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ST JULIENS CREEK
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SAP Worksheet #1—Title and Approval Page

Final

Quality Assurance Project Plan
Site Inspection, Phase 1 Underwater Geophysical Survey
Area UXO 001

St. Juliens Creek Annex
Chesapeake, Virginia

Contract Task Order WE10

January 2010

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Prepared under:

Navy CLEAN 1000 Program
Contract No. N62470-08-D-1000

Prepared by:

CH2MHILL

Virginia Beach, Virginia

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Executive Summary

This Munitions and Explosives of Concern (MEC) Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) is prepared to support Phase 1 of the Site Inspection (SI) field activities for Area UXO-001 at St. Juliens Creek Annex (SJCA) in Chesapeake, Virginia. The SI is being performed to support the determination of whether there was a release of MEC at the site due to the use of the on-site wharfs that were used for loading ships with ordnance; Phase 1 is a geophysical investigation to locate underwater anomalies, Phase 2 will be an anomaly investigation that will use the Phase 1 data to target areas for investigation (future MEC UFP-QAPP). The SI is not intended as a full-scale study of the nature and extent of contamination or explosives hazards, rather it is conducted to determine whether there is an on-site presence, or potential presence, of MEC and the nature of the associated threats. Its purpose is to augment the data collected in the PA and to generate, if necessary, sampling and other field data to determine if further response action or remedial investigation is appropriate. This Phase 1 MEC UFP-QAPP does not address munitions constituents (MC). If an onsite presence of MEC is determined to be present at the site, future MC sampling may be recommended and incorporated into the Phase 2 investigation.

Area UXO-001 is the current and former wharf areas at SJCA along the shoreline of the Southern Branch of the Elizabeth River. It comprises approximately 2,230 linear feet of current and former wharf (Wharf 1, Wharf 2, and Wharf 3). One wharf (Wharf 3), constructed in 1917 for loading Mark VI mines, was located in the northeast portion of SJCA adjacent to Buildings M-5 and 190. This wharf is no longer present, with the exception of remaining pilings. During World War II the existing southern wharf (Wharfs 1 and 2) was constructed in the southeast portion of the SJCA to support the increased production for the war. Ordnance loading activities continued until the early 1970s, when production declined commensurate with the disengagement policy and the reduced operations in Southeast Asia. The southern wharf was damaged when two ships struck it in 1975; however, portions of it are still functional. The damaged portion of the southern wharf is scheduled for demolition in fiscal year (FY) 2010. The remaining pilings of the northern wharf are also scheduled to be removed during this time.

This UFP-QAPP provides for a geophysical investigation of Area UXO-001, as it is currently defined. This will include traversing the site on pre-determined transects with both side-scan sonar and a magnetometer. Data from this investigation will be utilized to determine the potential presence or suggested absence of a potential MEC, identify concentrations of anomalies, and evaluate the need for additional investigations (such as visual inspection to attempt to determine the nature of anomalies or sampling for MC).

This MEC UFP-QAPP is intended to be the primary work-planning document for the activities being performed at the site. It serves as a guideline for the field activities and data quality assessment. This QAPP was developed in accordance with two guidance documents:

- *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS (USEPA, 2002)*
- *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (USEPA, 2005).*

This document consists of 37 worksheets, which are based upon the UFP-SAP format designed specifically for chemical sampling. Worksheets that are not applicable to this MEC UFP-QAPP format have been modified to meet the intent of the worksheet with respect to MEC, or have been designated as "Not Applicable." All tables are embedded within the worksheets. Figures are included at the end of worksheets, where applicable.

The Navy, Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic Division, is conducting this SI in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigation process. This site has been identified under the Navy Munitions Response Program (MRP). The United States Environmental Protection Agency, Region III is the lead regulatory agency and works in consultation with the Virginia Department of Environmental Quality (VDEQ). This QAPP will help ensure that geophysical data collected or compiled are scientifically sound, of known and documented quality, and suitable for intended uses.

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1 Base and Site Location
2 Site Features
3 Conceptual Site Model for MRP Area UXO 0001
4 MEC Notification Procedure
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Abbreviations and Acronyms

AM	activity manager
AQM	activity quality manager
CA	corrective action
CD	compact disk
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLEAN	Comprehensive Long-term Environmental Action Navy
CSM	conceptual site model
CTO	contract task order
DGM	digital geophysical mapping
EDD	electronic data deliverables
ERP	Environmental Restoration Program
ESS	explosive safety submission
FTL	Field Team Leader
FTP	file transfer protocol
FY	Fiscal Year
GIS	geographic information system
GPS	Global Positioning System
H&S	health and safety
HW	hazardous waste
IAS	Initial Assessment Study
iNFDAS	internet Navy Facility Assets Data Store
MC	munitions constituents
MEC	munitions and explosives of concern
MRP	Munitions Response Program
NAVFAC	Naval Facilities Engineering Command
NETOPS	Naval Engineering Training and Operating Procedure and Standard
NFA	no further action
PA	Preliminary Assessment
PAL	project action limit
PM	project manager
POC	point of contact
PQO	project quality objective

QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPM	remedial project manager
RRR	Relative Risk Ranking
RTK	real time kinetic
SAP	Sampling and Analysis Plan
SI	Site Investigation
SJCA	St. Juliens Creek Annex
SOP	standard operating procedure
SSA	Site Screening Assessment
SSC	site safety coordinator
SVOC	semivolatile organic compound
TBD	to be determined
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

SAP Worksheet #2—SAP Identifying Information

Site Name/Number: St. Juliens Creek Annex (SJCA) Area UXO-001
Operable Unit: Not Applicable
Contractor Name: CH2M HILL
Contract Number: N62470-08-D-1000, Contract Task Order WE10
Contract Title: Comprehensive Long-term Environmental Action Navy (CLEAN) 1000

1. **This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of:**
   - Uniform Federal Policy – Quality Assurance Project Plans (USEPA, 2005)
   - United States Environmental Protection Agency (USEPA) *Guidance for Quality Assurance Project Plans (QAPPs)*
   - USEPA QA/G-5, QAMS (USEPA, 2002)
   - USEPA *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006).
2. **Identify regulatory program:**

   Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
3. **This SAP is specific to:**

   Phase 1 of the SJCA Area UXO-001 Site Inspection
4. **List dates of scoping sessions that were held:**

Scoping Session	Date
SJCA Tier I Partnering Meeting – Initial scoping session	14 July 2009

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

Title	Date

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

   Virginia Department of Environmental Quality (VDEQ) – regulatory stakeholder

   USEPA Region 3 – regulatory stakeholder

SAP Worksheet #2—SAP Identifying Information (continued)

7. Lead organization (see Worksheet #7 for detailed list of data users):

Department of the Navy – Lead Agency

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

The worksheets that are not applicable to the munitions and explosives of concern (MEC) format of the UFP-QAPP are as follows: Worksheets 19, 24-28, and 30. These worksheets pertain to samples that are collected from the site and sent to an analytical laboratory. Since this phase of the project does not involve the collection of samples from the site, there is no information to enter into these worksheets. The determination of the applicability of the worksheets was made by the Naval Facilities Engineering Command (NAVFAC) munitions response group and are noted as not applicable in the "MEC UFP-QAPP Template." These worksheets are designated as "Not Applicable" in the document.

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

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

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SAP Worksheet #3—Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	Document Control Number (Optional)
Walter Bell, P.E.	Remedial Project Manager (RPM)	NAVFAC Mid-Atlantic	757-445-6638	walt.j.bell@navy.mil	An administrative record number will be assigned when the final document is being prepared.
Mike Green	MRP Quality Assurance Officer (QAO)	NAVFAC Atlantic	757-322-8108 757-202-0865	mike.green@navy.mil	
Robert Stroud	RPM	USEPA Region 3	410-305-2748	Stroud.Robert@epa.gov	
Karen Doran	RPM	VDEQ	804-698-4594	kmdoran@deq.virginia.gov	
Janna Staszak, P.E.	Activity Manager (AM)	CH2M HILL	757-671-6256	janna.staszak@ch2m.com	
Tim Wenk, P.E.	Project Manager (PM)	CH2M HILL	757-671-6265	tim.wenk@ch2m.com	
Paul Favara, P.E.	Activity Quality Manager (AQM)	CH2M HILL	352-384-7067	paul.favara@ch2m.com	
Tamir Klaff	Geophysical Senior Technical Consultant	CH2M HILL	703-669-9611	tamir.klaff@ch2m.com	
Tim Garretson	MEC Senior Technical Consultant	CH2M HILL	757-671-6224	tim.garretson@ch2m.com	
Andy Gascho	Technical Consultant	CH2M HILL	720-286-2397	andy.gascho@ch2m.com	
To be determined (TBD)	Field Team Leader (FTL)	CH2M HILL	TBD	TBD	
TBD	Field Team Members	CH2M HILL	TBD	TBD	
Brian Brunette	Geophysical Services Subcontractor Project Manager	ARM Geophysics	919-677-1519	bbrunetter@armgeophysics.net	

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SAP Worksheet #4—Project Personnel Sign-Off Sheet

Name	Organization/Title/Role	Telephone Number	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Janna Staszak, P.E.	CH2M HILL /AM	757-671-6256			
Tim Wenk, P.E.	CH2M HILL /PM	757-671-6265			
Paul Favara, P.E.	CH2M HILL /AQM	352-384-7067			
Tamir Klaff	CH2M HILL /Geophysical Senior Technical Consultant	703-669-9611			
Tim Garretson	CH2M HILL /MEC Senior Technical Consultant	757-671-6224			
Andy Gascho	CH2M HILL /Technical Consultant	720-286-2397			
To be determined (TBD)	FTL	TBD			
TBD	Field Team Member	TBD			
Brian Brunette	CH2M HILL /Geophysical Services Subcontractor Project Manager	717-508-0560			

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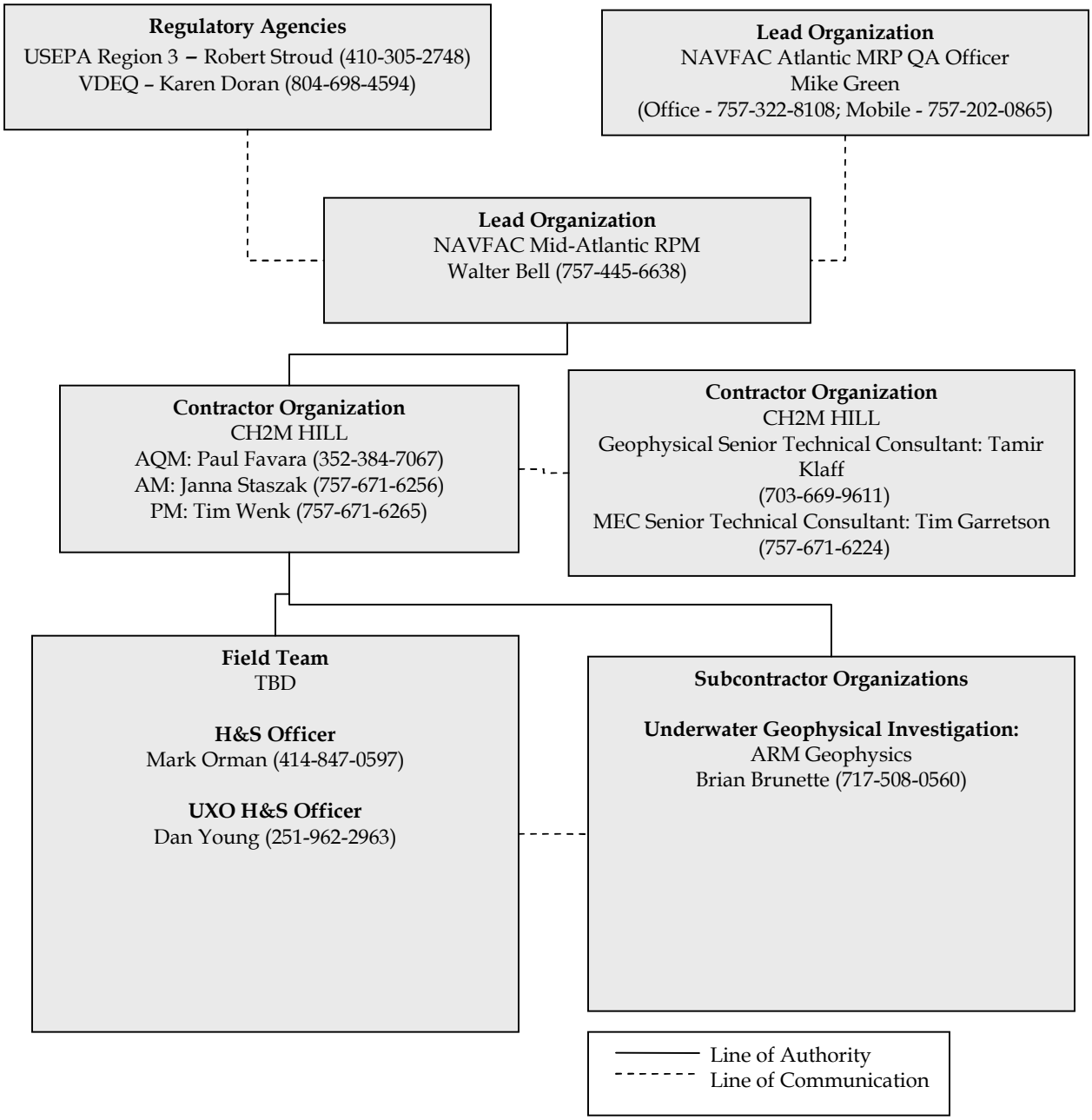
SAP Worksheet #5—Project Organizational Chart



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SAP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Communication with Navy (lead agency)	RPM	Walter Bell	757-445-6638	Primary point of contact (POC) for Navy; can delegate communication to other internal or external points of contact. Any issue that may impact project work should be reported to Walter immediately.
Communication with USEPA (regulatory agency)	RPM	Robert Stroud	410-305-2748	Primary POC for USEPA; can delegate communication to other internal or external points of contact. Upon notification of field changes, USEPA will have 24 hrs to approve or comment on the field changes.
Communication with VDEQ (regulatory agency)	RPM	Karen Doran	804-698-4594	Primary POC for VDEQ; can delegate communication to other internal or external points of contact. Upon notification of field changes, VDEQ will have 24 hrs to approve or comment on the field changes.
Oversight of Environmental Restoration Program (ERP) implementation	AM	Janna Staszak	757-671-6256	Primary POC for stakeholder and agency managers; can delegate communication to other contract staff as appropriate. Issues reported to the Navy RPM immediately and followed up in writing within 2 business days.
Management of ERP Implementation	PM	Tim Wenk	757-671-6265	Primary POC for field and project-specific activities; timing dependent on nature of communication and predefined schedules as applicable and as requested by stakeholder agencies. All information and materials about the project will be forwarded to the AM on a daily basis.
Technical communications for UFP-QAPP implementation, data interpretation	CH2M HILL Geophysical Senior Technical Consultant	Tamir Klaff	703-669-9611	Contact senior technical consultant regarding questions/issues encountered in the field, input on data interpretation, as needed. Senior technical consultant will have 24 hrs to respond to technical field questions as necessary. Responses will be communicated to the PM via email or phone.
Data tracking from collection through upload	CH2M HILL Geophysical Senior Technical Consultant	Tamir Klaff	(703) 669-9611	The Project Geophysicist will track data from collection through upload for review to ensure Work Plan requirements are met by Digital Geophysical Mapping (DGM) field staff. The Geophysicist will act as the main POC for the DGM subcontractor on all data related issues. Data collection issues will be reported to the PM within 4 hours.
Field and Data Collection Corrective Actions (CAs)	CH2M HILL Geophysical Senior Technical Consultant	Tamir Klaff	(703) 669-9611	Any CAs for field and data collection issues will be determined by the FTL and/or the Project Geophysicist and reported to the PM within 4 hours.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Technical communications for project implementation, and data interpretation	AQM	Paul Favara	352-384-7067	Contact AQM regarding questions/issues encountered in the field, input on data interpretation, as needed. AQM will have 24 hrs to respond to technical field questions as necessary. Responses will be communicated to the PM via email or phone.
Health and Safety (H&S)	Site Safety Coordinator (SSC)	TBD		Responsible for the adherence of team members to the site safety requirements described in the H&S Plan. Will report H&S incidents and near losses to PM.
SAP Field Changes	FTL	TBD		Notify the PM by phone and email of changes to the SAP made in the field and the reasons within 24 hours. Documentation of deviations from the work plan will be kept in the field logbook; deviations made only with the approval of the PM.
Field Corrective Action (CA)	FTL	TBD		The need for CA for field and analytical issues will be determined by the FTL and/or senior ecological risk assessor and senior consultant. The Sr. support will ensure SAP requirements are met by field staff. The FTL will notify the PM of any needed field CAs. The PM will have 24 hrs to respond to the request for field CA.
Reporting Data Quality Issues	ARM PM	Brian Brunette	717-508-0560	All QA/Quality Control (QC) issues with project data will be reported within 2 days to the project manager.

