FINAL

UNIFORM FEDERAL POLICY – QUALITY ASSURANCE PROJECT PLAN

MILITARY MUNITIONS RESPONSE PROGRAM
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PASSAGE KEY AIR-TO-GROUND GUNNERY RANGE
MANATEE COUNTY, FLORIDA

FUDS PROJECT NUMBER: I04FL040101

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Contract No.: W912DY-10-D-0025
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Prepared For:

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ACRONYMS

3Dg	3D Geophysics, Incorporated
APP	Accident Prevention Plan
ASR	Archives Search Report
ATGGR	Air-to-Ground Gunnery Range
BCEE	Board Certified Environmental Engineer
BIP	Blown-in-Place
BSI	Blind Seed Item
CESAJ	United States Army Corps of Engineers, Jacksonville District
CFR	Code of Federal Regulation
cm	centimeters
CMUA	Concentrated Munitions Use Area
COR	Contracting Officer's Representative
CSM	Conceptual Site Model
CSP	Certified Safety Professional
CWM	Chemical Warfare Materiel
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DGPS	Differential Global Positioning System
DID	Data Item Description
DN	Deficiency Notice
DoD	Department of Defense
DOI	Department of Interior
DQCR	Daily Quality Control Report
DQO	Data Quality Objective
DSOP	Diving Standard Operating Procedure
EM	Engineer Manual
EMI	Electromagnetic Induction
EOD	Explosive Ordnance Disposal
ESP	Explosives Site Plan
ESTCP	Environmental Security Technology Certification Program
FDEP	Florida Department of Environmental Protection
FGDC	Federal Geographic Data Committee
FL	Florida
FP	Follow-up Phase
FS	Feasibility Study
ft	feet
ftp	File Transfer Protocol
FUDS	Formerly Used Defense Site
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
GPS	Global Positioning System
GSV	Geophysical System Verification
H&S	Health and Safety

HAZWOPER	Hazardous Waste Operations and Emergency Response
HE	High Explosive
HTRW	Hazardous, Toxic and Radiological Waste
Hz	Hertz
IAW	In Accordance With
IGD	Interim Guidance Document
Inc.	Incorporated
INPR	Inventory Project Report
IP	Initial Phase
ISO	Industry Standard Object
ITS	Instrument Test Strip
IVS	Instrument Verification Strip
JV	Joint Venture (PIKA-Pirnie JV, LLC)
lb	pound
MC	Munitions Constituents
MD	Munitions Debris
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
MMRP	Military Munitions Response Program
MPC	Measurement Performance Criteria
MPPEH	Material Potentially Presenting an Explosive Hazard
MRSPP	Munitions Response Site Prioritization Protocol
MSD	Minimum Separation Distance
NA	Not Applicable
NAEVA	NAEVA Geophysics, Incorporated
NCMUA	Non-Concentrated Munitions Use Area
NCR	Non-Conformance Report
No.	Number
NOAA/NMFS	National Oceanic and Atmospheric Administration / National Marine Fisheries Service
NRL	Naval Research Laboratory
OE	Ordnance and Explosive
OESS	Ordnance and Explosive Safety Specialist
OSHA	Occupational Safety and Health Administration
PDT	Project Delivery Team
PE	Professional Engineer
PG	Professional Geologist
PLS	Professional Land Surveyor
PM	Project Manager
POC	Point of Contact
PP	Preparatory Phase
PPE	Personal Protective Equipment
PWS	Performance Work Statement
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation

RMS	Root Mean Square
RTK	Real Time Kinematic
SHM	Safety and Health Manager
SI	Site Inspection
SOP	Standard Operating Procedure
SPP	Systematic Planning Process
SSS	Side Scan Sonar
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	To Be Determined
TM	Technical Manual
TO	Task Order
TP	Technical Paper
TPP	Technical Project Planning
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
U.S.	United States
USACE	United States Army Corps of Engineers
USAESCH	United States Army Engineering and Support Center, Huntsville
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UUTA	Underwater UXO Towed Array
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
VSP	Visual Sample Plan
WERS	Worldwide Environmental Remediation Services
ºF	degrees Fahrenheit
%	Percent

Introduction

I.1 The PIKA-Pirnie JV, LLC[1] (hereafter referred to as the JV) has prepared this Quality Assurance Project Plan (QAPP) consistent with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) on behalf of the United States Army Corps of Engineers (USACE) to conduct a Remedial Investigation (RI)/Feasibility Study (FS) under the Military Munitions Response Program (MMRP) at the Passage Key Air-to-Ground Gunnery Range (hereafter referred to as Passage Key ATGGR), located in Manatee County, Florida (FL). A map showing the general site location (**Map B-1**) of the Passage Key ATGGR is included in **Appendix B**. Passage Key ATGGR is a Formerly Used Defense Site (FUDS) with designated FUDS project number I04FL040101. The FUDS program is overseen by the USACE.

I.2 This QAPP has been prepared in accordance with (IAW) the following documents:

- United States Army Engineering and Support Center, Huntsville (USAESCH) Data Item Description (DID) Worldwide Environmental Remediation Services (WERS)-001.01;
- Interim Guidance Document (IGD) 14-01 (Engineer Manual [EM] 200-1-15), *Technical Guidance for Military Munitions Response Actions* (2013);
- EM 385-1-1, *Safety and Health Requirements Manual* (2014);
- EM 385-1-97, *Explosives – Safety and Health Requirements Manual* (2013);
- *Munitions Response Remedial Investigation/Feasibility Study Guidance* (2009);
- United States Environmental Protection Agency (USEPA) guidance document 505-F-03-001 (2005); and
- Other IGD as appropriate.

This QAPP was developed with the understanding that unanticipated conditions encountered may dictate a change in the plan as currently written.

I.3 The overall RI/FS goals are to:

1. Characterize the nature (type) and extent (density and distribution) of munitions and explosives of concern (MEC) to determine if explosive hazards exist;
2. Assess the potential risk and hazards to human health, safety, and the environment arising from MEC;
3. Determine if there is an unacceptable explosive hazard at the site; and
4. Evaluate the site boundary based on the RI findings.

Secondary goals of the RI/FS are to update the Munitions Response Site Prioritization Protocol (MRSPP) and conceptual site model (CSM), as well as to evaluate remedial alternatives as part of the FS based on the RI findings. An initial MRSPP and CSM were provided as part of the Site Inspection (SI) Report dated March 2008.

I.4 For the former Passage Key ATGGR, the RI/FS will build on existing data to assess and delineate the nature and extent of MEC to determine if there is an unacceptable explosive hazard. If an unacceptable explosive hazard is present at the site, then the JV will perform a feasibility study (FS) to develop remedial action alternatives to address the unacceptable explosive hazard.

[1] The JV is comprised of protégé firm PIKA International, Incorporated (Inc.) and its mentor ARCADIS-US, Inc. (formerly Malcolm Pirnie, Inc.).

The RI will provide the data necessary to make sound decisions regarding remedial alternatives or to justify a no DoD action indicated determination. The RI strategies focus on collecting data sufficient to meet USACE and regulatory requirements and supporting remedial alternative decisions, if needed, for the former Passage Key ATGGR. The technical approach is designed achieve the data quality objectives (DQOs) developed and refined as part of the Technical Project Planning (TPP) process with USACE, United States Fish and Wildlife Service (USFWS), Florida Department of Environmental Protection (FDEP), Manatee County, United States Coast Guard (USCG) and other stakeholders [e.g., United States Coast Guard (USGC) and Florida Fish and Wildlife Conservation Commission (FWC)]. Both analog and digital geophysical mapping (DGM) methods, as well as intrusive investigation, will be used to gather data to define the nature and extent of MEC on the land portion associated with Passage Key and in the surrounding waters. Munitions constituent (MC) sampling is not planned since a concentrated source of munitions does not exist at the site based on previously documented information.

I.5 The purpose of this QAPP is to document the planning processes for collecting MEC data, including the implementation of the quality assurance (QA) and quality control (QC) activities developed for this project. The objectives of this QAPP are to generate project data that are technically valid, legally defensible, and are useful in meeting the project goals, as well as integrate the technical and QC requirements for future investigation activities. This QAPP addresses four primary elements:

- Project Management,
- Measurement and Data Acquisition,
- Assessment and Oversight, and
- Data Validation and Usability.

