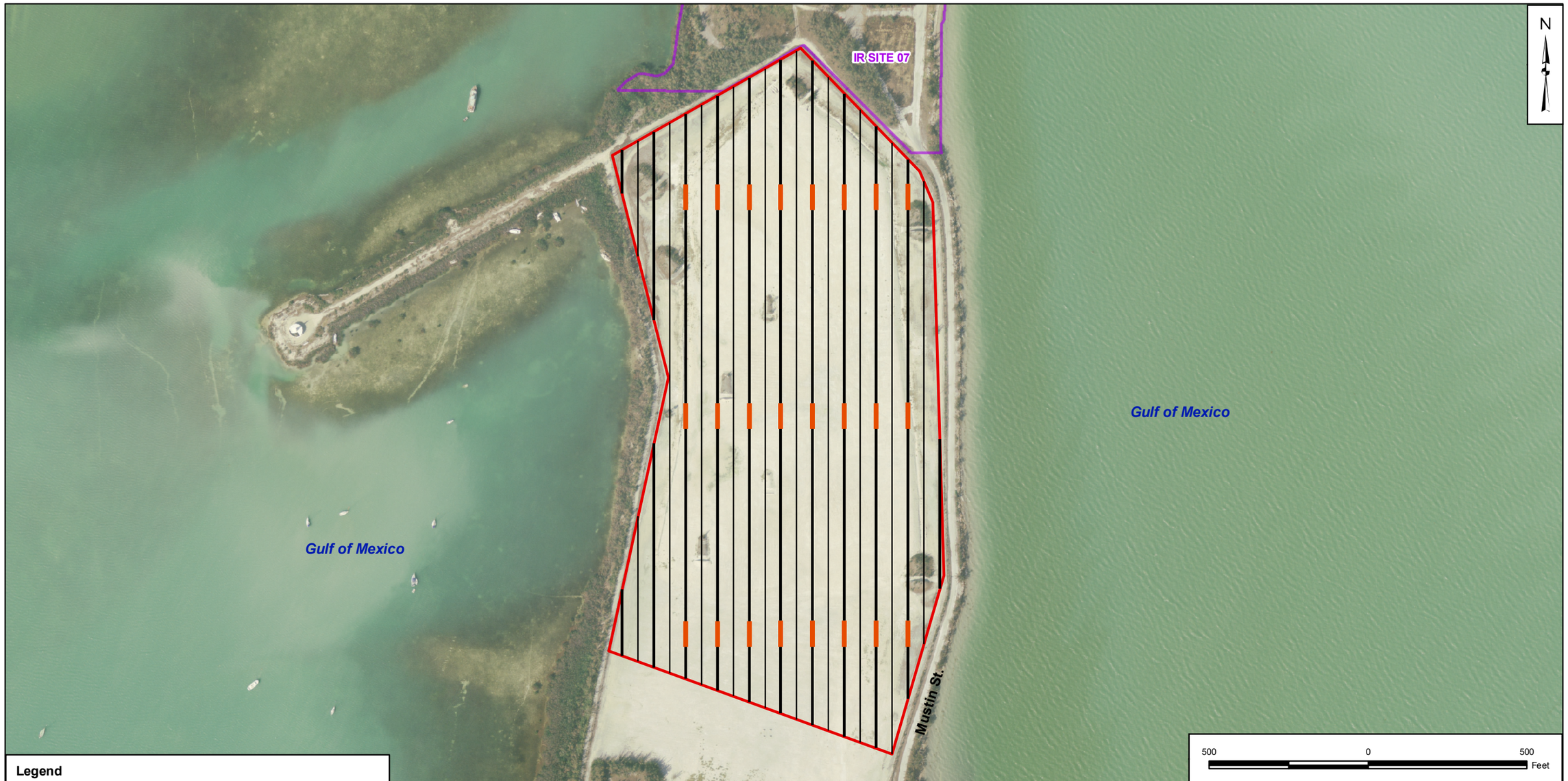
- GPS Points
- Tracked GPS Position
- GPS Line
- Site Boundary
- BRAC, IR, & SWMU Sites

DRAWN BY MJN	DATE 07-16-10
CHECKED BY MC	DATE 07-16-10
COST/SCHEDULE AREA	
SCALE AS NOTED	

NAVFAC

TRUMBO POINT TEMPORARY STAGING AREA
PRELIMINARY ASSESSMENT SITE VISIT RESULTS
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER CTO-JM39	
APPROVED BY MC	DATE 07-16-10
APPROVED BY ___	DATE ___
FIGURE NO. 10-2	REV 1



Legend

- Detector-aided surface survey investigation transects
- Semi-quantitative shallow subsurface survey investigation transects
- Site Boundary
- BRAC, IR, & SWMU Sites

DRAWN BY MJN	DATE 08-30-10
CHECKED BY MC	DATE 08-30-10
COST/SCHEDULE AREA	
SCALE AS NOTED	

NAVFAC

DREDGE SPOIL AREA, FLEMING KEY
MEC INVESTIGATION AREA
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER CTO-JM39	
APPROVED BY MC	DATE 08-30-10
APPROVED BY ___	DATE ___
FIGURE NO. 17-1	REV 2

Legend

- 25-ft Transect
- BRAC, IR, & SWMU Sites

DRAWN BY	DATE
MJN	07-16-10
CHECKED BY	DATE
MC	07-16-10
COST/SCHEDULE AREA	
SCALE	
AS NOTED	

NAVFAC

TRUMBO POINT TEMPORARY STAGING AREA
MEC INVESTIGATION AREA
NAS KEY WEST
KEY WEST, FLORIDA

CONTRACT NUMBER	
CTO-JM39	
APPROVED BY	DATE
MC	07-16-10
APPROVED BY	DATE
—	—
FIGURE NO.	REV
17-2	1

ATTACHMENT 1

MRP SOPS

STANDARD OPERATING PROCEDURE
MRP SOP 01
UXO DETECTOR-AIDED SURFACE SURVEYS

1.0 SCOPE AND APPLICABILITY

This document is designed to set a standard operating procedure (SOP) for detector-aided surface survey field operations during activities performed under the Munitions Response Program (MRP). This SOP is not site-specific, but rather is intended as a general guidance document for a variety of sites and conditions.

2.0 BACKGROUND

Detector-aided surface survey activities will be performed in accordance with all local, State, and federal regulations and will include all applicable DoD requirements. The scope of the detector-aided surface survey activities for a specific site will be defined in the project-specific Work Plans. Generally, all areas identified as suspect for munitions and explosives of concern (MEC) will receive an Unexploded Ordnance (UXO) detector-aided surface survey. UXO detector-aided surface survey operations may be used as a stand-alone method for site survey and assessment or in preparation for geophysical survey operations. UXO escort operations will be required during site visits (initial site assessments, planning, and stakeholders meetings), geophysical operations, and MC sampling operations and any other time where non-UXO trained personnel are conducting work in an MEC site. This SOP does not address UXO escort operations. UXO escort operations are addressed in the Munitions and Explosives of Concern and Chemical Warfare Agents Activities SOP which will be attached to the site-specific health and safety plans (HASPs) for those activities.

3.0 PERSONNEL QUALIFICATIONS

UXO personnel conducting detector-aided surface surveys shall be graduates of a military Explosive Ordnance Disposal (EOD) School of the United States, Canada, Great Britain, Germany, or Australia or a graduate of a formal training course of instruction or EOD assistant course as stated in DDESB TP-18.

UXO Senior UXO Supervisor (SUXOS)

The SUXOS will have a minimum of ten years experience in all aspects of munitions response actions or range clearance activities. A minimum of five years of the experience shall be in supervisory positions.

UXO Team Leader (UXO Technician III)

The UXO Team Leader will have a minimum of 8 years of EOD/UXO experience including prior military EOD and/or commercial UXO experience in munitions response actions, and/or range clearance activities. The UXO Team Leader may supervise up to six UXO technicians.

The UXO Team Leader will conduct detector-aided surface Survey activities as directed by the project manager (PM) and UXO Manager. The UXO Team Leader will be under the direct supervision of the UXO Manager.

UXO Quality Control Specialist (UXOQC)

The UXOQC specialist shall have a minimum of 8 years experience in all phases of munitions response actions and/or range clearance activities.

UXO Safety Officer (UXOSO)

The UXOSO shall have a minimum of 8 years experience in all phases of munitions response actions and/or range clearance activities.

UXO Technicians II

The UXO Technicians II will have prior military EOD experience or a minimum of 3 years of experience in munitions response actions and/or range clearance activities. The UXO technician will conduct detector-aided surface Survey activities as directed by the UXO Team Leader.

UXO Technician I

The UXO Technician I will have training as specified in DDESB TP-18. The UXO technician I will be directly supervised by a UXO Technician III or higher when conducting UXO activities.

4.0 DETECTOR-AIDED SURFACE SURVEY OPERATIONS

Equipment

A magnetic locator such as the Schonstedt, GA-52Cx instrument or equivalent and/or an all-metal detector such as the White's XLT or equivalent will be used for detector-aided surface Survey operations. The detection depth of the instrument is limited by size and orientation of a target and soil characteristics of the work area. The locators provide an audio signal for response, but do not store data. The magnetic locator does not need to be calibrated. The all-metal detector has field calibration. Calibration settings are specific to the make and model of the all metals detector. Table 1 lists the calibration settings for the White's spectrum XLT.

To ensure each detector is operating properly, the operator turns on the instrument and slowly moves the locator towards metal. As the probe advances toward the target, the audio signal will increase. Failure to detect the object is reason to reject the instrument.

The detectors will be checked daily before starting detector-aided surface survey activities, again at mid-day, and after any battery change. The normal daily check for detector-aided surface survey operations will be a test of instrument response and functionality within an Instrument Verification Strip (IVS) as detailed in the site-specific Work Plan. If an IVS is not specifically designated within the Work Plan, alternative methods may be used to perform daily instrument checks. One such method is commonly referred to as the "blanket test". To conduct the blanket test, an area near the work site and free of anomalies will be identified. The senior UXO Technician or UXOQC will position several Industry Standard Items (ISOs), inert munitions, or

surrogate munitions items on the surface and cover the items with a tarpaulin or similar cover so the items are not visible to the UXO technician. Each UXO technician will conduct a detector aided surface survey of the blanket test area and locate the test items. The senior UXO technician or UXOQC will compare the results of the test to the actual placement of the items and make corrections as necessary. UXO Technicians will also conduct random checks during daily operations.