SAP Worksheet #7—Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Walter Bell, P.E.	RPM	NAVFAC Mid-Atlantic	Coordinates the work of Navy resources to accomplish Environmental Restoration Program (ERP) goals and policies at SJCA
Janna Staszak, P.E.	AM	CH2M HILL	Oversees ERP activities at SJCA
Tim Wenk, P.E.	PM	CH2M HILL	Manages project; directs and oversees project staff
Paul Favara, P.E.	AQM	CH2M HILL	Provides senior technical support for overall project
Stacin Martin	Senior Reviewer	CH2M HILL	Provides program-level review of UFP-QAPP
Tamir Klaff	Geophysical Senior Technical Consultant	CH2M HILL	Provides senior technical support for geophysical investigation activities
Andy Gascho	Geophysical Technical Consultant	CH2M HILL	Provides technical support for geophysical investigation activities
Tim Garretson	MEC Senior Technical Consultant	CH2M HILL	Provides technical support for MEC-related issues
Mark Orman	H&S Officer	CH2M HILL	Prepares H&S Plan; manages H&S for all field activities
Dan Young	MEC H&S Officer	CH2M HILL	Assists in preparation of H&S Plan; manages H&S for all field activities involving MEC
FTL		CH2M HILL	Coordinates all field activities and sampling; tracks, stores, and retrieves all laboratory and field supplies
SSC		CH2M HILL	Oversees H&S for all field activities
Brian Brunette	PM for Geophysical Investigation Subcontractor	ARM Geophysics	Manages geophysical data and maintains communication with CH2M HILL PM and geophysical senior technical consultant

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SAP Worksheet #8—Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates
Area UXO-001 Geophysical Investigation	Hazwoper 40-hour training or 8-hour annual refresher, as appropriate	Registered training organization	Agency- and contractor-specific	FTL (TBD), field team members (TBD), SSC (TBD); Navy and regulatory agency representatives	Field team members and SSCs from CH2M HILL; onsite visitors from Navy and regulatory agencies	Contractor, Navy, or regulatory agency human resources department
Area UXO-001 Geophysical Investigation	SSC – Hazardous Waste (HW)	Registered training organization	Agency specific	SSC	SSC from CH2M HILL	Contractor human resources department
Area UXO-001 Geophysical Investigation	Use of DGM equipment and data interpretation software	---*	Prior to DGM activities	---*	CH2M HILL geophysicists DGM Subcontractor	Resume, as demonstrated experience and qualifications with equipment and software*
Area UXO-001 Geophysical Investigation	Training specified by Naval Engineering Training and Operating Procedure and Standard (NETOPS) #4-Dive Safety UXO Qualified Technician (DDESB Technical Paper 18)	---*	Prior to DGM activities	---*	Divers providing support to investigation if equipment becomes stuck on underwater obstacle	Resume, as demonstrated experience and qualifications, and copies of certifications
All Area UXO-001 Field Work	MEC Awareness Training†	CH2M HILL UXO Technician	Prior to mobilization	FTL (TBD), field team members (TBD), SSC (TBD), geophysical investigation subcontractor	Field team members and SSCs from CH2M HILL Field tem members from subcontractor.	Project folder

*Training of use of DGM equipment or data interpretation software will not be provided by CH2M HILL, the DGM subcontractor, or an outside vendor. The personnel using the equipment and software must have demonstrated experience and qualifications with the equipment and software prior to working at the site and the kickoff of this investigation

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

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SAP Worksheet #9—Project Scoping Session Participants Sheet

Project Name: Area UXO-001 Site Inspection – Phase 1 **Projected Date(s) of Investigation:** August-September 2009 **PM:** Tim Wenk – CH2M HILL	**Site Name:** Area UXO-001 **Site Location:** SJCA, Chesapeake, Virginia
Date of Session: July 14, 2009 **Scoping Session Purpose:** Discuss the approach to the Site Inspection at Area UXO-001 and determined data quality objectives	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Walter Bell	RPM	NAVFAC Mid-Atlantic	757-445-6638	walt.j.bell@navy.mil	RPM
John Burchette	RPM	USEPA Region 3	215-814-3378	Burchette.John@epa.gov	Regulator
Karen Doran	RPM	VDEQ	804-698-4594	kmdoran@deq.virginia.gov	Regulator
Janna Staszak	AM	CH2M HILL	757-671-6256	janna.staszak@ch2m.com	AM
Adrienne Jones	Deputy AM	CH2M HILL	757-671-6236	adrienne.jones@ch2m.com	PM

The scoping session for Area UXO-001 was conducted as part of the July 14, 2009 partnering meeting. The text below is taken from the partnering meeting minutes**:**

Objectives: Review the previous investigations, present the proposed Site Inspection strategy, and conduct a scoping session for the geophysical investigation at the site.

Overview of Discussion: Copies of the presentation were distributed. Janna provided a brief review of the history of Area UXO 1 and the investigations that have been conducted at the site. Karen asked why the dolphin wharf area was shown on the wharf figure in the presentation. Janna explained it was included as a reference for the historical site information included in the presentation and that it is not a part of the current site.

Janna explained the proposed SI investigation strategy for the site. It is proposed that the SI will be conducted in two phases. Phase 1 will consist of an underwater geophysical investigation (using a boat-towed array) to identify concentrations of metallic anomalies. It is assumed that the results of Phase 1 will require follow-up activities and the results will be used to guide Phase 2 of the investigation. A technical memorandum summarizing the geophysical investigation results will be produced. Walt explained that the Phase 1 results will be provided to the NNSY engineer to support preparation of an ESS determination request for demolition of one of the existing wharfs. Phase 2 will consist of targeted anomaly investigations. Areas with concentrations of anomalies will be dredged to determine if anomalies are MEC or MEC-related, and sediment samples will be collected from dredged material and analyzed for select constituents if MEC or MEC-related items are found. An SI Report will summarize both phases of the investigation.

SAP Worksheet #9—Project Scoping Session Participants Sheet (continued)

Janna explained that NAVFAC now requires UFP SAPs for MRP investigations. A template has been established to tailor the environmental investigation UFP SAP for use for MRP investigations. Therefore, the team needs to scope the investigation together. The team discussed Worksheets 10 and 11.

Worksheet #10, Problem Definition

The team identified the general problem to be addressed:

- Ordnance were loaded from the SJCA wharfs, and ordnance may have been dropped into the river during loading.

The team identified the environmental questions to be answered during the investigation:

- **Are metallic anomalies present in the sediment or on the sediment surface in the vicinity of the former ordnance loading wharfs?**
- If anomalies are present, what is their distribution?

Walt asked if the data collected during this phase of the investigation will be combined and presented with the sonar data previously collected. Janna responded that it could be; however, new side scan sonar data will be collected during this investigation to guide the equipment, due to the low visibility. John asked if there is any MEC that might not have a metal component. Janna responded that it is possible, though most do have a metal component and if the common types of MEC that contain metal aren't found, then it is not likely that the rare MEC without metal would be present. Janna discussed the idea that the decision making process for the site will need to be iterative and incorporate the various lines of evidence since it is very difficult site to investigate.

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

The team agreed that the data will be used by the Navy (and contractors), stakeholder agencies, and engineers/scientists/geophysicists. The PALs were established by the team as whether metallic anomalies are present that cannot be eliminated as MEC. Walt asked if an underwater camera should be used during the investigation.

Action Janna - Look into whether a video should be taken during the geophysical survey conducted during the UXO 1 SI.

(Note: During a follow-up discussion on August 11, 2009, the SJCA Tier I Partnering team concluded that a video would not add value to the investigation because of the poor visibility in the river and therefore did not incorporate it into the investigation scope.)

The team decided that the data will be used to support development of an ESS Determination request for the wharf demolition project, determine if additional investigation is warranted, and support scoping of additional investigation (e.g., areas of focus) and preparation of the associated ESS. The types of data needed are digital geophysical mapping (DGM) and side-scan sonar. Side-scan sonar is needed to help guide and protect the DGM equipment since that equipment needs to get as close to bottom of river and the wharfs as possible.

SAP Worksheet #9—Project Scoping Session Participants Sheet (continued)

The team discussed how good the data needs to be and decided that the data needs to be collected in accordance with equipment specifications. Additionally, data should be collected over the entire site area, with the exception of areas inhibited by obstructions or limited by safety. Walt would like to know the resolution of the side-scan sonar that will be used to in order to compare that to 2008 side-scan sonar data to determine whether a higher resolution is needed or if the 2008 data should be used.

The team discussed how much data needs to be collected and decided that the investigation should cover the current site boundary, acknowledging that areas may not be accessible due to presence and instability of the wharf. The investigation should not be conducted past the river channel because the ACOE have never identified MEC during dredging of the channel. Walt noted during the timeframe that munitions were loaded at the wharfs; the maximum size of ships was limited by the width of the Panama Canal locks. Karen requested adding that information in the SAP to help define the site boundary.

The team discussed where, when, and how the data should be collected. It was decided that the data should be collected within the current site boundary, during one event in November 2009 (date dependent on availability of the only subcontractor with the necessary capabilities), using boat-towed array.

The team discussed who will collect and generate the data, and how the data will be reported. [ARM Geophysics], a CH2M HILL subcontractor, will collect the data and provide CH2M HILL with a report documenting the activities and results. A CH2M HILL geophysicist will review their report and CH2M HILL will incorporate their report into a technical memorandum which will be sent to the team.

The team agreed on the following project quality objectives (PQOs):

- If no metallic anomalies are identified, then no further investigation will be conducted
- If metallic anomalies are identified, then the data will be reviewed by a geophysicist to ensure the detections are real (based on QC data)
- If metallic anomalies are identified that are consistent with ordnance having been dropped from the wharfs, then they will be used for scoping of a Phase 2 investigation

John asked if [ARM Geophysics] uses any type of quality control measures; Janna responded that they do but is unsure of the specifics. Karen asked if LUCs will always be needed at the site since the depth of the sediment is unknown and there is a possibility that something MEC-related may be present but outside of the range of detection. Janna responded that all the of the information will have to be looked at and uncertainties considered in order to determine a path forward, and LUCs will most likely have to be a component of all MR sites because of the associated uncertainties.

<u>Path Forward</u>: The schedule for the site is being driven by the Navy's request to have the anomaly information to support the wharf demolition by February 2010. The internal Draft Phase 1 SI Work Plan will be submitted for Navy MR review at the end of July, followed by a

30-day comment period. The Draft Phase 1 SI Work Plan will be submitted for team review in mid September.

SAP Worksheet #10—Problem Definition

Site History and Description

SJCA is approximately 490 acres and is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, southeastern Virginia. The location of SJCA is shown on Figure 1. SJCA was one of the largest ammunition depots in the United States involving wartime transfer of ammunitions to other naval facilities. Specific ordnance operations and processes conducted at SJCA included stockpiling Explosive D (ammonium picrate, or picrate acid) for use in projectiles, manufacturing Mark VI mines, assembling small-caliber guns and ammunition, storing torpedoes, filling shells, testing ordnance, and distributing and receiving ammunition. By 1975, all ordnance operations had been transferred to Naval Weapons Station Yorktown. As a result, decontamination was performed in, around, and under ordnance-handling facilities at SJCA in 1977.

Area UXO-001 is the current and former wharf areas along the shoreline of the Southern Branch of the Elizabeth River (shown on Figure 2). It comprises approximately 2,230 linear feet of current and former wharf (Wharf 1, Wharf 2, and Wharf 3.) One wharf (Wharf 3), constructed in 1917 for loading Mark VI mines, was located in the northeast portion of SJCA adjacent to Buildings M-5 and 190. This wharf is no longer present, with the exception of remaining pilings. During World War II the existing southern wharf was constructed in the southeast portion of the SJCA to support the increased production for the war. Ordnance loading activities continued until the early 1970s, when production declined commensurate with the disengagement policy and the reduced operations in Southeast Asia. The southern wharf was damaged when two ships struck it in 1975; however, portions of it are still functional. The damaged portion of the southern wharf is scheduled for demolition in fiscal year (FY) 2010. The remaining pilings of the northern wharf are also scheduled to be removed during this time.

Investigation History

The northern wharf area was investigated as IR Site 20. The following subsections describe the investigations performed under the IR Program and additional investigations conducted by the Navy for demolition planning. The following investigations/studies have been conducted at the site:

- **Initial Assessment Study (IAS).** The IAS report (NEESA, 1981) indicated that EOD team divers visually searched IR Site 20 (northern wharf) area and identified metal and thick silt deposits near the former wharf. The IAS report indicated that it was a reasonable assumption that ordnance had likely been dropped into the sediment adjacent to the former wharf area during loading and unloading operations. The assumed ordnance presence was not considered a hazard as long as the sediment was not disturbed. The IAS recommended that real estate records be annotated to indicate that ordnance may be present.
- **Relative Risk Ranking.** During the Relative Risk Ranking (RRR) (CH2M HILL, 1996), a site reconnaissance, a magnetometer survey, and sediment sampling were conducted in the IR Site 20 (northern wharf) area. Approximately 68 contacts were identified in three concentration areas around the former wharf pilings; however, contacts indicate all types of buried metallic objects and do not necessarily indicate the presence of MEC. No visual confirmation of the contacts was made. One volatile organic compound (VOC), multiple semivolatile organic compounds (SVOCs), one pesticide, one explosive, and multiple inorganics were detected in the sediment.

SAP Worksheet #10—Problem Definition (continued)

- **Site Screening Assessment.** As part of the site screening assessment (SSA), the analytical results from the IR Site 20 sediment samples collected during the RRR (CH2M HILL, 1996) were used to conduct human health and ecological risk screenings. No risk was identified to human receptors. Potential ecological risk was identified for benthic organisms in the sediment. The risk was considered minimal and no further evaluation of ecological risk was recommended. During the July 2001 partnering team site visit, consensus was reached for no further action (NFA) for IR Site 20 under CERCLA based on the findings of the human health and ecological risk screenings and the fact that potential risk from MEC would be addressed under the Navy's Range Program. The NFA decision was documented in the SSA. Based on recommendations made in the SSA, signs were posted in the area to prohibit intrusive activities, and USACE was notified of the potential presence of MEC. A note has been added to internet Navy Facility Assets Data Store (iNFDAS) under the St. Juliens Creek Annex Wharf Property Record Cards stating: "Unexploded ordnance may exist along all of the St. Juliens Creek Annex Wharfs." Additionally, the area is identified in the Environmental Restoration Plan Geographic Information System (GIS), which identifies areas of concern, is used during operational planning and decision-making at the facility, and is updated annually or when conditions change. The Navy's Range Program was never fully implemented, and ordnance sites are now addressed under the MRP. Because site history indicates a potential presence of MEC, in 2008 the wharf areas (northern and southern) were identified as MRP Area UXO-001 and included under the MRP.

- **Sonar Imagery.** In 2008 the Navy performed a sonar imagery survey of portions of the SJCA wharf areas. The investigation performed side scans using sonar technology to identify subsurface features and physical anomalies; the Wharf 3 area of interest was oriented in a circle in the vicinity of the pilings still present. The southern wharf area of interest was oriented in a large rectangle from beneath the wharf and extending into the channel. The investigation detected ten anomalies along the bottom of the river in the immediate vicinity of the southern wharf. The results of this survey are shown in Appendix A.

- **Preliminary Assessment.** The Preliminary Assessment (PA) Report (CH2M HILL, 2009) addressed the history of munitions use at the wharf areas that make up Area UXO-001. Onsite and offsite sources were researched to determine the potential for munitions to have been dropped into the water during ordnance loading operations at the wharfs from 1896 to the late 1970s. Although no documentation was found to confirm the presence of munitions in the vicinity of the wharf areas, anecdotal evidence obtained through individual interviews indicated there was a potential for munitions to have been dropped during loading operations, which may have resulted in MEC being present in the sediment beneath the wharf areas. No site visits or sampling was performed as part of the PA because UXO-001 is underwater. Based upon information obtained during the PA and the hazards associated with potential ordnance that may be present, the PA recommended further investigation at the site. The PA suggested that the subsequent investigation, the Site Inspection, could include anomaly detection and investigation in both the northern and southern wharf areas. It was recommended that no additional investigation be performed in the dolphin pier area, which was an area used for light storage.

SAP Worksheet #10—Problem Definition (continued)

General Problems to Address

The PA for Area UXO-001 evaluated the potential for munitions to have been dropped into the Southern Branch of the Elizabeth River during ordnance loading operations. Although there is no known official documentation of ordnance dropped in the water, anecdotal evidence suggests that ordnance may have been dropped in the water and covered by the river sediment. There is no definitive information about the site that can be used to determine whether or not ordnance was actually dropped into the river, the amount and exact location of the dropped ordnance, or the total footprint of the area where ordnance may have been dropped. Therefore, further investigation is necessary to determine the location of metallic anomalies representing potential MEC in the river sediment and whether the anomalies detected are MEC. Along with the potential explosive hazard associated with MEC that may be present at the site, it is possible for there to be contamination from munitions constituents (MC) leaching from the MEC. The purpose of the investigation discussed in this UFP-QAPP is to locate metallic anomalies in the river sediment at Area UXO-001. An investigation into the nature of the metallic anomalies and MC contamination at the site will be conducted, if warranted, following the geophysical investigation using procedures established in separate UFP-SAP. Figure 3 is a conceptual site model (CSM) for Area UXO-001 that shows the potential issues with the site and the exposure pathways.

The environmental questions to be answered during the investigation include:

- Are metallic anomalies present in the sediment or on the sediment surface in the vicinity of the former ordnance-loading wharfs?
- If anomalies are present in the sediment or on the sediment surface, what is the aerial distribution of the anomalies?

The scope of this investigation is to assess whether or not there is evidence that the ordnance loading activities at the wharfs at Area UXO-001 resulted in ordnance being dropped into the Southern Branch of the Elizabeth River. In order to support this determination, an underwater geophysical survey will be conducted using DGM techniques, side-scan sonar and a magnetometer array, within the northern and southern wharf areas.

The DGM data will assist in evaluating the potential for underwater metallic anomalies to be the result of ordnance loading operations at the northern and southern wharf areas. The results of this investigation will be presented in a technical memorandum and the Area UXO-001 SI Report. The technical memorandum will present the results of the DGM surveys and will provide recommendations for further investigation, if deemed necessary. If additional investigation is deemed necessary, the results of the DGM surveys and the subsequent investigation will be included in the Area UXO-001 SI Report.

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

Who will use the data?

- The data will be used by the Navy (and its contractors) and the other stakeholder agencies to determine the extent of metallic anomalies in the sediment or on the sediment surface. Engineers, scientists, and geophysicists will evaluate the data for decision making, and a geophysicist will evaluate DGM data quality.

What are the Project Action Limits (PALs)? (specific detailed list should be provided in WS#15)

- This investigation is being completed to gather information at the site that will be used to plan future investigations and site evaluations, if deemed necessary. The PAL established for this project is to determine if metallic anomalies are present in the sediment or on the sediment surface that cannot be eliminated as MEC.

What will the data be used for?

The data will be used to:

- Provide a line of evidence as to whether potential MEC is present at the site. The objective of the DGM survey is to determine the potential presence or suggested absence of MEC at SJCA Area UXO-001. The SJCA partnering team will evaluate this evidence and decide whether to modify the site boundary, if additional investigations at the site are necessary, or if no further action is required at the site.
- Help guide subsequent investigations, if necessary, to determine if any suspect anomalies are MEC and if MC has been released to the environment from identified MEC.
- Refine the aerial extent of the site
- Support development of an explosive safety submission (ESS) determination request by the wharf demolition contractor
- Support development of an ESS for Phase 2 of the SI.

