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FINAL STREAMLINED QUALITY ASSURANCE PROJECT PLAN UXO 2 MUNITIONS LOADING PIER COMPLEX SIDE-SCAN SONAR AND BATHYMETRIC SURVEY NWS EARLE NJ

3/1/2013

CH2MHILL

NAVFAC
Naval Facilities Engineering Command

Final

Streamlined Quality Assurance Project Plan UXO 0002, Munitions Loading Pier Complex Side-scan Sonar and Bathymetric Survey

Naval Weapons Station Earle

Sandy Hook Bay, Monmouth County, New Jersey

March 2013

Contract No. N62470-11-D-8012 | CTO-WE06

prepared by CH2MHILL.

QAPP Worksheet #1—Title and Approval Page

Final

Streamlined Quality Assurance Project Plan UXO 0002, Munitions Loading Pier Complex Side-scan Sonar and Bathymetric Survey

Naval Weapons Station Earle
Sandy Hook Bay, Monmouth County, New Jersey

Contract Task Order WE06

March 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

NAVFAC CLEAN 8012 Program
Contract N62470-11-D-8012

Prepared by

Virginia Beach, Virginia

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CH2M HILL – Project Manager

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Executive Summary

This Munitions and Explosives of Concern (MEC) Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) has been prepared to support Site Inspection (SI) field activities for the Munitions Loading Pier Complex at the Naval Weapons Station Earle, Sandy Hook Bay, Monmouth Country, New Jersey. The SI is being performed to support the determination of whether there has been a release of MEC to the underwater environment at the site. The SI is not intended as a full-scale study of the nature and extent of contamination or explosives hazards; rather, it is being conducted to assess whether there is a potential presence of MEC at the site. The activities conducted through this investigation do not address munitions constituents. If MEC is found to be present in the investigation areas, subsequent investigations may be conducted to assess the nature and extent of impacts to the environment.

The Department of the Navy (Navy) began using the Munitions Loading Pier Complex in the 1940s to load munitions and cargo onto ships. Based on the current use of the pier complex, this investigation will focus on the areas in the vicinity of Piers 1 and 2, which are no longer active. The historical munitions loading and unloading activities at the pier complex and the explosion of the USS Solar at Pier 1 while being unloaded in 1946 may have resulted in MEC being dropped or deposited into the bay.

This UFP-QAPP provides the approach for the side-scan sonar and bathymetric survey of the areas surrounding Piers 1 and 2. These data will be used primarily to assess the current site conditions and locations of potential obstructions or navigational hazards that may be encountered while conducting subsequent digital geophysical mapping at the site (which will be completed under a separate UFP-QAPP). However, data from this investigation will be utilized to the extent possible in the overall assessment of the potential presence or suggested absence of MEC items at the site. The investigation boundary around these two areas is an offset of approximately 250 feet around both piers. This proposed investigation area is based on the location of the munitions loading activities and the width of the largest ship that may have been loaded at the pier (approximately 250 feet wide) and is believed to be the most likely area to contain MEC, if present

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

- *Guidance for Quality Assurance Project Plans* (USEPA, 2002)
- *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005)
- *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006)

The UFP-QAPP format typically consists of 37 worksheets designed specifically for chemical sampling. However, because of the absence of chemical sampling and the limited scope of work for this investigation, some of the worksheets have either been modified or eliminated to meet the objectives of this phase of investigation for the SI. All applicable tables are embedded within the worksheets. Figures are provided at the end of worksheets, where applicable. Standard operating procedures are attached to provide more specific procedures for performing the work.

The Navy, Naval Facilities Engineering Command, Mid-Atlantic Division, is conducting this SI in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) investigation process. This site has been identified under the Navy Munitions Response Program. The U.S. Environmental Protection Agency Region II, and the New Jersey Department of Environmental Protection have been identified in the Federal Facility Agreement for Naval Weapons Station Earle as the agencies that will review these CERCLA documents. This UFP-QAPP will help ensure that the survey data collected or compiled are scientifically sound, of known and documented quality, and suitable for intended uses.

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QAPP Worksheets

Appendixes

Table

Figures

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Acronyms and Abbreviations

AM	Activity Manager
CA	corrective action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DGM	digital geophysical mapping
EOD	Explosive Ordnance Disposal
ESS	Explosives Safety Submission
FTL	Field Team Leader
FTP	file transfer protocol
GIS	geographic information system
H&S	health and safety
MEC	munitions and explosives of concern
MLW	mean low water
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NJDEP	New Jersey Department of Environmental Protection
NWS	Naval Weapons Station
PA	Preliminary Assessment
pdf	portable document format
PM	Project Manager
POC	point of contact
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RPM	Remedial Project Manager
SI	Site Inspection
SOP	standard operating procedure
TBD	to be determined
TIFF	Tagged Image File Format
UFP	Uniform Federal Policy
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
UXO 2	Site Unexploded Ordnance (UXO) 0002

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QAPP Worksheet #2—QAPP Identifying Information

Site Name/Number: Naval Weapons Station (NWS) Earle
Site Unexploded Ordnance (UXO) 0002 (UXO 2), Munitions Loading Pier Complex

Operable Unit: Not applicable

Contractor Name: CH2M HILL

Contract Number: N62470-11-D-8012, Contract Task Order WE06

Contract Title: Comprehensive Long-term Environmental Action—Navy 8012

1. **This Quality Assurance Project Plan (QAPP) was prepared in accordance with the requirements of:**

   - *Guidance for Quality Assurance Project Plans* (USEPA, 2002)
   - *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005)
   - *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006).

2. **Identify regulatory program:**

   Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

3. **This is a project-specific QAPP for:**

   Side-scan sonar and bathymetric survey of the inactive pier areas of UXO 2.

4. **List dates of scoping sessions that were held:**

Scoping Sessions for UXO 2	Date
Internal Naval Facilities Engineering Command (NAVFAC)-CH2M HILL Scoping Session	8/21/12

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

   There were no previous QAPPs completed for this site that are relevant to the current investigation.

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

   - Lead Organization—NAVFAC, Mid-Atlantic Division
   - Lead Regulatory Agency—U.S. Environmental Protection Agency (USEPA) Region 2
   - State Regulatory Agency—New Jersey Department of Environmental Protection (NJDEP)
   - Pier Owner—NWS Earle

QAPP Worksheet #2—QAPP Identifying Information (continued)

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

The worksheets that are not applicable to the munitions and explosives of concern (MEC) format of the Uniform Federal Policy (UFP)-QAPP are as follows: **Worksheets 3, 4, 8, 12, 13, 15-28,** and **30-37**. These worksheets have been excluded because one or more of the following: 1) they pertain to environmental samples that are collected from the site and sent to an analytical laboratory, which is not part of the scope of work; 2) they provide information that has been included In another worksheet or section of this document; or 3) they are not necessary for performing the initial data collection steps covered by this document (sidescan sonar and bathymetry). Worksheets that were not applicable to the streamlined MEC UFP-QAPP are listed as "excluded" in the table below and not included in this MEC UFP-QAPP. Where appropriate, an explanation for exclusion of a worksheet has been included.

UFP-QAPP Worksheet #	Required Information	Included or Excluded	Explanation
A. Project Management			
Documentation			
1	Title and Approval Page	Included	
2	Table of Contents QAPP Identifying Information	Included	
3	Distribution List	Excluded	Streamlined for initial data collection
4	Project Personnel Sign-Off Sheet	Excluded	Streamlined for initial data collection
Project Organization			
5	Project Organizational Chart	Included	
6	Communication Pathways	Included	
7	Personnel Responsibilities Table	Included	
8	Special Personnel Training Requirements Table	Included	
Project Planning/Problem Definition			
9	Project Scoping Session Participants Sheet	Included	
10	Problem Definition Site Maps (historical and present)	Included	
11	Project Quality Objectives/Systematic Planning Process Statements	Included	
12	Measurement Performance Criteria Table	Excluded	Equipment quality control (QC) procedures outlined in Appendix A (streamlined for initial data collection)
13	Sources of Secondary Use Data and Information Secondary Use of Data Criteria and Limitations Table	Excluded	No secondary use data used in developing this SAP.
14	Summary of Project Tasks	Included	
15	Reference Limits and Evaluation Table	Excluded	Lab related
16	Project Schedule/Timeline Table	Excluded	Streamlined for initial data collection