The normal setting for the Schonstedt instrument is 2; setting the instrument to 3 or 4 will make it more sensitive and setting the instrument to 1 will make it less sensitive. The instrument will not detect copper, brass, or aluminum munitions. The normal setting for the White's all-metal detector will vary according to site conditions.

UXO Detector-Aided Surface Survey

The objective of the UXO detector-aided surface survey is to locate suspect MEC/materials potentially presenting an explosive hazard (MPPEH) on the ground surface in a munitions response site (MRS). Early in the planning for the field activities, usually during the DQO process with the regulators and the client, the level of effort is determined for each MRS within a munitions response area (MRA). The level of effort can vary from a 100% UXO investigation where the entire footprint of the MRS receives a UXO detector-aided surface survey, to transects where five foot wide lanes receive a UXO detector-aided surface survey with each survey transect separated by a set number of feet depending on the percentage of survey coverage required for the MRS, or even a meandering path where a UXO detector-aided surface survey is conducted as the UXO technician meanders across the MRS. Each of these will be discussed in some detail below:

100% UXO Detector-aided Surface Survey

The first step in conducting a 100% UXO detector-aided surface survey is to identify the boundaries of the MRS. This can be done using a global positioning system (GPS) with preloaded grid coordinates, or through the use of a land surveyor.

The next step is vegetation management within the MRS to allow access to the locations where the surface survey is to be conducted. The degree of vegetation removal will depend on site-specific conditions. This can be accomplished with a brush cutting crew supervised by an UXO escort, or the UXO Team may conduct vegetation management operations depending on the size of the area and the amount of brush removal needed. Care must be taken to ensure that personnel do not disturb suspect MEC/MPPEH on the surface that may be obscured by vegetation

When adequate vegetation management has been accomplished, a grid system will be established across the MRS. The normal grid is 100ft X 100ft but may be larger or smaller if the MRS would be better covered with a different size. The grid is established using a GPS with preloaded grid corners, or surveyed by a land surveyor to establish the grid corners.

Each grid is then divided into search lanes. This is normally done by running a tape measure between the bottom and top east/west corner stakes. The UXO team runs rope lines from the 0

point on one tape to the 0 point on the other tape, from the 5ft point on one tape to the 5ft point on the next tape, and so on until the entire 100 ft grid has been divided into lanes.

A UXO detector-aided surface survey covering each survey lane is performed. Each UXO team member will start at one of the tapes and using the metal detector, proceed toward the other tape and locate any surface MEC within their lane. If suspect MEC is encountered, its location will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location system. The UXO Team will attempt to determine the suspect item's condition without moving or disturbing the item prior to proceeding with the surface survey. Each item will be marked with engineer flagging and given a unique ID number (See MEC Management and Accountability SOP). All available information about the item will be recorded in the logbook/MEC Accountability Log, including suspect MEC location, identification, and ID number. A digital photograph will be taken of each item. The UXO Team will not move or otherwise disturb the item in an attempt to collect information. After all available information is recorded; the UXO Team will resume the detector-aided surface survey.

When the UXO detector-aided surface survey of a grid is complete and all items have been located with coordinates and digitally photographed, the tape measures, ropes and other equipment will be moved to the next grid and that grid will be established as stated above. This process will continue until the entire MRS has been investigated with a 100% UXO detector-aided surface survey of all accessible areas.

Transect UXO Detector-aided Surface Survey

The first step in conducting a transect UXO detector-aided surface Survey is to identify the boundaries of the MRS. This can be done with a GPS with preloaded grid coordinates, or surveyed by a land surveyor.

End stakes of each transect are then established across the MRS. The transect end stakes are established using a GPS with preloaded end stake locations, or surveyed by a land surveyor. The distance between transects will be established in the site-specific work plan. The direction should be either north/south, or east west although other directions may be appropriate in specific circumstances.

If necessary, vegetation management will be performed along each transect to provide access for the surface survey. Transects should be cleared as needed to allow for the establishment of 5 foot wide survey lanes. This can be accomplished with a brush cutting crew supervised by an UXO escort, or the UXO Team may conduct vegetation management operations depending on the size of the area and the amount of brush removal needed. Care must be taken to ensure that personnel do not disturb suspect MEC items on the surface that may be obscured by brush and tall grass.

The UXO detector-aided surface surveys of each transect will then be performed. Each UXO team member will start at a transect end stake, and using the metal detector, proceed in a deliberate pattern to locate any surface MEC within their 5ft wide transect, toward the other corresponding end stake. The UXO team member will use a GPS or compass to maintain a generally straight transect during the investigation. If suspect MEC is encountered, its location will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location

system. The UXO Team will attempt to determine the suspect item's condition without moving or disturbing the item prior to proceeding with the surface Survey. Each item will be marked with engineer flagging and given a unique ID number (See MEC Management and Accountability SOP). All available information about the item will be recorded in the logbook/MEC Accountability Log, including suspect MEC location, identification, and ID number. A digital photograph will be taken of each item. The UXO Team will not move or otherwise disturb the item in an attempt to collect information. After all available information is recorded; the UXO Team will resume the detector-aided surface Survey.

When the UXO detector-aided surface survey of a transect is complete and all items have been located with coordinates and digitally photographed, the UXO team member may proceed to the next transect. This process will continue until all transects have been completed over the entire MRS as detailed in the site-specific Work Plan.

Meandering Path UXO Detector-aided Surface Survey

Generally, the meandering path UXO detector-aided surface survey is very similar to the transect UXO detector-aided surface survey. The main difference is there is very little need to cut brush as the UXO team members will meander around heavy brush and other obstacles.

The GPS will have information about the MRS preloaded to ensure that the path stays within the MRS. Again, the meandering path will be approximately 5ft wide and proceed across the MRS until the objectives (a set amount of time, distance, or suspect MEC items) have been investigated with the UXO detector-aided surface survey. The site-specific work plans will establish the area within the MRS to be covered with the meandering transects.

If suspect MEC is encountered, its location will be recorded and/or marked using a GPS, compass, and/or tape measure, or other grid coordinates location system. The UXO Team will attempt to determine the suspect item's condition without moving or disturbing the item prior to proceeding with the surface survey. Each item will be marked with engineer flagging and given a unique ID number (See MEC Management and Accountability SOP). All available information about the item will be recorded in the logbook/MEC Accountability Log, including suspect MEC location, identification, and ID number. A digital photograph will be taken of each item. The UXO Team will not move or otherwise disturb the item in an attempt to collect information. After all available information is recorded; the UXO Team will resume the detector-aided surface Survey.

Every effort will be made to identify each suspect MEC or MPPEH item located. Under no circumstances will any suspect MEC be moved in an attempt to make a definitive identification. The MEC item will be visually examined for markings and other external features such as shape, size, and external fittings. If unknown military munitions are encountered, the facility point of contact (POC) and the Tetra Tech UXO Manager will be notified.

Only UXO-qualified personnel will perform MEC identification procedures. As an exception, a UXO Technician I may assist in the performance of MEC identification procedures when under the supervision of a UXO Technician III or higher. All personnel engaged in field operations will be thoroughly trained and capable of recognizing the specific hazards of the procedures being performed. To ensure that these procedures are performed to standards, all field personnel

will be under the direct supervision of a UXO Technician III or higher. All suspect MEC items will be recorded following the requirements of this SOP, the site-specific Work Plan/QAPP, the project site-specific HASP, applicable ordnance operations procedural safety guidelines, and industry-accepted safe work practices and procedures.

All items discovered during the detector-aided surface Survey of the transects/grid will be left in place. No MEC will be moved during this part of the project. The facility POC will be notified of the presence of MEC so that arrangements may be made through the facility for proper disposition of the item(s).

Quality Control

During the detector aided surface survey the UXOQC, or Senior UXO technician if there is no UXOQC, will recheck 25% of the first four units of work (grids or transects). If quality requirements are not met on any lot of work, that lot will be rejected and the UXO team will rework the entire lot. Once quality requirements are met for four lots of work in a row, the UXOQC, or Senior UXO technician if there is no UXOQC may reduce the level of rechecks to 10% of each unit (grids or transects). If at any time a lot of work fails the quality control check, that complete lot will be reworked and the rechecks will be increased to 25% until four lots in a row pass the recheck.

Blind seeds may also be used to confirm the completeness of the detector-aided surface survey MEC/MPPEH investigation techniques. Blind seeds will be ISOs, inert munitions, or surrogate munitions items that will be placed within the survey area by the UXOQC to test their detection with the survey instrument. Items will be labeled with a unique identifier, placed within the survey transect, and a GPS location will be taken for the seeded item. Upon discovery of a blind seed item, the UXO Team will record the item's identifier, photograph the seed item, and capture the GPS location of the seed item. The ISOs will be placed at a minimum frequency of one per lot of work and a maximum frequency of 6 per lot of work.

Detector-Aided Surface Survey for Geophysical Survey

The UXO Technician will conduct a detector-aided surface survey of the grid or area to be surveyed and record the location of any MEC items discovered. Each item will be marked and recorded as described above. UXO avoidance will be practiced during the geophysical survey.

When allowed by the conditions of the Explosive Safety Submission (ESS) determination, any non-munitions debris may be moved to facilitate a more effective geophysical survey. Non-munitions debris may be collected and stockpiled in a designated area within the boundaries of the site. The facility must agree to take possession of this non-munitions debris and arrange the proper disposition of the material before any items may be moved or disturbed.