I.6 The above elements incorporate QA/QC requirements cited within the following documents:

- United States Environmental Protection Agency (USEPA) *Requirements for Quality Assurance Project Plans*, USEPA QA/R-5, March 2001;
- USEPA *Guidance on Systematic Planning Using the Data Quality Objectives Process*, QA/G-4, February 2006;
- *Uniform Federal Policy for Quality Assurance Project Plans*, Final Version March 2005;
- USEPA *Guidance on Quality Assurance Project Plans*, CIO-2106-G-05, January 2012;
- *Department of Defense Quality System Manual*, Version 4.2, October 2010.

I.7 The QAPP workbook format used herein implements the systematic planning process and was developed via collaboration between the USEPA, Department of Defense (DoD), and the Department of Energy. In 2010, a subgroup comprised of members from the participating agencies was established to review and optimize the QAPP workbook in close coordination with USEPA's update of QA/G5, *Guidance for Quality Assurance Project Plans*, CIO 2106-G-05, January 2012. The optimized workbook format is used for this QAPP. The information contained in the worksheets captures the elements that would be otherwise be included in related project-planning documents, such as a Sampling and Analysis Plan and Field Sampling Plan. **Table 1** is a crosswalk between the optimized QAPP worksheets numbers and titles and the CIO 2106-G-05 QAPP Guidance (USEPA, 2012).

I.8 Additionally, the following appendices are provided to supplement the information presented in this document:

- **Appendix A:** Performance Work Statement (PWS)
- **Appendix B:** Site Maps
- **Appendix C:** Points of Contacts (POCs)
- **Appendix D:** Accident Prevention Plan (APP)
- **Appendix E:** Field Forms
- **Appendix F:** Personnel Qualification Certification Letter
- **Appendix G:** TPP Memorandum
- **Appendix H:** Schedule
- **Appendix I:** Explosives Site Plan
- **Appendix J:** Dive Plan
- **Appendix K:** Field Standard Operating Procedures (SOPs)

Refer to the table of contents for the specific worksheets and appendices comprising this QAPP. In several cases, the appendices contain standalone documents and reference to these documents, where applicable, is made in this QAPP.

Table 1: Crosswalk between UFP-QAPP Workbook to 2106-G-05 QAPP

Optimized UFP-QAPP Worksheets		**2106-G-05 QAPP Guidance Section**	
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4 , 7 & 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certification
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure , Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field QC	2.3.5	QC Requirements
21	Field SOPs	2.3.2	Sampling Procedures and Requirements
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation

Optimized UFP-QAPP Worksheets		**2106-G-05 QAPP Guidance Section**	
28	Analytical QC and Corrective Action	2.3.5	QC Requirements
29	Project Documents and Records	2.2.8	Documentation and Records Requirements
31, 32 & 33	Assessments and Corrective Action	2.4	Assessments and Corrective Action
		2.5.5	Reports to Management
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #1 & 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

This worksheet identifies the principal points of contact for all organizations having decision authority in the project and documents their commitment to implement the QAPP. Signatories usually include the lead organization's Project Manager (PM) and QA Manager, and individuals with approval or oversight authority. Signatures indicate that officials have reviewed the QAPP and concur with its implementation as written. If separate concurrence letters are issued, the original correspondence will be maintained with the final, approved QAPP in the project file. It is the JV's responsibility to make sure all signatures are in place before work begins.

1. Project Identifying Information:
    a. Site Name: Passage Key ATGGR
    b. Project Name: RI/FS
    c. Site Location: Passage Key, Manatee County, FL
    d. Site Number (No.): FUDS Project No. I04FL040101
    e. Contract/Work assignment Number: WERS Contract W912DY-10-D-0025 / Task Order (TO) 0021
2. Department of Defense (DoD) Organization(s):
    a. USAESCH
        i. Name: Ms. Rebecca Terry
        ii. Title: USACE Contracting Officer's Representative (COR)
        iii. Signature: Signature on file
        iv. Date: 02 November 2015
    b. USAECH
        i. Name: Ms. Mary Young
        ii. Title: USACE Military Munitions Design Center Technical Manager
        iii. Signature: Signature on file
        iv. Date: 02 November 2015
    c. USACE, Jacksonville District (CESAJ)
        i. Name: Mr. Frank Araico

ii. Title: USACE PM

iii. Signature: Signature on file

iv. Date: 02 November 2015

3. Contractor: The JV
   a. Contractor PM
      i. Name: Ms. Susan Burtnett, PE, BCEE
      ii. Title: PM
      iii. Signature:
      iv. Date: 02 November 2015
   b. Contractor QA Manager
      i. Name: Mr. Al Larkins
      ii. Title: Corporate Quality Manager
      iii. Signature:
      iv. Date: 02 November 2015
4. Federal Regulatory Agency: Not Applicable (NA)
5. State Regulatory Agency (name/title):
   a. Florida Department of Environmental Protection (FDEP)
      i. Name: Mr. Joseph McGarrity
      ii. Title: Federal Facilities Coordinator
6. Other Stakeholders (as needed):
   a. USFWS
   b. Manatee County
7. List plans and reports from previous investigations relevant to this project:

Title	Approval Date
Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS), Inventory Project Report (INPR), Passage Key Air to Ground Gunnery Range, FL, Site No. I04FL040100	December 1993
DERP-FUDS, INPR, Requiring an Ordnance and Explosives (OE) Engineering Evaluation and Cost Analysis (EE/CA) for Project No. IO4FL040101, Passage Key Air-to-Ground Gunnery Range, Manatee County, FL	August 2000
Final Archive Search Report, Passage Key Air-to-Ground Gunnery Range, Manatee County, Florida, Project Number I04FL040101	August 2002
Final Site Inspection Report, Passage Key Air-to-Ground Gunnery, Manatee County, Florida	March 2008

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

This worksheet identifies key project personnel, as well as lines of authority and lines of communication among the DoD organization, prime contractor, subcontractors, and regulatory agencies (see **Figure 3-1**). Additionally, a list of QAPP recipients along with their contact information is provided in **Table 3-1**.