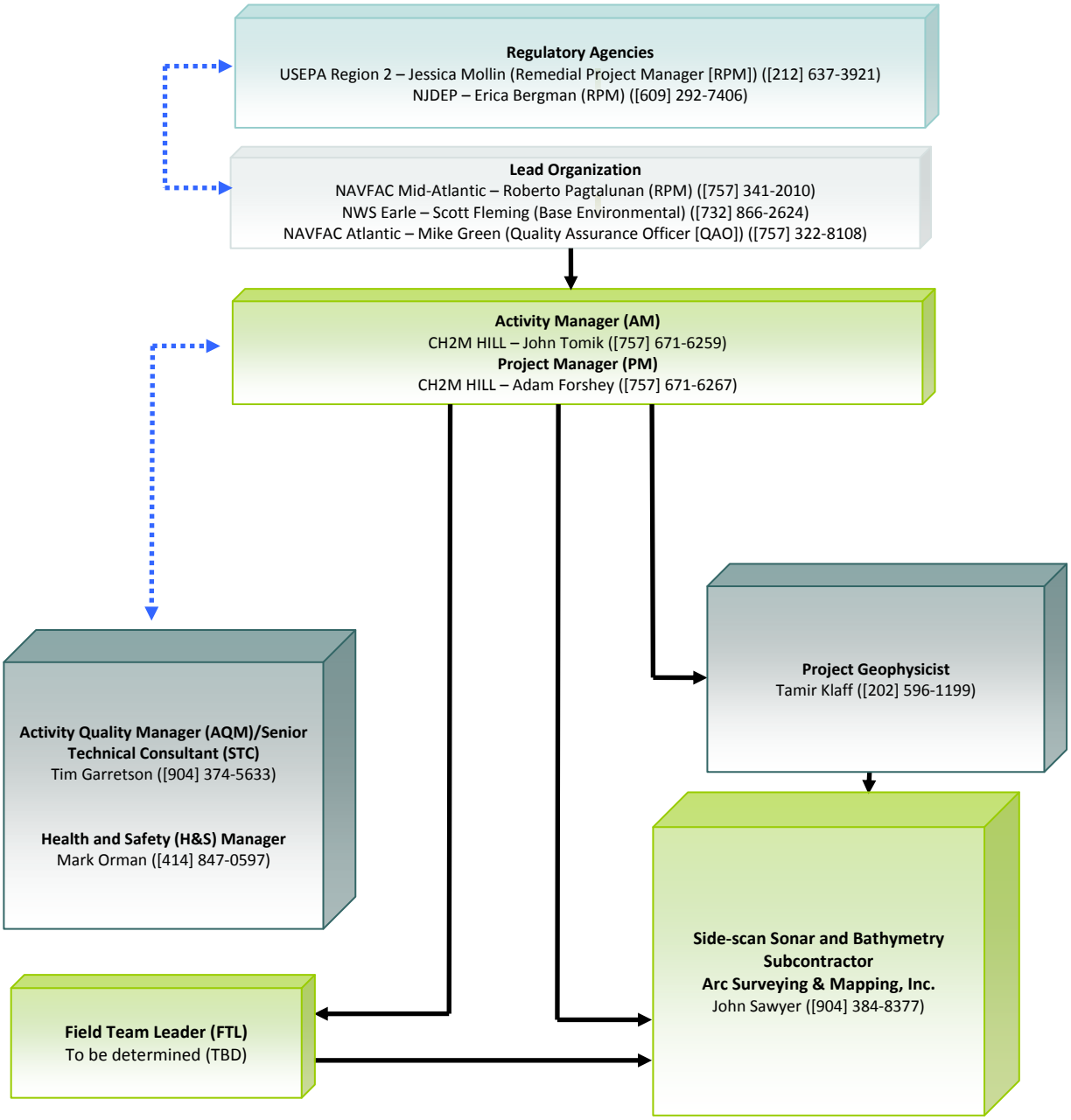
QAPP Worksheet #2—QAPP Identifying Information (continued)

UFP-QAPP Worksheet #	Required Information	Included or Excluded	Explanation
B. Measurement Data Acquisition			
Sampling Tasks			
17	Sampling Design and Rationale	Excluded	Investigation design and rationale outlined in Worksheets 10 and 11 (streamlined for initial data collection)
18	Sampling Locations and Methods/Standard Operating Procedures (SOPs) Requirements Table Sample Location Map(s)	Excluded	Streamlined for initial data collection (all SOPs are included as Appendix A)
19	Analytical Methods/SOP Requirements Table	Excluded	Lab Related
20	Field Quality Control Sample Summary Table	Excluded	Lab Related
21	Project Sampling SOP References Table Sampling SOPs	Excluded	Streamlined for initial data collection (all SOPs are included as Appendix A)
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Excluded	Streamlined for initial data collection (equipment calibration, maintenance, testing is included in Appendix A)
Analytical Tasks			
23	Analytical SOPs Analytical SOP References Table	Excluded	Lab Related
24	Analytical Instrument Calibration Table	Excluded	Lab Related
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Excluded	Lab Related
Sample Collection			
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	Excluded	Lab Related
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	Excluded	Lab Related
Quality Control Samples			
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	Excluded	Lab Related
Data Management Tasks			
29	Project Documents and Records Table	Included	
30	Analytical Services Table Analytical and Data Management SOPs	Excluded	Lab Related
C. Assessment Oversight			
31	Planned Project Assessments Table Audit Checklists	Excluded	Streamlined for initial data collection
32	Assessment Findings and Corrective Action Responses Table	Excluded	Streamlined for initial data collection (Corrective Action [CA] form included as Appendix B)
33	Quality Assurance (QA) Management Reports Table	Excluded	Streamlined for initial data collection

QAPP Worksheet #2—QAPP Identifying Information (continued)

UFP-QAPP Worksheet #	Required Information	Included or Excluded	Explanation
D. Data Review			
34	Verification (Step I) Process Table	Excluded	Data review/verification procedures discussed in Appendix A (Streamlined for initial data collection)
35	Validation (Steps IIa and IIb) Process Table	Excluded	Streamlined for initial data collection
36	Validation (Steps IIa and IIb) Summary Table	Excluded	Streamlined for initial data collection
37	Usability Assessment	Excluded	Streamlined for initial data collection

QAPP Worksheet #5—Project Organizational Chart



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QAPP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Communication to and from the Navy (such as submission of UFP-QAPP for review and receipt of regulatory comments)	Navy Remedial Project Manager (RPM)	Roberto Pagtalunan	(757) 341-2010	Primary point of contact (POC) for Navy (via e-mail, telephone, hard copy, or in person, as warranted); can delegate communication to other internal or external POCs.
Communication to and from USEPA (such as receipt of UFP-QAPP for review and submission of USEPA comments)	USEPA RPM	Jessica Mollin	(212) 637-3921	Primary POC for USEPA (via e-mail, telephone, hard copy, or in person, as warranted); can delegate communication to other internal or external POCs.
Communication to and from NJDEP (such as receipt of UFP-QAPP for review and submission of NJDEP comments)	NJDEP RPM	Erica Bergman	609-292-7406	Primary POC for NJDEP (via e-mail, telephone, hard copy, or in person, as warranted); can delegate communication to other internal or external POCs.
Navy QA/QC input	Navy Quality Assurance Officer (QAO)	Mike Green	(757) 322-8108	Provides review comments to Navy contractor on pre-draft UFP-QAPP . Provides overall Navy guidance via direct communication with Navy contractor QAO, as warranted.
Communication to and from Navy contractor (such as submission of UFP-QAPP for review and receipt of regulatory comments, updates on project progress, and communication of stakeholder expectations)	CH2M HILL Activity Manager (AM)	John Tomik	(757) 671-6259	Primary POC for Navy contractor (via e-mail, telephone, hard copy, or in person, as warranted); can delegate communication to other contractor personnel, as appropriate.
Project administration and logistics	CH2M HILL Project Manager (PM)	Adam Forshey	(757) 671-6267	Direct communication (via e-mail, telephone, hardcopy, or in person, as warranted) to and from Navy contractor project personnel to ensure appropriate project implementation.
Implementation of sampling activities and UFP-QAPP changes in the field	CH2M HILL Field Team Leader (FTL)	To be determined (TBD)	TBD	Documentation of deviations from the UFP-QAPP made in field logbooks and rationale for deviations, made within 24 hours of deviation; assistance in material procurement and delivery; survey oversight and implementation; deviations made only with approval from contractor PM.
Field CAs	CH2M HILL FTL	TBD	TBD	See **Worksheet 32** of the UFP-QAPP guidance for Assessment Findings and CA Responses. If CAs are identified, **Appendix B** (**Worksheet 32-1, CA Form**) will be completed and saved with the project file.

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QAPP Worksheet #7—Personnel Responsibilities Table

Name	Title	Organizational Affiliation	Responsibilities
Roberto Pagtalunan	NWS Earle RPM	Navy	Munitions Response Program activities implemented under this UFP-QAPP.
Scott Fleming	NWS Earle Base Environmental	Navy	Base coordination and access and POC with Base entities.
Mike Green	QAO Lead	Navy	Navy QA; ensures the Navy is completing work in accordance with the UFP-QAPP.
John Tomik	CH2M HILL AM	CH2M HILL	Responsible for coordination of CH2M HILL's munitions response activities at NWS Earle; assists in data evaluation and interpretation; reviews report.
Adam Forshey	CH2M HILL PM	CH2M HILL	Project administration; coordinates staffing; monitors project performance; ensures work is done in accordance with the UFP-QAPP.
Tim Garretson	CH2M HILL Munitions Response Technical Lead	CH2M HILL	As the technical lead, supports decision making with respect to MEC investigations and procedures.
Tamir Klaff	CH2M HILL Project Geophysicist	CH2M HILL	Ensures that all investigation practices are being conducted as appropriate; provides QC review of subcontractor deliverables.
TBD	FTL	CH2M HILL	Oversees data management to ensure collection of accurate and complete data; coordinates field activities.