What types of data are needed (matrix, target analytes, analytical groups, field screening, onsite analytical or offsite laboratory techniques, sampling techniques)?

- Bathymetry and side-scan sonar data is needed to guide the DGM equipment around underwater obstacles.
- Bathymetry and side-scan sonar data is needed to map the bottom of the river in the current boundary of the site to assist in the identification of items on the surface of the sediment.
- An underwater magnetometer array will be used to detect ferrous anomalies on both the sediment surface and below the sediment. Detection parameters are further defined in Worksheet 15.
- Depth and altitude data will be collected for the array using a depth sensor and altimeter. The intended operational depth of the system will be within 10 ft of the sediment surface.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

- Data positioning will be recorded through Real Time Kinematic (RTK) Global Positioning System (GPS) on the boat with the magnetometer array position calculated by a cable layback algorithm. The sampling rate will be at 10 samples per second.
- QC checks will be conducted on the RTK GPS using existing monuments (Third Order Class II) at SJCA. The control checks will be conducted daily to ensure the RTK GPS is accurately recording the location of the survey.
- QC testing will be performed on the geophysical equipment to ensure functionality.
- All field activities will be recorded in paper or digital logbooks.

How "good" do the data need to be in order to support the environmental decision?

- Performance functionality QC testing will be performed on all geophysical equipment to ensure adequate detection capabilities. Equipment must pass all QC tests as described in SOP-002 and SOP-003.
- The relative horizontal accuracy of the GPS information shall conform to the FGDC Geospatial Positioning Accuracy Standards, Part 2: National Standard for Spatial Data Accuracy. RTK GPS will be used; therefore, the accuracy will be sub-centimeter for the actual coordinate obtained at the rover. However, once calculations are made back to the geophysical system, accuracies are typically sub-meter for the geophysical data positioning of the underwater anomaly. This level of accuracy will be sufficient for guiding Phase 2 of the investigation, if necessary.
- Data should be collected from the site to the maximum extent practicable. Underwater obstacles and hazards may make data collection in certain areas very difficult or unobtainable and present safety issues to those conducting the investigation. These locations should be noted in the field notebook by the FTL and by the data collection team so gaps or discrepancies in the data can be explained.
- Instrument-specific software will be used for initial data processing, and the output will be imported into Geosoft Oasis Montaj™ for additional processing, graphical display, anomaly selections and QA/QC. Types of processing will be system specific, but the general processing steps that may be performed to ensure quality data include the following:
  - Positional offset correction
  - Sensor bias, background leveling and/or standardization adjustment
  - Sensor drift removal
  - Latency or lag correction
  - Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)

  - Contour level selection with background shading
  - Digital filtering and enhancement (low pass, high pass, band pass, convolution, correlation, non-linear, etc.)
- To ensure quality data analysis to support the environmental decision, MEC-experienced data processing geophysicists will use the following criteria for identifying anomalies:
  - Maximum amplitude of the response with respect to local background conditions
  - Lateral extent (plan size) of the area of response
  - Shape of the response
  - Location of the response with respect to the edge of the grid, unsurveyable areas, underwater features
- The resolution of the side-scan sonar should be of sufficient quality to allow the data collection team identify underwater obstacles and hazards.

How much data should be collected (number of samples for each analytical group, matrix, and concentration)?

- Data should be collected from the entire area currently designated as Area UXO-001, including areas immediately around the abandoned wharfs. Data collection across the site will allow the Navy (and its contractors) and the other stakeholder agencies to identify any anomalous areas, which will be used to support decisions for reducing the site footprint, conducting additional investigations, approaches for additional investigations, or no further action. Although the intention is to collect data from throughout entire site, the total coverage of the area may be limited due to underwater obstacles and hazards that present accessibility issues and safety concerns. However, it is anticipated that the underwater obstacles and hazards will not have a significant impact on the overall quality of the data nor will they limit the ability to perform the DGM survey across a majority of the site.

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

- DGM data will be collected from the entirety of Area UXO-001 during one field event. The field event is planned to occur in November 2009; the schedule will be contingent upon the subcontractor's availability to conduct the work, as there is a limited number of platforms available to collect anomaly data as needed for this site. Data will be collected and generated in accordance with the procedures outlined in this UFP-QAPP using underwater magnetometer array and sidescan sonar.
- Hand-recorded notes will be generated by the CH2M HILL FTL during the investigation to document work accomplished, variations from the work plan, field conditions, and other pertinent data/information that can be used to help identify gaps, discrepancies, and oddities in the recorded data.

Who will collect and generate the data? How will the data be reported?

- Field notes collected by CH2M HILL during the geophysical investigation will scanned in and included in the Phase 1 Technical Memorandum as an appendix. Information contained in the notes will be reviewed by the PM and geophysicist during the investigation

and while reviewing the investigation results and summarized preparing the Phase 1 Technical Memorandum and the Area UXO-001Site Inspection Report.

- ARM Geophysics, a subcontractor to CH2M HILL, will collect the DGM and sidescan sonar data.
- Instrument-specific software will be used for initial data processing, and the output of the magnetometer data will be imported into Geosoft Oasis Montaj™ for additional processing, graphical display, anomaly selections, and QA/QC.
- No later than 3 working days after collection, the DGM subcontractor will provide each day's data for QC inspection via the Internet using a File Transfer Protocol (FTP) site, electronic mail (email) attachments for small files under 5 megabytes, or digital compact disk (CD). Such data are considered to be in raw form. These data will be corrected for sensor offsets, latency, and drift. Also provided will be a digital planimetric map, in Geosoft format and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map.
- All geophysical field data will be provided to CH2M HILL in delineated fields as x, y, z, d, v1, v2, and so on, where x and y are Universal Transverse Mercator (UTM) Grid Plane Coordinates in Easting (meters) and Northing (meters) directions, z (altimeter reading), d (depth sensor reading), and v1, v2, v3, and so on are the instrument readings. The last data field will be a time stamp. Each data field will be separated by a comma or tab. Each file containing data will be logically and sequentially named so that the file name can be easily correlated with the area surveyed.
- Within 5 working days of data collection, the processed geophysical field data, all final maps, and supporting geophysical interpretations will be provided to CH2M HILL. All geophysical data will be accompanied by a report documenting the field activities associated with the data and the processing performed. Information to be provided is summarized in Table 11-1.

TABLE 11-1
Processing Documentation Requirements

Information Type	"Raw" Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Site ID	X	X	X
Geophysical instrument type used	X	X	
Positioning method used	X	X	
Instrument serial numbers (geophysical and positioning)	X	X	
Coordinate system and unit of measure	X	X	
Surveyed area identifier	X	X	X
Date of data collection	X	X	X
Raw data file names associated with delivery	X	X	
Processed data file names associated with delivery	X	X	

TABLE 11-1
Processing Documentation Requirements

Information Type	"Raw" Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Name of Project Geophysicist	X	X	
Name of Site Geophysicist	X	X	
Name of data processor	X	X	
Data processing software used	X	X	
Despiking method and details	X	X	
Sensor drift removal and details	X	X	
Latency/lag correction and details	**X**	**X**	
Sensor bias, background leveling and/or standardization adjustment method and details		**X**	
PDF document showing graphical results of each field quality control test	**X**	**X**	
Geophysical noise identification and removal (spatial, temporal, motional, terrain induced) and details		**X**	
Other filtering/processing performed and details		**X**	
Gridding method		**X**	
Anomaly selection and decision criteria details		**X**	
Geosoft ".xyz" file for unit of survey being delivered (e.g. grid or area agreed upon with MR Geophysicist)		**X**	
Geosoft ".grd" file for unit of survey being delivered		**X**	
Geosoft ".map" file for unit of survey being delivered		**X**	
PDF of Geosoft map for unit of survey being delivered		**X**	
Geosoft ".map" mosaic of all processed data to date		**X**	
PDF mosaic of Geosoft map of all processed data to date		**X**	
Other processing comments		X	
Date data processing is completed	X	X	
Data delivery date	X	X	
Scanned copy of field notes and field mobile data collection device notes (if applicable)	X		

How will the data be archived?

- All files will be made available for QC verification during the project to verify that the field and data processing procedures are properly implemented. All raw data files, final processed data files, hard copies, and field notes will be maintained for the duration of the

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

project. Electronic data will be stored on the local CH2M HILL server and will be posted to the Navy's FTP site.

- The data will be archived in accordance with Navy Guidance. At the end of the project, archived data will be returned to the Navy.

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

- If no metallic anomalies are identified, then the SJCA partnering team will decide whether the site should be investigated further
- If metallic anomalies are identified, then the data will be reviewed by a geophysicist to ensure the detections are real (based on QC data)
- If metallic anomalies are identified that are consistent with ordnance having been dropped from the wharfs (i.e., anomalies are in the location of the wharfs), then they will be used for scoping of a Phase 2 investigation
- If metallic anomalies are not identified within the current site boundaries, then the site boundary may be adjusted to reduce the footprint of the site.

SAP Worksheet #12-1—Measurement Performance Criteria Table (MR) – Field QC Samples

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
Equipment functional test	Accuracy and Sensitivity	Twice daily (beginning and end of the day)	Items are detected in the expected location	
DGM Survey Data Collection Static Background and Static Spike Data	Sensitivity	The survey equipment is placed within or near the survey boundaries in an area free of metallic contacts and collecting data for (minimally) a 1-minute period.	Performed to determine if unusual levels of instrument or ambient noise exist ± 20% of standard item response, after background correction	At the beginning and end of each work day
Vibration Test	Accuracy	Cable shake/vibrations applied to instrument	Data profile does not exhibit data spikes	Beginning of each day
Equipment Warm-up	Completeness	Daily, prior to the start of work	Power on	Minimum of 15 minutes prior to the start of work
DGM Survey	Accuracy and Precision	Resurvey	Duplication of results	2% of the total area

SAP Worksheet 12-2—Definable Features of Work Auditing Procedure

Definable Feature of Work	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Pre-mobilization Activities	GIS Setup	Verify GIS system is functional and ready for site data	PP	Once	GIS system has been set up and is ready for site data	Do not proceed with field activities until criterion is passed
	Document Management and Control	Verify appropriate measures are in place to manage and control project documents	PP	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
	Data Management	Verify appropriate measures are in place to manage and control project data	PP	Once	Appropriate measures are in place to manage and control project data	Do not proceed with field activities until criterion is passed
	Subcontractor Procurement	Ensure procurement of subcontractors and verify qualifications, training, licenses	PP/IP	Once	Subcontractors' qualifications, training, and licenses are up to date and acceptable	Ensure subcontractor provides qualifications, training, and licenses or change subcontractor
	Work Plan	Verify the Project Work Plan has been developed and approved	PP/IP	Once	Work Plan has been prepared and approved, all parties agree to the technical and operational approach	Do not proceed with field activities until criterion is passed

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

Definable Feature of Work	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Mobilization/Site Preparation	Onsite Document Review	Verify Project Plans are approved and review with project team and get appropriate signatures	PP/IP	Once	Document is approved and has been reviewed and acknowledged by appropriate project team members	Personnel who are not familiar with the Project Plans may not proceed with field activities until criterion are passed
	Establish Communication and Logistics	Verify functionality of communications equipment and logistical support is coordinated	PP/IP	Once	Communications and other logistical support are coordinated	Do not proceed with field activities until criterion is passed
	Local Agencies and Emergency Services Notification	Verify local agencies and emergency services have been notified of site activities	PP/IP	Once	Emergency services and local agencies are aware of site activities	Do not proceed with field activities until criterion is passed
	Verify site specific training	Verify all site specific training has been performed and acknowledged	PP/IP	Once	Site specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed
	Site Boundary and Transect Establishment	Verify area/boundary and transects	PP/IP	Once	Area/boundary is correct and transects are appropriate	Stop activities until area/boundary/transect approach is verified
DGM Survey	Equipment Testing	Verify equipment testing has been performed and equipment is functional	IP/FP	Once/Daily/ As Required	Equipment passed functionality test as required by this UFP-QAPP	Repair or Replace instrument
	Work Methods	Verify work methods are established and communicated	IP/FP	Daily	Work methods are established and communicated and being performed in accordance with this UFP-QAPP and SOPs	Stop activities until the MEC UFP-QAPP and SOPs can be followed and any activities not performed within compliance are re-evaluated and re-performed, if necessary

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

Definable Feature of Work	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
DGM Survey (cont.)	Geophysical Survey (Side-scan and magnetometer)	Verify DGM survey of the area is performed as detailed in this MEC UFP-QAPP	IP/FP	Daily	DGM activities are being performed in accordance with this UFP-QAPP and SOPs	Stop work until DGM activities are corrected and in compliance with the MEC UFP-QAPP and SOPs
	Data Transfer/Upload to FTP	Verify data is transferred for review	IP/FP	Per Data Collection Set	Data has been transferred as required by this UFP-QAPP and SOPs	Request transfer of data
DGM Data Evaluation	Geophysical Data Processing and Interpretation	Verify data processing is adequately performed and interpretation/ anomaly selection is appropriate	IP/FP	Per Data Package	Data is appropriately processed and interpreted and anomaly selection has been made as detailed in this UFP-QAPP	Request data be resubmitted or recollected, as necessary, for adequate review.
Demobilization	Demobilize from the site	Verify equipment and personnel have been demobilized from the site and the site is returned to pre-mobilization condition	FP	Once	All personnel and equipment have been demobilized and the site is in pre-construction condition	Restore site to preconstruction condition, package and ship all equipment offsite, demobilize crew
Final Reports and Closeout	Data Compiling and Reporting	Verify data has been properly reported and included within a presentable report	IP	Once	Data is available in a report	Retrieve all data necessary and compile into report
	Document Preparation	Prepare a summary report of results of site activities. Ensure all levels of review are performed	FP	Once	Summary report is generated and reviewed as required	Compose report and submit for proper reviews
	Data Archiving	Verify data back-up systems are in place	IP	Once	Data back-up systems are in place	Ensure data back-up systems are in place
	Procurement Closeout	Verify all Purchase orders and invoices are completed and approved	IP	Once	Invoices and purchase orders are complete and approved	Complete and approve purchase orders and invoices prior to procurement closeout

SAP Worksheet #13—Secondary Data Criteria and Limitations Table

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
2008 side-scan sonar data	Data collected in 2008 by NAVFAC in an independent side-scan sonar survey of the northern and southern wharf areas.	NAVFAC	Data will be compared to data collected during this investigation and used to identify potential underwater obstacles and hazards.	Items on the river bottom that are capable of moving may not be in the same location as previously observed.
Final Preliminary Assessment Report	Final Preliminary St. Juliens Creek Annex, Chesapeake, Virginia, June 2009	CH2M HILL, June 2009	Information from this report will be used to define the footprint of Area UXO-001 and establish the investigation area.	Limited historical records were available/identified during the PA.
2009 side-scan sonar data	Side-scan sonar used simultaneously to DGM array.	CH2M HILL	Data will be used to help determine the proposed sample locations for Phase 2 of the SI.	Items on the river bottom that are capable of moving may provide inaccurate data and may not be present during subsequent investigations.

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SAP Worksheet #14—Summary of Project Tasks

Field Investigation Activities

The technical approach for the proposed field activities at Area UXO-001 is detailed below. A site-specific HASP will be completed prior to commencement of the field event. Applicable SOPs for project tasks outlined in this section are listed on Worksheet #21 and provided in **Attachment B**.

- **Mobilization**
  - Following approval of the UFP-QAPP, CH2M HILL will begin mobilization activities. Prior to mobilization, all field team members will review this SAP and the project-specific HASP. A field team kickoff meeting will be held prior to mobilization to ensure that personnel are familiar with the scope of field activities and safety issues. Mobilization activities include coordination with base personnel, building operators, and subcontractors, and preparation of field equipment.
  - Mobilization for the field effort includes procurement of necessary field equipment and subcontractors and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.
  - Prior to beginning any phase of work, CH2M HILL and its subcontractors will have field meetings to discuss the work items, worker responsibilities, and familiarize workers with the HASP.
  - Based on the site history and nature of the investigation, there is a low probability of encountering MEC. Therefore, an ESS Determination will be submitted to Naval Ordnance Safety and Security Activity for implementation of MEC awareness training prior to the field activities and maintenance of a qualified MEC technician on-call for the duration of the project. The MEC awareness training will be incorporated into the initial meetings and will involve participation by all field staff and subcontractors on-site during the investigation. The procedures for communicating potential MEC to the Navy if any suspected MEC is encountered at SJCA is provided in Figure 4.
- **DGM and Side-Scan Sonar Surveys**
  - Prior to the start of the survey, DGM equipment will be validated against known standards and features with known locations to demonstrate instrument functionality and the effectiveness of sampling and data interpretation procedures.
  - The current footprint of Area UXO-001 will be surveyed using sidescan sonar and an underwater magnetometer array to the maximum extent practicable. It is possible that underwater obstructions and environmental conditions may impede the ability for the survey equipment to access all areas.

SAP Worksheet #14—Summary of Project Tasks (continued)

- **DGM Data Interpretation**
  - Geophysicists with CH2M HILL and ARM Geophysics will process, review, and interpret data obtained from the DGM survey. The data will be validated by a geophysicist that is well versed in the interpretation of DGM data at MEC sites. The data will be examined for consistency, anomalous results, reasonableness, and utility using professional judgment and procedures.
- **Demobilization**
  - All project-related equipment will be removed from the site. Rental equipment will be packaged and shipped for return to the appropriate vendors. Subcontractor equipment will be removed from the site by the subcontractor

Data Management Activities

- **QA/QC**
  - See **Worksheet 20** for details on QA/QC techniques.
  - Implement SOPs for field activities being performed.

SAP Worksheet #15—Reference Limits and Evaluation Table

Due to the nature of this investigation, there are no traditional reference or action limits that can be established for this phase of the SI. The detection of underwater anomalies will depend on the size and orientation of the object and the distance the sensors are from the object. Additionally, the sensors used during the investigation are capable of detecting ferrous anomalies. If non-ferrous anomalies exist at the site, they may not be identified during the survey. Since the distance of the sensor from the object is the only variable that can be relatively controlled, the distance of the sensors from the bottom of the river will be minimized to the extent practicable.