Figure 3-1: Project Organization Chart

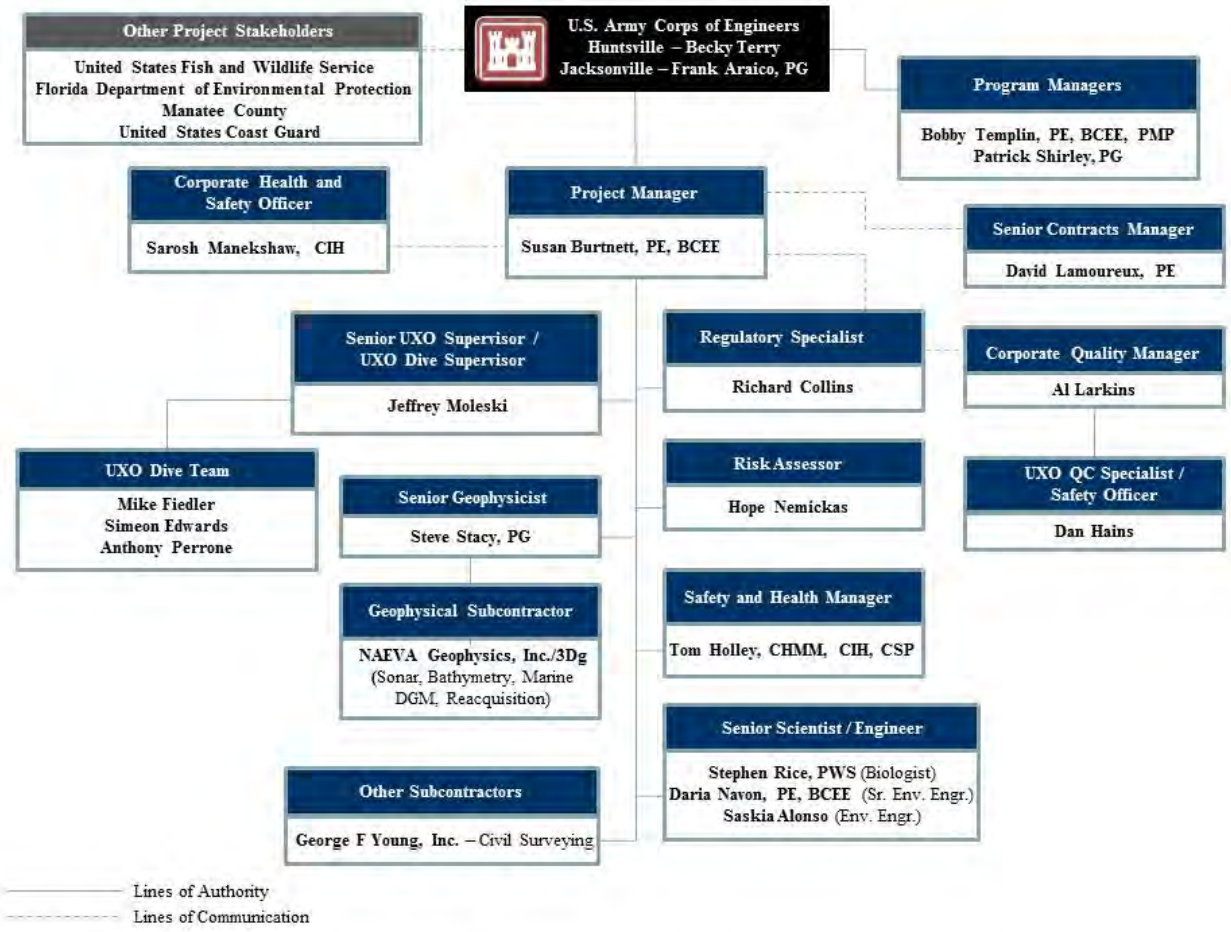


Table 3-1: QAPP Distribution List

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
Rebecca (Becky) Terry	COR	USACE	256-895-1788	rebecca.k.terry@usace.army.mil
Frank Araico	PM	USACE	904-232-1804	frank.x.araico@usace.army.mil
Mary Young	Technical Manager	USACE	256-895-1859	mary k.young@usace.army.mil
Kelly Enriquez	Geophysicist	USACE	256-895-1373	kelly.d.enriquez@usace.army mil
As assigned	OESS	USACE	As assigned	As assigned
Bobby Templin, PE, BCEE, PMP	Program Manager	JV	303-503-2793	btemplin@pikainc.com
Patrick Shirley, Professional Geologist (PG)	Deputy Program Manager	JV	864-987-3909	patrick.shirley@arcadis-us.com
Susan Burtnett, PE, BCEE	PM	JV	813-857-0021	susan.burtnett@arcadis-us.com
Al Larkins	Corporate Quality Manager	JV	410-332-4814	al.larkins@arcadis-us.com
Sarosh Manekshaw, Certified Industrial Hygienist (CIH)	Corporate Health and Safety (H&S) Officer	JV	713-412-9948	smanekshaw@pikainc.com
Tom Holley, Certified Hazardous Materials Manager (CHMM), CIH, Certified Safety Professional (CSP)	Safety and Health Manager (SHM)	JV	704-900-9375	tom holley@arcadis-us.com
Steve Stacy, PG	Senior Geophysicist	JV	703-465-4234	steve.stacy@arcadis-us.com
Daria Navon, PE, BCEE	Senior Environmental Engineer	JV	813-242-7208	daria.navon@arcadis-us.com
Saskia Alonso	Environmental Engineer	JV	703-465-4201	saskia.alonso@arcadis-us.com
Stephen Rice, Professional Wetland Scientist	Project Biologist	JV	407-659-5553	stephen.rice@arcadis-us.com
Richard Collins	Regulatory Specialist	JV	410-923-7765	richard.collins@arcadis-us.com
Hope Nemickas	Risk Assessor	JV	631-391-5237	hope.nemickas@arcadis-us.com
Jeffrey Moleski, Explosive Ordnance Disposal (EOD)	Senior Unexploded Ordnance (UXO) Supervisor (SUXOS)	JV	757-705-0051	jmoleski@yahoo.com
Dain Hains	UXO QC Specialist (UXOQCS) / UXO Safety Officer (UXOSO)	JV	813-810-3600	dan.hains@arcadis-us.com

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

This worksheet is used to identify key project personnel for the contractor performing tasks defined in this QAPP. Information regarding specialized training/certifications is provided for key field personnel.

ORGANIZATION: JV

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications for the Project Title/Role(1)	Signature/ Date(2)
Bobby Templin, PE, BCEE, PMP	Program Manager	B.S. / M.S. Civil/Environmental Engineering 30 years of experience Program/Project Manager for numerous MMRP and Hazardous, Toxic and Radioactive Waste (HTRW) sites. Involved with numerous projects for the Army, Navy, and Air Force.	---	Signature on file
Patrick Shirley, PG	Deputy Program Manager	B.S. Geology 30 years of experience Program/Project Manager for numerous MMRP and HTRW sites for the Army, Navy, and Air Force.	---	Signature on file
Al Larkins	Corporate Quality Manager	BTech, Hazardous Materials Management, U.S. Navy 35 years of experience Developed and managed the execution of UXO APP/SSHPs, work plans, and SOPs. Conducts QC inspections, analyzes UXO and operational risks and hazards, and enforces compliance with safety regulations.	---	Signature on file
Susan Burtnett, PE, BCEE	PM	B.S. / M.S. Civil Engineering 28 years of experience PM on numerous munitions response projects for Army, Navy, and Air Force sites, including FUDS in FL.	• Currently registered FL PE or PG • Occupational Safety and Health Administration (OSHA): Initial 40 Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) • OSHA: 30 Hour Construction • OSHA: 24-Hr Supervised Field Training	Signature on file

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications for the Project Title/Role[1]	Signature/ Date[2]
			• OSHA: Hazardous Waste Operations 8 Hour Refresher 29 Code of Federal Regulation (CFR) 1910.120(e)(8) • Hazard Com. 29 CFR 1910.1200(h) • UXO General Awareness training	
David Lamoureux, PE	Senior Contracts Manager	B.S. Civil Engineering 45 years of experience Contract manager on numerous munitions response projects for Army and Navy sites. Experienced in FFP, T&M, cost plus fixed fee, and cost plus incentive fee contracts primarily with environmental, construction, service, and A&E contracts as well as with performance-based contracts and private/public ventures.	---	Signature on file
Steve Stacy, PG	Senior Geophysicist	B.S. Geology, M.S. Geophysics 13 years of experience in the collection, processing, and interpretation of various geophysical methods. Ten years of experience in all aspects of MMRP geophysical investigations.	• OSHA: Initial 40 Hour HAZWOPER • OSHA: 8-hour HAZWOPER Refresher • UXO General Awareness training	Signature on file
Daria Navon, PE, BCEE	Senior Environmental Engineer	B.S. / M.S. Environmental Engineering 16 years of experience Involved in numerous munitions projects for the Army and Navy sites, including FUDS projects in FL.	---	Signature on file
Saskia Alonso	Environmental Engineer	B.S. Civil Engineering 10 years of experience Staff engineer working on munitions response projects for the Army and Navy sites, including FUDS projects in FL.	---	Signature on file