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QAPP 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
Fieldwork	Use of side-scan sonar and bathymetric survey equipment	---[a]	Prior to survey activities	---[a]	CH2M HILL geophysicists, Side-scan sonar/bathymetric survey subcontractor	Resume, as demonstrated experience and qualifications with equipment and software
Fieldwork	Boat Safety Course or US Coast Guard Operator's (Captains) license	US Coast Guard or other approved National Association of State Boating Law Administrators(N.A.S.B.L.A.)	Prior to mobilization	Boat Captain	Side-scan sonar/bathymetric survey subcontractor	Project file, subcontractor records
Fieldwork	MEC Awareness Training[b]	CH2M HILL UXO Qualified Personnel	Prior to mobilization	FTL (TBD), field team members (TBD), Site Safety Coordinator (TBD), subcontractor	Field team members and Site Safety Coordinator from CH2M HILL Field team members from subcontractor	Project file

Notes:

[a] Training for equipment use will not be provided onsite by CH2M HILL, the survey subcontractor, or an outside vendor. The personnel using the equipment and software must have demonstrated experience and qualifications before working at the site and the kickoff of this investigation.

[b] MEC awareness training will include Recognize, Retreat, Report (RRR or 3-R) training and an overview of the explosives safety submission (ESS) requirements. The RRR 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. The ESS component of the training will present the requirements (for example, procedures, separation distances, exclusion zones) to the field team.

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QAPP Worksheet #9-1—Project Scoping Session Participants Sheet

Project Name: UXO 2 Site Inspection (SI) **Projected Date(s) of Sampling**: Fall 2012 **PM:** Adam Forshey/CH2M HILL	**Site Name**: UXO 2 **Site Location**: NWS Earle, Sandy Hook Bay, Monmouth County, New Jersey
Date of Session: 8/21/12 **Scoping Session Purpose:** Side-scan Sonar and Bathymetric Survey	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Roberto Pagtalunan	RPM	NAVFAC Mid-Atlantic	(757) 341-2010	roberto.pagtalunan@navy.mil	NAVFAC Mid-Atlantic RPM
Mike Green	Navy QAO	NAVFAC Atlantic	(757) 322-8108	mike.green@navy.mil	Navy MR support/reviewer
Adam Forshey	PM	CH2M HILL	(757) 671-6267	adam.forshey@ch2m.com	CH2M HILL PM
Tim Wenk	Technical Support	CH2M HILL	(757) 671-6265	tim.wenk@ch2m.com	Technical support

Comments/Decisions:

Roberto Pagtalunan/NAVFAC and Adam Forshey and Tim Wenk/CH2M HILL met to discuss the approach for conducting the SI as well as the equipment to be used during the side-scan sonar and bathymetry survey. The discussion also included a review of preliminary Naval Ordnance Safety and Security Activity comments on the ESS Determination Request that was submitted in support of the work. The group discussed the equipment to be used during the side-scan sonar and bathymetry survey and digital geophysical mapping (DGM) investigation, which will likely be tethered and/or attached to the boat and not remotely controlled. As such, the equipment may become entangled on items on or protruding from the sediment surface or break free from the tether.

If the equipment becomes stuck or breaks free of the tether, UXO-qualified divers would be required to recover the equipment. The group discussed options related to equipment recovery, including the potential use of the local Explosive Ordnance Disposal (EOD) team, as necessary. Mike Green/NAVFAC was called to discuss the potential option of having the EOD team provide this support rather than contracting a vendor with qualified personnel. Mr. Green stated that he would research the ability to use the EOD team for this purpose.

An inter-agency (NAVFAC, NJDEP, and USEPA) scoping meeting could not be held because of scheduling conflicts. Regulatory review and input will be incorporated into the MEC UFP-QAPP. If an additional scoping session is requested by the regulators, it will be coordinated and incorporated into this document.

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QAPP Worksheet #10—Problem Definition

Facility Description

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles south of New York City (**Figure 1**). The station consists of two areas: the 10,160-acre inland Main Base (Mainside area), and the 706-acre Waterfront area, which includes the NWS Earle Munitions Loading Pier Complex (**Figure 2**).

The Mainside area is approximately 10 miles inland from the Atlantic Ocean, in Colts Neck, Howell, and Wall townships and Tinton Falls Borough. The surrounding area contains agricultural land, vacant land, and low-density housing. The Mainside area consists of a large, undeveloped portion of land associated with ordnance operations, production, and storage; this portion of the Base is encumbered by explosive safety quantity distance arcs that restrict use and development. Other land use in the Mainside area consists of residences, offices, workshops, warehouses, recreational space, open space, and undeveloped land.

The Waterfront area, which is approximately 10 miles north of the Mainside area (**Figure 1**), is in Middletown Township; the pier complex is within the Monmouth County Bayshore Region. The Bayshore is situated on Raritan Bay and the Atlantic Ocean and is close to New York City and several New Jersey attractions. The Monmouth County Bayshore Region is characterized by traditional downtowns and dense residential neighborhoods.

Normandy Road, a government-owned military highway, is used for transporting munitions and other military materials between the Mainside and Waterfront areas. The road has seven crossings to facilitate east-west passage by the civilian population. Munitions and other supplies pass from the Mainside area along the railroad tracks and Normandy Road to the Waterfront area to reach the ships at the NWS Earle Munitions Loading Pier.

Site Background

UXO 2

Ammunition and military supply ships are homeported and resupplied at the NWS Earle Munitions Loading Pier Complex. Sandy Hook Bay is on the north shore of the New Jersey coast, west of the Sandy Hook peninsula, and borders the communities of Leonardo and Atlantic Highlands to the east and Belford to the west. The Sandy Hook Channel entrance leads to Terminal Channel and the NWS Earle Munitions Loading Pier Complex. Terminal Channel, entered from Sandy Hook Channel, approximately 1 mile west-southwest of the northern tip of Sandy Hook, leads to a turning basin and three deepwater piers and one shallow water pier at the NWS Earle Munitions Loading Pier complex (**Figure 2**). The current loading pier complex stretches 2.9 miles into Sandy Hook Bay.

The areas around the Munitions Loading Pier and the Terminal Channel are restricted, as defined in the Code of Federal Regulations, Title 33, Paragraph 334.102 (**Figure 2**). No unauthorized vessels are permitted to enter the restricted area at any time, and vessels are only authorized to cross the Terminal Channel when there are no Navy vessels transiting the channel. Piers 1 and 2 were recommended for further investigation by the Preliminary Assessment (PA). Additional details on Piers 1 and 2 are provided below and within the UXO PA (CH2M HILL, 2012). The three-dimensional conceptual site model is provided as **Figure 3**.

Pier 1

The initial pier complex consisted of Trestle 1 and Pier 1 (commonly referred to as the Navy Barge Pier). The pier and trestle were constructed of wooden piles and a concrete surface. Pier 1, constructed in 1943, originally measured 2,370 feet in length by 64 feet in width and was connected to Trestle 1; Trestle 1 extended the pier approximately 1.4 miles (4,742 feet in length and 34 feet in width) into Sandy Hook Bay. Following completion of the initial pier complex, the need for a larger deep-water pier to support the Army

QAPP Worksheet #10—Problem Definition (continued)

and Navy was identified. In response, Pier 1 was expanded approximately 250 feet. When completed, the Pier 1 berthing areas were to have been maintained at -18 feet mean low water (MLW) along the east and west sides of the pier for barges and ships with drafts of less than 15 feet; current depths range from -11 to -13 feet MLW. Currently, Pier 1 runs parallel to Trestle 1A and is approximately 2,229 linear feet in length and approximately 60 feet in width. Access to the pier is blocked by a physical barrier, and the pier is no longer used for munitions loading.

Pier 2

Currently, Trestle 1A leads to Pier 2 and Berths 2N1 and 2N2 on the west and east sides of the pier, respectively. Initially, Old Trestle 2 (2,772 feet long by 34 feet wide) was the transport to Pier 2. Constructed in 1944, Pier 2 measures 695 feet in length by 90 feet in width and is extended by an approximately 260-foot-long walkway (**Figure 2**). Berth lengths on Pier 2 are 600 feet. A 500-foot-long elevated loading platform is located along each side of the pier. Pier deck height is +13 feet MLW, and the loading platform height is +18 feet MLW. The berthing areas at Pier 2 were reportedly maintained at -35 feet MLW. Pier 2 was previously used as the Navy deep water pier for cargo and munitions loading and was capable of accommodating two cruisers, destroyers, or merchant ships (CH2M HILL, 2012). Pier 2 is no longer used for cargo or munitions loading. Currently, Pier 2 is still accessible by Base personnel but is not in use.

Investigation History

A PA was completed as the first step in the CERCLA process for UXO 2. The PA report concluded that the potential exists for MEC to be present at UXO 2 as a result of historical loading operations at the pier complex and the explosion of the USS Solar at Pier 1 while being unloaded in 1946 (CH2M HILL, 2012). As outlined in the PA report, dredging operations conducted at the former footprint of the Pier 3 area (Pier 3A is now constructed within the former footprint of Pier 3) resulted in the identification of approximately 34 MEC items. The possibility for similar MEC may exist based on similar use of Piers 1 and 2. Based on information obtained during the PA and the hazards associated with MEC that may be present, it was recommended that an SI be performed for the inactive portions of UXO 2 (Pier 1 and Pier 2 areas) to further evaluate the potential presence or absence of MEC at the site. The SI is intended to supplement the PA and is not intended to be a full assessment of the nature and extent of any release of MEC at the site. The SI will determine the need for a further evaluation of the nature and extent of MEC and munitions constituents at the site.