This investigation will determine if detectable underwater anomalies exist at the site in locations that coincide with the locations of former munitions loading activities.

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SAP Worksheet #16—Project Schedule / Timeline Table (optional format)

Task	Start Date	Duration
Phase 1 SI Work Plan		
Pre-Draft UFP-QAPP Submission	21-Aug-09	
Navy Comment Period	24-Aug-09	22 days
Draft UFP-SAP Work Plan	23-Sep-09	10 days
Regulatory Comment Period	7-Oct-09	22 days
Final UFP-SAP Work Plan	6-Nov-09	10 days
Phase 1 SI Investigation - Underwater DGM		
Preparation	17-Nov-09	10 days
Investigation Completion	1-Dec-09	6 days
Data Analysis and Evaluation	9-Dec-09	17 days
Phase 1 SI Technical Memorandum		
Draft TM Submittal	6-Jan-10	
Team Comment Period	7-Jan-10	23 days
Final TM Submittal	9-Feb-10	10 days

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SAP Worksheet #17—Sampling Design and Rationale

The objective of the DGM survey is to determine the potential presence or suggested absence of MEC at SJCA Area UXO-001. This section of the MEC UFP-QAPP details the specific definable features of work to be performed to meet the objective of the SI. The definable features of work and tasks to be performed during this SI are presented in Worksheet #14 and detailed below. The schedule of activities for the project is shown in Worksheet #16. Each of these work elements for the SI, the SOPs that define the methods for performing the activities, and any other supporting documentation for performing the SI are presented in **Table 17-1**.

TABLE 17-1

Definable Feature of Work	SOP	Supporting Document(s)
Pre-Mobilization Activities	-	UFP-QAPP, Scope of Work
Mobilization/Site Preparation	-	UFP-QAPP, Site Specific HASP
Magnetometer Array Survey	SOP-002	UFP-QAPP
Geophysical Data Processing	SOP-002	UFP-QAPP
Side-Scan Sonar Survey	SOP-003	UFP-QAPP
Demobilization	-	UFP-QAPP
Final Report and Closeout	-	UFP-QAPP, Scope of Work

Pre-Mobilization Activities

Prior to mobilization to the site, planning activities will be performed to enhance timely project execution. This MEC UFP-QAPP has been developed to provide detail for how the project will be performed and the quality standards to which it will be compared. Prior to mobilization to the site, this plan will be reviewed and approved by the Navy, the Regulators, and CH2M HILL and its subcontractor(s). Additionally, coordination will be made to ensure GIS information and equipment are available and updated for project activities, document and data management procedures are in place, and all subcontractors have been procured. Subcontractor qualifications, certifications, and licenses will be reviewed prior to selection.

Mobilization and Site Preparation

Field personnel, equipment, and materials will be mobilized to the site to complete the DGM survey. On-site personnel will review this UFP-QAPP and all applicable SOPs and appendices. Additionally, nautical charts will be reviewed to identify potential navigational hazards that may be encountered during the survey. Appropriate site-specific training, including health and safety review for site activities, geophysical survey training, and MEC Awareness Training will be verified or performed. Minimum training requirements are listed in Worksheet #8. Additionally, a morning safety meeting will be conducted each day to review the tasks to be performed that day and any potential hazards.

SAP Worksheet #17—Sampling Design and Rationale (continued)

All equipment will be inspected upon arrival at the site, tested for functionality, and repaired or replaced as necessary to ensure quality performance. Equipment inspections will also be performed daily throughout the project to ensure proper functionality and prevent any damage. Good housekeeping procedures will be followed to reduce the risk of equipment damage. Other equipment and requirements will be outlined in the Site Specific Health and Safety Plan.

The FTL will ensure that on-site communications (e.g. mobile phones, 2-way radios) have been established between team members. Construction support zones and break areas will be identified prior to beginning work. It is not anticipated that any utility location will be required because no intrusive activities are planned during this phase of the SI.

DGM Survey

After site-setup activities have been completed, the DGM surveys will be performed. Note that applicable QC checks of the equipment, as described in Worksheet #12 and Appendix B, will be performed as required throughout the DGM survey process.

An initial sweep of the survey area will be performed using the side-scan sonar to determine the presence of possible obstructions or hazards that may impede the magnetometer survey. Next, a side-scan sonar and magnetometer survey will be performed. The focus of the DGM survey will primarily be on the wharf areas, which are most likely to contain MEC. Data will be collected in transects that allow for surveying the entire investigation area. The system operator will attempt to maintain the height of the sensor as close to the bottom of the river that is practical and consistent throughout the survey area. Data collection speed will be consistent between each transect lane. Figure 5 shows the investigation area for the geophysical investigation.

Once data has been collected, it will be downloaded by the geophysical subcontractor for processing. No later than 3 working days after data collection, this raw-data will be transferred to CH2M HILL for QC inspection. Data will be transferred using email, online FTP sites, or CDs.

Geophysical Data Processing and Interpretation

No later than 3 working days after collection, the DGM subcontractor will provide each day's data for QC inspection. Such data are considered to be in raw form. These data will be corrected for sensor offsets, latency, and drift. Also provided will be a digital planimetric map, in Geosoft format and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map.

All geophysical field data will be provided to CH2M HILL in delineated fields as x, y, z, d, v1, v2, and so on, where x and y are UTM Grid Plane Coordinates in Easting (meters) and Northing

SAP Worksheet #17—Sampling Design and Rationale (continued)

(meters) directions, z (altimeter reading), d (depth sensor reading), and v1, v2, v3, and so on are the instrument readings. The last data field will be a time stamp. Each data field will be separated by a comma or tab. Each file containing data will be logically and sequentially named so that the file name can be easily correlated with the area surveyed.

Within 5 working days of data collection, the processed geophysical field data, all final maps, and supporting geophysical interpretations will be provided to CH2M HILL. All geophysical data will be accompanied by a report documenting the field activities associated with the data and the processing performed. Information to be provided is summarized in Table 11-1 of Worksheet #11.

Both the DGM subcontractor and CH2M HILL will perform QC of geophysical data and data deliverables at each step of the processing path. Data will not move to the next stage until they have passed the QC check. QC checks to be performed on field forms, pre-processed data and processed data can also be found in this figure.

Once QC inspection of all geophysical data has been performed, the data will be evaluated to determine the potential presence of MEC at the site. The data will be reviewed by MEC-experienced data processing geophysicists. The geophysicists will use the following criteria for selecting significant anomalies:

- Maximum amplitude of the response with respect to local background conditions
- Lateral extent (plan size) of the area of response
- Shape of the response
- Location of the response with respect to the edge of the grid, unsurveyable areas, underwater features

This data will be compared with known characteristics of munitions items which are likely to have been used at the site to determine the potential presence or suggested absence of a release of MEC at the site. The magnetometer data will be compared to the side-scan sonar results to determine if anomalies detected on the sediment surface can be eliminated as potential MEC items.

Demobilization

Prior to demobilization from the site, an inspection will be performed to ensure all project objectives have been achieved and the work is accepted by the Navy. Once approval is received, equipment and crew will be demobilized from the site. All staging or storage areas will be removed and the site will be returned to pre-mobilization condition.

Final Report and Closeout

At the conclusion of the field activities and data processing and interpretation, a technical memorandum will be generated to document the activities performed at the site and summarize the results and conclusions of the DGM survey. The technical memorandum will be submitted to the Navy for review within 30 days of completion of the geophysical investigation.

SAP Worksheet #17—Sampling Design and Rationale (continued)

Information from the technical memorandum will be included in the SI report following Phase 2 of the SI, if Phase 2 of the SI is deemed necessary. The SI report will be generated in accordance with the EPA Guidance for performing a Site Inspection under CERCLA. The report will include an updated conceptual site model based upon the findings at the site and recommendations for future activities.

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

Data collection activities performed at the site will include a side-scan sonar and magnetometer survey (using a Geometrics G882 cesium vapor magnetometer or equivalent). The DGM survey will be focused around the former ordnance-loading wharfs. Based upon available site data from the preliminary assessment report, these areas may contain potential MEC. The wharf areas are identified on Figure 2.

Grid Location / ID Number	Exclusion Areas	Matrix	Depth relative to Ground Surface	Survey Methodology	Degree of Investigation or Coverage	SOP Reference[1]
Wharf 1 Area	Collapsed wharf and navigational hazard areas	Underwater seafloor surface and near surface (sediment)	NA	magnetometer and side-scan sonar	100% of the accessible area	SOP-002, SOP-003
Wharf 2 Area	Wharf pilings and navigational hazard areas	Underwater seafloor surface and near surface (sediment)	NA	magnetometer and side-scan sonar	100% of the accessible area	SOP-002, SOP-003
Wharf 3 Area	Wharf pilings and navigational hazard areas	Underwater seafloor surface and near surface (sediment)	NA	magnetometer and side-scan sonar	100% of the accessible area	SOP-002, SOP-003

[1]Standard operating procedure (SOP) or worksheet that describes the sample collection procedures.

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SAP Worksheet #19—Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[1]	Containers (number, size, and type)	Sample volume[2] (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time[3] (preparation / analysis)

Not Applicable

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

[2] Provide the minimum sample volume or mass requirement if it differs from the container volume.

[3] Maximum **holding time is calculated fro**m the time the sample is collected to the time the sample is prepared/extracted.

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SAP Worksheet #20—Field Quality Control Sample Summary Table

Matrix	Characteri-zation or Clearance Procedure	Number of units applicable to QC Survey	No. of Field Duplicates	Number of seed items per area (grid)	No. of Field Blanks	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples	Total Number or area of QC Sampling
Sediment	Underwater DGM survey	2% of all geophysical data collected to be resurveyed for QC	Duplicate random resurvey of 2% of all geophysical data.		Not applicable to subsurface geophysical surveys	Not applicable to subsurface geophysical surveys	Not applicable to subsurface geophysical surveys	Not applicable to subsurface geophysical surveys	Based on planned DGM survey of 25 acres, a total of approximately 0.5 acres are to be re-surveyed for QC purposes.

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SAP Worksheet #21—Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Originating Organization of SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-001	Preparing Field Log Books	CH2M HILL	N/A	N	None
SOP-002	SOP for Magnetometer Survey on Underwater UXO Contract Sites, 2 February 2010	ARM Geophysics	Magnetometer	N/A	None
SOP-003	SOP for Side Scan Sonar Surveys on Underwater UXO Contract Sites, 2 February 2010	ARM Geophysics	Side Scan Sonar	N	None

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

Field Equipment	Activity[1]	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference[2]	Comments
Equipment functional test	Verification	Twice daily (beginning and end of the day)	Items are detected in the expected location	Inspect/repair equipment until functioning properly	Equipment operator		FTL to verify test is completed and record results in field notebook.
DGM Survey Data Collection Static Background and Static Spike Data	Calibration, Verification	The survey equipment is placed within or near the survey boundaries in an area free of metallic contacts and collecting data for (minimally) a 1-minute period. Conducted at the beginning and end of each work day	Performed to determine if unusual levels of instrument or ambient noise exist ± 20% of standard item response, after background correction	Recalibrate to make sure background correction is accounted for	Equipment operator		FTL to verify test is completed and record results in field notebook.
Vibration Test	Verification	Cable shake/vibrations applied to instrument daily prior to the start of work.	Data profile does not exhibit data spikes	Check connections to ensure they are tight	Equipment operator		FTL to verify test is completed and record results in field notebook.
Equipment Warm-up	Verification	Daily, minimum of 15 minutes prior to the start of work	Power on		Equipment operator		FTL to verify test is completed and record results in field notebook.
DGM Survey	Calibration, Verification	2% of the total survey area	Duplication of results	Inspect/repair equipment until functioning properly. Repeat survey if necessary.	Equipment operator		

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

[2] Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

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SAP Worksheet #23—Analytical SOP References Table

SOPs for data interpretation are described on Worksheet #21.

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SAP Worksheet #24—Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]

Not Applicable

[1] Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

[2] Name or title of responsible person may be used.

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

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[2]	SOP Reference[1]

Not Applicable

[1] Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

[2] Name or title of responsible person may be used.

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SAP Worksheet #26—Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization):
Sample Packaging (Personnel/Organization):
Coordination of Shipment (Personnel/Organization):
Type of Shipment/Carrier:
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization):
Sample Custody and Storage (Personnel/Organization):
Sample Preparation (Personnel/Organization):
Sample Determinative Analysis (Personnel/Organization):
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection):
Sample Extract/Digestate Storage (No. of days from extraction/digestion):
Biological Sample Storage (No. of days from sample collection):
SAMPLE DISPOSAL
Personnel/Organization:
Number of Days from Analysis:

Not Applicable

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SAP Worksheet #27—Sample Custody Requirements Table

Not Applicable

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SAP Worksheet #28—Laboratory QC Samples Table

Matrix	
Analytical Group	
Analytical Method / SOP Reference	

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank						
LCS						
PT						
LFB						

Not Applicable

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SAP Worksheet #29—Project Documents and Records Table

Document	Where Maintained
• Field Notebooks • Field work plans • CA Forms • Electronic Data Deliverables • Meteorological Data from Field • Equipment/Instrument check logs • Subcontractor Work Plan • DGM subcontractor notes and field logs • Equipment Maintenance, Testing, and Inspection Logs • Reported Result for QC Checks • Data Package Tracking Checklists • Pre-processed Data • Final DGM Survey Data • Raw Data (stored on disk) • Field Photograph Log* • Daily Project Reports • Daily Health and Safety documents • Training Records • QC Documentation and reports • Meeting Agendas, Minutes, presentations, etc • Summary Reports	• Field data deliverables such as logbooks entries, electronic data deliverables (EDDs), field work plans, daily reports, etc will be kept on CH2M HILL's local internet server. • DGM survey information hardcopy deliverables and data processing/interpretation documents will be saved on the network server. • DGM survey data and results will be reported in the SI report

Photography at SJCA must be approved by the facility prior to being distribution or use in reports, presentations, or any other form of mass communication. Approval for the use of photographs will be obtained by the SJCA RPM, Walter Bell. Photographs can not include sensitive information, including, but not limited to, base activities and security measures.

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SAP Worksheet #30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person and telephone number)	Backup Laboratory / Organization[1] (name and address, contact person and telephone number)

Not Applicable

[1] If the laboratory is not known at time of SAP submission, put “TBD” in the column as a placeholder.

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SAP Worksheet #31—Planned Project Assessments Table

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of CA** (title and organizational affiliation)
Data storage and transfer system check	Prior to initial data collection and once weekly	Internal	CH2M HILL	CH2M HILL Geophysicist	Geophysical Subcontractor	Geophysical Subcontractor	CH2M HILL
Field Performance Audit	Once per definable feature of work.	Internal	CH2M HILL	FTL and/or Geophysicist	FTL, Geophysical Subcontractor	FTL, Geophysical Subcontractor	CH2M HILL

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SAP Worksheet #32—Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Field Performance Audit	Checklist and written audit report	Tim Wenk and Tamir Klaff - CH2M HILL	Verbal – immediately Written Documentation –Within 24-hours of audit	Field Audit Form, CA Form, and Memorandum	FTL (TBD) – CH2M HILL AQM – CH2M HILL	Within 24 hours

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SAP Worksheet #32-1—Field Performance Audit Form

Project Responsibilities

Project No.: _____ Date: _____

Project Location: _____ Signature: _____

Team Members:

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

_____

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

_____

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

_____

Data Collection

Yes _ No _ 1) Is data being collected as stated in the SOPs?
Comments _____

_____

Yes _ No _ 2) Is data being collected as specified in the work plan?
Comments _____

_____

Yes _ No _ 3) Are quality assurance checks performed as specified in the work plan?
Comments _____

_____

Yes _ No _ 4) Are photographs taken and documented?
Comments _____

_____

SAP Worksheet #32-1—Field Performance Audit Checklist (continued)

Document Control

Yes _ No _ 1) Have any accountable documents been lost?
Comments _____

_____

Yes _ No _ 2) Have any accountable documents been voided?
Comments _____

_____

Yes _ No _ 3) Have any accountable documents been disposed of?
Comments _____

_____

SAP Worksheet #32-2—Corrective Action Form

Person initiating corrective action (CA) _____ Date _____

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

_____

_____

_____

Cause of problem, if known or suspected: _____

_____

_____

_____

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

_____

_____

_____

_____

_____

_____

CA implemented by: _____ Date: _____

CA initially approved by: _____ Date: _____

Follow-up date: _____

Final CA approved by: _____ Date: _____

Information copies to:

_____

_____

_____

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SAP Worksheet #33—QA Management Reports Table

Type of Report	Frequency	Projected Delivery Date	Person Responsible for Report Preparation	Report Recipient(s)
Daily QC Report	Daily	Following Day	CH2M HILL FTL	Navy
QC Meeting Minutes	Post Meeting	Within 7 days	Site QC Manager	Navy
Preparatory Inspection Forms	Once for each definable feature of work (prior to start of task)	With daily reports the following day after meeting	Site QC Manager	Navy
Initial Inspection Forms	Once for each definable feature of work (prior to start of task)	With daily reports the following day after meeting	Site QC Manager	Navy
Follow-Up Inspection Forms	Once for each definable feature of work (document in daily reports)	Document in Daily Reporting	Site QC Manager	Navy
Phase I SI Technical Memorandum	Post-field Event	December 15, 2009	Tim Wenk/ CH2M HILL	Stakeholders, see **Worksheet #4**

The Phase 1 technical memorandum and SI Report will address the following:

- Summary of project QA/QC requirements/procedures
- Conformance of project to the MEC UFP-QAPP requirements/procedures
- Status of project schedule
- Deviations from the MEC UFP-QAPP and approved amendments that were made
- Results of data review activities (how much usable data was generated)
- CAs if needed and their effectiveness
- Data usability with regards to: precision, accuracy, representativeness, completeness, comparability, and sensitivity
- Limitations on data use

SAP Worksheet #33—QA Management Reports Table (continued)

The Phase 1 technical memorandum and SI Report will also include data quality concerns:

- Narrative and timelines of project activities
- Summary of PQO development
- Reconciliation of project data with PQOs
- Summary of major problems encountered and their resolution
- Data summary, including tables and figures
- Conclusions and recommendations

SAP Worksheet #34—Verification (Step I) Process Table

Verification Input	Description	Internal / External	Responsible for Verification
Evidence of required approval of plan (MEC UFP-QAPP)	Evidence of approval and completeness of UFP-QAPP. Includes establishment of PQOs, QC criteria, SOPs, project specific action limits, figures, etc.	Internal	Tim Wenk, CH2M HILL
Site Specific Training Records	Ensure project personnel have proper training and certification to perform site activities and achieve project data quality objectives.	Internal	Tim Wenk, FTL (TBD) CH2M HILL
DGM Survey Data Methods	Ensure DGM survey data methods are reviewed so data collection is performed as defined in the UFP-QAPP.	Internal	Tamir Klaff CH2M HILL
Data Collection and Transfer	Ensure data collection is complete and recorded accurately and that data transfer protocol are adequate.	Internal	Tamir Klaff CH2M HILL
Performance requirements (including QC criteria)	Ensure performance requirements are fully established (see **Worksheet #12**and **Worksheet #15**).	Internal	Tamir Klaff CH2M HILL
Field Log Notebooks	Ensure field notes are complete for field data collection, including data collection times, onsite operations, site conditions, etc. The field notes will also be used to document, explain, and justify all deviations from the approved UFP-QAPP and other work planning documents.	Internal	Tim Wenk, FTL (TBD) CH2M HILL

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

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation
IIb	Onsite Screening	Ensure that all field data meet Work Plan requirements for completeness and accuracy based on the field calibration records.	FTL CH2M HILL
IIa	DGM Survey Data Methods	Verify that all data collected were in accordance with the SOPs and requirements of the MEC UFP-QAPP. Ensure any deviations from the MEC UFP-QAPP are documented.	FTL and Geophysicist CH2M HILL
IIa	Data Collection and Transfer	Ensure all data are usable and have been corrected in accordance with data processing procedures defined in SOP-002 and SOP-003.	Geophysicist CH2M HILL
IIa	Performance requirements (including QC criteria)	Establish that QC tests were performed and compliant with method-required limits as specified in **Worksheet #12.**	FTL and Geophysicist CH2M HILL
IIa	Field Log Notebooks	Review field logbooks, field documents, and data deliverables for compliance to methods and signatures.	FTL and PM CH2M HILL
IIb	Performance requirements (including QC criteria)	Ensure that the data report has been provided and that all data is complete. Evaluate if all data collection procedures were followed with respect to the equipment and QC process. Compare the results of the data collection and QC data to the previously established PQOs, Performance Criteria, and PALs (see **Worksheet #11, Worksheet #12.** and **Worksheet #15**).	Geophysicist CH2M HILL

[1] IIa=compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005.]