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications for the Project Title/Role[1]	Signature/ Date[2]
Stephen Rice, Professional Wetland Scientist	Project Ecologist	M.S., Environmental Science, B.S., Biology 22 years of experience Certified Ecologist Certified in Florida Unified Wetland Delineation Methodology; Experience in diverse environmental studies, including physicochemical, biological identification/ classification, toxicological testing and monitoring, and taxonomic surveys.	---	Signature on file
Sarosh Manekshaw, CIH	Corporate H&S Officer	B.S. Chemical Engineering / M.S. Chemical Engineering 44 years' experience implementing, developing, and managing H&S programs, including projects with hazards associated with MEC risks.	• CIH • OSHA: Initial 40 Hour HAZWOPER • OSHA: 8-hour HAZWOPER Refresher • OSHA: 30-hour Construction Safety • USACE Construction Quality Management for Contractors	Signature on file
Tom Holley, CHMM,CIH, CSP	SHM	B.S. Biology / Minor, Chemistry 23 years' experience providing H&S oversight. Designated Health & Safety Plan Preparer for numerous munitions-related projects/	---	Signature on file
Richard Collins	Regulatory Specialist	18 years of experience providing regulatory guidance and strategy development.	---	Signature on file
Jeffrey Moleski, EOD	SUXOS/UXO Dive Supervisor	Graduate of Naval EOD School Experience as SUXOS and UXO dive supervisor for marine MEC investigations, including removal actions.	• Master EOD • OSHA: Initial 40 Hour HAZWOPER • OSHA: 30 Hour Construction • OSHA: 24-Hr Supervised Field Training • OSHA: Hazardous Waste Operations 8 Hour Refresher 29 CFR 1910.120I(8) • Cardiopulmonary Resuscitation 29 CFR 1910.151 (b) • First Aid 29CFR 1910.151(b) • Hazard Com. 29 CFR 1910.1200(h) • Operations Safety Training 28 CFR 1910.120I(3)(i) • H&S Orientation; UXO remediation site training	Signature on file

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications for the Project Title/Role[1]	Signature/ Date[2]
Dan Hains	UXOQCS/UXOSO	Graduate of Naval EOD School B.A. Business Management / B.S. Information Systems Management Certified Protection Professional Master EOD Officer SUXOS, QA Manager, and UXO Safety Manager under USACE regulations. 40+ years of experience in UXO safety and the disposal of UXO, bulk explosives, and hazardous and reactive materials.	• Master EOD • OSHA: Initial 40 Hour HAZWOPER • OSHA: 30 Hour Construction • OSHA: 24-Hr Supervised Field Training • OSHA: Hazardous Waste Operations 8 Hour Refresher 29 CFR 1910.120I(8) • Cardiopulmonary Resuscitation 29 CFR 1910.151 (b) • First Aid 29CFR 1910.151(b) • Hazard Com. 29 CFR 1910.1200(h) • Operations Safety Training 28 CFR 1910.120I(3)(i) • H&S Orientation; UXO remediation site training	Signature on file
Mike Fiedler	UXO Diver	Graduate of Naval EOD School Experience as a UXO technician and diver for marine MEC investigations, including removal actions.	• Master EOD • OSHA: Initial 40 Hour HAZWOPER • OSHA: Hazardous Waste Operations 8 Hour Refresher 29 CFR 1910.120I(8) • Cardiopulmonary Resuscitation 29 CFR 1910.151 (b) • First Aid 29CFR 1910.151(b) • H&S Orientation; UXO remediation site training	Signature on file

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications for the Project Title/Role(1)	Signature/ Date(2)
Simeon Edwards	UXO Diver	Graduate of Naval EOD School Experience as a UXO technician and diver for marine MEC investigations, including removal actions.	• Master EOD • OSHA: Initial 40 Hour HAZWOPER • OSHA: Hazardous Waste Operations 8 Hour Refresher 29 CFR 1910.120I(8) • Cardiopulmonary Resuscitation 29 CFR 1910.151 (b) • First Aid 29CFR 1910.151(b) • H&S Orientation; UXO remediation site training •	Signature on file
Anthony Perrone	UXO Diver	Graduate of Naval EOD School Experience as a UXO technician and diver for marine MEC investigations, including removal actions.	• Master EOD • OSHA: Initial 40 Hour HAZWOPER • OSHA: Hazardous Waste Operations 8 Hour Refresher 29 CFR 1910.120I(8) • Cardiopulmonary Resuscitation 29 CFR 1910.151 (b) • First Aid 29CFR 1910.151(b) • H&S Orientation; UXO remediation site training	Signature on file

Notes:

(1) Training listed is required for the project title/role only and not the personnel holding that position.

(2) Signatures indicate personnel have read and agree to implement this QAPP as written (signatures required for Final submittal only).

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

This worksheet should be used to document specific issues (communication drivers) that will trigger the need to communicate with other project personnel or stakeholders. Its purpose is to ensure there are procedures in place for providing the appropriate notifications and generating the appropriate documentation when handling important communications, including those involving regulatory interfaces, unexpected events, emergencies, non-conformances, and stop-work orders. Examples are provided below; additional drivers may be added as needed.

Communication Driver	Organization	Name/Role	Contact Information	Procedure (timing, pathway, documentation, etc.)
Contract and project execution decisions and modifications	USAESCH	Becky Terry *USACE COR*	256-895-1788	Communicate contract and project execution decisions and QAPP modifications to the USACE PM and the JV PM, as necessary. All approved QAPP modifications will be included in the amendments to the QAPP by the JV and signed within 7 working days.
Project management issues and modifications	CESAJ	Frank Araico *USACE PM*	904-232-1804	Communicate project management decisions and QAPP modifications to the USACE COR and the JV PM, as necessary. All approved QAPP modifications will be included in the amendments to the QAPP by the JV and signed within 7 working days.
Technical decisions and modifications	USAESCH	Mary Young *USACE Technical Manager*	256-895-1859	Communicate technical decisions and QAPP modifications to the USACE COR and PM and the JV PM, as necessary. All approved QAPP modifications will be included in the amendments to the QAPP by the JV and signed within 7 working days.

Communication Driver	Organization	Name/Role	Contact Information	Procedure (timing, pathway, documentation, etc.)
Geophysical decisions and modifications	USAESCH	Kelly Enriquez *USACE Geophysicist*	256-895-1373	Communicate geophysical data decisions (*e.g.,* IVS report) and QAPP modifications to the USACE COR and PM and the JV PM and Senior Geophysicist, as necessary. All approved QAPP modifications will be included in the amendments to the QAPP by the JV and signed within 7 working days.
Geophysical deliverables (e.g., IVS Letter Report, Anomaly Selection Memo, data deliverables)	JV	Steve Stacy JV Senior Geophysicist	703-465-4234	The JV's Senior Geophysicist will provide geophysical deliverables to the USACE geophysicist, Technical Manager, COR, and PM within the timelines outlined in USACE DID WERS-004.01.
Quality control reports	JV	Dan Hains JV UXOSO/UXOQC	813-810-3600	The JV's UXOQC will provide quality control reports to the USACE COR, PM, Geophysicist, and Technical Manager on a daily basis.
Project issues	JV	Susan Burtnett *JV PM*	813-857-0021	The JV PM will notify the USACE COR and PM of project issues within 7 days by telephone and e-mail.
Identification of MEC and, any necessary, evacuations	JV	Susan Burtnett *JV PM*	813-857-0021	The JV PM will notify the USACE COR and PM within 24 hours by telephone and email.
Regulatory agency (FDEP) interface	JV	Susan Burtnett *JV PM*	813-857-0021	Communication with FDEP will include USACE representatives. At the direction of the USACE COR or PM, the JV PM may communicate directly with the FDEP by phone or email. If this occurs, the USACE COR and PM will be copied on any communications with FDEP.

Communication Driver	Organization	Name/Role	Contact Information	Procedure (timing, pathway, documentation, etc.)
Field progress reports	JV	Jeffrey Moleski *SUXOS* Dan Hains *UXOQCS/UXOSO* Susan Burtnett *JV PM*	757-705-0051 813-810-3600 813-857-0021	Daily reports will be provided to the USACE within 24 hours of the work accomplished. The SUXOS, UXOQCS, or JV PM will send the daily reports (within 24 hours). Amended field progress reports will be provided within 7 days by email.
Stop work due to safety issues	JV	Sarosh Manekshaw *JV Corporate H&S Officer* Tom Holley *JV SHM* Dan Hains *UXOQCS/UXOSO* Susan Burtnett *JV PM*	713-412-9948 201-398-4495 813-310-3600 813-857-0021	Work may be stopped at any time for any safety concern. Refer to the APP included as **Appendix D** to this QAPP for specifics related to H&S. Persons other than the responsible entity may also stop work for safety concerns. All stop work issues will be recorded in the Daily QC Report (DQCR). The JV PM will notify the USACE COR and PM, by phone within 24 hours, if there is a stop work situation. Email documentation will follow within 24 hours.
QAPP changes prior to field work	JV	Susan Burtnett *JV PM*	813-857-0021	The JV PM will submit documented amendments within 10 working days for transmittal to the USACE COR and PM for approval.
QAPP changes during project execution	JV	Susan Burtnett *JV PM*	813-857-0021	The JV PM will obtain same-day approval from SUXOS. The JV PM will then notify and obtain approval for QAPP modifications from the USACE COR and PM. All approved QAPP modifications will be included in the amendments to the QAPP by the JV and signed within 7 working days.