General Problems to Address

Based on the recommendations of the PA report, there is a potential for MEC to have been dropped or released at UXO 2. Therefore, the purpose of the SI activities discussed in this UFP-QAPP is to conduct a side-scan sonar and bathymetric survey in the vicinity of Piers 1 and 2 (**Figure 4**) that will be used to support additional SI activities, including DGM to detect metallic items on or beneath the sediment surface (to be performed after to this investigation). The investigation boundary around these two areas is an offset of approximately 250 feet around both piers. This proposed investigation area is based on the location of the munitions loading activities and the width of the largest ship that could have been loaded at the pier (approximately 250 feet wide) and is believed to be the most likely area to contain MEC, if present. Data from the side-scan sonar and bathymetric survey will be used to assess existing site conditions, including water depth and sediment surface contours, and to locate navigational obstructions or items that may be protruding from the sediment surface that could entangle or foul equipment that may be used during the future DGM survey. Additionally, the data may be used to support findings of the SI to confirm the presence or suggested absence of MEC at the site (such as individual or groups of possible munitions protruding from the surface of the sediment).

QAPP Worksheet #10—Problem Definition (continued)

The questions to be answered during this portion of the SI are as follows:

- Are adequate water depth and sediment surface contour data available to facilitate selection of an appropriate technology for future investigations and limit future potential contact of equipment with the sea floor?
- Are underwater obstructions present on or protruding from the sediment surface in the vicinity of Piers 1 and 2, and could these obstructions impair or negatively affect a DGM survey in these areas?
- Are underwater obstructions present on or protruding from the sediment surface indicative of munitions shapes or evidence of munitions[1] in the vicinity of Piers 1 and 2?

The overall scope of the SI is to assess whether or not there is evidence that the munitions loading activities at the piers resulted in munitions being released into the Sandy Hook Bay immediately surrounding Piers 1 and 2. However, the specific scope of this investigation is to gather information about the site conditions to support a DGM survey. The combination of these SI data will be used to determine the potential presence or suggested absence of MEC at the site and evaluate the need for additional investigation at the site.

The results of the side-scan sonar and bathymetric survey will be summarized in a technical memorandum report following the investigation and will be used in the development of the DGM approach, which will be presented in a separate UFP-QAPP[2].

[1] The side-scan sonar and bathymetry survey data will not be the sole line of evidence used to define the potential presence or suggested absence of MEC at UXO 2. Data from subsequent investigations may be supplemented by side-scan sonar and bathymetric survey data to support this determination.

[2] The technical memorandum summarizing the findings of the side-scan sonar and bathymetric survey will be included as an appendix to the QAPP for DGM.

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

Who will use the data?

- Participants from the Navy, USEPA, and NJDEP will use the data to support additional investigations to help determine if MEC is present at UXO 2. Engineers, geophysicists, and scientists will use the data to aid in making site management decisions.

What are the Project Action Limits?

- The purpose of this investigation is to gather initial information about the site to help determine what additional data may be required to evaluate the site and plan for future investigations, if necessary. Therefore, because no quantitative risk-based decisions will be generated from these data, no specific Project Action Limits are established.

For what will the data be used?

- Evaluate site conditions, locate underwater obstructions, develop sediment surface contours, and measure water depths in the vicinity of the inactive piers at UXO 2 to support subsequent investigations.
- Support data collected during subsequent investigations as to whether potential MEC may be present at the site.

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

- A bathymetric survey will be conducted to measure the current water depths in the vicinity of Piers 1 and 2. This information will be used to develop sea floor contours. Side-scan sonar imaging will be collected in the vicinity of the piers to locate potential obstructions or surface protrusions that may affect equipment to be used during future investigations. The images and data will be of a quality that will allow for location and imaging of potential obstructions on or protruding from the sediment surface that may entangle or affect the use of DGM equipment.
- Data positioning will be recorded through a global positioning system unit on the boat used to support the survey.
- QC testing will be performed on the sonar and survey equipment to ensure functionality. The equipment used to support this investigation will be tested to ensure functionality on a daily basis in accordance with the SOP (**Appendix A**).
- A summary of all field activities will be recorded on paper or digital logbooks. If digital logbooks are used, all information recorded using the digital logbook will be converted into a portable document format (pdf) file that must contain a digital signature (including date and time stamp) of the personnel logging the field activities. The data generated from the investigation will be provided by the subcontractor in the form of maps, tables, and data files and will be summarized in a technical memorandum, which will be included as an appendix to the UFP-QAPP for the DGM investigation.

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

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

- Side-scan sonar images, positioning data, and bathymetric data will be of a quality that will allow for location and imaging of potential obstructions on or protruding from the sediment surface that may entangle or affect the use of DGM equipment. The information obtained from this side-scan sonar and bathymetric survey will be used to support additional investigations at the site in which environmental decisions will be made.
- Performance functionality QC testing will be performed on equipment to ensure adequate detection capabilities. Details regarding QC tests are included in **Appendix A**.
- Data obtained from the survey and field logbooks will be available for QC. The QC review of the field logbooks will allow the reviewer to verify that equipment functionality tests are being conducted at least once a day and that other details pertaining to the investigation have been recorded.
- Data should be collected from the site to the maximum extent practicable. Underwater obstructions 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 by the field team so that gaps or discrepancies in the data may be explained.

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

- An attempt will be made to collect data from 100 percent of the two areas designated as inactive munitions loading areas (Piers 1 and 2), where accessible. Side-scan sonar data will be collected from all accessible areas at 100 percent redundancy to maximize areal coverage. Areas that are inaccessible will be documented in field notes and the field logbook.

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

- The side-scan sonar and bathymetric survey will be conducted throughout the entirety of the investigation areas, where accessible. The field investigation is planned to occur in late 2012; the schedule will be contingent upon Base operations at NWS Earle and preventing impacts to the mission of the facility. Data will be collected and generated in accordance with the procedures outlined in this UFP-QAPP and attached SOPs.
- The field team will record work accomplished, variations from the work plan, field conditions, and other pertinent data and 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?

- The field team, which will consist of Arc Surveying & Mapping members and a CH2M HILL FTL, will collect the sonar and bathymetry data. The data collected will be used to generate maps, obstruction/contact lists, and bathymetry data that may be presented in the SI report.
- All production data, including initial data imaging, obstruction position/location, and QC data, are to be processed, interpreted, and delivered to the CH2M HILL Project Geophysicist within 5 days of data collection. The deliverable must include geo-referenced Tagged Image File Format (TIFF) images and shape files appropriate for import into geographic information system (GIS) software. Images must be broken into blocks of no greater than 100 megabytes each.

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

- All potential targets will be identified in Excel spreadsheets with coordinates of the potential targets.
- Coordinates for all deliverables must be in North American Datum 1983, Universal Transverse Mercator, Zone 18, meters.
- Field notes documented by the field team during the survey will be scanned and included in the technical memorandum and, if necessary, the SI report as an appendix.

How will the data be archived?

- All files will be made available for QC verification throughout the project to verify that the field procedures are properly implemented. All raw data files, hard copy documents, and field notes will be maintained by CH2M HILL for the duration of the project. Hard copy documents will be maintained at the CH2M HILL office in Virginia Beach, Virginia. Electronic data will be stored on the local CH2M HILL server and will be posted to the Navy's file transfer protocol (FTP) site. All hardcopy and electronic documents will be maintained at the CH2M HILL office in Virginia Beach, Virginia through the duration of the project (at a minimum). Upon project completion, relevant data and documents will be archived at the Federal Record Center. Additionally, final hardcopy and electronic reports will be stored on the Administrative Record.
- 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 Project Quality Objectives in the form of if/then qualitative and quantitative statements.

- If navigational obstructions are located, then subsequent investigations (DGM) will be modified as appropriate to prevent equipment from encountering the obstructions.
- If munitions shapes or evidence of possible MEC are observed, then this information will be used as a supplemental line of evidence to support subsequent investigations. However, these data alone will not be used to determine the potential presence or suggested absence of MEC at the site.
- If no navigational obstructions are located, then subsequent investigations (DGM) will be planned for the investigation areas to the maximum extent practicable (depth limitations for current technologies may limit data collection/quality).

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QAPP Worksheet #14—Summary of Project Tasks

The primary objective of the survey is to locate underwater obstructions to appropriately modify subsequent SI investigations (such as DGM) at UXO 2. This section of the MEC UFP-QAPP details the specific definable features of work to be performed to meet the objective of the investigation. The principal tasks associated with the definable features of work are detailed as follows. Each of these work elements for the investigation, the SOPs that define the methods for performing the activities, and any other supporting documentation for performing the SI are presented in **Table 14-1**.

TABLE 14-1
Site Inspection Activities

Definable Feature of Work	SOP	Supporting Document(s)
Pre-Mobilization Activities	-	UFP-QAPP
Mobilization/Site Preparation	-	UFP-QAPP
Side-scan Sonar and Bathymetric Survey	Appendix A	UFP-QAPP
Demobilization	-	UFP-QAPP
Reporting	-	UFP-QAPP

Pre-Mobilization Activities

Before mobilization to the site occurs, planning activities will be performed to ensure procedures are in place to perform the fieldwork. This MEC UFP-QAPP has been developed to provide details of how the side-scan sonar and bathymetric survey will be performed and the quality standards to which it will be compared. Before mobilization to the site occurs, this plan will be reviewed and approved by the Navy, the regulators, and CH2M HILL and its subcontractor(s). Additionally, internal coordination will take place so that GIS information and equipment are available and updated for project activities, document and data management procedures are in place, and all necessary subcontractors have been procured. Subcontractor qualifications, certifications, and licenses will be reviewed before selection. Additionally, field team personnel will provide information to the Navy that will be necessary for obtaining access to the facility and investigation area. This information will be coordinated with the NWS Earle Environmental POC (Scott Fleming).