TABLE 1

Whit's Spectrum XLT Settings		
Basic Adjustments:	**UXO 1**	
Target Volume	58	
Audio threshold	23	
Tone (audio frequency)	226	
Audio Disc.	on	
Silent Search	off	
Mixed-Mode	on	
A.C. Sensitivity	60	Adjust at a test Grid. Compare with another White's
D.C. Sensitivity	30	Adjust at a test Grid. Compare with another White's
Backlight	0	
Viewing Angle	25	
Pro Options:		
"Audio"		
Ratchet Pinpointing	on	
S.A.T. Speed	7	
Tone I.D.	on	
V.C.O.	on	
Absolute Value	off	
Modulation	on	
"G.E.B/Trac"		
Autotrac	on	
Trac View	off	
Autotrac Speed	14	
Autotrac Offset	+1	
Trac Inhibit	on	
Coarse B.E.B.	54	These numbers are variable and will change automatically.
Fine G.E.B.	160	These numbers are variable and will change automatically.
"Discrimination"		
Disc. Edit	+95 Accept	
Block Edit	+95 Accept	
Learn Accept	off	
Learn Reject	off	
Recovery Speed	20	

Whit's Spectrum XLT Settings		
Basic Adjustments:	**UXO 1**	
Bottlecap Reject	20	
"Display"		
Visual Disc.	off	
Icons	on or off	
V.D.I. Sensitivity	55	
D.C. Phase	9on	
Graph Averaging	on	
Graph Accumulating	on	
Fade Rate	u	
"Signal"		
Transmit Boost	off	
Transmit Frequency	1 to 7	
Preamp Gain	4	

STANDARD OPERATING PROCEDURE
MRP SOP 02
MEC MANAGEMENT AND ACCOUNTABILITY

A. SCOPE AND APPLICABILITY

This document is designed to set a standard operating procedure (SOP) for the management and accountability of Munitions and Explosives of Concern (MEC) encountered during activities performed under the Munitions Response Program (MRP).

B. BACKGROUND

MEC activities will be performed in accordance with all local, State, and federal regulations and will include all applicable DoD requirements. Generally, MEC will be encountered during the performance of Unexploded Ordnance (UXO) detector-aided surface survey operations, subsurface geophysics investigations and UXO Escort operations. UXO detector-aided surface survey operations may be used as a stand-alone method for site survey and assessment or in preparation for geophysical survey and other operations. UXO escort operations may be required during site visits (initial site assessments, planning, and stakeholders meetings), geophysical operations, construction support during subsurface activities, and MC sampling operations.

C. PERSONNEL QUALIFICATIONS

UXO personnel shall be graduates of a military Explosive Ordnance Disposal (EOD) School of the United States, Canada, Great Britain, Germany, or Australia or a graduate of a formal training course of instruction or EOD assistant course as stated in DDESB TP-18.

D. MEC MANAGEMENT AND ACCOUNTABILITY OPERATIONS

UXO Detector-Aided Surface Survey

If suspect MEC is encountered, its location will be recorded and/or marked using a GPS, tape measure, or other grid coordinate location system. The UXO Team will attempt to determine its condition without moving or disturbing the item prior to proceeding with the surface survey. Each item will be marked with engineer flagging and given a unique ID number. ID numbers will start with a letter(s) corresponding to the site or grid in which the item is located. This will be followed by the transect number of the site or grid specific to the location of the item. Lastly, a number will be assigned to the individual items within the transect. These numbers will start at 01 and run consecutively. For example:

*The site name is **O**pen **B**urn **P**it. The first transect within the Open Burn Pit is **A1**. The first item encountered in transect A1 is item **01**. The ID number assigned to the item is **OBP-A1-01.***

All available information about the item will be recorded in the logbook/MEC Tracking Log as presented in Attachment 1 to this SOP, including suspect MEC location, identification, and ID number. A digital photograph will be taken of each item. The UXO Team will not move or otherwise disturb the item in an attempt to collect information. After all available information is recorded; the UXO Team will resume the detector-aided surface survey.

Every effort will be made to identify each suspect MEC item located. Under no circumstances will any suspect MEC be moved in an attempt to make a definitive identification. The MEC item will be visually examined for markings and other external features such as shape, size, and external fittings. Prior to any documentation being developed on an MEC item, all fusing will be definitively identified if it is possible to safely do so visually without disturbing the ordnance item. This identification will consist of fuse type by

function and condition (armed or unarmed) and the physical state/condition of the fuse, i.e., burned, broken, parts exposed/sheared, etc.

Only UXO-qualified personnel will perform MEC identification procedures. As an exception, a UXO Technician I may assist in the performance of MEC identification procedures when under the supervision of a UXO Technician III or higher. All personnel engaged in field operations will be thoroughly trained and capable of recognizing the specific hazards of the procedures being performed. To ensure that these procedures are performed to standards, all field personnel will be under the direct supervision of a UXO Technician III or higher. All suspect MEC items will be recorded following the requirements of this SOP, the site-specific Work Plan/QAPP, the project site-specific HASP, applicable ordnance operations procedural safety guidelines, and industry-accepted safe work practices and procedures.

Detector-Aided Surface Survey for Geophysical Survey

The UXO Technician will conduct a detector-aided surface survey of the grid or transect to be surveyed and record the location of each MEC item discovered, if any. Each item will be marked and recorded as described above. UXO avoidance will be practiced during the geophysical survey.

When allowed by the conditions of the Explosive Safety Submission (ESS) determination, any non-munitions debris may be moved to facilitate a more effective geophysical survey. Non-munitions debris may be collected and stockpiled in a designated area within the boundaries of the site. The facility must agree to take possession of this non-munitions debris and arrange the proper disposition of the material before any items may be moved or disturbed.

UXO Escort Operations

One UXO Technician, qualified as a UXO Technician II or higher, will be required to support each field team engaged in operations in areas suspected to contain MEC. If any MEC is encountered, the item will be avoided during this phase of the project.

The UXO Technician will not attempt to identify the type or condition of the ordnance during escort operations. Any area with visible ordnance or MEC will be clearly marked, and the area will be avoided. The location of visible ordnance or MEC will be recorded and noted in the field logs. If more senior level personnel are present on site, MEC findings will be reported to the UXO Team Leader. No ordnance, munitions, explosives, or ordnance-related materials will be moved, removed, or disposed of during UXO Escort duties.

E. NOTIFICATIONS IF MEC IS ENCOUNTERED

Any MEC item discovered during a detector-aided surface Survey, geophysical survey, or UXO escort operation will be left in place and will not be moved. Should MEC be encountered, the following scenarios should be addressed as follows:

(1) If a complete MEC item or ordnance related material is encountered that is believed to pose a hazard, is unexpectedly encountered at a given site, is encountered outside of the current established site boundaries, or is unknown, the UXO Team Leader, with support by UXO Technicians on site as necessary, will document the following information, as provided on Attachment 1, for notification purposes:

- Site Name
- Date/Time Encountered
- Name and UXO Category of Person Providing Notification
- Location of Item (provide coordinates)

- Type of Item (provide digital photograph)
- Apparent Fuze Condition (armed or unarmed)
- Physical Condition (burned, broken, parts exposed/sheared, etc)
- Physical Appearance (buried, staged, etc.)
- Activity in Progress

The UXO Team Leader will attempt to identify the type and/or condition of the ordnance and its location, as described above, and will immediately report this information to the client point of contact at the facility and the Tetra Tech UXO Manager. Prior to any documentation being performed on a suspect MEC item, all fuzing will be definitively identified only if it is possible to safely do so visually without disturbing the item. If directed by the point of contact at the facility, UXO personnel may take emergency non-invasive action such as securing the area until the appropriate exclusion and safety zones have been determined.

The point of contact at the facility will be responsible for notifying appropriate EOD personnel or for designating this notification task to the Tetra Tech UXO Team Leader. The notification to EOD personnel should be immediate if a live MEC item is encountered which could be a hazard to personnel, or if the item is unknown so that arrangements may be made through the facility for proper disposition of the item(s). If the facility initiates an emergency response or disposal action, an attempt should be made to obtain follow-up documentation to detail the date and method of disposition. This information may also help to ascertain the actual type and condition of the item (live or inert filled) to aid in future classification of the site.

(2) If the MEC item cannot be identified by type as a conventional munition, and/or if in the unlikely event that the MEC is suspected to be potential Chemical Warfare Material (CWM), personnel will withdraw upwind from the area, assemble at a pre-designated rally point, secure the site, and immediately request assistance from the point of contact at the facility and notify the Tetra Tech UXO Manager. If so directed, UXO personnel will take emergency non-invasive actions such as covering the item with plastic sheeting and securing the area until the appropriate exclusion and safety zones have been determined.

(3) If Hazardous, Toxic, or Radiological Waste (HTRW) is encountered on-site, the work site will be evacuated until the Tetra Tech Project Health and Safety Officer, with concurrence of the client point of contact at the facility, identifies and implements appropriate protective measures.

For any of the scenarios, upon receiving notification from the Tetra Tech UXO Team Leader, the Tetra Tech UXO Manager will then immediately inform the Tetra Tech Project Manager, who will then immediately inform the client Project Manager. Tetra Tech Program Management personnel will then be notified. The client Project Manager will then make all other necessary notifications within the client's organization.

The following table lists contacts information.

Position	Name	Organization	Direct Dial Phone	Cell Phone
Project Manager	Michelle Blanken	Tetra Tech	412.921.8549	412.600.8502
UXO Manager	Ralph Brooks	Tetra Tech	770.413.0965 Ext. 231	404.661.4916
NAS Key West POC/Site Activities Manager	Robert Courtright	NAS Key West	305.293.2881	
Navy Remedial Project Manager	Dana Hayworth	NAVFAC SE MRP	904.542.6417	

ATTACHMENT 1

MEC TRACKING LOG
NAS Key West, Florida
SITE: _____

ID #	ITEM ID	UXO TECH NAME	ITEM COORDINATES	DATE/TIME FOUND	DIGITAL PHOTGRAPH NUMBER	ARMED / UNARMED	PHYSICAL CONDITION / APPEARANCE	DATE DESTROYED

STANDARD OPERATING PROCEDURE
MRP SOP 03
GEOPHYSICAL SURVEY

1.0 SCOPE AND APPLICABILITY

This operating procedure is designed to provide a regular set of guidelines for conducting geophysical surveys for Munitions Response Programs (MRPs). The general procedure is intended to apply to a wide variety of investigations (targets).

2.0 SUMMARY OF METHOD

Various military operations (transport, training, practice and experimental) over time have resulted in the deposition of a wide assortment of munitions of explosive concern (MEC), and a large effort is underway to search and remove such items from many of the active and inactive military sites across the country. MEC range from small objects (20mm) to large objects (bombs), and their potential abundance on a site can vary considerably as well. Geophysics is a non-intrusive approach often used to locate buried objects that could be MEC. Numerous steps are involved in selecting a geophysical approach, and they are described below.