Communication Driver	Organization	Name/Role	Contact Information	Procedure (timing, pathway, documentation, etc.)
Field corrective actions	JV	Susan Burtnett *JV PM*	813-857-0021	The JV PM will communicate field corrective actions within 24 hours to the USACE COR and PM by phone and email. Documentation of the corrective action will occur within 7 working days.

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Project Kick-off Conference Call – 28 August 2014

A project kick-off conference call was held on 28 August 2014 in order to: (1) introduce the USACE and JV project team members and to identify their roles; (2) discuss the RI/FS project objectives; (3) discuss known site information and the proposed technical approach; (4) identify/confirm project stakeholders; (5) provide an overview of the project schedule; (6) discuss the TPP meeting dates and possible meeting locations; and (7) discuss whether a right of entry is needed. A list of attendees and meeting minutes are provided within **Appendix G**.

Technical Project Planning Meeting #1 – 04 November 2014
Remedial Investigation/Feasibility Study, Former Passage Key Air-to-Ground Gunnery Range, Manatee County, Florida

A stakeholder TPP meeting for the RI/FS at the Former Passage Key ATGGR was held at 1000 on 04 November 2014 at the Manatee County Public Safety Center, Bradenton, FL. The purpose of the meeting was to:

- Confirm project stakeholders;
- Discuss communication tools and protocols;
- Review the MMRP and RI objectives;
- Review site information and current CSM;
- Present the proposed technical approach; and
- Introduce and develop preliminary DQOs.

A list of attendees, meeting presentation, and meeting minutes are provided in **Appendix G**.

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

The initial CSM for Passage Key ATGGR was developed as part of the SI (USACE, 2008) and is presented within this worksheet.

10.1 Site History

Prior to military use, Passage Key, located in Manatee County, Florida, was owned by the Department of Interior (DOI) and managed as one of the first national wildlife refuges (USACE, 1993). In 1943, the War Department acquired a permit to use the key and surrounding waters as a ground strafing and dive bombing range. The site was used for training purposes during World War II until October 1945. The former Passage Key ATGGR was comprised of 13,147.72 acres extending from Tampa Bay west into the Gulf of Mexico. The majority of the acreage consisted of the water area associated with the safety fan for the range. Refer to **Map B-1** in **Appendix B** for the general location of the former Passage Key ATGGR.

The site included Passage Key, which was a 36.37-acre island in the early 1940s. The land associated with Passage Key today is little more than a sand bar. The Sarasota Army Air Field was assigned the responsibility for constructing, maintaining, and operating bombing and strafing targets on Passage Key. The 13,146.72-acre area associated with the former Passage Key ATGGR contained two banks of targets located on Passage Key. The target banks, which faced north and south, were constructed 500 feet (ft) apart; with each location set up with six targets. Historical munitions used at the range during training included practice and high explosive (HE) bombs and small arms ammunition.

The War Department relinquished the permit for the Passage Key ATGGR in March 1946, which returned Passage Key back to the DOI (USACE, 2008). The site has been managed as the Passage Key National Wildlife Refuge by the USFWS since that time.

Passage Key ATGGR was recommended for no further action in the 1993 INPR; however, due to four UXO items identified in 1998, a 2000 INPR was completed and an OE investigation was recommended. The UXO identified in 1998 included three 100-pound (lb) general purpose bombs and one 100-lb photoflash bomb discovered on or near the island. The bombs were detonated by either the U.S. Air Force or U.S. Navy EOD unit (USACE, 2002). An Archives Search Report (ASR) and SI were subsequently completed at the site in 2002 and 2008, respectively, to assess the potential for OE. No indications of MEC or munitions debris (MD) were observed during the ASR and SI site visits. Because the potential for MEC still exists, the SI recommended an RI/FS be conducted to characterize MEC. Munitions constituents (MC) sampling was not conducted during the SI. Due to dynamic coastal environment at the site and lack of a concentrated source of MEC, the SI noted that sampling for MC was not recommended.

10.2 Passage Key Overview

The former Passage Key ATGGR is located approximately 10 miles northwest of downtown Bradenton, FL, one mile north of Anna Maria Island, and 1.35 miles south of Egmont Key at the entrance to Tampa Bay from the Gulf of Mexico (see **Map B-1** in **Appendix B**). Passage Key, which is only accessible by boat, is a meandering barrier island surrounded by the waters of the Gulf of Mexico and Tampa Bay. Although once much larger, the key today consists of a small sand bar with no vegetation. The water surrounding the sand bar is very shallow, with depths of just one to two ft. While Passage Key is closed to all public use due to its importance to wildlife and designation as a National Wildlife Refuge, the key and surrounding waters are frequently visited by recreational boaters.

Due to erosion and shifting sands, the key is now much smaller and has changed in location and shape over time (see **Map B-2** in **Appendix B** for site details). The FUDS boundary, which is comprised of approximately 170.5 acres, includes the historical (early 1940s) location of Passage Key and the surrounding waters. The historical air-to-ground gunnery range and bombing target area (5.7 acres) is located within the FUDS boundary. The area that is the focus of the RI/FS includes approximately 649 acres, most of which is water. This area includes the FUDS boundary, as well as the other locations where Passage Key migrated over time.

10.3 Known or suspected MEC

Munitions potentially used at the site, based on historical documents, include small arms ammunition (.50 cal), miniature practice bombs, miniature practice bomb signals, 100-lb practice bombs, spotting charges, 100-lb general purpose bombs, 100-lb photoflash bombs, and 2.25-inch practice rockets. UXO found and detonated at the site in 1998 included three 100-lb general purpose bombs and one 100-lb photoflash bomb (USACE, 2008).