Mobilization and Site Preparation

Field personnel, equipment, and materials will be mobilized to the site to complete the survey. Onsite personnel will review this UFP-QAPP and all applicable SOPs and appendixes. Nautical charts also will be reviewed to locate potential navigational hazards that may be encountered during the survey. Appropriate site-specific training, including health and safety (H&S) review of site activities, emergency responses, and communications, will be conducted before the start of work. Additionally, a morning safety meeting will be conducted each day to review the tasks to be performed that day and any potential hazards.

All equipment will be inspected upon arrival at the site, tested for functionality, and repaired or replaced as necessary for 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.

The CH2M HILL FTL will ensure that onsite communications (such as mobile phones and two-way radios) have been established between team members. Construction support zones and break areas will be identified before work begins.

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

Side-scan and Bathymetric Survey

After site-setup activities have been completed, the side-scan sonar and bathymetric survey will be performed. The expected duration of the survey work is 5 days.

The survey will provide complete bottom coverage of the identified areas of concern. The surveying equipment will be capable of detecting and avoiding any obstructions that may be located within the investigation area.

- Side-scan data will be collected with an EdgeTech 4200 system or technically comparable (same resolution) system.
- The side-scan sonar system will be set to maximize the resolution of the sonar imagery. One hundred percent of the accessible survey area will be imaged during the side-scan sonar survey.
- Water and bottom conditions will be evaluated to select operating parameters and survey geometry to provide the best possible level of sonar record detail.
- Data will be collected with 100 percent redundancy to ensure total area coverage.
- All production data, including initial data imaging, obstruction positions, and QC data are to be processed, interpreted, and delivered to the CH2M HILL Project Geophysicist within 5 days of data collection. The deliverable must include geo-referenced TIFF images and shape files appropriate for import into GIS software.
- All potential targets will be noted in Excel spreadsheets provided with coordinates of the targets.
- Coordinates for all deliverables must be in North American Datum 1983, Universal Transverse Mercator, Zone 18, meters.

Note that QC procedures and specifics regarding equipment operations and conducting the side-scan sonar and bathymetric survey are included in **Appendix A**.

Demobilization

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

Reporting

At the conclusion of the field activities, a brief technical memorandum will be prepared to document the activities performed at the site and summarize the results and conclusions of the survey. The technical memorandum will include final side-scan sonar and bathymetry maps, a target list of potential obstructions, supporting interpretations, and a narrative description of the field activities, including data collection methodology, processing, interpretation, and results. The narrative will also detail the accuracy of the equipment, describe the instrumentation that was used, provide the limitations of the equipment and data, and detail the QC checks performed to ensure equipment functionality. Details from the technical memorandum may be included in the subsequent SI UFP-QAPP for further SI investigation activities (DGM). Following the review by the Navy, the technical memorandum will be distributed to USEPA and NJDEP.

QAPP 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 and Instrument Check Logs • Field Team Notes and Field Logs • Equipment Maintenance, Testing, and Inspection Logs • Reported Result for QC Checks • Raw Data (stored on disk) • Field Photograph Log • Daily Project Reports • Daily H&S Documents • QC Documentation and Reports • Meeting Agendas, Minutes, and Presentations • Summary Reports	• Field data deliverables such as logbooks entries, electronic data deliverables, field work plans, and daily reports will be kept on CH2M HILL's network server. • Survey information hardcopy deliverables and data processing and interpretation documents will be saved on CH2M HILL's network server. • Survey data and results will be reported in a subsequent UFP-SAP for the SI.

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References

CH2M HILL. 2012. *Final Preliminary Assessment Report UXO 0002 – Munitions Loading Pier Complex. NWS Earle, Sandy Hook Bay, Monmouth County, New Jersey.* November.

U.S. Environmental Protection Agency (USEPA). 2002. *Guidance for Quality Assurance Project Plans.* USEPA QA/G-5, QAMS.

USEPA. 2005. *Uniform Federal Policy for Quality Assurance Project Plans.* EPA-505-B-04-900A. Version 1. Final. March.

USEPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process.* EPA/240/B-06/001. Final. February.

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Figures

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\NWSEARLE\MAPFILES\SSS\FIGURE 1 - NWS EARLE LOCATION MAP.MXD BHATHAWAY 8/22/2012 7:48:37 AM

Legend

- NWS Earle - Mainside Area
- NWS Earle - Waterfront Area
- Normandy Road
- Monmouth County, NJ

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Miles

Figure 1
NWS Earle Location Map
NWS Earle Munitions Loading Pier Complex
Monmouth County, New Jersey

CH2MHILL

Legend

- NWS Earle Boundary - Waterfront Area
- UXO 2 Boundary
- NWS Earle Restricted Zone (33CFR334.102)

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Feet

Imagery: 2007

Figure 2
NWS Earle Munitions Loading Pier Complex and UXO 2 Details
NWS Earle Munitions Loading Pier Complex
Monmouth County, New Jersey

CH2MHILL

LEGEND

- UXO 2 Boundary
- NWS Earle Restricted Zone (33CFR334.102)
- Turning Basin and Navigation Channel
- NWS Earle Waterfront Area
- Building
- Approximate Water Depth Contour (ft below MLW)
- Approximate Location of Alexander Hamilton Wreck

Acronyms:

- CFR – Code of Federal Regulations
- ft – feet
- MLW – mean low water
- MEC – munitions and explosives of concern
- MC – munitions constituents
- NWS – Naval Weapons Station
- USS – United States Ship

Future Trespasser (Fishermen): Potential exposure to MEC and MC through direct contact. Could result in physical movement of MEC if caught in fishing equipment. Aquatic organisms caught and consumed may result in exposure to MC.

Potential MEC: Possibly distributed throughout (and potentially beyond) this area from the explosion of the USS Solar.

Future Construction Worker: Potential exposure to MEC and MC through accidental contact during construction/maintenance/demolition activities.

Dredging In 2005-2006 resulted in the identification of 34 MEC items.

Dredging potentially could result in physical movement of MEC.

To Terminal Channel

Navigational Buoys mark the boundary of the maintained dredged area for the Munitions Loading Pier Complex.

Potential MC: Potentially released as a result of deterioration or cracks in MEC.

Marshlands

NWS Earle Waterfront Area

Normandy Road

Old Trestle 2

Trestle 1

Trestle 1A

Trestle 2

Trestle 3A

Trestle 4

Wye area

Pier 1

Pier 2

Pier 2A

Pier 4

Former Pier 3 Footprint

Alexander Hamilton Wreck

SANDY HOOK BAY

Sediment*

5

10

15

35

45

Potential MC: Possibly dropped or mishandled during munitions loading activities or released during USS Solar explosion.

Alexander Hamilton: Caught on fire during a storm and sunk while berthed at Pier 1. The remnants are identified as a federally protected cultural resource.

USS Solar: Exploded while docked at Pier 1; the hulk of the ship was recovered and removed, however, remnants of the ship may remain underwater. The explosion damaged a portion (northern tip) of Pier 1.

Future trespasser (diver): Potential exposure through direct contact with MEC and MC.

Benthic Dwelling and Aquatic Organisms: Potential ecological receptors exposed through ingestion and direct contact with MC and detonation of MEC.

Navigational Buoys mark the Leonardo Harbor Channel

Note: Not to scale.

*Based on the 2004 sediment cores collected in the vicinity of Pier 3, shallow sediment characteristics are the following:

- 0-3 ft – organic black muck with shell hash
- 3-5 ft – black silty clay
- 5-7 ft – orange/gray/brown silty clay and sand

FIGURE 3
UXO 2 Conceptual Site Model
Naval Weapons Station Earle
Sandy Hook Bay, Monmouth County, New Jersey

Legend

- NWS Earle Boundary - Waterfront Area
- NWS Earle Restricted Zone (33CFR334.102)
- UXO 2 Area Recommended for SI
- UXO 2 Area to be Evaluated Once No Longer Active

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Feet

Imagery: 2007

Figure 4
UXO 2 Summary
NWS Earle Munitions Loading Pier Complex
Monmouth County, New Jersey

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Appendix A
Field Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Underwater Investigation Equipment Detachment

I. Purpose and Scope

The purpose of this Standard Operating Procedure (SOP) is to identify the means and methods to be employed for detaching underwater investigation equipment in the event it becomes stuck or entangled on an underwater obstruction. If the equipment becomes stuck/entangled the operators must be able to detach the equipment from the boat to minimize the potential injury to personnel on the boat. In addition, because the investigation will be conducted in an area that potentially contains munitions and explosives of concern (MEC), recovering stuck or entangled equipment may be delayed as the recovery will be performed by divers with the appropriate qualifications to dive at the site. Therefore, the procedures in this SOP will be used to help ensure the safety of the survey crew and to help facilitate the recovery of the survey equipment if the equipment becomes stuck/ entangled during the investigation.