All UXO Survey and avoidance activities and geophysical surveys will be carried out in accordance with all local, state, and federal regulations, and will include general guidance from applicable USACE Data Item Description requirements, including Engineer Pamphlet EP-75-1-2 dated 01 August 2004 (USACE 2004), Data Item Descriptions; MR-001 (USACE 2003a), MR-005-05A (USACE 2003c), MR-005-05 (USACE 2003d), and MR-005-07 (USACE 2003e). Additional guidance is provided in Ordnance and Explosives Digital Geophysical Mapping Guidance – Operational Procedures and Quality Control Manual (DGM QC Guidance) (USACE 2003f).

3.0 PERSONNEL QUALIFICATIONS

Personnel responsible for designing or conducting geophysical processes should possess education and training in geophysics to insure proper procedures are followed. Sub-contractors should possess similar personnel requirements when implementing a geophysical plan. Personnel will meet the requirements of USACE Data Item Description OE – 025.01 (USACE 2002) described below.

Project Geophysicist - This individual has overall responsibility for design, implementation, and management of all geophysical investigations required for the work effort, but may not necessarily be on-site full time.

Site Geophysicist - This individual is responsible for day-to-day operations of the site geophysical investigations.

4.0 SURVEY DESIGN

Several considerations must be taken into account when designing a geophysical survey:

Site Preparation: Sites suspected to contain MEC must be inspected by a properly qualified UXO technician. The inspection will include, as a minimum, a visual inspection as well as possibly assisted by a hand-held magnetic or all-metals locator. This is to ensure safety for setting monuments or survey stakes, and in collecting the survey data. All movable aboveground metal should be removed from the site prior to commencement of the geophysical survey in order to obtain subsurface information (not be interfered with by the aboveground metal that could mask subsurface metal).

Vegetation can also create limitations for survey coverage. Brush cutting and vegetation clearing may be necessary to acquire geophysical data.

Equipment Selection: An understanding of the nature of the suspect MEC must be established first in order to select the proper equipment for the survey site.

Magnetometer surveys are selected when the potential MEC targets are comprised of a substantial ferrous (iron) component, and the site is expected to have low levels of cultural 'noise' (ex. power lines, scrap mixed in with the soil, numerous aboveground metallic objects that cannot be removed from the survey area). Maximum prospecting depth is limited by the strength of the magnetic field for the potential MEC (controlled by the mass, diameter and orientation of the buried metallic object). Sensor height will be determined by the Geophysicist based on the nature of site conditions and expected target sizes and depths.

EM induction surveys are selected when the potential MEC targets are comprised of a significant component of any type of metal. Normally maximum prospecting depths are limited to about 12 to 18 feet below ground surface for the largest potential targets, but will range to very shallow depths for small metallic objects.

Certain geologic conditions may be prohibitive to the success of a geophysical survey, and in such cases a pilot test or Geophysical Prove Out may be required to determine whether the survey equipment can detect the buried targets. Examples of such conditions include ultra-mafic soils or shallow bedrock, high electrically conductive soils (perhaps fill containing scrap metal) or salt water conditions which can interfere with the detection capabilities of the survey equipment.

Survey Coverage: Expected target sizes, anticipated burial depths and the target metal mass must be evaluated by the Geophysicist in order for proper selection of survey line spacing given the selection of geophysical equipment in order to possess a high level of confidence that the project goals can be accomplished. Surveys conducted using 2.5 ft line spacing with an EM61 or G-858 magnetometer will provide 100% effective survey coverage for most MEC targets. Conversely, in cases where a reconnaissance survey is needed, meandering path or non-traditional survey geometries may be substituted to accomplish the project goals. In all cases, consideration must be given to past, current and future land uses to assure that the survey approach meets the client objectives.

Survey Location: Locating survey lines (data) can be accomplished in a few ways. The level of accuracy needed and the surrounding site features will help determine the acceptable location technique. Small survey areas may be located with a high level of accuracy using tape measures to create survey lines (grids). The grids may then be referenced directly to permanent and semi-permanent site features.

Larger survey areas or survey areas in remote areas may need a different location method to maintain a high level of accuracy. Professional surveying or integrating DGPS measurements with the geophysical data can be used in large areas to maintain high location accuracy. Numerous GPS units (DGPS) are readily available to achieve sub-meter accuracy. Specialized GPS units (Real Time Kinematic or RTK) should be employed when sub-foot accuracies are needed. GPS units do not normally operate effectively in wooded areas, and professional surveying or total stationing methods may be required for high level accuracy in those areas. Alternatively, wooded survey areas may be established by tape measure, followed by GPS (where a clear GPS signal can be received), total stationing or professional surveying of several survey grid points or corners.

Data Sampling: Data must be collected at intervals to satisfactorily sample the anticipated targets. Expected target sizes, anticipated burial depths and the target metal mass must be evaluated by the Geophysicist in order for proper selection of data sampling intervals. Data station intervals will normally be determined from the movement speed along the survey lines with respect to the data initiation interval (normally automatic or sometimes manual as a function of time). Measurements may be triggered by a survey wheel attached to the survey instrument when sufficient data density can be achieved. Calibration of the survey wheel may be needed depending on the instrument setup.

5.0 EQUIPMENT

Instrument Checks:

Equipment Standardization. Geophysical sensors and support equipment, navigation equipment, and operator performance will be checked and tested at specific intervals and must meet the appropriate acceptance criteria. Table 1 lists the tests, and their required frequencies and acceptance criteria modified from USACE Engineering Pamphlet (EP) 75-1-2 (2004). These tests plus the initial out-of-box tests are detailed below.

Out-of-Box-Tests. The following out-of-box procedures will be conducted before the pre-seed geophysical survey of the test plot area begins:

- Inventory and inspect all equipment to confirm all components are present and in good condition.
- Assemble the equipment and power up.

Regular Tests.

1. **Equipment/Electronics Warm-Up.** This test minimizes sensor drift caused by thermal stabilization. Most instruments need a few minutes to warm up before data collection begins. All manufacturer instructions will be followed or, if none are given, data readings will be observed until they stabilize. Acceptance Criterion: Equipment Specific (typically 5 minutes). This test will be conducted each time the unit is started.

2. **Equipment Null.** The EM61 and EM31 equipment should be nulled before data collection at each site. The units should be nulled in areas determined to represent background levels (non-anomalous areas 'quiet areas').

3. **Record Sensor Positions.** The purpose is to document relative navigation and sensor offsets, detector separation, and detector heights above the ground surface. This information will ensure that the detector offset corrections and gradient calculations can be done correctly and that the surveys are repeatable. Acceptance Criterion: ±2 inches for EM61 and 858 standard units and ±6 inches for EM31. This test will be conducted at the beginning of the 1st day and when an equipment configuration change is made.

4. **Personnel Test.** This test ensures that survey personnel have removed all potential interference (metal) sources from their bodies. Common interference sources are ballpoint pens, steel-toe boots, or large metallic belt buckles, which can produce data anomalies similar to OE targets. All personnel who will be coming near the sensor during survey operations should remove metallic items from themselves, and if not possible then readings should be monitored and recorded to judge the effect of the metallic items in order to meet the following acceptance criteria. Acceptance Criterion: EM61 2 mV, magnetometer 2 nT, EM31 1mS/m or ppt. This test will be conducted at the beginning of each day if the operator is wearing metallic items that could interfere with equipment operation..

5. **Static Background and Static Spike (or Standard Response) Test.** These tests quantify instrument background readings and electronic drift, locate potential interference spikes in the time domain, and determine impulse response and repeatability of the instrument to a standard test item (typically a 2-inch-diameter steel trailer hitch ball). Improper instrument function, the essence of local sources of ambient noise (such as EM transmissions from high-voltage electric lines), and faulty equipment are all potential causes of inconsistent, non-repeatable readings. A minimum of 3 minutes static background test after instrument warm-up, followed by a 1-minute standard response test, in turn followed by an additional 1 minute static background test, will be performed. The field geophysicist must review the readings to confirm they are stable before the geophysical survey continues. Guidance Criteria: Static Background test EM 61 ± 3 mV, magnetometer ± 5 nT, EM31 ± 1 mS/m or ppt ; Static Response Test ±20% of standard item response after background correction. This test will be conducted at the beginning of each day.

6. **Base-Line Test.** This test is conducted in an area that has low background noise and no sources of anomalous response. The test line will be well marked to facilitate data collection over exactly the same line each time the test is performed. The test may need to be conducted at the beginning, middle and end of each day to check for instrument drift

(baseline shift in data values) or in the situation where a magnetic base station is not used during a magnetometer survey in order to make any necessary data value adjustments.

7. **Pull-Away Test.** This test demonstrates the effects of the navigational equipment. All equipment will be powered up and operating as it would be during the survey. Acceptance Criterion: document the effects of the navigational equipment on the geophysical readings. Effects should be small. Test should be performed before the geophysical survey begins, and if the equipment configuration changes during the survey.

8. **GPS Positioning.** The GPS positioning system will be tested by surveying two survey control points. The GPS coordinates are compared with the documented coordinates for the control points. Acceptance Criterion: sub-meter or better (based on project requirements). Test should be performed as a minimum at the beginning of the project and if an equipment change is made. GPS survey instruments should also be closely monitored during field acquisition by using Dilution of Precision (DOP) criteria, or as a minimum # of satellite signals received criteria. DOP should normally be less than 3 to obtain high quality results, and at least 6 satellites should also indicate high quality results.

   Latency is an issue when a separate GPS controller (from the geophysical controller) is used to acquire the GPS data. If separate controllers are used, care should be taken to synchronize the clocks in both the GPS and geophysical units, and a test must be set up to measure the latency inherent in using two different accuracy clocks. The test should consist of positioning oneself overtop of a linear metallic object (ex. pipe) at several points and recording data with the all of the survey equipment, and again using only the GPS equipment to compare the results and determine the necessary adjustment.

9. **Azimuth Test.** The purpose of this test is to optimize the sensor orientation to avoid optically pumped magnetometer sensor "dead zones", and obtain a strong signal strength.

6.0 QUALITY ASSURANCE / QUALITY CONTROL

All documentation will be available to base personnel. Operational and test procedures will conform to the manufacturer's standard instructions. QC of the instruments' data will be achieved daily by field testing, checking the sensor and navigation system against a known target to ensure that they are operating properly. All geophysical instruments and equipment used to gather and generate field data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of the results are consistent with the manufacturer's specifications. Calibration, repair, or replacement records will be filed and maintained by the field geophysicist and may be subject to audit by the quality assurance (QA) manager. Potential data problems include source data errors, data entry errors, data editing errors, and user errors. All data will be reviewed to identify and correct any of these errors should they occur.