10.3.1 Evaluation of CWM Presence

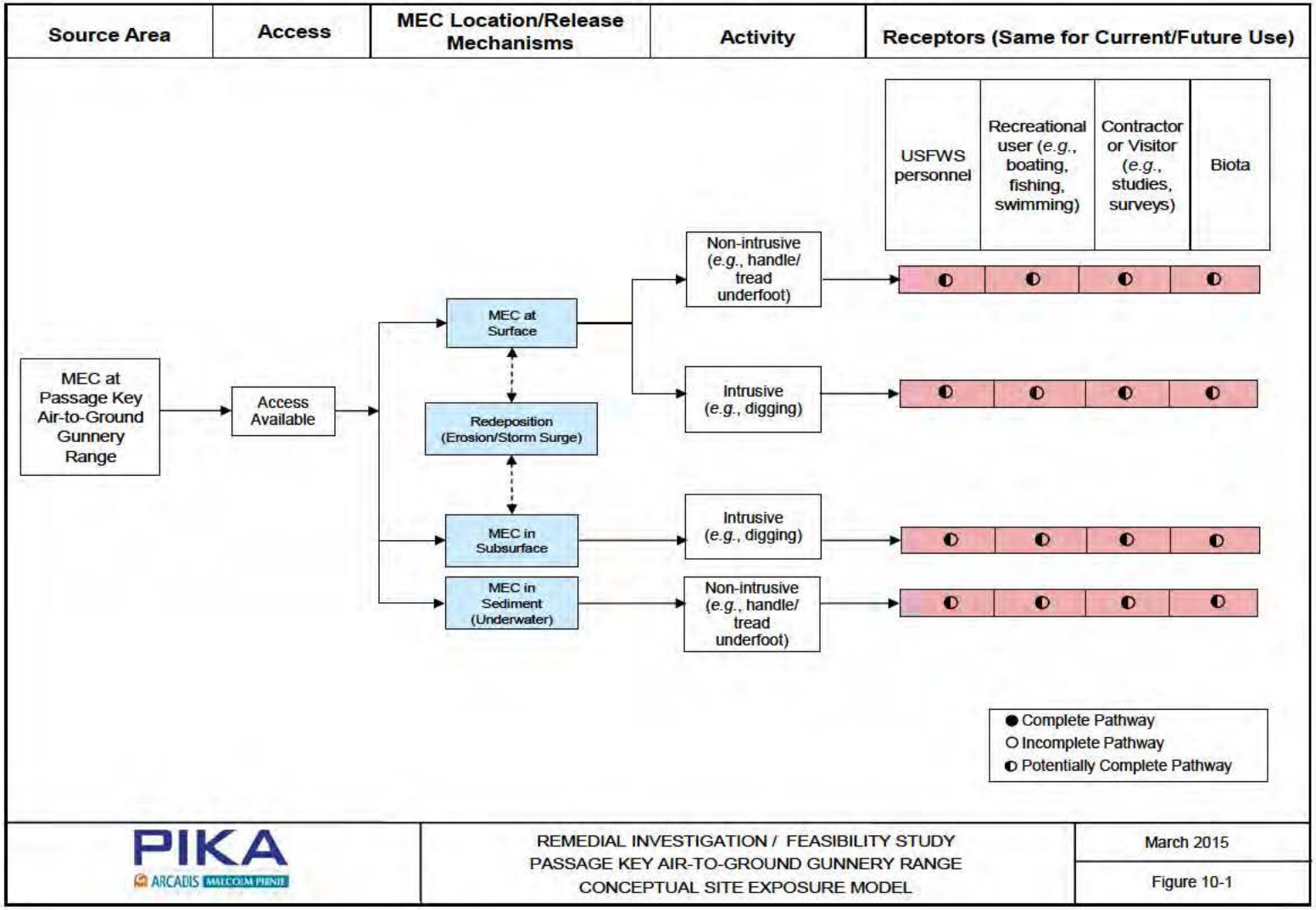
The INPR (USACE, 2000) found no evidence of chemical warfare materiel (CWM) storage, usage, or disposal at the Passage Key ATGGR. Additionally, the evidence of CWM hazards was not identified during the SI Investigation.

10.4 Potential Receptors and Exposure Pathways

MEC may be present on or beneath the sediment surface under the water. MEC at the sediment surface may be encountered through non-intrusive activities, such as handling or striking a MEC item; MEC beneath the sediment surface may be encountered through intrusive activities, such as digging or burrowing; and MEC may be re-deposited due to currents or storm surge.

MEC is accessible to both human receptors and biota. Human receptors include agency personnel, contractors or visitors (*e.g.*, conducting natural resource surveys or other studies), and recreational users (fishing, boating, swimming). Ecological receptors include primarily marine biota; the land area is minimal and changes with the tides reducing the likelihood of migrating birds or biota. See **Figure 10-1** for a graphical representation of the conceptual site exposure model.

Figure 10-1: Passage Key ATGGR Conceptual Site Exposure Model



10.4.1 Regional Sensitive Ecological Resources

The State of Florida supports 112 federally-listed threatened and endangered species consisting of 57 animals and 55 plants. According to the Florida Natural Areas Inventory, 10 of these federally-listed species are known to exist in Manatee County. These species are the:

- West Indian Manatee (*Trichechus manatus*),
- Green Sea Turtle (*Chelonia mydas*),
- Loggerhead Sea Turtle (*Caretta caretta*),
- Leatherback Sea Turtle (*Dermochelys coriacea*),
- Kemp's Ridley Sea Turtle (*Lepidochelys kempii*),
- Gulf Sturgeon (*Acipenser oxyrinchus desotoi*),
- Eastern Indigo Snake (*Drymarchon couperi*),
- Bald Eagle (*Haliaeetus leucocephalus*),
- Wood Stork (*Mycteria americana*), and
- Piping Plover (*Charadrius melodus*).

Passage Key, a USFWS National Wildlife Refuge that was established in the late 1940s following the DoD's use of the island and surrounding waters, was at one time a larger, mangrove-covered island with a fresh water lake. Currently, the key consists of only a small sand bar that is mostly submerged depending on the tides. Both the size and location of Passage Key have changed and shifted significantly over time. Storms, such as hurricanes and tropical storms, as well as the key's location at the mouth of Tampa Bay, create changing conditions where sediment erosion and deposition occur constantly. While nesting had not been observed on the island for several years, the key has increased in size due to sediment deposition over the last year or two and now provides a resting area for birds. With the key's location at the mouth of Tampa Bay and because the majority of the site consists of open water, marine mammals, sea turtles, and other protected marine species could be present in the project area depending on the time of year. While seagrass habitats have been identified in the project area (see **Map B-3** in **Appendix B**), the majority of the site consists of a sandy bottom with little to no seagrass, reef, or corals.

Given the potential presence of a variety of protected species, field activities for the RI/FS will be conducted by personnel that have been trained as marine mammal and sea turtle monitors. Equipment will be monitored so damage to the bottom does not occur, including in areas where seagrass could be present. Additionally, agency support will be provided by FWC to monitor for protected species by boat and fixed-wing aircraft during demolition activities where the potential to impact marine species is the greatest. Coordination with FWC, USFWS, USCG, National Oceanic and Atmospheric Administration / National Marine Fisheries Service (NOAA/NMFS), and other agencies began early in the planning process and will continue throughout the field effort.

10.5 Current Land Use

Because of its small size and importance to wildlife, Passage Key is closed to all public use. Although the island is now too small to support nesting birds, it is still under the USFWS jurisdictional control.

Public access is technically restricted at the site, but there are no signs or barriers to prevent access. As such, the key and surrounding waters are routinely used by the public for swimming, boating and fishing.

10.6 Site Description

10.6.1 Climate

The former Passage Key ATGGR is in part of the humid region of the U.S. and is sunny for 65 percent (%) of the year, with the sunniest months being April and May. Afternoon humidity is usually 60% or higher in the summer months, but ranges from 50 to 60% the remainder of the year. Prevailing winds are easterly, but westerly afternoon and early evening sea breezes occur most months of the year. The outstanding feature of the area's climate is the summer thunderstorm season. Thunderstorms occur in the late afternoon hours from June through September. The maximum temperature for the area was recorded at 99 degrees Fahrenheit (ºF) during the month of June, while the minimum temperature was 18ºF in December. During the summer months, some 30 inches of rain falls, which is about 60% of the annual total. The greatest risk of hurricanes has been during the months of June through October. The highest frequency of dangerous lightning occurs during the months of June, July, and August.

10.6.2 Topography and Vegetation

The project area consists of an intermittently submerged sandbar at the entrance to Tampa Bay from the Gulf of Mexico. **Map B-4** in **Appendix B** illustrates the bathymetry from 2007, the most recent year available, in the RI/FS Investigation Area. Water depths surrounding Passage Key ATGGR will be recorded as part of the DGM survey. The soils of the former Passage Key ATGGR are composed mainly of sand and shell fragments. There are two basic types of soil. The first type is beach sand, which is composed of slightly alkaline sand and shell fragments along the Gulf of Mexico shoreline. The majority of the beach deposits are under water during high tides. The second soil type is very similar. It typically has a surface layer that is seven inches thick. It is composed of fine sand and about 10% sand-sized shell fragments. Given the subtropical climate in the Tampa Bay area, there is little to no potential for frost development on the sand bar associated with Passage Key. Vegetation on Passage Key is very limited or non-existent due to the dynamic environment in which the key is located. The sand bar, and historically larger land area, changes in size and location over time due to storms, currents, and erosion/deposition of bottom sediments at the mouth of Tampa Bay where the key is located. The ephemeral nature of the sand bar/land area is affected by the erosion/deposition of sediments and is also subject to lateral movement over time, as well.