II. Equipment and Materials

- GPS unit
- Float, such as a mooring buoy or shrimp/crab buoy
- Strain member weak-link assembly
- Cable management systems

III. Procedures and Guidelines

General:

- All underwater survey equipment must be connected to the boat in a manner that will allow the equipment to be detached if the equipment becomes stuck or entangled on an underwater obstruction.
- A 'hard snag' is defined as a snag that renders the towed apparatus immoveable. For dynamic towing applications a 'weak link' must be used at the vessel tow point so that, in the event of a hard snag, the strain member will detach at the vessel tow point. This requirement prevents damage to the vessel structure and potential injury due to strain member backlash.
- All electrical connections must be equipped with pull-away connectors at the tow point of the survey vessel, or be rigged with sufficient excess cable to allow time for the vessel to stop in the event of a hard snag. The excess cable must be rigged and positioned so that it does not present a danger to crew members in the event of a hard snag.
- Personnel operating around cables attached to the underwater survey equipment must remain clear of cables during the investigation to minimize the potential for the cables to contact them or wrap around a body part in the event the equipment becomes stuck or entangled.

Equipment Detachment Process:

1. Once it has been determined that the underwater survey equipment has become stuck or entangled, the boat must stop immediately.
2. Attempt to recover the equipment from the boat/above the water in a manner that does not result in additional health and safety issues for personnel around the equipment lines/cables. If the equipment is recovered, the location of the entanglement should be recorded and the equipment must be inspected prior to resuming survey activities.

3. If all reasonable efforts to recover the equipment from the boat have been attempted and the equipment remains stuck, detach the equipment from the boat. Detachment and 'weak link' breakaway points must be identified prior to field activities.
4. Attach a float to the line/cable so that the line can be reacquired from above the water.
5. Record the location of the float using a GPS unit. These coordinates will be provided to the equipment recovery team so they can have the general location of the equipment and the float.

IV. Attachments

- None

Standard Operating Procedure – September 2012

Hydrographic Survey Equipment and Procedure Index

Equipment Data Acquisition and Processing

Introduction

This Standard Operating Procedure (SOP) details all Arc Surveying and Mapping survey equipment and methods used to acquire and process side-scan and bathymetric survey data. This survey including Quality Control Standards and Field Calibration will be performed in accordance with US Army Corps of Engineers (ACOE) Hydrographic Survey Manual EM1110-2-1003. Survey systems and methods used during this project are chosen based on the water depth, sea and weather conditions, and the ability of the vessel to safely navigate the area.

A. Equipment

A.1 Survey Launch

Survey Launch will be a trailerable 21-ft Monarch Little Giant built in 1978 and refurbished in 2011. The launch point for site access will be identified prior to mobilization. Dimensions are 21'L x 8'W with a static draft of 1.6', powered by twin 115 hp Yamaha outboards. The vessel is registered in the State of Florida and is US Coast Guard inspected. Cruising speed is 25 knots – survey speed is 2 -5 knots. It is possible (depending on weather) that a local vessel of opportunity may be utilized for this project.

A.2 Sounding Equipment

Sounding equipment will be a Reson SeaBat 7125 Ultra High Resolution Multibeam Dual Frequency Echosounder operating at 200 kHz or 400 kHz. The Reson 7125 a 165 degree swath using 512 beams each of which has a 1.5° beam width. The maximum ping rate of this echosounder is 50 Hz. Soundings will be acquired in US feet.

The sonar head contains a curved face projector (Reson 8101 transducer) and transmits a pulse of acoustic energy across the direction of travel illuminating a thin strip of seabed. The acoustic returns are picked up by the receiver section of the sonar head, amplified, digitized, and sent to the topside processor for beam forming and processing.

The processing unit performs the beam forming, bottom detection and controls the sonar head with respect to gain, ping rate and transmit angle. It also contains the interfaces for all time-critical external sensors such as attitude data, position, and the 1 PPS (pulse per second) signal. Real time velocities are also interfaced to the 7125 using a Reson sound velocity profiler (SVP) mounted on the transducer for initial beam forming and steering. Data are transmitted to the survey computer via Ethernet connection.

The sonar head is a side mount located on the port side of the vessel just aft of the wheel house. The sound velocity probe is mounted on transducer. The TSS VRU-210 Motion Reference Unit is mounted 0.52m starboard of the transducer. The Trimble DSM 232 DGPS antenna is mounted directly over the transducer and the SG Brown Meridian Surveyor Gyro Compass is mounted in the wheel house parallel to the keel of the vessel. This enables all the data to be collected with zero offsets other than the MRU.

The equipment used for this investigation will be operating outside of the auditory range of marine mammals (including even high frequency cetaceans with an auditory range up to 180 kHz), finfish, etc. The multibeam echosounder and sidescan sonar equipment to be employed during the investigation will operate at 200 kHz - 400 kHz and from 400 kHz up to 1600 kHz, respectively. Specification sheets for the proposed equipment have been included as an attachment to this SOP. These ranges are above the auditory range of marine mammals. Furthermore, based on environmental assessments conducted for the Pier Complex, the occurrence of whales within Sandy Hook Bay is considered extremely rare. If any whales are spotted during the investigation the survey operations will be temporarily halted until the whales are no longer observed in the area.

A.3 Positioning Equipment

A.3.1 Applanix Wavemaster POS

The survey vessel will be equipped with a position and orientation system for marine vessels (POS MV) Wavemaster inertially aided real time kinematic (IARTK) technology provides attitude, heading, heave, position and velocity data.

A.3.2 Odom Digibar Pro Velocity Probe

The Odom Digibar Pro will be used to obtain sound velocity profiles at frequent intervals during the course of the survey. Sound velocities will be collected at .5 meter intervals through the water column at different locations in the survey area. These velocities will be post processed into the multibeam data.

A.4 Software

A.4.1 Acquisition Software

A.4.1.1 Hypack and Hysweep Version's 2011

Hypack is used for vessel navigation and line tracking during data collection. The Hypack Survey program is used to log data and is used in conjunction with Hypack/Hysweep Survey programs to log vessel positioning. In addition, the Hysweep interface enables the boat operator to view the nadir depths in the Hypack survey data information window. The vessels DGPS system is configured in the software for positioning only. Data is saved with a .RAW extension.

A.4.1.2 Hysweep 2011

Hysweep is used for Multibeam data collection as well as navigation. Different displays are available for the survey technician to ensure bottom coverage and real time Quality Control (QC) of data during the survey. The motion reference unit (MRU), Gyro and the Reson 7125 are configured in Hysweep for data collection. Data is collected on the survey computer (Dell Laptop). Survey lines will be laid out at a 16m interval to ensure 200 percent bottom coverage during the survey. The files are collected with an .HSX extension these are raw multibeam files in Hysweep.

B. Data Processing and Quality Control

B.1 Shallow-Water Multibeam Data MB MAX (Hysweep)

Shallow-water multibeam (SWMB) data are monitored in real-time using the 2-D and 3-D data display windows in Hypack Hysweep, and the Reson controller window. The Reson 7125 control interface allows the operator the ability to control ping rate and pulse length as well as gain and power settings. The Reson 7125 control interface is virtually hands free and is typically set up prior to data collection. Adjustments to the gates can be made to ensure that false returns or outliers are eliminated during data collection. Power settings can be adjusted along dock faces or around structures to eliminate reflections or false returns. Data is also viewed in the Hysweep interface screen allowing the operator to see 3-D representations of the bottom, as well as cross section views along with preset error displays, such as heave drift and sounding overlays to previous sweeps and numerous other Quality Assurance (QA) tools built into the software. During data collection any soundings not meeting International Hydrographic Organization (IHO) standards are automatically removed.

Hypack Hysweep .HSX files are loaded into the Hysweep multibeam data processing software at the completion of the survey. The data in the HSX file is displayed in a way that heave, pitch, roll and heading as well as positioning, velocities, and tide values for each individual line are displayed prior to integration into the sounding information from the 7125. After examination of this data it is then combined with the Reson 7125 data and the sweeps are reviewed. Typically 100 sweeps are displayed at a time and any outliers are removed with the editing tools available in MB Max. Any anomalies found during this step of the processing such as targets identified on the seafloor are saved to a Hypack target file (.TGT). Upon completion of sweep editing, all data is saved to Hysweep .HS2 format then exported in the appropriate matrix (i.e. 1m x 1m grid) with the minimum sounding being exported. An "all file" is also saved containing every data point in an ASCII format.

C. Corrections to Echo Soundings

C.1. Sound Velocity

As stated above sound velocity data is collected real time at the transducer via RESON SVP sound velocity probe attached directly to the transducer.

The Odom Digibar Pro is used to collect sound velocity profiles throughout the water column during the survey and is incorporated into the data during post processing

C.2. Vessel Offsets and Dynamic Draft Corrections

Angular offsets and navigation timing errors of the multibeam system are determined using a patch test. A series of calibration lines are run and processed using Hysweep Patch test program. The test will be conducted following the re-installation of the multibeam transducer. These values are entered into the device setup in Hysweep prior to data collection.