7.0 FIELD REPORTING AND RECORDS MANAGEMENT

Field data sheets/notes will be maintained for all geophysical activities. This SOP contains copies of the field forms and checklists. Project documentation will be collected and managed

on-site during the life of all field activities. Geophysical data will be recorded digitally and downloaded to a field computer for review in the field. In addition to the copy of data saved on the field computers hard drive, a copy of the data will be saved on a compact disk (CD) for backup before the data are erased from the equipment. The project geophysicist will review the downloaded data to verify that the download system is functioning properly. This review will also check the field data for QC review. The review will verify that the data are valid and useable for the intended purpose.

8.0 INSTRUMENT VERIFICATION STRIP

An Instrument Verification Strip (IVS) may be performed to evaluate geophysical surveying techniques and personnel that will apply to MEC sites. IVSs are important in testing the survey technique to determine whether it is capable of detecting the target items.

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Instrument Verification Strip -

The specific objectives for the Instrument Verification Strip (IVS) will be:

- Determine whether the proposed geophysical technique is appropriate for this type of investigation.
- Provide a safe area with a known set of isolated objects (for example, single inert UXO). The sensor signatures from these items may be used to evaluate the equipment limitations in the site geologic setting and to optimize equipment, procedures, and data analysis. Response curves to industry standard objects (ISOs) and standard munition items will be compared to IVS survey data to assess whether or not the technique appears to have typical detection capabilities for survey work.
- Assess the operators' performance and update related procedures to assist in the development of operator measurement techniques.
- Establish a baseline of performance capabilities for the selected instruments.
- Evaluate average speed and minimum along-track sampling required to detect target items.
- Evaluate all data processing (see MRP SOP 04 named Geophysical Data Processing and Analysis), including distance corrections, map production, and target selection, to produce final datasets.
- Detect items within the USACE's 11x rule, which states that generally munitions can typically be detected within a depth equal to 11 times their diameter.
- Identify horizontal positions of detected seed items to be within project specified accuracy or better (depending on investigation goals).

Test Plot/Test Strip Design. The proposed test plot/test strip layout shall be included in the work plan, and the following recommendations from USACE Data Item Description MR-005-05A, Revision 1 December 2003 should be used as guidelines for establishing the IVS:

a. Plot Size and Location. Selection of the plot area should be based upon the technical and site-specific considerations developed and finalized during the TPP process and/or project team meetings, and follow anticipated layout for project data collection. It may be advantageous to plan the IVS location outside of areas where digging is restricted to UXO technicians and/or oversight by UXO technicians.

b. Seed Items. Describe the planned seeding methodology for known items. In addition to the known seed items. Once placed, all seeded items and corner markers should be surveyed and photographed. The planned IVS target layout plan shall be updated to reflect the "as built" configuration. The seeded items should be tagged with a non-biodegradable label identifying the items as inert and providing a contract reference, a point of contact address, phone number, and a target identifier.

   A tabulated list, available in digital format, containing the seed items, ID numbers, depths, proposed orientation (or survey information on the nose, tail, and center point of the item) shall be included. Inert munition items should be used whenever possible.

c. Site Preparation. Describe any preparation that may be necessary to allow accessibility with geophysical instruments. This may include vegetation removal and/or surface clearance. After this step, the test plot should duplicate, as closely as possible, the conditions under which the geophysical surveys will be conducted.

d. Location Surveying. Describe the location methods to be employed. The location of the test plot corners and seed items shall be surveyed to a horizontal accuracy established during the TPP process and/or project team meetings.

e. Pre-Seeding (Background) Geophysical Mapping. Describe background geophysical mapping. After a site has been selected and the surface prepared, pre-seeding geophysical surveys shall be performed with each detector type in order to determine and document base-line geophysical conditions at the site.

f. Quality Control. Describe Quality Control measures to be implemented.

g. Anomaly Avoidance. Anomaly avoidance will be performed by all site workers for all anomalies located, visually or with metal detectors, during preparation of the test plot site. A statement that the contractor shall use anomaly avoidance techniques shall be included. This is to ensure the location of each excavation and corner marker/stake is clear of metallic anomalies before placing seed items or site corner markers, and includes utilizing the background geophysical data.

h. Data Collection Variables. It is important to collect and analyze test plot data using the same equipment and procedures that are planned for field use. It is strongly recommended that key personnel from the IVS perform the production survey to minimize the learning curve and provide project continuity. Some data collection elements are subject to modification and

evaluation and multiple geophysical surveys using each proposed geophysical instrument may be performed. These elements include: instrument height, instrument orientation and direction of travel, instrument channel selections, measurement interval along survey line, lane width, etc.

i. Data Analysis and Interpretation. All data collected from each geophysical instrument will be post-processed and analyzed. It is required that all data channels are analyzed to ensure the best methodology is established for each site.

j. Data Evaluation. The geophysical data must be evaluated and scored so that the different geophysical approaches can be compared and ranked. No single geophysical system is likely to achieve maximum scores in all evaluated areas. Therefore, the evaluation team must determine which approach is likely to be most efficient for the site.

IVS Approval and Reporting.

After the IVS field work has been completed, the contractor shall present the data to the Project Geophysicist and Project Manager, or the Project Manager's designee for approval prior to site work. The stationary positioning of the seed items must be shown relative to the data to provide comparison of the anomaly location with the seed item location to evaluate positional accuracy. The results of the IVS will be summarized in the geophysical report and will include:

a. As-built drawing of the IVS plot;
b. Pictures of the seed items;
c. Profile and/or contour maps of the geophysical data;
d. Summary of the IVS results;
e. Proposed geophysical equipment, techniques, and methodologies; and
f. Sufficient supporting information to justify the project team's recommendations.

The Contractor may not proceed with production geophysical mapping until the designated project team member approves the IVS results.

Table 1: Geophysical Equipment QC Tests
Munitions and Explosives of Concern Sites
Military Munitions Response Program

Test No.	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning, Middle and End of Day	1st Day on Site
1	Equipment Warm-up	Equipment Specific (typically 5 minutes)	X			
2	Equipment Null	Conduct in non-anomalous areas				X
3	Record Sensor Positions	± 2 inches (standard EM61/858), ±6 inches EM31				X
4	Personnel Test	EM61 2 mV p-p (channel 3 on MkII), magnetometer 2 nT, EM31 1 mS/m or ppt		X		
5	Static Background and Static Spike	Background: EM61 ± 3 mV p-p, magnetometer ± 5 nT, EM31 ±1 mS/m or ppt. Spike: ± 20% of standard item response, after background correction		X		
6	Base-Line Test	Check for instrument drift /diurnal ch. (to correct data readings if needed)			X (EM31 or MAG)	
7	Pull Away Test	Navigation equipment should have minimal effect on readings				X
8	GPS Positioning	Positional Accuracy: sub-meter				X
9	Azimuth Test	Strong signal strength, no dropouts				X

Notes: cm – centimeter, mV – millivolt, ppt – parts per thousand, nT – nanotesla, mS/m – millisiemens per meter

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DAILY QUALITY CONTROL REPORT	
Contract Number:	Project:
Location:	Date:
List Features of Work and Equipment Used, Locations (areas surveyed), and List Personnel Present	
Rework Items Identified Today (Not Corrected by Close of Business)	Rework Items Corrected Today
Remarks/Describe any Idle or Downtime and/or Equipment Problems	
On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.	_____ ERT Representative _____ Date
Tetra Tech Quality Assurance	
Quality Assurance Representative Remarks and/or Exceptions to the Report	
Inspection of Field Activities Performed	_____ Tetra Tech QA Representative _____ Date

TETRA TECH NUS, INC.

DAILY INSTRUMENT	IVS REPORT

Project Name: **Project No**: **Location**: **Date**:

I. Test Plot Information

Item Number	Inert Item/Surrogate Description	Depth (inches)	Azimuth/ Inclination Angle(Degrees)	Comments
1				
2				
3				
4				
5				
6				
7				
8				

II. Instrument Information

Instrument Type/Manufacture	Instrument Serial Number	Test Plot Items Instrument Tested on (List Item Numbers)	Settings On Instrument Tested (As Per WP)	Test Results, ☒ indicates good for operation	Personnel Testing Equipment	Comments
				☐		
				☐		
				☐		
				☐		

III. Problems Encountered / Corrective Actions Taken / Additional Comments.

explain in space below:

IV. Supervisor

Name and Signature:	Title/Company:	Date:

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QUALITY CONTROL SURVEILLANCE REPORT	Report Number:
Project Name:	Contract No:
Client:	Project Manager:

1 - Activity

☐ Project Readiness UFP-SAP Review	☐ Pre-Operational Team Training Review	☐ Mobilization/Site Preparation	☐ Brush Cutting and Vegetation Clearance
☐ Pre-Survey IVS Review	☐ Daily Function Test	☐ UXO Detector-Aided Surface Sweeps/Quality Control Check	☐ UXO Detector-Aided Surface Sweep Field Data Collection &Transcription
☐ Geophysical Survey	☐ Geophysical Survey Field Data Collection and Transcription	☐ GPS Data	☐ Demobilization
☐ Other:	☐ Other:	☐ Other:	☐ Other:

2 - Phase

☐ Preparatory	☐ Initial	☐ Follow up

3 - References [(1)]

4 – Observed Condition/Activities and Comments [(1)]

5 – Results of Surveillance

☐ Acceptable	☐ Unacceptable	Deficiency #: NCR #:
Conducted By:	Signature:	Date:

6 – Project Manager Review

☐ Concur ☐ Non-Concur	Signature:	Date:

7 - Distribution

☐ PM ☐ FOL ☐ SUXOS ☐ UXO Manager ☐ Safety ☐ Other:

[(1)] Add / reference continuation sheets as necessary.