IIb=comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005]

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

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Sediment	Anomalies identified during DGM survey	a.) Satisfactory review of data b.) Location of blind seeds	CH2M HILL geophysicist
IIb	Sediment	Anomalies identified during DGM survey	Results of survey and re-survey match	CH2M HILL geophysicist

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SAP Worksheet #37—Usability Assessment

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

- To assess whether a sufficient quantity of acceptable data are available for decision-making, the data will be reconciled with ARM Geophysics following validation and review of data quality indicators. The data will be reviewed by MEC-experienced data processing geophysicists. The data will be compared to:
  - Maximum amplitude of the response with respect to local background conditions
  - Lateral extent (plan size) of the area of response
  - Shape of the response
  - Location of the response with respect to the edge of the grid, unsurveyable areas, underwater features
- If significant inconsistency in data is detected it will be evaluated to assess impact on decision-making.
- If significant deviations are noted between QC of equipment, background information, and field data the cause will be further evaluated to assess impact on decision making,

Identify the personnel responsible for performing the usability assessment.

- The CH2M HILL Project Team, including the PM, AM, and Geophysical Senior Technical Consultant, will review the data and compile a technical memorandum for the Tier I Partnering Team (Navy, USEPA, and VDEQ). The Tier I Partnering Team as a whole will assess the usability of the data according to project objectives.

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

The following will be prepared by CH2M HILL and presented to and submitted to the Tier I Partnering Team for review and decisions on the path forward for the site:

- Data tables will be produced for geophysical data and will reflect which anomalies were selected as significant and which were eliminated from consideration during data interpretation.
- Figures will be produced to reflect detected underwater anomalies as well as the QC seeds used.
- The Phase 1 SI investigation technical memorandum will identify any data usability limitations and make recommendations for Phase 2 of the Site Inspection, if necessary.
- A data quality evaluation section will be included as part of the Phase 1 Technical Memorandum and SI report to summarize the results of the data collection and interpretation.
- The Phase 1 Technical Memorandum and SI report will identify any data usability limitations and make recommendations for CA if necessary.

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Figures

Legend

SJCA Boundary

UXO-001 Boundaries

Southern Wharf: 4.49 acres

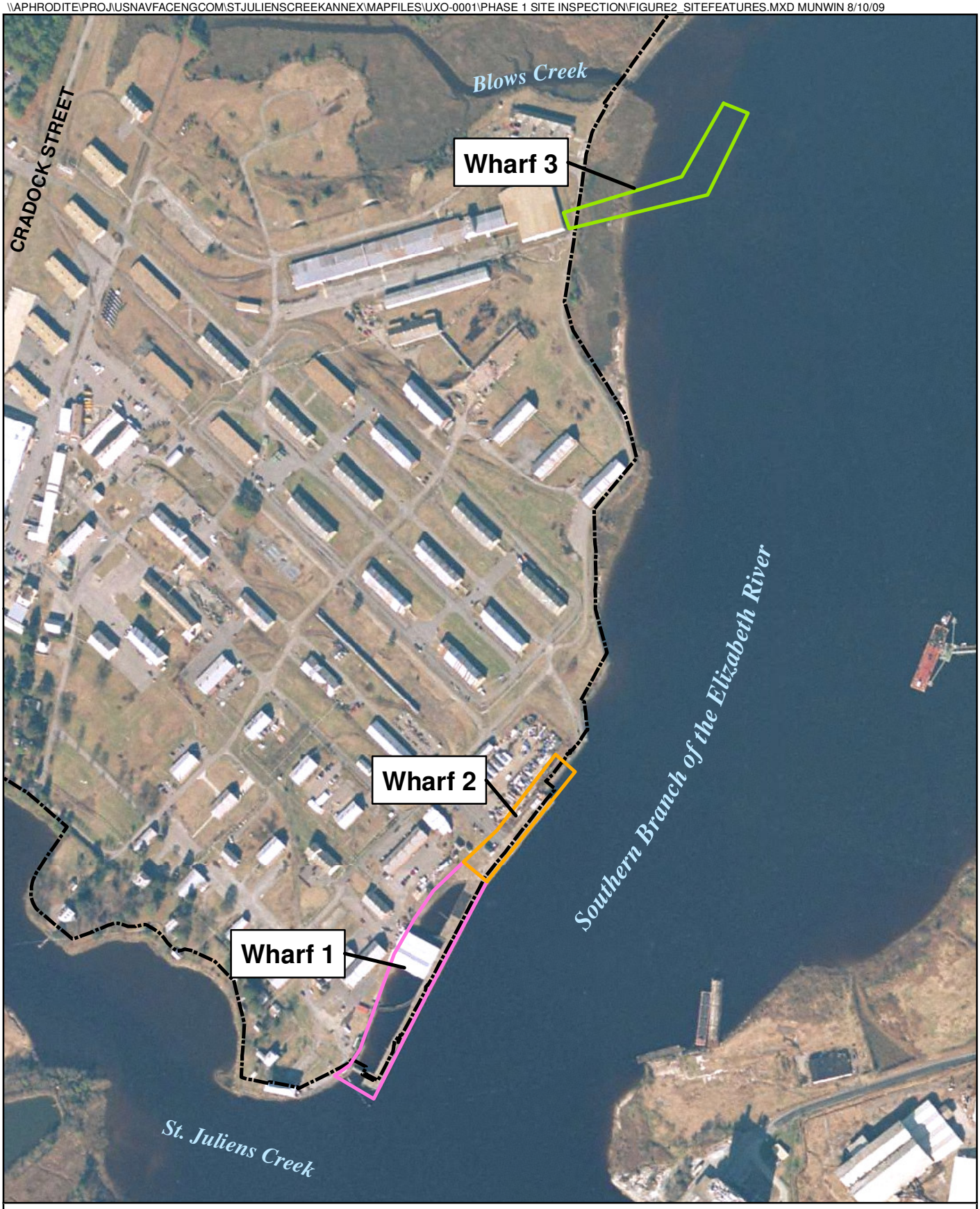
Northern Wharf: 1.70 acres

N
W E
S

0 500 1,000 Feet

Figure 1
Base and Site Location
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL



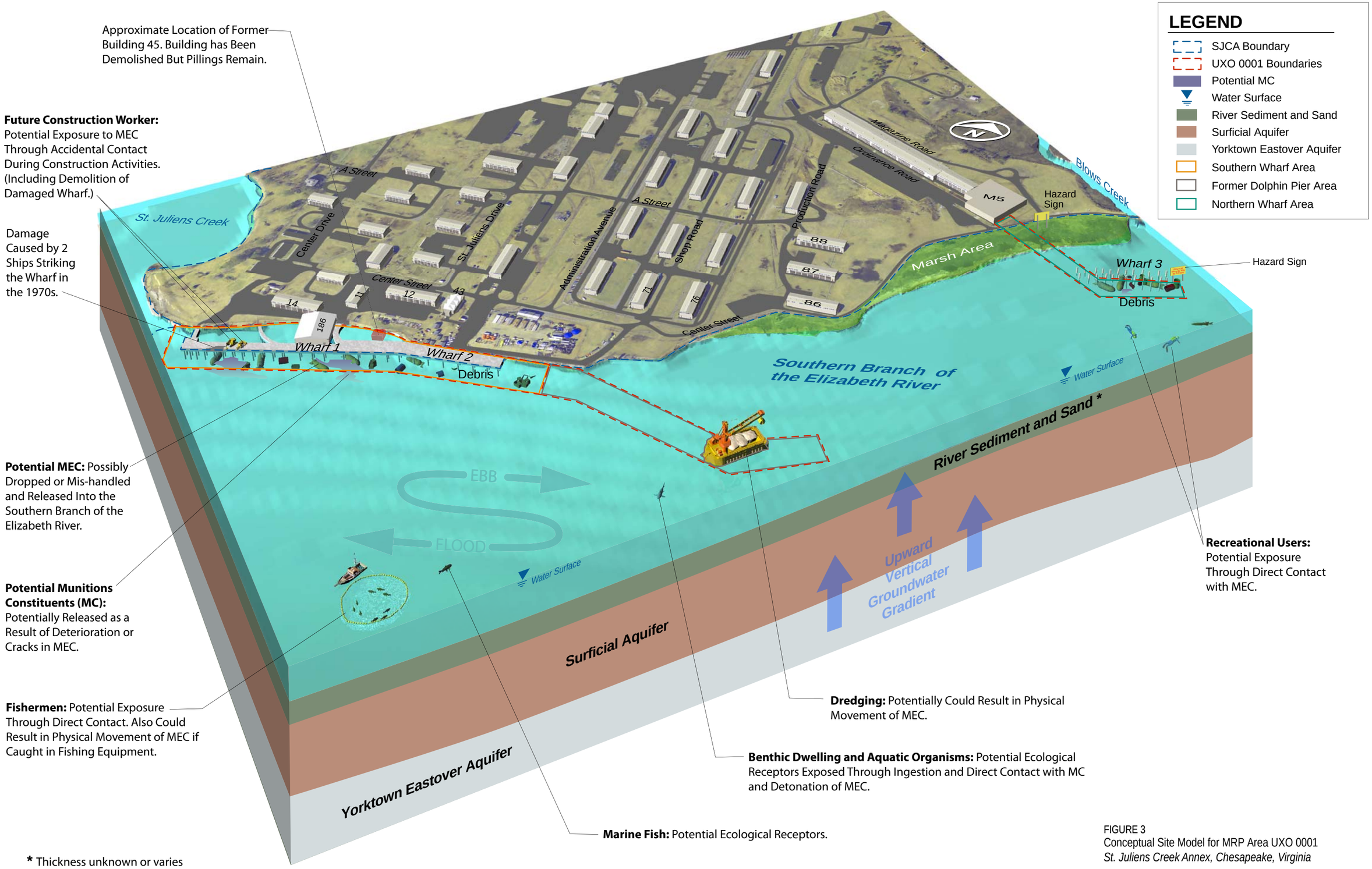
Legend
- SJCA Boundary
- Wharf 1
- Wharf 2
- Wharf 3

N
W E
S

0 250 500 Feet

Figure 2
Site Features
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

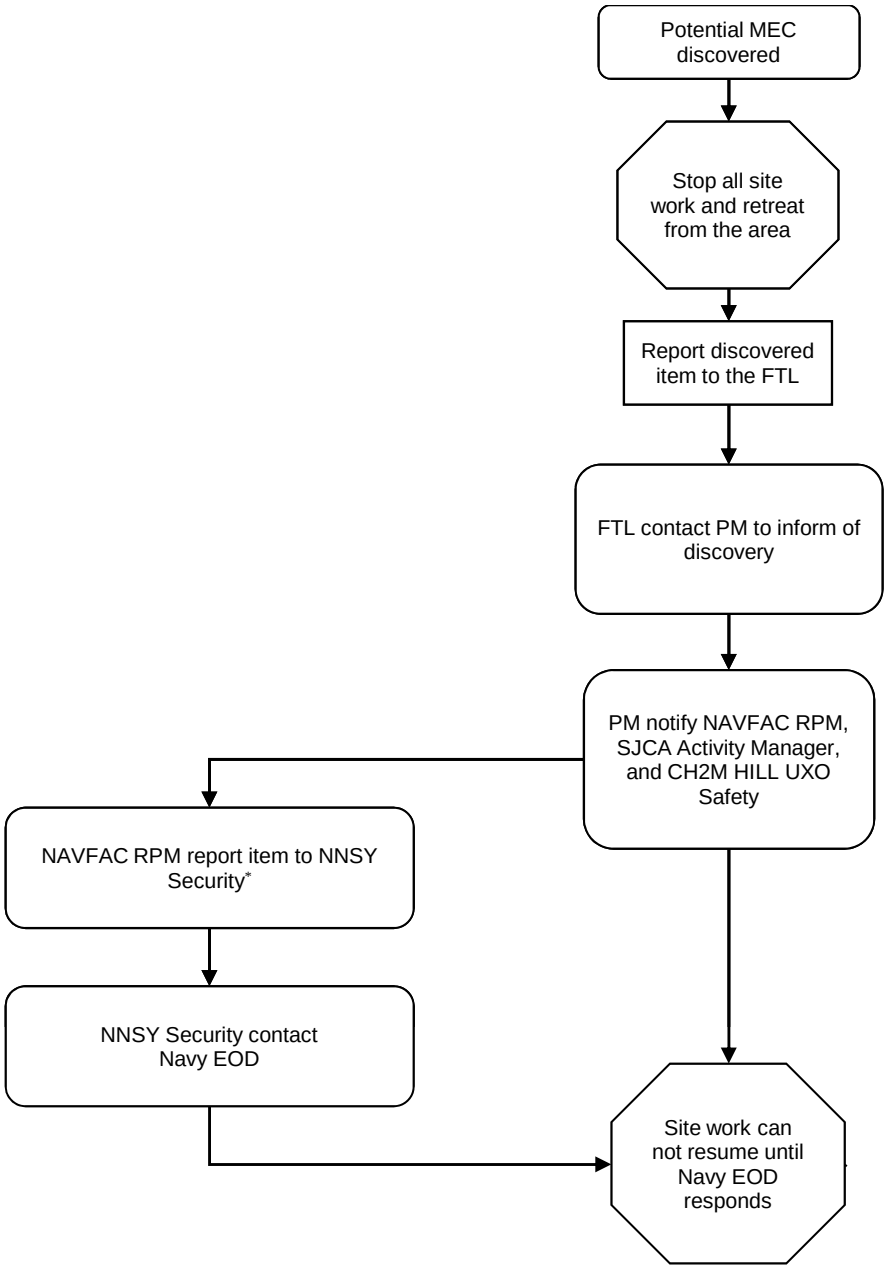


* Thickness unknown or varies

FIGURE 3
Conceptual Site Model for MRP Area UXO 0001
St. Juliens Creek Annex, Chesapeake, Virginia