C.3 Heave, Pitch, Roll, Heading, and Timing

The Applanix POS MV provides attitude, heading, heave, position and velocity data to Hypack, which is stored in the HSX multibeam file. Data quality is monitored while surveying by observing the Hysweep device interface. Alarms are triggered when accuracy values fall below user-defined values. Survey vessel navigation lines are established prior to work. Each navigation line contains parallel lines on each side of the proposed survey trackline (e.g. 10 ft each side of navigation line) that causes an alarm to trigger if the survey vessel navigates outside of the proposed vessel track limits.

As discussed in the previous section, navigation timing error is determined using the patch test and applied to data in the Hysweep survey interface.

C.4 Horizontal and Vertical Datum

Coordinates for the survey will be in North American Datum (NAD) 1983, Universal Transverse Mercator (UTM), Zone 18, meters.

C.5 Side Scan Sonar Procedure

Navigation

The GPS (Global Positioning System) will be differential with a published accuracy of plus or minus 1 meter. The DGPS (Differential Global Positioning System) corrections will be obtained through the nearest United States Coast Guard (USCG) Beacon. The tow-fish will be positioned by entering the cable layback and offset from the DGPS antenna into a layback and offset adjustment in the Hypack Program. The tow-fish position will be supplied to the side-scan computer by the Hypack computer. The DGPS antenna will be located as close as possible to the tow-fish. The positional accuracy of the targets will be within +/- 3 meters. A NOAA navigation chart will be used as a background in the Hypack navigation display with potential hazards highlighted.

Sonar

Pier 1 Site (shallow water 13')

The Tow-fish will be connected to a nylon line that will be tied off to a cleat on the boat. A minimum amount of line will be let out in order to maintain the depth of the tow-fish no deeper than 4 feet at the Pier 1 site. The tow-fish will be prevented from going any deeper than 4 feet below the water surface by not allowing any more than 4 feet of line out. The range scale will be 50 meters providing a swath of coverage of 100 meters (328 feet) on each survey line. At least 2 survey lines will be run on the west side of the pier. The first survey line will be 60 feet from the pier and the second line will be 120 feet from the pier. This will provide 200% coverage of the bottom and provide coverage of the nadir area under the tow-fish of adjacent lines. 200% coverage will provide multiple passes on potential targets to facilitate interpretation and help eliminate returns caused by fish and other extraneous sources. The coverage will be complete on the west side between Pier 1 and Trestle 1A and beyond 250 feet on the east side. The tow-fish will be towed near the water surface to maximize height of the sensor above the bottom and avoid potential hazards. Dual frequency mode will be used for differential comparison between high and low frequency signatures which will facilitate interpretation and help eliminate returns caused by fish and other extraneous sources. Target spatial resolution

will be 0.4 meters x 0.4 meters or less. Survey speed will be between 2 and 5 knots. All operations will occur during daylight.

Pier 2 Site (deeper water 35')

The Tow-fish will be connected to a nylon line that will be tied off to a cleat on the boat. A sufficient amount of line will be let out in order to maintain optimum altitude of the tow-fish (10 -20% of range). The range scale will be 50 meters providing a swath of coverage of 100 meters (328 feet) on each survey line. At least 2 survey lines will be run on each side of the pier. The first survey line will be 100 feet from the pier and the second line will be 140 feet from the pier. This will provide 200% coverage of the bottom and provide coverage of the nadir area under the tow-fish of adjacent lines. 200% coverage will provide multiple passes on potential targets to facilitate interpretation and help eliminate returns caused by fish and other extraneous sources. Coverage will exceed 250 feet from both sides of Pier 2. Two survey lines will be run between the walkways that extend out from the end of Pier 2. Dual frequency mode will be used for differential comparison between high and low frequency signatures which will facilitate interpretation and help eliminate returns caused by fish and other extraneous sources. Target spatial resolution will be 0.4 meters x 0.4 meters or less. Survey speed will be between 2 and 5 knots. All operations will occur during daylight.

Data Processing

Post processing will be conducted using the Chesapeake SonarWiz5 program to import the geo-encoded sonar files where they will be smoothed navigationally and adjusted with time varied gain and bottom tracking prior to water column removal. They will then be cut and pasted electronically to form the geo-referenced tiff images smaller than 100 megabytes each. Targets, including obstructions and anomalies on the sediment surface, will be identified and added to a target report as an excel file including coordinates. These, along with Quality Control data and raw data (.jsf files), will be provided as preliminary deliverables. The grid coordinate system for all deliverables will be NAD 1983, UTM. Zone 18, meters.

Quality Control

The DGPS receiver will be configured such that satellites below 8 degrees above the horizon will not be used in position computations. The age of pseudo-range corrections used in position computation will not exceed 20 seconds. Horizontal Dilution of Precision (HDOP) will be monitored and recorded. If corrections exceed 20 seconds or HDOP

exceeds 2.5 nominally the survey will be delayed until conditions improve. A minimum of four satellites will be used to compute all positions. All of these can be monitored by the Hypack program and provide an alarm if exceeded. A control point will be selected to check the geographic and projected grid position by moving the DGPS antenna in close proximity to it prior to departure and upon return to port each day.

Side-scan maintenance and calibration checks will be performed per the system manual prior to the start of the survey. A wet test will be performed at the dock prior to departure to ensure all channels are operating and detecting targets. Confidence checks of the side-scan sonar system will be conducted at least once daily. These checks will be accomplished at the outer limits of the range scales being used based on a feature near or on the bottom. Each sonar channel (i.e., port and starboard channels) will be checked to verify proper system tuning and operation. Confidence checks can be made on any discrete object, offshore structure, or bottom feature, which is convenient or incidental to the survey area. Check features can include wrecks, offshore structures, navigation buoy moorings, distinct trawl scours, or sand ripples.

Confidence checks can be made during the course of survey operations by noting the check feature as a saved target. These check targets can be included in the target report supplied with the preliminary mosaics. Data will be monitored for the effects of sea state, surface clutter, thermal layering and other possible interference with data quality. If interference is encountered the survey will be modified or stopped until it can be corrected.

EdgeTech
An Affiliate of ORE Offshore

4125
SIDE SCAN SONAR SYSTEM

FEATURES

- Ultra high resolution images
- Lightweight for one person deployment
- Standard heading, pitch, roll & pressure sensors
- Choice of dual simultaneous frequencies
- Runs on AC or DC
- Pole mount option for shallow water use

APPLICATIONS

- Hydrographic Surveys
- Geological Surveys
- Search & Recovery
- Channel/Clearance Surveys
- Bridge/Pier/Harbor Wall Inspection
- Hull Inspections

EdgeTech's 4125 Side Scan Sonar System was designed with both the Search & Recovery (SAR) and shallow water survey communities in mind. The 4125 utilizes EdgeTech's Full Spectrum® CHIRP technology, which provides higher resolution imagery at ranges up to 50% greater than non-CHIRP systems operating at the same frequency. This translates into more accurate results and faster surveys, thus cutting down on costs.

Two dual simultaneous frequency sets are available for the 4125 depending on the application. The 400/900 kHz set is the perfect tool for shallow water survey applications, providing an ideal combination of range and resolution. The 600/1600 kHz set is ideally suited for customers that require ultra high resolution imagery in order to detect very small targets (SAR).

There are two towfish options for the system; one with telemetry and one without. The towfish with added telemetry provides the ability to operate over longer tow cable lengths for operation in deeper waters. Both frequency sets are available for either towfish.

The 4125 system can be powered by both AC and DC for added versatility and is delivered in portable rugged cases for ease of transport from site-to-site. As is standard with all of EdgeTech's towed side scan systems, the 4125 comes with a safety recovery system which will prevent the loss of a towfish if it becomes snagged on an obstacle during a survey.

A standard 4125 System comes with a choice of towfish and a portable water resistant topside processor with a splash-proof, drop & shock resistant laptop computer including EdgeTech's easy-to-use Discover acquisition software. A 50m Kevlar tow cable is included as standard with customer-specified lengths also available. Multiple options are available such as a v-fin depressor, keel weight, pole mount and hull scan bracket for added versatility.