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IVS Checklist

Project Name: _____
Project Location: _____
Name and Title: _____
Date: _____

Objectives

Have survey objectives been determined, clarified, and documented?	Y	N	NA
Will the IVS be available during the project for the evaluation of suspected instrument malfunctions or evaluation of new equipment and operators?	Y	N	NA

Site Preparation

Has surface clearance been performed?	Y	N	NA
Has background geophysical survey been performed before burial?	Y	N	NA

IVS Seeding

Have the following steps been taken to ensure accurate locations for the seeded items:

Thorough notes taken on each item's burial?	Y	N	NA
Measure depth to top and center of mass of each object?	Y	N	NA
GPS or a land surveyor employed to record the position of each item?	Y	N	NA

Checklist for Out of Box Equipment Tests

Project Name: _____
Project Location: _____
Name and Title: _____
Date: _____

Has the equipment been inventoried and inspected for damage or wear?	Y	N	NA
Are spare parts (cables) included with the system?	Y	N	NA
Has the cable shake test been performed? (Replace any fault components)	Y	N	NA

Checklist for Initial Instrument Tests

Project Name: _____
Project Location: _____
Name and Title: _____
Date: _____

Has the sensor travel test been performed (for underwater surveys), and are the results acceptable to meet survey objectives?	Y	N	NA
Has the GPS unit been checked for accuracy requirements against two known locations?	Y	N	NA
Has the optimum sensor height for each instrument been determined?	Y	N	NA
Have the pull-away and/or interferences tests been performed and successfully demonstrated no influence for navigational or towing equipment?	Y	N	NA
Has an appropriate data acquisition rate been selected?	Y	N	NA

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Checklist for Daily Instrument Checks

Project Name: _____
Project Location: _____
Name and Title: _____
Date: _____

Has the operator been checked for presence of metal?	Y	N	NA
Has the instrument been warmed-up?	Y	N	NA
Have the sensor positions been measured and recorded?	Y	N	NA
Has a static background and spike test been performed successfully?	Y	N	NA
Has the equipment function test been performed with detection of all the test targets?	Y	N	NA
Have all loose cables been secured?	Y	N	NA
Has the EM61 or EM31 been nulled (power on)?			
Has the geophysical equipment been set up according to manufacturer's specifications?	Y	N	NA
Were the data monitored during data collection for anything unusual?	Y	N	NA

Checklist for Field Editing

Project Name: _____
Project Location: _____
Name and Title: _____
Date: _____

Have the following items been evaluated for correctness and edited if necessary:

Line numbers?	Y	N	NA
Start and end points?	Y	N	NA
Line direction?	Y	N	NA
Fiducial locations?	Y	N	NA

Have the data been examined for geophysical noise?	Y	N	NA
Have the data been examined for the presence of drop-outs and spikes?	Y	N	NA
Have the edited data been converted to the appropriate .xyz format?	Y	N	NA

If using magnetics, have the following steps been taken:

Examined base station data for any problems?	Y	N	NA
Performed diurnal correction to field magnetometer data?	Y	N	NA

Have the positional data been evaluated for accuracy and completeness?	Y	N	NA

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DETECTOR-AIDED ANOMALY SUBSURFACE TRACKING TABLE
DREDGE SPOILS AREA
FLEMING KEY, NAS KEY WEST, FLORIDA

Transect Segment	# of Anomalies	Color Code	Date Collected

KEY

Blue: 0
Green: 0-5
Yellow: 6-20
Red: 21+

STANDARD OPERATING PROCEDURE
MUNITIONS RESPONSE PROGRAM (MRP) SOP 05
GPS DATA COLLECTION AND TRANSFER

1.0 OVERVIEW

The primary purpose of this Standard Operating Procedure (SOP) is to provide the Field Technicians with basic instructions for operating a handheld Global Positioning System (GPS) unit allowing them to set GPS parameters in the receiver, record GPS positions on the field device, and transfer the data for integration into existing Geographic Information System (GIS) figures.

This SOP is specific to GIS quality data collection for Trimble-specific hardware and software.

If possible, the Trimble GeoXT or XH Operators Manual should be downloaded onto the operator's personal computer for reference before or while in the field. The manual can be downloaded at the following website:
http://trl.trimble.com/docushare/dsweb/Get/Document-311749/TerraSyncReferenceManual.pdf

Unless the operator is proficient in the setup and operation of the GPS unit, the Project Manager (or designee) should have the GPS unit shipped to the project-specific contact listed below in the Pittsburgh, Pennsylvania office at least five working days prior to field mobilization so project-specific data files (i.e. shape files), background images, data dictionaries, and correct coordinate systems can be uploaded into the unit.

Tetra Tech NUS
Attn: Michelle Blanken
661 Anderson Drive, Bldg #7
Pittsburgh, PA 15220

The SOP also describes how field collected data is to be transferred through the use of the MRP Website. (http://www.ttnus.com/MRPRepository/). This website serves as a centralized portal to facilitate data exchange for field personnel, GIS staff, and project managers. The website contains a "Reference" page that will contain the latest version of this SOP and other valuable documentation.

For technical questions regarding operation of the GPS units and data collection, please contact John Wright (john.wright@tetratech.com). For general questions about this SOP and use of the MRP website, please contact Mark Maguire (mark.maguire@tetratech.com).

2.0 REQUIRED EQUIPMENT

The following hardware and software should be utilized for locating and establishing GPS points in the field:

2.1 GPS Hardware & Equipment

- Hand-held GPS Unit capable of sub-meter accuracy. This includes the docking cradle, a/c adapter, stylus, and USB cable for data transfer. Two models, the GeoXH and GeoXT, are acceptable for use. The XH yields higher accuracy (in both real-time and post-processed) and should always be requested when highly precise data is required.

- An external antenna will yield better satellite reception, especially in heavy tree canopy. Associated accessories include a range pole and hardware clamp, for mounting the GPS unit to the pole.

- Indelible marker.

- Non-metallic pin flags for temporary marking of positions.

2.2 GPS Software

The following software is required to transfer data from the handheld GPS unit to a personal computer:

- Trimble TerraSync version 2.6 or later (pre-loaded onto GPS unit from vendor)

- Microsoft ActiveSync version 4.5 or later. Download to personal computer from:
  http://www.microsoft.com/windowsmobile/en-us/downloads/microsoft/activesync-download.mspx

  Note: Windows Vista and Windows 7 users should download Windows Mobile Device Center version 6.1 or later from the following site, if it is not already loaded on the machine:
  http://www.microsoft.com/windowsmobile/en-us/downloads/microsoft/device-center-download.mspx

- Trimble Data Transfer Utility (freeware version 2.1 or later). Download to personal computer from:
  http://www.trimble.com/datatransfer.shtml

3.0 START-UP PROCEDURES

Prior to utilizing the GPS in the field, ensure the unit is fully charged. The unit may come charged from the vendor, but an overnight charge is recommended prior to fieldwork.

The Geo-series GPS units require a docking cradle for both charging and data transfer. The Geo-series GPS unit is docked in the cradle by first inserting the far domed end in the top of the cradled, then gently seating the contact end into the latch. The power charger is then connected to the cradle at the back end using the twist-lock connector. Attach a USB cable as needed between the cradle (B end) and the laptop/PC (A end).

It is recommended that the user also be familiar and check various Windows Mobile settings. One critical setting is the Power Options. The backlight should be set as needed to conserve power when not in use.

3.1 Initial Start Up

1) Power on the GPS unit by pushing the small green button located on the lower right front of the unit.

2) Utilizing the stylus that came with the GPS unit, launch **TerraSync** from the Windows Operating System by tapping on the start icon located in the upper left hand corner of the screen and then tap on **TerraSync** from the drop-down list.

3) If the unit does not default to the Setup screen, tap the Main Menu (uppermost left tab, just below the Windows icon) and select Setup.

4) If the unit was previously shipped to the Pittsburgh office for setup, you can skip directly to Section 4.0. However, to confirm or change settings, continue on to Section 3.1.

3.2 Confirm Setup Settings

Use the Setup section to confirm the TerraSync software settings. To open the Setup section, tap the Main Menu and select Setup. (Note that if the unit was shipped from the Pittsburgh office, these settings should have been set for your specific project. Feel free to contact Pittsburgh staff with any questions.)

1) Tap on the Coordinate System.
2) Verify the project specs are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu. **Note:** It is always best to utilize the Cancel tab rather than the OK tab if no changes are made since configurations are easily changed by mistake.
3) Tap on the Units.
4) Verify the user preferences are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
5) Tap Real-time Settings.

6) Verify the Real-time Settings are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
7) The GPS unit is now configured correctly for your specific project.

3.3 Antenna Connection

1) If a connection has been properly made with the internal antenna, a satellite icon along with the number of usable satellites will appear at the top of the screen next to the battery icon. If no connection is made (e.g.: no satellite icon), tap on the GPS tab to connect antenna.
2) At this point the GPS unit is ready to begin collecting data.

3.4 Loading a Background file

This section provides instructions on pulling in a pre-loaded background file. These files are helpful in visualizing your current location.

1) From the Main Menu select Map, then tap on Layers, select the background file from drop down list.
2) Select the project-specific background file from the list of available files.
3) Once the selected background file appears, the operator can manipulate the screen utilizing the +/- and <-/-> functions at the bottom of the screen.
4) In operating mode, the operator's location will show up on the background file as a floating "x".

4.0 FIELD DATA COLLECTION

For MRP data collection activities, a new GPS file should be created **every day** and transferred **nightly** using the MRP website (see Section 9.0). This is to insure the timely transfer of data, file organization in the database, and allow for next-day GIS mapping. Also, individual GPS data files should be **unique to a particular site** or unit (typically a UXO number). If multiple sites are visited in a single data, multiple files should be created.

4.1 Creating a Data File

1) From the Main Menu select Data.
2) From the Sub Menu (located below the Data tab) select New which will bring up the New Data File menu.
3) An auto-generated filename appears and should be edited for your specific project. The following naming convention should be followed as closely as possible: **IH-UXO4-01012010-TeamA**, where "IH" is the installation abbreviation (Indian Head), "UXO04" is the site, and "01012010" is the data in MMDDYYYY format. If multiple teams are being deployed across an individual site on the same day, it is important to specify the

field team name at the end of the file name ("TeamA"). If the integral keyboard does not appear, tap the small keyboard icon at the bottom of the screen.

4) Select the data dictionary that will be used to collect features. The data dictionary provides predefined fields and drop-down menus to facilitate data collection as it relates to specific MRP data types. The MRP data dictionary is entitled "**MRP Data Collection**" and should appear in the data dictionary drop-down list. This should have been pre-loaded into the GPS prior to use. The data dictionary file is available on the MRP website under the "Reference" section.
5) After entering the file name and selecting the data dictionary, tap Create to create the new file.
6) Confirm antenna height if screen appears. Antenna height is the height that the GPS unit will be held from the ground surface (Typically 3 to 4 feet)
7) The Choose Feature screen appears.