10.6.3 Regional Geologic and Hydrogeologic Setting

The two major geologic formations in the region are the Hawthorn Formation of the lower Miocene and the Caloosahatchee Marl of the lower Pliocene. The Caloosahatchee Marl is of marine origin. It consists of sand, sandy clay and marl and is from 2% to 85% shells. The maximum thickness of the formation is about 50 ft. The Hawthorn Formation consists of interbedded sand, clay, marl, limestone, lenses of fuller's earth, and land-pebble phosphate. The surface soils of the area have been identified as Palm Beach and St. Lucie. The Palm Beach series consists of nearly level well-drained shelly sands. Typically, the surface layer, about 20 inches thick, is light gray sand that is about 18% small shells and shell fragments. Below this area are layers of light-gray sand in which the content of shell fragments increases with increasing depth. These layers extend to a depth of 80 inches. The water table is at a depth of more than 40 inches. The soil has very rapid permeability, very low water capacity, low organic-matter content, and low natural fertility. The St. Lucie series consists of shell sub-stratum sand in a nearly level soil. In most places the surface layer is very dark gray fine sand about three inches thick.

Below this is very dark gray fine sand about 34 inches thick. The next layer is very pale brown, loose fine sand that extends to a depth of 40 inches or more. This is underlined by layers of mixed light-gray or white sand, seashells, and shell fragments.

The Floridan aquifer is the principal aquifer supplying most of the water used in the region. It is represented by limestone and dolomites of the Upper Floridan aquifer which includes the Avon Park Limestone and Ocala Group limestones (including the Suwannee Limestone). The top of the Floridan aquifer is defined as the first consistent limestone below which no clay confining beds occur. The configuration of the top of the aquifer is highly variable due to erosion and dissolution of the limestones that form its upper surface. The elevation of the top of the aquifer within the area ranges from 300-450 ft below sea level. The regional direction of ground-water movement in the Floridan Aquifer is from east to west. Recharge of the Floridan aquifer occurs from the overlying water-table aquifer in areas where it is in direct contact with the Floridan or through confining beds between the Floridan and the water-table aquifer.

10.6.4 Regional Hydrologic Setting

Passage Key's location along the west coast of FL at the entrance to Tampa Bay from the Gulf of Mexico.

10.6.5 Cultural Sites

No known historical, archeological, or cultural sites are located within the project site.

10.7 Data Gaps and Uncertainties

To date, there is no data for Passage Key providing anomaly and MEC density, percent coverage, or depth of MEC. Historical information included in the INRP, ASR, and SI reference a surface clearance that was conducted prior to the property being returned to USFWS management following World War II. There is also general information describing the three 100-lb general purpose and one photoflash bombs that were blown-in-place (BIP) at the site in 1998 and where these items were found. An additional 100-lb photoflash bomb was found and BIP in September 2015. While the former target area location is known (see Map B-1 in Appendix B), no concentrated munitions use area (CMUA) has been documented for the site. Because there are no known CMUAs and because only five UXO have reportedly been found since the key's use as a bombing and gunnery range in the 1940s, there is not an unacceptable hazard scenario that currently exists. Passage Key is managed as a National Wildlife Refuge and signs are posted that discourage people from trespassing on the key, which is off-limits to the public. The waters surrounding the key are routinely patrolled by USFWS and other law enforcement officers who are familiar with the key's former use. There are procedures in place per USFWS should UXO be identified at the site in the future. Additionally, the USFWS is not aware of any UXO remaining at the site. An investigation has not been performed at the site to confirm this.

Passage Key's location along the west coast of FL at the entrance to Tampa Bay from the Gulf of Mexico makes it susceptible to littoral drifting of the sand bottom. Storms, including hurricanes, tend to increase the shifting effect. Since the 1940s when Passage Key was used as an air-to-ground gunnery range, strafing range, and bombing target, the location of the key has shifted and the size and shape of the key have changed significantly based on review of bathymetry and historical aerial photography. Due to these constantly changing conditions and the timeframe since the site was used for DoD purposes, it is possible MEC may be located anywhere within the FUDS boundary, and potentially outside of this boundary within the 3,000-foot radius circle for the former bombing target (and, although less likely, beyond the bomb target radius).

MC sampling is not included in the proposed field activities because of the shifting sands and changing configuration at Passage Key and because there are no known or suspected concentrated sources of MEC. Only five 100-pound general purpose and photoflash bombs have been documented as having been found at the site since it was returned to use as a National Wildlife Refuge following its WWII use. In the absence of a concentrated source, MC sampling is not warranted. MC sampling may be considered in the event a CMUA is discovered during the RI. If this occurs, the PDT will be contacted and the plan for MC sampling, if needed, will be discussed and agreed upon.

QAPP Worksheet #11: Project/Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

This worksheet is used to develop and document the project's quality objectives or DQOs using a systematic planning process (SPP). Examples of SPP include: 1) the DQO Process[2], and 2) the USACEs TPP[3]. The JV utilized the DQO process to develop the RI approach for Passage Key ATGGR.

Table 11-1 describes the MEC DQOs using EPA's 7-step DQO process. The selected investigation design is presented in Worksheet #17.

[2] Guidance on Systematic Planning Using the Data Quality Objectives Process, U.S. EPA, EPA QA/G-4, February 2006.
[3] Technical Project Planning Process, U.S. Army Corps of Engineers, EM 200-1-2, August 1998