For more information please visit EdgeTech.com

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EdgeTech
An Affiliate of ORE Offshore

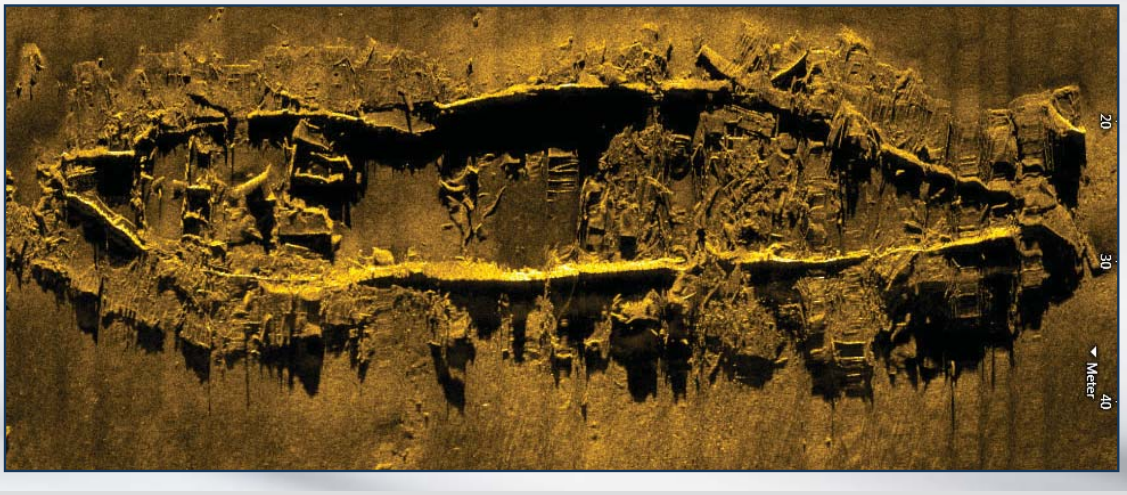
4125
SIDE SCAN SONAR SYSTEM

KEY SPECIFICATIONS

SONAR		
Frequencies (Dual Simultaneous)	Choice of either a 400/900 kHz or 600/1600 kHz towfish	
Pulse Type	EdgeTech's Full Spectrum® CHIRP (user-selectable CW pulses also included)	
Operating Range	150m @ 400 kHz, 75m @ 900 kHz; 120m @ 600 kHz, 35m @ 1600 kHz	
Horizontal Beam Width	0.46° @ 400 kHz, 0.28° @ 900 kHz; 0.33° @ 600 kHz, 0.20° @ 1600 kHz	
Vertical Beam Width	50°	
Resolution Across Track	400 kHz: 2.3 cm, 900 kHz: 1.5 cm, 600 kHz: 1.5 cm, 1600 kHz: 0.6 cm	
TOWFISH	**4125 Towfish**	**4125 Towfish with added telemetry***
Diameter	9.5 cm (3.75 inches)	9.5 cm (3.75 inches)
Length	97 cm (38 inches)	112 cm (44 inches)
Weight in Air	15 kg (34 pounds)	20 kg (44 pounds)
Tow Cable Type	Multi-conductor up to 150m max length (will provide a typical operational depth down to 50m)	Coaxial up to 600m max length (will provide a typical operational depth down to 200m)
Max Depth Rating of Towfish	200m	
Material	Stainless Steel	
Standard Sensors	Heading, Pitch, Roll, Pressure (Depth)	

** The 4125 Towfish with added telemetry is slightly larger to incorporate the electronics necessary to run over longer coaxial tow cables*

SPLASH-PROOF TOPSIDE PROCESSOR	
Power Input	12-24 VDC or 115/230 VAC, 50/60 Hz
Connections	AC, DC, Ethernet (to laptop), Towfish
Hardware	Ruggedized splash-proof, drop & shock resistant laptop
Operating System	Windows® XP
Acquisition Software	EdgeTech DISCOVER
SYSTEM OPTIONS	Keel weight, v-fin depressor wing, pole mount, quick change hull scan bracket



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SeaBat® 7125

ULTRA HIGH RESOLUTION MULTIBEAM ECHOSOUNDER

The new generation SeaBat 7125 builds on the field experience and feedback from many users around the world and brings unparalleled resolution and installation flexibility. The system is available in three separate configurations; one designed specifically for installation on small survey vessels and a 6000m depth rated system for either ROV or AUV use.

Each of these configurations utilise the same transducer set and provide identical high performance, superlative data quality, features and ease of use over depths from 0.5m to 500m.

Special emphasis has been put on maximizing operational efficiency and features such as variable swath width and roll stabilisation combined with a high ping rate and excellent data quality .

Surface Vessel Installation - SV2
The new SeaBat 7125-SV2 is a highly integrated single or dual frequency system designed with ease of installation and operation as a high priority. The system consists of a surface transceiver with integrated multiport card and a standard 25m cable run to the transducers. The transceiver hardware is suitable for running data acquisition software and is available with RESON PDS2000 software pre-installed and configured.

ROV2
For deep-water use the ROV version of the SeaBat 7125 has a 6000m depth rating and includes a 6000m rated titanium interface bottle. The system performance and feature set is identical to the other members of the 7125 family thus providing commonality and ease of use.

PRODUCT LOGBOOK

BEAM DENSITY	Up to 512 beams in selectable modes optimises operations for any survey type
ROLL STABILIZATION	Real-time roll stabilization maximizing usable swath
DEPTH	Dual frequency provides seamless coverage from 0.5 to 400m typical depth
IHO	Compliance with IHO SP44Ed5 over entire depth range
DIAGNOSTICS	Advanced diagnostics
HIGH SPEED	High ping rate allows high-speed operations without compromising data density
WATER COLUMN DATA	Allows collection of high density water column data for advanced processing

AUV
The AUV version of the 7125 provides on-board data processing and logging as well as interface to third party sensors. The electronics are supplied mounted on an aluminium frame for ease of integration and an optional 6000m depth-rated titanium electronics housing is available. The 7125-AUV provides high quality data and performance commensurate with the other versions of the 7125.

SEABAT 7125 SYSTEM SPECIFICATIONS

	7125 SV2	7125 ROV2	7125 AUV
POWER REQUIREMENT	111/220 VAC, 50/60 Hz	48V DC (±10%)	48V DC (± 10%)
	500W average	110W max	200W max
TRANSDUCER CABLE LENGTH	25m standard	3m standard	3m standard
		10m optional	10m optional
LCU TO PROCESSOR CABLE LENGTH	N/A	25m (ST), 6m, 5m (pigtail)	N/A
SYSTEM DEPTH RATING	25m	6000m	6000m optional
FREQUENCY	200kHz or 400kHz (dual frequency available)		
ALONG-TRACK TRANSMIT BEAMWIDTH	2° at 200kHz & 1° at 400kHz		
ACROSS-TRACK RECEIVE BEAMWIDTH	1° at 200kHz & 0.5° at 400kHz		
MAX PING RATE	50Hz (±1Hz)		
PULSE LENGTH	33µsec to 300µsec		
NUMBER OF BEAMS	512EA/ED at 400kHz, 256EA/ED at 200kHz		
MAX SWATH ANGLE	140° (165°)		
TYPICAL DEPTH	0.5m to 150m at 400kHz, 0.5m to 400m at 200kHz		
MAX DEPTH	175m at 400kHz, 450m at 200kHz		
DEPTH RESOLUTION	6mm		
DATA OUTPUT	Bathmetry, sidescan and snippets 7K data format		
TEMPERATURE:	-2° to +35°C		
FLEXMODE:	Optional		

COMPONENT	7125 SV2	7125 ROV2	7125 AUV
EM 7216 RECEIVER	✓	✓	✓
TC 2181 DUAL FREQUENCY 200/ 400 kHz PROJECTOR	✓		
TC 2160 400kHz PROJECTOR		✓	✓
TC 2163 200kHz PROJECTOR (OPTIONAL)		✓	✓
7-LINK CONTROL UNIT		✓	
SONAR PROCESSOR UNIT WITH MONITOR, KEYBOARD AND POINTER DEVICE		✓	
SV TRANSCEIVER WITH MONITOR, KEYBOARD AND POINTER DEVICE	✓		
7-I INTEGRATED CONTROL AND PROCESSOR UNIT			✓

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SEABAT 7125 SYSTEM SPECIFICATIONS

	Height [mm]	Width [mm]	Depth [mm]	Weight [kg/air]	Weight [kg/water]
TC 2181 DF 200/ 400 kHz PROJECTOR	**87**	**93**	**280**	**4.5**	**3.4**
TC 2160 400 kHz PROJECTOR	**77**	**62**	**285**	**2.7**	**1.7**
TC 2163 200kHz PROJECTOR	**115**	**100**	**280**	**7.5**	**5**
EM 7216 200/400 kHz RECEIVER	**137**	**496**	**102**	**10.7**	**5.7**
SURFACE TRANSCEIVER	**5U**	**19"**	**557**	**20**	**N/A**
LCU BOTTLE	**530**	**Ø174**	**N/A**	**15.7**	**5.2**
ICPU FRAME	**172**	**166**	**497**	**10**	**N/A**
SONAR PROCESSOR	**5U**	**19"**	**630**	**30**	**N/A**

OPTIONS:

Mounting Bracket with Fairing

SVP-70 sound velocity probe with 25m cable

Extended warranty/ support & maintenance contracts

Fiber-optic conversion for ROV installations

7125SV2

7125 ROV2

WHY CHOOSE A SEABAT 7125 SYSTEM?

- Maximum Productivity during data collection
  - Up to165degree swath
  - Roll Stabilization
  - Up to 512 beams in operator selectable modes
- Uncompromised clean data sets
  - Quality Filters/flags
  - Interactive, Comprehensive GUI
  - Industry leading bottom detect methods
- Ease of Installation and Use
  - -Fully automatic operation
  - Single highly integrated topside transceiver
  - Integrated Multibeam acquisition and processing software
  - Extremely portable wet-end
- Maximum Operational Flexibility
  - 400 and 200kHz operation for seamless data collection from 0.5m to 500m
  - Variable and Steerable swath
  - Simultaneous output of bathymetry, Sidescan, Snippets backscatter, and raw water column data
  - Adaptive gates
  - Uncertainty Output

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Appendix B
Corrective Action Forms

SAP Worksheet #32-1—Corrective Action Form

Person initiating corrective action (CA) _____ Date _____

Description of problem and when identified:

_____

_____

_____

_____

Cause of problem, if known or suspected:

_____

_____

_____

_____

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:

Anita Dodson/ Navy CLEAN Program Chemist

NAVFAC Chemist