ES032009004GNV UXO-0001_3D_Conceptual_Site_Model_ver13.ai 6-16-09 mlb

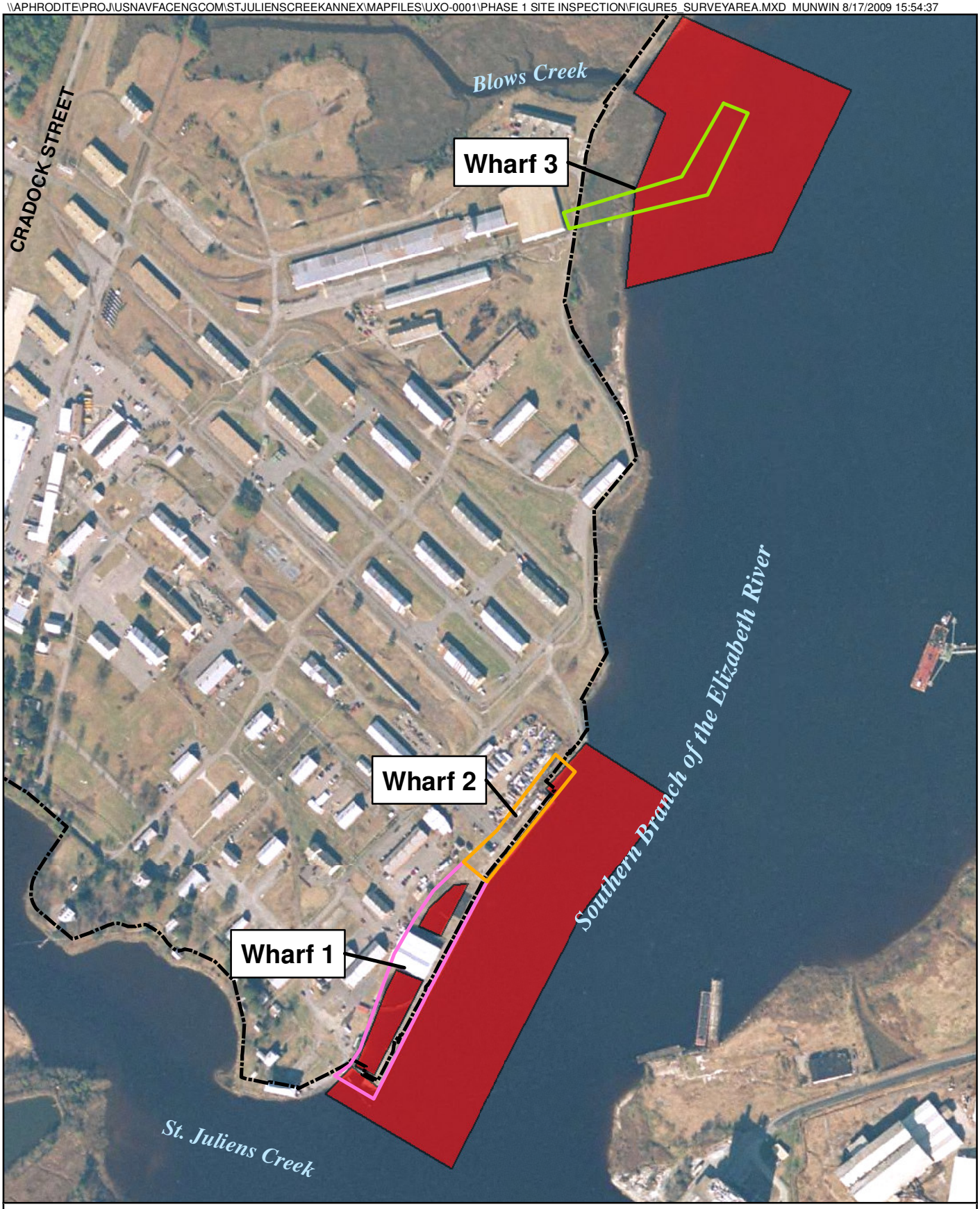
CH2MHILL



* NAVFAC will inform NOSSA of item discovery

Role	Contact	Office Phone	Cell Phone
NAVFAC RPM	Walt Bell	757-445-6638	--
Deputy Activity Manager	Adrienne Jones	757-671-6236	--
Activity Manager	Janna Staszak	757-671-6256	757-268-6136
CH2M HILL PM	Tim Wenk	757-671-6265	757-469-5294
CH2M HILL UXO Safety	Dan Young	251-962-2963	251-752-0148
NNSY Security	--	757-396-5111	--

Figure 4
Area UXO-001 MEC Notification Procedure
St. Juliens Creek Annex
Chesapeake, Virginia



Legend

- SJCA Boundary
- Wharf 1
- Wharf 2
- Wharf 3
- Survey Area

N
W E
S

0 250 500 Feet

Figure 5
Survey Area
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Appendix A
Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Preparing Field Log Books

I. Purpose

To provide general guidelines for entering field data into log books during site investigation and remediation field activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement of much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. PROCEDURES FOR COMPLETING FIELD LOG BOOKS

1. Field notes commonly are kept in bound, orange-covered logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.

2. On the inside cover of the log book the following information should be included:

   - Company name and address
   - Log-holders name if log book was assigned specifically to that person

- Activity or location
- Project name
- Project manager's name
- Phone numbers of the company, supervisors, emergency response, etc.

3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."

4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.

5. Daily entries will be made chronologically.

6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.

7. Each page of the log book will have the date of the work and the note takers initials.

8. The final page of each day's notes will include the note-takers signature as well as the date.

9. Only information relevant to the subject project will be added to the log book.

10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. INFORMATION TO BE INCLUDED IN FIELD LOG BOOKS

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.

2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.

3. Scope: Describe the general scope of work to be performed each day.

4. Weather: Record the weather conditions and any significant changes in the weather during the day.

5. Tail Gate Safety Meetings: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/ problems, and other pertinent information.

6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.

7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.

8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.

9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.

10. Time: Keep a running time log explaining field activities as they occur chronologically throughout the day.

11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.

12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.

13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.

14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.

15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.

16. Any conditions that might adversely affect the work or any data

obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).

17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:

- Description of the general sampling area – site name, buildings and streets in the area, etc.
- Station/Location identifier
- Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
- Sample matrix and type
- Sample date and time
- Sample identifier
- Draw a box around the sample ID so that it stands out in the field notes
- Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples
- Number and type of sample containers collected
- Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
- Parameters to be analyzed for, if appropriate
- Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. SUGGESTED FORMAT FOR RECORDING FIELD DATA

1. Use the left side border to record times and the remainder of the page to record information (see attached example).

2. Use tables to record sampling information and field data from multiple samples.

3. Sketch sampling locations and other pertinent information.

4. Sketch well construction diagrams.

STANDARD OPERATING PROCEDURES

FOR

MAGNETOMETER SURVEYS

ON

UNDERWATER UXO CONTRACT SITES

Prepared By: Kyle Kingman
Reviewed By: Ian Wilson
Approved By: Brian Brunette

Revision History			
Version 1.0	Feb-02-2010	Kyle Kingman	Initial Version

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II. MATERIALS AND EQUIPMENT ____ *3*

III. PROCEDURE ____ *3*

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3. **Data Acquisition** ____ 5
4. **Quality Control and Assurance** ____ 6
5. **Deliverables** ____ 7

IV. EQUIPMENT DATA SHEET ____ *8*

I. OBJECTIVE

The objective of this standard operating procedure is to provide a general overview of magnetometer and transverse gradiometer (TVG) data acquisition and its application for the detection of specific metallic submerged targets, cultural resources, and debris field mapping and characterization. These procedures may vary slightly depending on specific client technical requirements, survey site layout, and overall objectives of the survey.

II. MATERIALS AND EQUIPMENT

1. Magnetometer towfish with pressure sensor and altimeter (x 2 with wing if TVG option)
2. Towfish Cable with kellems grip
3. Magnetometer acquisition laptop computer with MagLog software
4. GPS navigation system –including at a minimum: receiver, antenna, navigation PC with Hypack software
5. Power supply - generator with fuel, extension cords, UPS battery backup, line conditioner
6. Magnetometer spare parts kit
7. Magnetometer operator's manual and software manual with installation disks
8. Mobilization kit – hardware, consumables, tools, tie-downs
9. Survey vessel- vessel of opportunity, contracted, or internally owned and supplied.

III. PROCEDURE

1. <u>Preparation</u>

1.1 Prior to commencing survey operations, all appropriate documentation pertaining to a specific project should be prepared and carefully reviewed. This documentation should include, but is not limited to: (1) the required client supplied precise detailed survey location, area or extent, coverage, and sampling interval desired; (2) Contact information for all relevant parties, agencies, or emergency communication lines; (3) Access to the survey area, all required permits or security clearance or other needed documents; and (4) Available relevant survey site information consisting of previous survey results, expected hazards, hindrances, or constraints whether physical, legal, or environmental.

1.2 A suitable survey vessel is chosen based on the factors listed in 1.1. The vessel will meet or exceed current Coast Guard regulations and project safety standards. The vessel will be capable of safe and efficient maneuvering throughout the entire planned survey area and transit to and from the site. The vessel will be of sufficient size and seaworthiness to accommodate all planned survey equipment and essential project personnel.

1.3 A project specific equipment list is generated prior to mobilization. All equipment is assembled and tested before being sent out into the field to check for completeness, integrity, functionality, and reliability. All spares kits, tool sets, hardware, software and consumables are checked for completeness.

1.4 Appropriate cycle rate, sensor height, and line spacing and orientation should be determined and configured to provide sufficient coverage to meet the client's needs. If a UXO survey (or comparable), a G882 transverse gradiometer (TVG) system is preferable unless the client requests a single magnetometer. The proper working projected coordinate system, vertical datum, and linear units must be set for the project.

2. Mobilization and Calibration

2.1 If using RTK positioning, the base station must be set up and tested. Set up the RTK base station in a secure, stable, and unobstructed location near the survey site. Make sure a strong GPS signal is being received and properly read by the navigation software. A GPS check against a known control point is required.

2.2 Interface the Hypack navigation computer, GPS positioning system, and magnetometer computer. Carefully measure and input all relevant sensors and tow point offsets into Hypack. Verify the offsets of the vessel layout with a vessel drawing. Ensure these offsets are applied and noted in the survey log. Perform a GPS check over a known control point and ensure the calculated position is within acceptable tolerances from the provided coordinates.

2.3 Ensure the magnetometer or TVG is properly connected to the tow point, all electrical plugs are secure and fastened, and hardware sufficiently tightened. Start the magnetometer operating software (MagLog) and configure a new project file and data directory. Perform a functionality test on each magnetometer sensor by sending power to the towfish and passing a known metal object such as a shot put past each sensor at a fixed height. Make sure each sensor detects the object and the results are repeatable.

2.4 Conduct a tool box talk prior to the first deployment to discuss the tasks of all essential survey personnel, potential hazards and safe handling of the towfish during deployment and recovery procedures, and instruct the vessel captain of safe vessel maneuvering whilst towing the magnetometer or TVG. After arriving at the survey location, lower the towfish to the appropriate altitude while moving at the expected survey speed. The towfish should be maintained at a near constant altitude above the bottom whenever possible.

Additionally, the amount of cable deployed should be carefully measured for layback calculations. The layback should be entered into the MagLog software with each change of cable out. If using a digital cable counter, the cable out value should be fed directly into MagLog or through Hypack. If using a digital cable counter, ensure the counter is functioning smoothly and properly and is reading zero when the magnetometer or TVG is at the tow point.

2.5 Calibration requires the operator, under survey conditions, to acquire a test line past a known object such as a navigational buoy or pipeline. The data should be free from interference or spikes. Verify the sensor offsets, layback, geometry, and positioning by conducting another pass on the same target in the opposite direction. Adjust the towfish height, layback, or boat speed as necessary to optimize the record quality.

3. Data Acquisition

3.1 The Hypack navigation computer should be loaded with the current project with all correct inputs and outputs configured and functioning properly. Ensure the data is logging properly and the correct active survey line is selected.

3.2 Maneuver the vessel such that it begins an approach to the line with sufficient space to ensure a straight entry and consistent appropriate speed and altitude of the towfish. Begin logging data at the start of the line and check to ensure the data is both logging and being saved to the correct directory. At the end of the line, end logging when the towfish has passed the end of line. The active survey line should either increment or decrement to the next line to be run. If possible, run survey lines such that adjacent lines are run in opposite directions.

Continually monitor the magnetometer record to ensure good data quality. The towfish should maintaining proper height off bottom, usually 5 to 20 ft depending on the requirements. Be especially careful to monitor the towfish altitude while maneuvering between survey lines. Either reduce the layback or increase speed while turning to reduce the risk of impacting the bottom between survey lines. Ensure the sampling rate is 10 times per second. Survey speed should be maintained between 2 to 3 knots which will result in an adequate sampling interval down line. The sample interval should not exceed 0.7 feet which occurs at 4.15 knots.

3.3 Ensure there is adequate digital storage space to contain more than the required amount of survey data on board the vessel. At the end of the day, back up all digital survey data to a stable storage medium such as an external USB hard drive, DVD, or network attached storage drive. Two full digital copies of all data should be made and double checked for completeness before deleting any data off the acquisition data storage hard drives. If practical, designate one person responsible for all data storage, backup, and eventual removal. If possible, avoid deleting any data until a full project data copy is verified at the office.

4. Quality Control and Assurance

4.1 All raw survey data and information (e.g., field notes, equipment, instrumentation frequencies and cycle rate, weather, line name, time, heading, etc.) must be documented electronically or in a field note book. A detailed geophysical line log and survey log should be carefully maintained.

4.2 Magnetometer or TVG data is reviewed daily in MagPick or GeoSoft software. A contoured magnetic image is generated to check the overall quality, accuracy, position, and coverage of the records. Repeated lines will be collected over about 2% of the survey area to test qualitative repeatability.

4.3 Real time survey coverage monitoring of towfish position will be performed using Hypack. A survey postplot of fish position will be generated daily to double check coverage and monitor the survey's progress.

5. Deliverables

5.1 All magnetometer or TVG data will be recorded in ascii text format and given to the client as raw data files. The magnetometer data will be initially processed for amplitude adjustment (drift corrections) and positional adjustment (lag corrections), subsequently reviewed for data quality, and finally targets will be selected an overlain on a map for review. Finally, a geo-referenced processed pseudo analytic signal or residual magnetic anomaly amplitude color image will be produced as a geotiff or jpeg image with targets overlain.

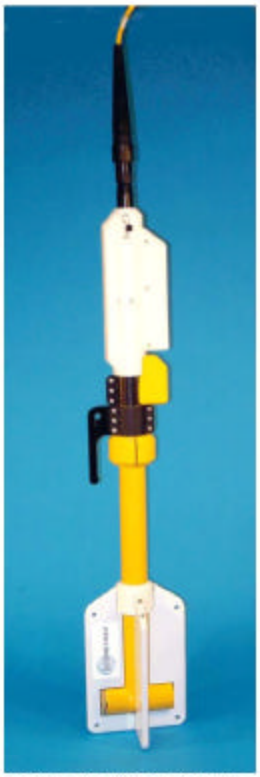
5.2 The final product will be magnetometer anomaly list inclusive of significant discrete anomalies listed in sequential order with their individual discrete position and corresponding applicable response characteristics (such as amplitude, size, etc.) catalogued for reference. Non-discrete anomalies or debris areas will be outlined as an area polygon, as apposed to numerous meaningless discrete anomalies. The findings will be summarized in a brief summary report.

IV. EQUIPMENT DATA SHEET

GEOMETRICS

G-882 MARINE MAGNETOMETER

- ***CESIUM VAPOR HIGH PERFORMANCE – Highest detection range and probability of detecting all sized ferrous targets***
- ***NEW STREAMLINED DESIGN FOR TOW SAFETY – Low probability of fouling in lines or rocks***
- ***NEW QUICK CONVERSION FROM NOSE TOW TO CG TOW – Simply remove an aluminum locking pin, move tow point and reinsert. New built in easy carry handle!***
- ***NEW INTERNAL CM-221 COUNTER MODULE – Provides Flash Memory for storage of default parameters set by user***
- ***NEW ECHOSOUNDER / ALTIMETER OPTION***
- ***NEW DEPTH RATING – 4,000 psi !***
- ***HIGHEST SENSITIVITY IN THE INDUSTRY – 0.004 nT/√Hz RMS with the internal CM-221 Mini-Counter***
- ***EASY PORTABILITY & HANDLING – no winch required, single man operation, only 44 lbs with 200 ft cable (without weights)***
- ***COMBINE TWO SYSTEMS FOR INCREASED COVERAGE – Internal CM-221 Mini-Counter provides multi-sensor data concatenation allowing side by side coverage which maximizes detection of small targets and reduces noise***



G-882 with Weight Collar Depth Option & Altimeter

Very high resolution Cesium Vapor performance is now available in a low cost, small size system for professional surveys in shallow or deep water. High sensitivity and sample rates are maintained for all applications. The well proven Cesium sensor is combined with a unique and new CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your computer and standard printer with our MagLogLite™ software to log, display and print GPS position and magnetic field data. The G–882 is the lowest priced high performance full range marine magnetometer system ever offered.

The G-882 offers flexibility for operation from small boat, shallow water surveys as well as deep tow applications (4,000 psi rating, telemetry over steel coax available to 10Km). The G-882 also directly interfaces to all major Side Scan manufacturers for tandem tow configurations. Being small and lightweight (44 lbs net, without weights) it is easily deployed and operated by one person. But add several streamlined weight collars and the system can quickly weigh more than 100 lbs. for deep tow applications. Power may be supplied from a 24 to 30 VDC battery power or the included 110/220 VAC power supply. The tow cable employs high strength Kevlar strain member with a standard length of 200 ft (61 m) and optional cable length up to 500m with no telemetry required.

A rugged fiber-wound fiberglass housing is designed for operation is all parts of the world allowing sensor rotation for work in equatorial regions. The shipboard end of the tow cable is attached to an included junction box or optional on-board cable for quick and simple hookup to power and output of data into any Windows 98, ME, NT, 2000 or XP computer equipped with RS-232 serial ports.

The G-882 Cesium magnetometer provides the same operating sensitivity and sample rates as the larger deep tow model G-880. MagLogLite™ Logging Software is offered with each magnetometer and allows recording and display of data and position with Automatic Anomaly Detection and automatic anomaly printing on Windows™ printer! Additional options include: MagMap2000 plotting and contouring software and post acquisition processing software MagPick™ (free from our website.)

The G-882 system is particularly well suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stone and other scattered shipwreck debris, munitions of all sizes (UXO), aircraft, engines and any other object with magnetic expression. Objects as small as a 5 inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range. (Refer to table at right).

The design of this high sensitivity G-882 marine unit is directed toward the largest number of user needs. It is intended to meet all marine requirements such as shallow survey, deep tow through long cables, integration with Side Scan Sonar systems and monitoring of fish depth and altitude.