4.2 Collecting Features

1) If not already open, the Collect Feature screen can be opened by tapping the Main Menu and selecting Data. The Sub Menu should default to Collect.
2) **<u>Do not</u> begin the data logging process until you are at the specific location for which you intend to log the data.**
3) A known reference or two should be shot at the beginning and at the end of each day in which the GPS unit is being used. This allows for greater accuracy during post-processing of the data.
4) Upon arriving at the specific location, select the proper feature type from the data dictionary list (MEP Object, Transect End Point, GPS QC Point, or General Point).
5) Tap Create to begin data logging.
6) As the GPS is collecting positions, enter the feature attributes, starting with the Item ID. This field is required and will not allow the user to continue or save the position without entering a value. Enter any additional notes or feature descriptions in the appropriate fields.
7) Data logging can be confirmed by viewing the writing pencil icon in the upper part of the screen. Also, the logging counter will begin. As a Rule of Thumb, accumulate a minimum of 20 readings on the counter, per point, as indicated by the logging counter before saving the GPS data.
8) Once the counter has reached a minimum number of counts (i.e. 20), tap on OK to save the data point to the GPS unit. Confirm the feature. All data points are automatically saved within the GPS unit.
9) Repeat steps 2 through 8, giving each data point a unique name or number.

Note: If the small satellite icon or the pencil icon is blinking, this is an indication the GPS unit is not collecting data. A possible problem may be too few satellites. While still in data collection mode, tap on Main Menu in upper left hand corner of the screen and select Status. Skyplot will display as the default showing the number of available satellites. To increase productivity (number of usable satellites) use the stylus to move the pointer on the productivity and precision line to the left. This will decrease precision, but increase productivity. The precision and productivity of the GPS unit can be adjusted as the number of usable satellites changes throughout the day. To determine if GPS is correctly

recording data, see Section 5.2. If the precision toggle is decreased, the user should frequently check the Skyplot display to restore the default values as soon as possible.

4.3 Navigation

This section provides instructions on navigating to saved data points in an existing file within the GPS unit.

1) From the Main Menu select Map.
2) Using the Select tool, pick the point on the map to where you want to navigate.
3) The location you select will have a box placed around the point.
4) From the Options menu, choose the Set Nav Target (aka set navigation target).
5) The location will now have double blue flags indicating this point is you navigation target.
6) From the Main Menu select Navigation.
7) The dial and data on this page will indicate what distance and direction you need to travel to reach the desired target.
8) Follow the navigation guide until you reach the point you select.
9) Repeat as needed for any map point by going back to Step 1.

4.4 Data Quality Control

Quality control checks should be performed each day of data collection and/or data navigation. QC checks are important both to understand real-time accuracy while in the field, and also to provide control data needed during post-processing.

1) Known survey benchmarks, surveyed monitoring wells, or other established and documented control points should be identified
2) GPS equipment should be placed on known control points and positions recorded
3) For data collection tasks - QC check data should be collected at least at the start and completion of the fieldwork for the day of data collection. Additional occupation and collection of control point data should occur as possible during the work day, and should increase in frequency as the number of data points increase and the need for accurate data collection increases
4) For navigation tasks such as stake placement for planned sample locations, QC data checks should be done at least at the start and completion of the fieldwork for each day. Known visible targets should be occupied and observed by the user, while the GPS satellite status and other user interface data is reviewed. The user should assess whether the real-time accuracy settings on the GPS are within the tolerance of the observed visual reference points.

4.5 Viewing Data or Entering Additional Data Points to the Current File

1) To view the stored data points in the current file, tap on the Main Menu and select Map. Stored data points for that particular file will appear. Use the +/- and <-/-> icons in lower left hand corner of screen to zoom in/out and to manipulate current view.
2) To return to data collection, tap on the Main Menu and select Data. You are now ready to continue to collect additional data points.

4.6 Viewing Data or Entering Data Points from an Existing File

1) To view data points from a previous file, tap on Main Menu and select Data, then select File Manager from the Sub Menu.
2) Highlight the file you want to view and select Map from the Main Menu.
3) To add data points to this file, tap on Main Menu and select Data. Continue to collect additional data points.

4.7 Shutting Down

This section provides instruction for properly shutting down the GPS unit.

1) When shutting down the GPS unit for the day, first click on the "X" in the upper right hand corner.
2) You will be prompted to ensure you want to exit TerraSync. Select Yes.
3) Power off the GPS unit by pushing the small green button located on the bottom face of the unit.
4) Place the GPS unit in its cradle to recharge the battery overnight. Ensure the green charge light is visible on the charging cradle.

5.0 DATA TRANSFER

This section describes how data should be downloaded from the GPS units and uploaded to a central website for post-processing and integration into GIS datasets. GPS data collected on a given day should be transferred **that night** for post-processing by GIS staff the next morning. Once post-processed, the GPS data will be plotted on a map and be immediately provided to the project team for review. Data upload, download, and review will be facilitated through a secure MRP website: http://www.ttnus.com/MRPRepository/

5.1 Load Data from the GPS Unit to Your Computer

1) Install the Data Transfer and ActiveSync software installed on your PC (see section 2.2)
2) Connect the GeoXH/XT to your PC via an A/B USB cable (blade end and square end type "HP printer" style)
3) ActiveSync should auto-detect the connection and recognize the data collector
4) Make sure the data file desired is CLOSED in TerraSync prior to transfer
5) Connect via ActiveSync as a guest (not a partnership)

6) Run the Trimble Data Transfer Utility program on your PC
7) Select "***GIS Datalogger on Windows CE***" or similar selection
8) Hit the green connect icon to the right - the far right area should say "***Connected to ....***" if successful
9) Select the "***Receive***" data tab (under device)
10) Select "***Data***" from file types on the right
11) Find the file(s) needed for data transfer. You can sort the data files by clicking on the date/time header
12) Select or browse to a C-drive folder you can put this file for upload
13) When the file appears on the list, hit the "***Transfer All***". Once complete, a packet of multiple data files will appear on your computer in the specified folder.

5.2 Gain Access to MRP Website

1) Confirm that your computer has internet access
2) Click on the following link: http://www.ttnus.com/MRPRepository/
3) To register for the website, click on the "Register here" link. Enter your information and click "Submit." NOTE: Requests for registration are sent to Ralph Basinski, Program Manager, for approval. Please contact mark.maguire@tetratech.com if you experience any access issues.
4) Enter your username (Tetra Tech email address) and password to log in.

5.3 Upload GPS Data from Your Computer to the MRP Website

1) From the main page, select "Upload" from the menu at left.
2) Select the type of data you are uploading, typically "GPS Field Data"
3) Select the appropriate Installation and Site. Remember that GPS files should be unique for each site, even if multiple sites are visited in one day. If collected data is not associated with a site, select "Other."
4) Select "browse" to navigate to the appropriate *.SSF file on your computer. When you use the Trimble download utility to grab data from the GPS unit, multiple files will appear on your computer. You only need to the upload the *.SSF file.
5) Populate the "Comments" field to describe the dataset and any other pertinent information. This information will be provided to the GIS analyst who will be integrating the dataset, so be sure to be as descriptive as possible especially if there are any issues with the data. (For example, if you were to sample 16 points and for some reason you believe only 15 were logged, it is helpful to share this information.)
7) Select "Upload." Users will be notified if the files were uploaded successfully.

5.4 Download Data from the MRP Website to Your Computer

The download utility on the MRP website will serve different user types. **Field staff** will use the utility to download GIS figures (in PDF format) and view the previous day(s) field data on aerial photographs, checking for any discrepancies or missing data elements. **Project Managers** will also have the ability to download and view these figures, to visualize the data and track project

progress. This utility will also allow **GIS Analysts** to download the *.SSF files posted by field staff for post-processing and map plotting.

To download GIS Figures:

1) From the main page, select “Download” from the menu at left.
2) Select an Installation and Site
3) Users can view Figures for a particular date or by a range of dates, by selecting the ` appropriate options. To search all dates, leave all of these fields as the default.
4) Select “Search”
5) A table will appear showing the files available for download. Simply click on the link to the file and you will be prompted to save it to your computer.

STANDARD OPERATING PROCEDURE
MRP SOP 06
VEGETATION MANAGEMENT AT MEC SITES

A. SCOPE AND APPLICABILITY

This document is designed to set a standard operating procedure (SOP) for vegetation management during activities performed at Munitions and Explosives of Concern (MEC) sites. Inherently, a strong possibility exists that MEC and material potentially presenting an explosive hazard (MPPEH) may be encountered. The procedures detailed in MRP SOP 01, UXO Detector-Aided Surface Surveys, provide specific guidance for UXO survey operations and equipment. MRP SOP 02, MEC Management and Accountability, provides instructions and procedures to be followed in the event that suspect MEC/MPPEH is encountered. Additionally, MEC activities will be performed in accordance with all local, State, and federal regulations and will include all applicable DoD requirements.

B. BACKGROUND

Vegetation management may be required in preparation for field activities at MEC sites. Trees, brush, grass, and other vegetation can impede the performance of MEC operations, geophysical surveys, and related investigation and remediation activities. The degree of vegetation removal will be site-specific and based upon the conditions encountered and activities to be conducted. Following is a general discussion of the type of equipment/techniques that will be used.

- Hand held brush cutters (string or blade) will be used to cut light vegetation and small grassy areas.
- Mechanized lawn mowers will be used to mow larger grassy areas.
- Chain saws will be used in heavier brush areas, to trim tree limbs, and to cut small trees up to 2 inches in diameter.
- Tractor-mounted brush hogs will be used in larger areas and heavier brush areas.
- Brush/vegetation cutting will be left at the site of the area cleared. If this is impractical, a wood chipper may be utilized.

Smaller brush cutting/vegetation management operation will be conducted by the Unexploded Ordnance (UXO) staff. On larger project sites, subcontractors may be utilized. If it is necessary to utilize subcontractors, an UXO escort will be provided during subcontracted brush/vegetation management operation.

C. PERSONNEL QUALIFICATIONS

UXO personnel shall meet the training requirements as stated in DDESB TP-18. Subcontractors will meet the training and medical surveillance requirements as stated in the Tetra Tech NUS Health and Safety Guidance Manual. Where applicable, vegetation management equipment will only be operated by personnel licensed or certified on that equipment.

D. VEGETATION MANAGEMENT

Vegetation management at MEC sites may range from minor grass cutting and tree limb trimming to the total removal of all site vegetation. The extent and methods of vegetation management are driven

primarily by the project specific scope of work, but will also be influenced by such factors as munition sensitivity, terrain, impacts to the environment, threatened or endangered species, current and future land use, available technology, and cost.

Prior to conducting vegetation management operations, a visual UXO surface survey will be conducted. All suspect MEC/MPPEH will be located and marked. UXO avoidance will be practiced during vegetation management operations. Vegetation management crews will not work within marked areas containing suspect MEC/MPPEH. Additionally, brush and grass will be cut no closer than 6 inches from the ground surface to avoid inadvertent contact with partially buried or shallow subsurface MEC.

Site Setup

The boundary of the work area will be established by land survey or GPS coordinates. Corner points of grids and start and end points of transects will also be located. Boundary lines of grids and transect lines will be marked using engineers flagging tape to provide visual guidance for the vegetation management crew when line of sight between stakes or markers is impeded.

UXO Escort will be provided for survey personnel and no stakes or markers will be driven into the ground until the immediate area of the stake or marker is surveyed and declared clear of surface and shallow subsurface anomalies.

Tree Cutting

Tree cutting will occur on a case-by-case basis as required to accomplish the site specific scope of work. Trees will be cut using chainsaws or hand tools. Generally, trees 2 inches in diameter and smaller will be cut as necessary to facilitate the planned site activities. Trees will be sectioned, if necessary, and removed from the immediate work area to avoid interfering with site operations.

Brush Cutting

Brush cutting will be accomplished using hand held brush cutters equipped with string or blade cutting attachments. Larger or heavier brush may require the use of chainsaws. Where appropriate, a tractor or skid-steer with a bush hog mower attachment may also be used. Brush will be cut to a height that allows clearance for UXO operations and geophysical equipment operation but no closer than 6 inches above the ground surface.

Grass Cutting

Grass cutting will be accomplished using mechanized lawn mowing equipment or hand held brush cutters equipped with string attachments. Grass will be cut to a height that allows clearance for UXO operations and geophysical equipment operation but no closer than 6 inches above the ground surface.

Alternative Methods

In rare instances, large scale vegetation clearance methods such as controlled burning or hydraulic ax deforestation may be necessary. An UXO escort will be provided during large scale vegetation clearance operations. At no time will UXO staff directly engage in controlled burning operations or in the operation of hydraulic ax deforestation equipment.

E. VEGETATION DISPOSAL

Vegetation disposal must be coordinated with the facility environmental office. Provided that site activities do not result in significant quantities of material, the preferred method of vegetation disposal will be on-site disposal. Vegetation will be removed from the immediate work area to avoid interfering with site activities, and allowed to naturally decompose.

A wood chipper may also be used to effectively dispose of vegetation without removing the vegetation from the work site. Wood chips will be disposed of away from the immediate work area to avoid interfering with site activities when possible. If necessary, wood chips will be spread over the work site to a depth of no greater than 4 inches to avoid interference with detection depth capabilities of UXO and geophysics equipment.

F. SAFETY

General safety precautions are located in the Tetra Tech NUS Health and Safety Guidance Manual. Specific guidelines are located in the site-specific Health and Safety Plan (HASP) and the Accident Prevention Plan (APP).

Personal Protective Equipment (PPE)

PPE for vegetation management operations will be level D protection with the following additions:

- Logging helmet with attached face shield
- Chainsaw chaps
- Hearing protection
- Leather work gloves

Personnel Safety

The UXO Safety Officer (UXOSO) will be on-site at all times during vegetation management operations. The primary responsibilities of the UXOSO during vegetation management activities are:

- To provide a safety brief detailing the operation, safety, and maintenance of the specific equipment being utilized;
- To insure that MEC/MPPEH hazards remain a primary concern for personnel involved in vegetation management activities;
- To insure that PPE is serviceable and worn properly during vegetation removal activities; and
- To insure that individual personnel utilizing vegetation removal equipment maintain safe working distances from other personnel within the work area.

Additionally, an UXO Escort will be provided at all times during vegetation management activities. The UXO Escort will be utilized even when UXO Staff perform vegetation management. This will provide a more focused observation of the work area for MEC/MPPEH and related hazards.

Equipment Safety

Equipment will be inspected for serviceability daily prior to the commencement of vegetation management activities. Periodic spot checks will also be conducted throughout the day to insure that chains and blades remain properly tightened and sharpened. All equipment will be operated and maintained in accordance with the manufacturer's recommendations.

ATTACHMENT 2

ESS DETERMINATION APPROVAL LETTER

DEPARTMENT OF THE NAVY
NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY
FARRAGUT HALL
3817 STRAUSS AVENUE, SUITE 108
INDIAN HEAD, MD 20640-5151

8020
Ser N537/1141
26 Jul 10

From: Commanding Officer, Naval Ordnance Safety and Security Activity
To: Commanding Officer, Naval Facilities Southeast (OPDE3)

Subj: EXPLOSIVES SAFETY SUBMISSION (ESS) DETERMINATION REQUEST FOR NAVAL AIR STATION KEY WEST MULTIPLE RANGE SITES

Ref: (a) E-mail NAVFAC Southeast IPT South Atlantic (OPDE3) Mr. D. Hayworth/NOSSA (N535) Ms. S. McCahill of 22 July 10 (w/encl)
(b) NOSSAINST 8020.15B
(c) NAVSEA OP 5, Volume 1, Seventh Revision, Change 8

1. As requested by reference (a), the Naval Ordnance Safety and Security Activity (NOSSA) reviewed the subject Explosives Safety Submission (ESS) Determination Request in accordance with references (b) and (c). Based on the information provided, NOSSA has determined that an ESS is not required to conduct site inspection field work at nine range sites (Skeet Range #820, North Boca Chica; Pistol Range #821, North Boca Chica; Skeet Range, Boca Chica Field; Shooting-in-Butt Range, Boca Chica Field; Marine Rifle Range, Sigsbee Park Annex; Pistol Range, Trumbo Point Annex; Skeet Range, Trumbo Point Annex; Rifle Range, Truman Annex; and Pistol Range Fleming Key) at the Naval Air Station Key West.

2. As outlined in your request, we understand that the likelihood of encountering Munitions and Explosives of Concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH) during the proposed project has been determined to be low and that the following conditions apply:

a. Surface and shallow sub-surface soil samples (0 to 24 inches below grade surface) will be collected by hand and with direct push technology. Sediment samples will be collected by hand or by ponar dredge from a small boat if waters are too deep to wade.

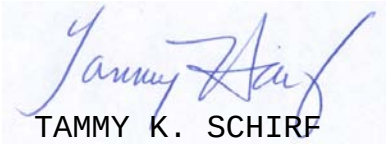
b. The site is outside of all existing explosives safety quantity distance arcs.

3. If any MEC or MPPEH items are encountered, the following steps must be taken:

a. For expended or unexpended small arms ammunition, note their description and location, notify the responsible Explosives Safety officer (ESO) and the project manager, and handle them in accordance with reference (c) and applicable environmental regulations.

b. For items other than expended or unexpended small arms ammunition, stop all operations, notify the responsible ESO, project manager, and request an emergency response from the cognizant Explosive Ordnance Disposal detachment. Operations cannot resume until NOSSA has been contacted and has provided guidance regarding the need for an ESS for this project.

4. The NOSSA point of contact for this ESS determination is Ms. Sherry McCahill who can be contacted at DSN 354-5628 or commercial at 301-744-5628.



TAMMY K. SCHIRF
By direction

Copy to:
CNO (N411; N453)
NAVFAC HQ (ENV)
CNRSE (N01OSH02)
EFD SOUTH (B. Seward)
NOSSA ESSOLANT (N5L)

DEPARTMENT OF THE NAVY
NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY
FARRAGUT HALL
3817 STRAUSS AVENUE, SUITE 108
INDIAN HEAD, MD 20640-5151

8020
Ser N535/1175
4 Aug 10

From: Commanding Officer, Naval Ordnance Safety and Security Activity
To: Commanding Officer, Naval Facilities Engineering Command Southeast (OPDE3)

Subj: EXPLOSIVES SAFETY SUBMISSION (ESS) DETERMINATION REQUEST FOR NAVAL AIR STATION KEY WEST DREDGE MATERIAL SITES

Ref: (a) E-mail NAVFAC Southeast (OPDE3) Mr. D. Hayworth/ NOSSA (N535) Ms. S. McCahill of 23 July 10 (w/encl)
(b) E-mail NAVFAC Southeast (OPDE3) Mr. D. Hayworth/ NOSSA (N535) Ms. S. McCahill of 2 Aug 10
(c) NOSSAINST 8020.15B
(d) NAVSEA OP 5, Volume 1, Seventh Revision, Change 8

1. As requested by reference (a) and clarified by reference (b), the Naval Ordnance Safety and Security Activity (NOSSA) reviewed the subject Explosives Safety Submission (ESS) Determination Request in accordance with references (c) and (d). Based on the information provided, NOSSA has determined that an ESS is not required to conduct Site Inspection (SI) field work at Naval Air Station Key West's Fleming Key Dredge Spoil Area and the Trumbo Point Temporary Staging Area.

2. As outlined in your request, we understand that the likelihood of encountering Munitions and Explosives of Concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH) during the proposed operation has been determined to be low and that the following conditions apply:

a. During the SI field work, anomaly avoidance techniques will be employed when detector-aided surface surveys and vegetation management activities are conducted by UXO technicians.

b. No intrusive activities or intentional physical contact with MEC and/or MPPEH are authorized.

c. Any site visitors will be escorted by UXO-qualified personnel.

d. The site is within existing explosives safety quantity distance arcs, but outside of K18 intraline distance from any potential explosion site.

3. If surface MEC or MPPEH is discovered on the site while employing anomaly avoidance techniques, the item will be avoided and its location and description will be reported to the cognizant Explosive Safety Officer and the Navy Project Manager. An emergency response from the cognizant Explosive Ordnance Disposal detachment must be requested, if appropriate.

4. The NOSSA point of contact for this ESS determination is Ms. Sherry McCahill who can be contacted at DSN 354-5628 or commercial at 301-744-5628.

PAMELA G. CLEMENTS
By direction

Copy to:
CNO (N411C; N411C2; N453; N453C)
NAVFAC HQ (ENV3)
CNRSE (N01OSH02)
NOSSA ESSOLANT (N5L)