Typical Detection Range For Common Objects

Ship 1000 tons	0.5 to 1 nT at 800 ft (244 m)
Anchor 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
Automobile	1 to 2 nT at 100 ft (30 m)
Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
100 KG of iron	1 to 2 nT at 50 ft (15 m)
100 lbs of iron	0.5 to 1 nT at 30 ft (9 m)
10 lbs of iron	0.5 to 1 nT at 20 ft (6 m)
1 lb of iron	0.5 to 1 nT at 10 ft (3 m)
Screwdriver 5 inch	0.5 to 2 nT at 12 ft (4 m)
1000 lb bomb	1 to 5 nT at 100 ft (30 m)
500 lb bomb	0.5 to 5 nT at 50 ft (16 m)
Grenade	0.5 to 2 nT at 10 ft (3 m)
20 mm shell	0.5 to 2 nT at 5 ft (1.8 m)

MODEL G-882 CESIUM MARINE MAGNETOMETER SYSTEM SPECIFICATIONS

OPERATING PRINCIPLE:	Self-oscillating split-beam Cesium Vapor (non-radioactive)
OPERATING RANGE:	20,000 to 100,000 nT
OPERATING ZONES:	The earth's field vector should be at an angle greater than 6° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.
CM-221 COUNTER SENSITIVITY:	<0.004 nT/√Hz rms. Up to 20 samples per second
HEADING ERROR:	±1 nT (over entire 360° spin)
ABSOLUTE ACCURACY:	<2 nT throughout range
OUTPUT:	RS-232 at 1,200 to 19,200 Baud
MECHANICAL:	
Sensor Fish:	Body 2.75 in. (7 cm) dia., 4.5 ft (1.37 m) long with fin assembly (11 in. cross width), 40 lbs. (18 kg) includes Sensor and Electronics and 1 main weight. Additional collar weights are 14lbs (6.4kg) each, total of 5 capable
Tow Cable:	Kevlar Reinforced multiconductor tow cable. Breaking strength 3,500 lbs, 0.48 in OD, 200 ft maximum. Weighs 17 lbs (7.7 kg) with terminations.
OPERATING TEMPERATURE:	-30°F to +122°F (-35°C to +50°C)
STORAGE TEMPERATURE:	-48°F to +158°F (-45°C to +70°C)
ALTITUDE:	Up to 30,000 ft (9,000 m)
WATER TIGHT:	O-Ring sealed for up to 4,000 psi (9000 ft or 2750 m) depth operation
POWER:	24 to 32 VDC, 0.75 amp at turn-on and 0.5 amp thereafter
ACCESSORIES:	
Standard:	View201 Utility Software operation manual and ship kit
Optional:	Telemetry to 10Km coax, gradiometer (longitudinal or transverse), reusable shipping case
MagLog Lite™ Software:	Logs, displays and prints Mag and GPS data at 10 Hz sample rate. Automatic anomaly detection and single sheet Windows printer support

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE ***12/06***

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GEOMETRICS
Innovation • Experience • Results

G-882TVG CESIUM MAGNETOMETER & TRANSVERSE GRADIOMETER

- **Marine Search Applications for UXO, pipelines, lost objects with Multi-Sensor Array Capability**
- **High Sensitivity – 0.004 nT/sq-rt-Hz RMS with dual CM–221 Larmor Counters**
- **Very Low Heading Error – ±0.25nT over 360° equatorial and polar spins**
- **Versatility – CM-221 counter includes 8 channel 12 bit A to D converters for real time internal diagnostics, digital data stream concatenation, and short, long or telemetry over coax options**
- **Reliability and Ruggedness – Cesium magnetometers never need be returned to factory for calibration or tuning. Designed for tough environmental conditions and high "G" loads**

- **Gradiometer arrays offering simultaneous operation of up to 8 separate sensors using the designed-in multi-sensor data concatenation of the CM-221 internal counter**
- **Geometrics offers complete turnkey systems including tow cables, gradiometer wing, digital data acquisition systems with real time anomaly detection, GPS navigation and post acquisition data processing software and training.**

The Geometrics Model G-882TVG Transverse Gradiometer system mates the well- proven high-performance cesium sensor with dual high sensitivity and high speed CM-221 Larmor Counters. This advanced integrated magnetometer system provides unmatched versatility in performance, with a wide sensor separation for maximum target detection efficiency and survey cost effectiveness.

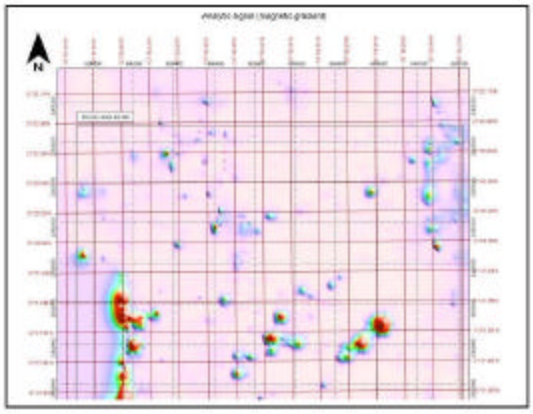
The system comprises a transverse wing and two G-882 Cesium Vapor magnetometer fish with stabilizer weights and fins. Tow cables may be up to 150m in length with standard power supply or up to 700m with a high capacity voltage sense supply. Depth sensors provide gradiometer attitude and depth information to the operator depth and an echo-sounder altimeter provides height above sea floor for proper system flight control.

Dual sensors are synchronized to 1ms sampling and data is transmitted via RS-232 for recording by any standard PC computer using our industry standard MagLogLite software. High sample and data transmission rates (up to 40 samples per second) are standard.

The G-882G provides sensitivities of 0.004 nT/√Hz RMS or approximately 0.01 nT P–P at 10 Hz, selectable via software command for detection of the smallest anomalies. MagLog software computes the transverse difference for display and analysis in real time, using the customer supplied GPS for interpolation and target positioning.

The system's high performance is excellent for the detection and delineation of cables, pipelines, environmental, archaeological or military UXO and EOD targets.

Software
Geometrics supplies MagMap2000 and MagPick with each system for analysis and interpretation of total field and gradient data. Analytical signal is computed from the transverse gradient, longitudinal time gradient and computed vertical gradient to give a time-variation free data set for contouring and plotting of anomaly targets. Simultaneous dual inversion routines in MagPick produce a located target worksheet with models including object latitude-longitude position and depth of burial. Download ftp://geom.geometrics.com/pub/mag/Software/Posters.zip for more information



MODEL G-882TVG MARINE CESIUM GRADIOMETER SPECIFICATIONS

OPERATING PRINCIPLE:	Self-oscillating split-beam cesium vapor (non-radioactive)
OPERATING RANGE:	20,000 to 100,000 nT
OPERATING ZONES:	The earth's field vector should be at an angle greater than 10° from the sensor's equator and greater than 10° from the sensor's long axis. Automatic hemisphere switching.
SENSITIVITY WITH CM-221 COUNTER:	<0.004 nT/sq-rt-Hz RMS. Typically 0.01 nT P-P at a 0.1 second (10 Hz) sample rate (90% of all readings falling within the P-P envelope)
SAMPLE RATE:	Up to 40Hz in 100ms increments
HEADING ERROR:	<0.25 nT over entire 360° equatorial and polar spins
ABSOLUTE ACCURACY:	<3 nT throughout range
OUTPUT:	Cycle of Larmor frequency = 3.498572 Hz/nT, RS-232 data at 115K baud, concatenated data streams from 2 to 8 sensors depending on sample rate
MECHANICAL:	Total weight including 70kg (155 lbs) including two fish, wing and tow cable. Sensor separation is 1. 5m for maximum gradient
CABLES:	Vectran Reinforced multi-conductor tow cable. Breaking strength 3,600 lbs, 0.48 in OD, 500 ft standard maximum. Up to 2100 ft with variable voltage supply. 200 ft (60m) weighs 17 lbs (7.7 kg).
OPERATING TEMPERATURE:	-30°F to +122°F (-35°C to +50°C)
STORAGE TEMPERATURE:	-48°F to +158°F (-45°C to +70°C)
ALTITUDE:	Up to 30,000 ft (9,000 m)
DEPTH RATING:	Depth rated to 4,000 psi (2,700m)
POWER:	115/220 VAC, 60 watts at turn-on and 40 watts thereafter
ACCESSORIES:	
Standard:	Power/RS-232 multiconductor cable (electronics to power/data junction box with 9 pin RS-232 connector and power lugs), lengths to be specified, operation manual and reusable shipping and storage containers
Optional:	
Logging Software	MagLog (Logs GPS and Mag. shows trackplot, mag profile, other data)
Processing software	MagMap2000, MagPick

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE ***05/09***

GEOMETRICS
Innovation · Experience · Results

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STANDARD OPERATING PROCEDURES

FOR

SIDE SCAN SONAR SURVEYS

ON

UNDERWATER UXO CONTRACT SITES

Prepared By: Kyle Kingman
Reviewed By: Ian Wilson
Approved By: Brian Brunette

Revision History			
Version 1.0	Feb-02-2010	Kyle Kingman	Initial Version

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I. OBJECTIVE

The objective of this standard operating procedure is to provide a general overview of side scan sonar data acquisition and its application for the detection of submerged obstructions, cultural resources, and seabed characterization. These procedures may vary slightly depending on specific client technical requirements, survey site layout, and overall objectives of the survey.

II. MATERIALS AND EQUIPMENT

1. Side scan sonar towfish
2. Towfish Cable with kellems grip or towing point
3. Side scan sonar topside unit
4. Side scan sonar acquisition computer with dual monitors
5. Power supply - generator with fuel, extension cords, UPS battery backup, line conditioner
6. Sonar spare parts kit
7. Side scan sonar operators manual and software manual with installation disks
8. GPS navigation system –including at a minimum: receiver, antenna, navigation PC with Hypack software
9. Mobilization kit – hardware, consumables, tools, tie-downs
10. Survey vessel- vessel of opportunity, contracted, or internally owned and supplied.

III. PROCEDURE

1. <u>Preparation</u>

1.1 Documentation - Prior to commencing survey operations, all appropriate documentation pertaining to a specific project should be prepared and carefully reviewed. This documentation should include, but is not limited to: (1) the required client supplied precise detailed survey location, area or extent, coverage, and resolution desired; (2) Contact information for all relevant parties, agencies, or emergency communication lines; (3) Access to the survey area, all required permits or security clearance or other needed documents; and (4) Available relevant survey site information consisting of previous survey results, expected hazards, hindrances, or constraints whether physical, legal, or environmental.

1.2 Vessel - A suitable survey vessel is chosen based on the factors listed in 1.1. The vessel will meet or exceed current Coast Guard regulations and project safety standards. The vessel will be capable of safe and efficient maneuvering throughout the entire planned survey area and transit to and from the site. The vessel will be of sufficient size and seaworthiness to accommodate all planned survey equipment and essential project personnel.

1.3 Mobilization - A project specific equipment list is generated. All equipment is assembled and tested before being sent out into the field to check for completeness, integrity, functionality, and reliability. All spares kits, tool sets, hardware, software and consumables are checked for completeness.

1.4 Acquisition - Appropriate sonar range, frequency, and line spacing and orientation should be determined and configured to result in at least 200 percent coverage, or 100 percent sonar data overlap of the seafloor. The nadir of every sonar line is covered by the adjacent line, unless requested otherwise by the client. The proper working projected coordinate system, vertical datum, and linear units must be set for the project.

2. Mobilization and Calibration

2.1 Positioning - If using RTK positioning, the base station must be set up and tested. Set up the RTK base station in a secure, stable, and unobstructed location near the survey site. Make sure a strong GPS signal is being received and properly read by the navigation software. A GPS check against a known control point is preferred.

2.2 Positioning system - Interface the Hypack navigation computer, GPS positioning system, and side scan sonar topside unit. Carefully measure and input all relevant sensors and tow point offsets into Hypack. Verify the offsets of the vessel layout with a vessel drawing. Ensure these offsets are applied and noted in the survey log. Perform a GPS check over a known control point and ensure the calculated position is within acceptable tolerances from the provided coordinates.

2.3 Side Scan Sonar - Ensure the side scan is properly connected to the tow point, all electrical plugs are secure and fastened, and hardware sufficiently tightened. Start the side scan sonar operating software and configure a new project file and data directory. Perform a rub test on each transducer by sending power to the towfish and gently hand-rubbing each transducer and observing the resulting friction spikes in the sonar waterfall display. Ensure each transducer is clean.

2.4 Deployment - Conduct a tool box talk prior to the first deployment to discuss the tasks of all essential survey personnel, potential hazards and safe handling of the towfish during deployment and recovery procedures, and instruct the vessel captain of safe vessel maneuvering whilst towing the side scan. After arriving at the survey location, lower the towfish to the appropriate altitude while moving at the expected survey speed. The towfish should be maintained at an altitude above the bottom equal to 10 percent of the range. The amount of cable deployed should be carefully measured for layback calculations. The layback should be entered into the sonar acquisition software with each change of cable out. If using a digital cable counter, the cable out value should be fed directly into the sonar acquisition software or through Hypack. If using a digital cable counter, ensure the counter is functioning smoothly and properly and is reading zero when the side scan is at the tow point.

2.5 Calibration - While under survey conditions acquire a test line and review the quality and display of the digital and hard copy records (if applicable). Adjust the gain, towfish height, layback, or boat speed as necessary to optimize the sonar record quality. Ensure the side scan is operating at the appropriate range and frequency for full sonar coverage throughout the survey site. Ensure the data is properly tagged with GPS position and all relevant annotations displayed such as line name, heading, fix or event mark, and time. Tow the side scan past a discrete target such as a navigational buoy, piling, or other object to ensure the target is detected. Verify the sensor offsets, geometry, and positioning by conducting another pass on the same target in the opposite direction.

3. Data Acquisition

3.1 Survey Program - The Hypack navigation computer should be loaded with the current project with all correct inputs and outputs configured and functioning properly. Ensure the data is logging and the correct active survey line is selected.

3.2 Running lines - Maneuver the vessel such that it begins an approach to the line with sufficient space to ensure a straight entry and consistent appropriate speed and altitude of the towfish. Begin logging data at the start of the line and check to ensure the data is both logging and being saved to the correct directory. At the end of the line, end logging when the towfish has passed the end of line. The active survey line should increment or decrement to the next line to be run.

If possible, run survey lines such that adjacent lines are run in opposite directions. Continually monitor the sonar record to ensure good data quality and that the towfish is maintaining proper height off bottom. Be especially careful to monitor the towfish altitude while maneuvering between survey lines. Either reduce the layback or increase speed while turning to reduce the risk of impacting the bottom between survey lines.

3.3 Data storage - Ensure there is adequate digital storage space to contain more than the required amount of survey data on board the vessel. At the end of the day, back up all digital survey data to a stable storage medium such as an external USB hard drive, DVD, or network attached storage drive. Two full digital copies of all data should be made and double checked for completeness before deleting any data off the acquisition data storage hard drives. If practical, designate one person responsible for all data storage, backup, and eventual removal. Avoid deleting any data until a full project data copy is verified.

4. Quality Control and Assurance

4.1 All survey information (e.g., field notes, equipment specs, weather, line name, time, heading, etc.) must be documented electronically or in a field note book.

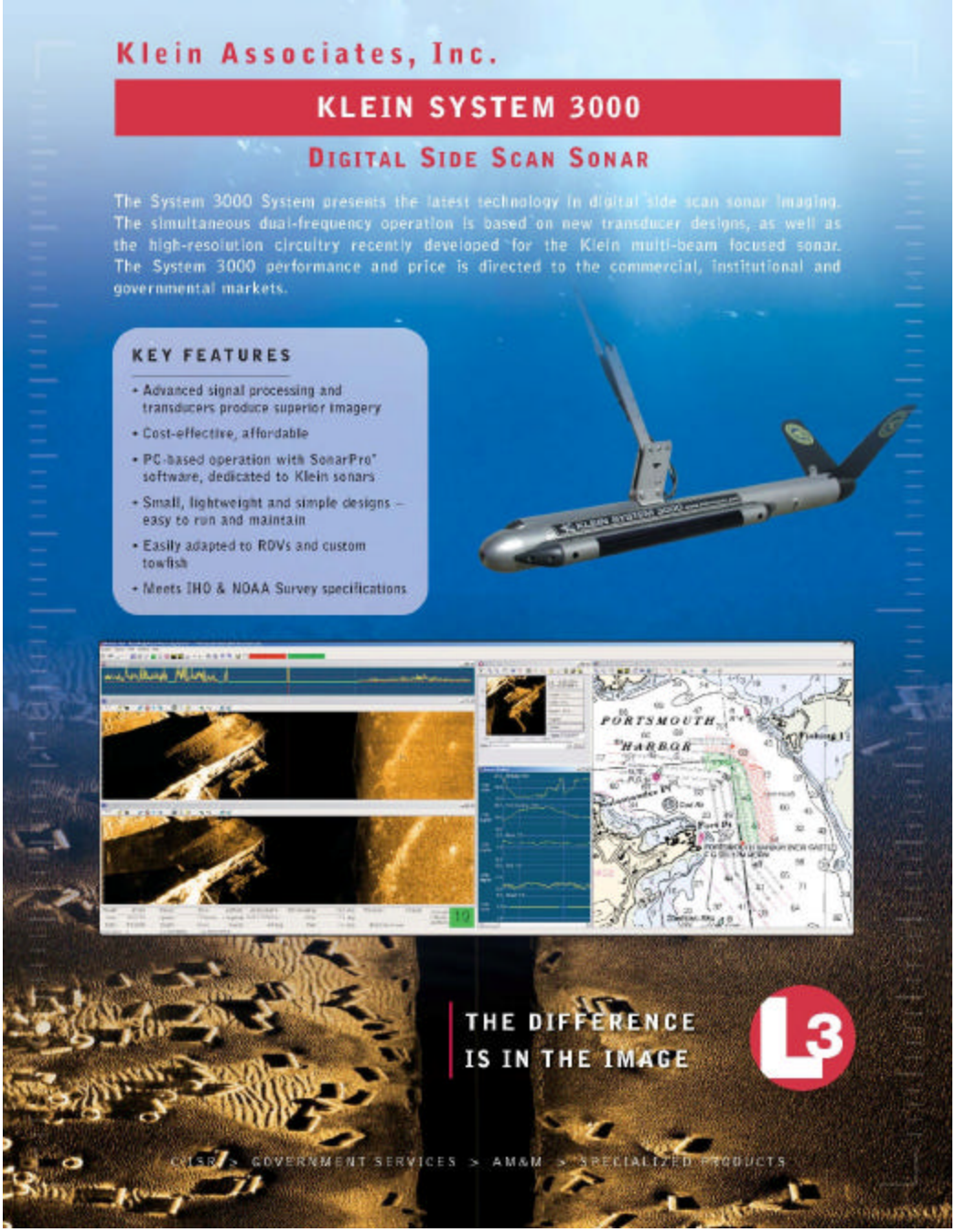
4.2 Side scan sonar data is reviewed for interpretability in Coda GeoSurvey software. A side scan sonar mosaic is generated to check the overall quality, accuracy, position, and coverage of the records.

5. Deliverables

5.1 Side scan sonar data will be recorded in XTF or COD format and given to the client as raw data files. Paper hard copies will be created and provided upon the client's request. Geo-referenced sonar mosaic will be generated and delivered as a geotiff image.

5.2 The side scan sonar records will be analyzed for significant targets or bottom features. All significant detected features will be plotted at their locations on the geo-referenced drawings. A sonar target list is produce containing target-id number, dimensions (if measurable), description, and location.

IV. EQUIPMENT DATA SHEETS



Klein Associates, Inc.

KLEIN SYSTEM 3000

DIGITAL SIDE SCAN SONAR

Towfish Specifications	
Frequencies	100 kHz (132 kHz +/- 1% act) 500 kHz (445 kHz, +/- 1% act)
Transmission pulse	Tone burst, operator selectable from 25 to 400 µsecs. Independent pulse controls for each frequency
Beams: Horizontal Vertical	 0.7 deg @ 100 kHz, 0.21 deg @ 500 kHz 40 deg
Beam tilt	5, 10, 15, 20, 25 degrees down, adjustable
Range scales	15 settings -- 25 to 1,000 meters
Maximum range	600 meters @ 100 kHz 150 meters @ 500 kHz
Depth rating	1,500 meters standard, other options available
Construction	Stainless Steel
Body length	122 cm (48 in)
Body diameter	8.9 cm (3.5 in)
Weight (in air)	29 kg (63.9 lbs)
Standard sensors:	Roll, pitch, heading
Options	Magnetometer, pressure, acoustic positioning

Transceiver Processor Unit (TPU) Specifications	
Operating system	vxWorks® with custom application
Basic hardware	Standard 19-inch rack or table mount, VME bus structure
Outputs	100 Base-T_X, Ethernet LAN
Navigation input	NMEA 0183
Power (includes towfish)	120 watts @ 120/240 VAC, 50/60 Hz
Interfacing	Interfaces to all major sonar data processors
Options	Splash-proof packaging option available

Tow Cable

Klein offers a selection of coaxial, Kevlar® reinforced, lightweight cables, double armored steel cables, and interfaces to fiber optic cables. All cables come fully terminated at the towfish end.

Klein Sonar Workstation Specifications	
Basic operating system	Windows NT®, 2000®, or equivalent
Sonar software	SonarPro®
Data format	SDF or XTF or both selectable
Data storage	Internal hard drive, CD/DVD-RW
Hardware	Industrial PC
Options	Optional waterproof laptops

SonarPro® Software

Custom developed software by users and for users of Klein side scan sonar systems operating on Windows NT®, 2000®. Field-proven for many years. SonarPro® is a modular package combining ease of use with advanced sonar features.

Basic modules	Main program, data display, information, target management, navigation, data recording & playing, and sensor display.
Multiple display windows	Permits multiple windows to view different features as well as targets in real time or in playback modes. Multi-windows for sonar channels, navigation, sensors, status monitors, targets, etc.
Survey design	Quick and easy survey set up with ability to change parameters, set tolerances, monitor actual coverage, and store settings.
Target management	Independent windows permitting mensuration, logging, comparisons, filing, classification, positioning, time & survey target layers, and feature enhancements. Locates target in navigation window.
Sensor window	Displays all sensors in several formats (includes some alarms) and responder set up to suit many frequencies and ping rates.
Networking	Permits multiple, real time processing workstations via a LAN including "master and slave" configurations.
"Wizards"	To help operator set up various manual and default parameters.
Data comparisons real time	Target and route comparisons to historical data.

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Klein.Mail@L-3com.com
www.L-3Klein.com

L3 communications
Klein Associates, Inc.

L-3. Headquartered in New York City, L-3 Communications employs over 64,000 people worldwide and is a prime contractor in aircraft modernization and maintenance, C4ISR (Command, Control, Communications, Intelligence, Surveillance and Reconnaissance) systems and government services. L-3 is also a leading provider of high technology products, subsystems and systems.

Cleared for public release. Specifications subject to change without notice. Call for latest revision. Windows NT, 2000, VxWorks, and Kevlar - are registered trademarks of Microsoft Corp., Wind River Systems, Inc., and DuPont - respectively. SonarPro® is a registered trademark of L-3 Klein Associates, Inc. 4/09

Appendix B
ESS Determination

REQUEST FOR AN EXPLOSIVES SAFETY SUBMISSION DETERMINATION

Instructions: Project managers shall complete all blocks in this request and enclose it in a letter or memo, fax it, or attach it to a digitally signed e-mail, and send to either:

NOSSA (N53) 4234 Steve's Way, Ste 121 Indian Head, MD 20640-5058 Fax: 301-744-6749 (DSN 354) E-mail: inhdnossa-ess@navy.mil	COMMARSYSCOM (PM AMMO) 2200 Lester Street Quantico, VA 22134-5010 Fax: 703-432-3160 (DSN 378) E-mail: explosivessafety@usmc.mil

Site name/number, Activity, City, State and ZIP code:	Munitions Response Area UXO-001 (current and former wharf areas), St. Juliens Creek Annex (SJCA), Chesapeake, Virginia	Date submitted:	December 10, 2009
Project manager: Contact information	Mr. Walter Bell, NAVFAC Mid-Atlantic, 757-445-6638 (phone), 757-444-3000 (fax), walt.j.bell@navy.mil	EOD/UXO contractor: Contact information	EOD Mobile Unit 2 Norfolk Detachment 1924 Powhatan Street Norfolk, VA 23511-3329 Tel: 757.444.2552 Fax: 757.444.5759

Site history: Briefly describe past MEC or MPPEH use at the site

SJCA is located at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, Virginia (Figure 1). Area UXO-001 is the current and former wharf areas along the shoreline of the Southern Branch of the Elizabeth River (Figure 2). It comprises approximately 2,230 linear feet of current and former wharf (Wharf 1, Wharf 2, and Wharf 3); Wharfs 1 and 2 make up the southern wharf area, while wharf 3 is in the northern wharf area. Wharf 3, constructed in 1917 for loading Mark VI mines, was located in the northeast portion of SJCA adjacent to Buildings M-5 and 190. This wharf is no longer present, with the exception of remaining pilings.

Ordnance loading activities continued until the early 1970s, when production declined commensurate with the disengagement policy and the reduced operations in Southeast Asia. The southern wharf was damaged when two ships struck it in 1975; however, portions of it are still functional

Specific ordnance operations and processes conducted at SJCA included stockpiling Explosive D (ammonium picrate, or picrate acid) for use in projectiles, manufacturing Mark VI mines, assembling small-caliber guns and ammunition, storing torpedoes, filling shells, testing ordnance, and distributing and receiving ammunition.

Although no documentation was found during the Preliminary Assessment of Area UXO-001 to confirm the presence of munitions in the vicinity of the wharf areas, anecdotal evidence obtained through individual interviews indicated there was a potential for munitions to have been dropped during loading operations, which may have resulted in munitions and explosives of concern (MEC) being present in the sediment beneath the wharf areas. The type and quantity of munitions that may have been dropped was not

	specified nor was the exact location.
MEC or MPPEH known or suspected to be present: Quantity, type/nomenclature, and condition	No MEC has been encountered to date at the site.
Work task/project being proposed: Briefly describe proposed work; identify encumbering ESQD arcs	The proposed work at the site will consist of conducting a digital geophysical mapping (DGM) investigation at the site to identify metallic anomalies in the sediment. The DGM equipment will be towed by a boat over the entire investigation area (Figure 3) within 5 feet of the sediment surface. No intrusive activities or intentional contact with sediment or surficial MEC will be conducted. Underwater obstacles and debris may be present along the river bottom that could ensnare or entangle the DGM equipment. In the event the equipment becomes stuck on an underwater obstacle, divers may be required to free the equipment from the obstacle. **The general field approach for the Area UXO-001 UXO support is as follows:** 1) UXO qualified technician(s) will provide recognize, retreat, and report (RRR) training to all on-site staff. 2) On-call UXO qualified diver(s) will provide avoidance support in the event the DGM equipment becomes stuck on an underwater obstacle.
Likelihood of encountering MEC or MPPEH: Low, medium or high	Low

Legend

SJCA Boundary

UXO-001 Boundaries

Southern Wharf: 4.49 acres

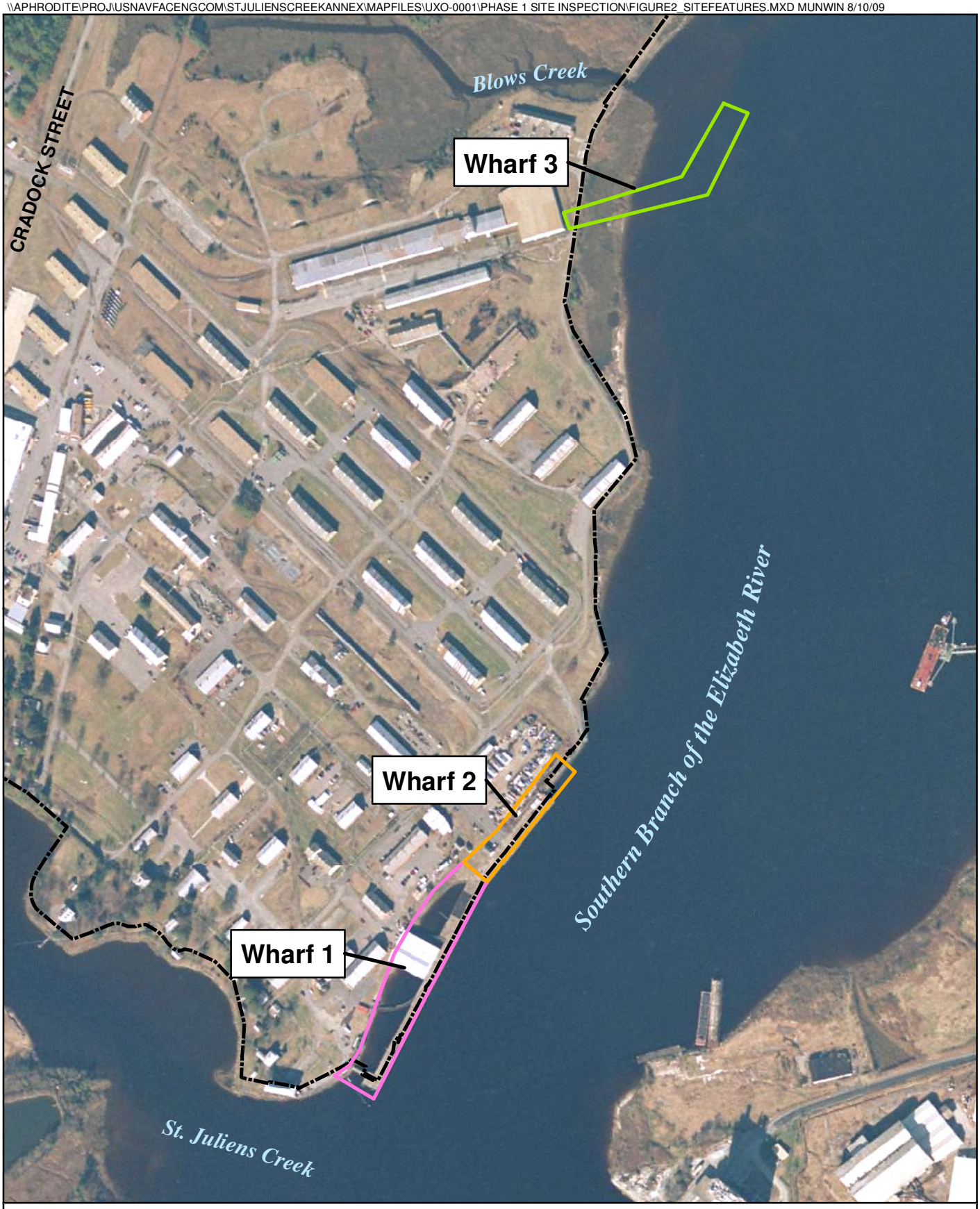
Northern Wharf: 1.70 acres

N
W E
S

0 500 1,000 Feet

Figure 1
Base and Site Location
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL



Legend
- SJCA Boundary
- Wharf 1
- Wharf 2
- Wharf 3

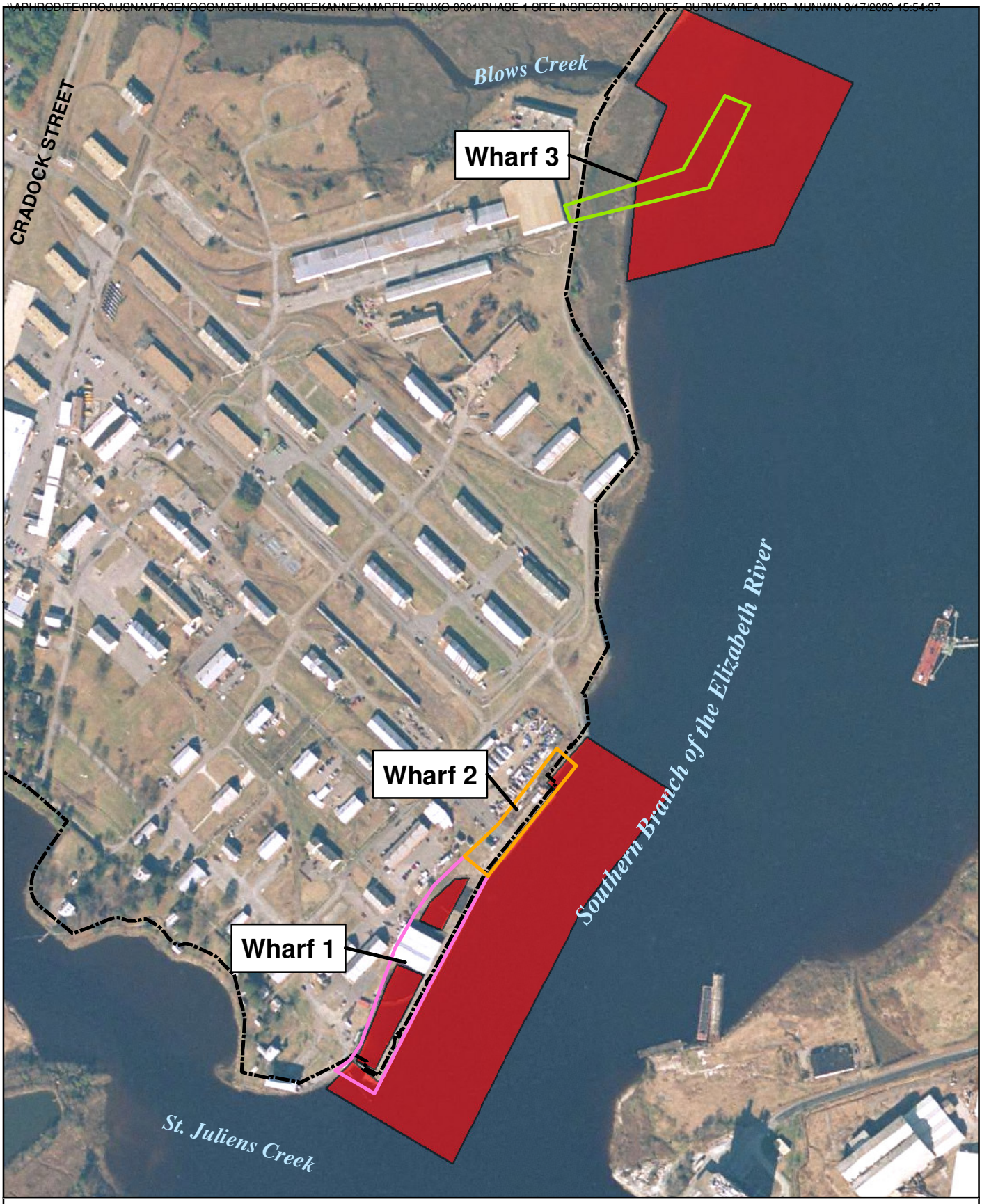
N
W E
S

0 250 500 Feet

Figure 2
Site Features
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

\\APHRODITE\PROJ\USNAVFACENGCOM\STJULIENSCREEKANNEX\MAPFILES\UXO-0001\PHASE 1 SITE INSPECTION\FIGURE5_SURVEYAREA.MXD MUNWIN 8/17/2009 15:54:37



Legend
- SJCA Boundary
- Wharf 1
- Wharf 2
- Wharf 3
- Survey Area

N
W E
S

0 250 500
Feet

Figure 3
Survey Area
UXO-001 Phase 1 Site Inspection
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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

8020
Ser N539/2102
28 Dec 09

From: Commanding Officer, Naval Ordnance Safety and Security Activity
To: Commanding Officer, Naval Facilities Engineering Command, Mid-Atlantic

Subj: EXPLOSIVES SAFETY SUBMISSION DETERMINATION REQUEST FOR UNDERWATER DIGITAL GEOPHYSICAL MAPPING OF MUNITIONS RESPONSE AREA UXO 1, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Ref: (a) E-mail NAVFAC MIDLANT Mr. W. Bell/NOSSA (N539) Mr. D. Murray of 10 Dec 09 (w/encl)
(b) NOSSAINST 8020.15B, Explosives Safety Review, Oversight, and Verification of Munitions Responses, of 26 Jan 09
(c) NAVSEA OP 5, Revision 7

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 underwater digital geophysical mapping (DGM) of Area UXO 1 (current and former wharf areas) at St. Juliens Creek Annex, Chesapeake, Virginia.

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. DGM equipment will be towed by a vessel within approximately 5 feet of the sediment surface over the entire investigation area. There will be no intrusive activities or intentional contact with sediment or surficial MEC or MPPEH.

Subj: EXPLOSIVES SAFETY SUBMISSION DETERMINATION REQUEST FOR UNDERWATER DIGITAL GEOPHYSICAL MAPPING OF MUNITIONS RESPONSE AREA UXO 1, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

b. Contractor unexploded ordnance (UXO) qualified technician(s) will provide MEC/MPPEH recognition training to all on-site workers. Additionally on-call UXO qualified diver(s) will provide MEC/MPPEH avoidance support in the event the towed DGM equipment becomes stuck on an underwater obstacle.

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

3. If surficial 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 will be requested.

4. The NOSSA point of contact for this ESS determination is Mr. Douglas Murray, who can be contacted at DSN 354-5630 or commercial at 301-744-5630.

TAMMY K. SCHIRF
By direction

Copy to:
CNO (A. Malson; W. Holmes and E. Newbaker)
NAVFAC HQ (R. Sadorra)
NAVFAC MIDLANT (W. Bell)
NAVSHIPYD NORFOLK (D. Garcia)
NOSSA ESSOLANT (B. Sizemore and D. Moore)