Table 11-1: MEC DQOs

DQO	Problem Statement	Project Goals	Required Information Inputs	Input Boundaries	Analytical Approach	Performance Criteria	Plan for Obtaining Data
Explanation	*Define the problem that necessitates this study*	*Identify study questions*	*Identify data and information needed to answer study questions*	*Specify the target population and define spatial limits*	*Develop the logic for drawing conclusions from findings*	*Specify probability limits for false rejections and false acceptance decision errors*	*Select the plan that meets the performance criteria*
MEC characterization	Passage Key ATGGR was formerly used as a bombing range during World War II. The site is a shifting sand bar and any historical munitions used at the site could have shifted and/or buried due to the dynamic currents and shifting sands at the site. As a result of the site's use as a bombing range, there is a potential for munitions and explosives of concern (MEC) to be present which may pose a threat to human health and the environment; however, the nature and extent of MEC is not known. Although the	• Are there CMUAs that exist within the RI/FS Investigation Area? • Is there one, or are there several areas, where unacceptable risk scenarios exist due to potential explosive hazards? • What are the types of explosive hazards found at the site, and were they found within or outside of a CMUA? • Are exposure pathways for humans complete? <u>Alternative Outcomes include:</u> • A recommendation for No Further Action (NFA) if no explosive hazards are identified and an unacceptable risk scenario does not exist. • An evaluation of	• Data collected during previous activities, such as historical information (e.g., studies documenting currents, sediment deposition/ erosion, storms, and hurricanes), previous visual survey findings, anomaly locations, and MEC/MD locations prior to removal. • Oceanographic data such as bathymetric and side scan sonar (SSS) data. • Results of visual observations within transects and in grids located on land and/or in shallow water. • Analog (anomaly location) or digital (instrument response and anomaly location) geophysical data. • Results of intrusive investigation of identified anomalies. • Survey of site receptors who access the site via	• The horizontal input boundary is the RI/FS Investigation Area that is based on the historical bombing range boundary (see **Map B-1**). • The horizontal boundary of the investigation will be extended if indications of MEC (i.e., MEC or CMUAs) are found at the investigation area boundary. • The vertical extent of the investigation will be the lesser of the maximum instrument detection depth or 4 ft, which is the planned maximum depth of intrusive investigations	• Search for a CMUA ○ Parameters of Interest: Analog and DGM anomalies detected along transects, transect paths, VSP background anomaly density of 10 anomalies/acre, expected target density average of 40 anomalies/acre above background, a circular target area with a 450-ft radius width, and a transect width of 2-meters. ○ Inferences include: DGM data will be the primary data collected. If DGM data can't be collected in water depths less than 3 ft and on exposed sandbars, then analog geophysical methods will be used to fill in DGM data gaps. The two datasets will be evaluated separately. For DGM, inferences include any DGM signal that is above the anomaly detection threshold as documented in the IVS Letter Report (nominally 5x to 7x the RMS noise at the IVS). For analog, all detected analog anomalies will be evaluated. If the actual background anomaly rate differs from the above, the actual rate will be used to assess transect spacing performance for detecting a CMUA. ○ Decision Rules: All areas flagged as above background will be assessed for their potential to be a CMUA. All remaining areas will be identified as non-CMUA (NCMUA). If at any time during the RI the assumption that a CMUA contain munitions other than 100-lb practice and 100-lb HE bombs, the actual munitions identified will be used to asse4ss transect spacing performance for detecting a CMUA. • Assess areas flagged as above background for their potential to be a CMUA ○ Parameters of Interest: Anomaly density exceeds the critical target area density of 50 anomalies/acre; elevated anomaly density area size is greater than 5 acres. Up to 2 200' x 50' DGM grids will be surveyed within each elevated anomaly area. All detected analog anomalies on the transects will be intrusively investigated to determine their nature. ○ Inferences include: DGM data will be the primary data collected. If DGM data can't be collected in water depths less than 3 ft and on exposed sandbars, then analog geophysical methods will be used to fill in DGM data gaps. Any signal in the DGM grids that is above the anomaly detection threshold as documented in the IVS Letter Report (nominally 5x to 7x the RMS noise at the IVS) and that meets the anomaly selection criteria as documented in the IVS Letter Report and refined in the Anomaly Selection Memo will be intrusively investigated. The Anomaly Selection Memo will document the decision logic for selecting anomalies within each elevated anomaly density area to intrusively investigate. All analog anomalies within potential a CMUA will be intrusively investigated. Anomaly locations along transect paths will be used to differentiate between potential CMUA and NCMUA areas. Intrusive investigation results will be used to define the location(s) and spatial extent of MEC. ○ Decision rules: The Anomaly Selection Memo will outline the protocol for sampling DGM anomalies within potential CMUAs to determine if MEC,	• Project-specific Measurement Performance Criteria (MPCs) are presented in Worksheet #12. Project-specific MPCs are the criteria that collected data must meet to satisfy the DQOs. Failure to achieve the MPCs may have an impact on end uses of the data, which will be discussed in a data usability assessment report.	• Geophysical Transect Surveys ○ Amount and spacing of geophysical transects will be designed to achieve a 90% confidence of traversing a circular high anomaly density area (potential CMUA) with a radius of 450, which is based on a 100-lb practice bomb in the marine environment (see **Section 17.5** in **Worksheet 17** for details on the VSP design). ○ Collect marine DGM and analog data to detect anomalies in 10.5 acres/ 13.2 miles of transects. Transects (2 meter wide) are spaced 403 ft apart as a result of the above design criteria. ○ If indications of MEC are located within 200-ft of the RI/FS Investigation Area boundary, additional transects will be added outside the boundary. ○ Collect analog data (*i.e.*, mag and dig) along transects in areas inaccessible to the marine DGM sensor (*e.g.*, water depths < 3 ft, sand bar). ○ Transects in shallow, near-shore marine (*e.g.*, < 3 ft water depth) and on the exposed sand bar will be completed using a handheld, analog, all metals detectors. ○ For the deeper marine environment (*i.e.*, > 3 ft), identify anomalies using the underwater UXO towed array (UUTA) that consists of the EM61-Flex3 positioned with real time kinematic (RTK) differential global positioning systems (DGPS), a pressure transducer to measure depth below water surface, an inclinometer to measure the angle of the downrigger, SSS, and a bottom finder to measure the depth of the water column to ensure the system stays close to the sediment and does not hit obstructions. • Geostatistical Analysis of Geophysical Anomalies on Transects – Use VSP to: ○ Map anomaly density and distribution. ○ Delineate the approximate boundary of the target area/non-target areas (*i.e.*, the boundary between the high and background or low anomaly density areas). • Marine DGM Grid Survey ○ The randomly placed grid investigation acreage will be designed to determine, with 90%

DQO	Problem Statement	Project Goals	Required Information Inputs	Input Boundaries	Analytical Approach	Performance Criteria	Plan for Obtaining Data
	current and future land uses are known for Passage Key, the nature and extent of UXO presence has not been determined. As such, the RI findings will be used to determine whether an unacceptable risk exists due to explosive hazards. At this time, the existing information for the site and current use does not indicate an unacceptable risk scenario exists.	remedial alternatives in the FS, including alternatives for explosive hazard source removal and for preventing receptor interaction with explosive hazards. The RI data will be used to determine whether areas within the RI/FS Investigation Area exist that present an unacceptable risk to receptors under current and future use scenarios due to the presence of explosive hazards. The if/then statements in the column titled "Analytical Approach" describe the overall decision logic to support answering the study questions.	boat and use the land for either recreational activities (as trespassers) or for ecological monitoring. This information will be used to understand the various human interactions that may occur and how those interactions could create a complete exposure pathway for non-intrusive and intrusive activities based on the explosive hazards, if determined to be present, at the site.	below sand/sediment surface. If no indications of MEC are discovered (i.e., MD, HE munitions fragments, and high anomaly density areas), then the MRS will be determined to be free of MEC contamination within the limits of the investigation. " *Constraints: Field work is scheduled to occur between October and December to avoid natural resource concerns, such as the presence of protected species that occur more frequently outside of this three-month window.*	Material Potentially Presenting an Explosive Hazard (MPPEH), Munitions Debris (MD) or fragments from High Explosive (HE) munitions are located within the elevated anomaly density area. If no indications of MEC are discovered (i.e., no MEC, MPPEH, MD, HE munitions fragments), then the elevated anomaly density area will be determined to be a NCMUA. If a CMUA is identified at the RI/FS Investigation Area boundary, additional DGM transects will be conducted outside of the boundary to delineate the extent of the CMUA. • Assess areas identified as NCMUAs o Parameters of Interest: Transect anomaly density is less than 50 anomalies/acre. Up to 10 200' x 50' DGM grids will be randomly placed across the investigation area, excluding any suspected CMUA, to assess residual MEC hazards and determine if the MEC density in this area is less than 1.0 UXO/acre to a 90% statistical confidence level. All analog transect anomalies will be intrusively investigated, including within NCMUAs. o Inferences include: Any signal in the DGM grids that is above the anomaly detection threshold as documented in the IVS Letter Report (nominally 5x to 7x the RMS noise at the IVS) and meets the anomaly selection criteria in the IVS Letter Report and Anomaly Selection Memo will be intrusively investigated. Anomaly locations along transect paths will be used to differentiate between potential CMUA and NCMUA areas. Intrusive investigation results will be used to define the location(s) and spatial extent of MEC. o Decision Rules: If anomaly density is less than 50 anomalies/acre, the area will be investigated to determine the MEC density. If MEC is identified within the DGM grids, the MEC density will be evaluated to determine whether a) additional MEC investigation is required, or b) the revised MEC density is suitable to meet the project DQOs and anticipated future land uses. • General decision rules: o If there are more than 15% no finds, then the JV will perform a root cause analysis to determine the cause. o If the metallic source of a geophysical anomaly is deeper than 4 ft below the ground surface (on land) or 4 ft below the sediment surface in the underwater environment, then the intrusive investigation will be stopped and the dig team will note that the anomaly source is too deep to recover. o If indications of MEC are identified at the RI/FS Investigation Area boundary, then additional grids and/or transects will be DGM surveyed and anomalies investigated to determine the extent of MEC. o If no indications of MEC are discovered (i.e., no MEC, MD, HE munitions fragments, high anomaly density areas) within the RI/FS Investigation Area, then the RI/FS Investigation Area will be determined to be free of MEC contamination within the limits of the investigation. *Alternative actions will be formulated in the Feasibility Study based on the location and density of MEC, land use, and other data gathered during the investigation and comparison of those data with criteria established herein.*		confidence, a statistical upper bound of 1.0 MEC/acre to represent the greatest potential MEC density in those areas that are not suspected to be CMUAs (*i.e.*, areas outside the target areas). o 2.29 acres with 10 200-foot by 50-foot randomly placed non-CMUA grids using the UUTA. o 0.46 acres with 2 200-ft x 50-ft grids biased CMUA grids using the UUTA. • Intrusive Investigation o All analog transect anomalies will be intrusively investigated. o Within each high anomaly density area, the JV will intrusively investigate anomalies within the DGM grids that meet the anomaly selection criteria to determine if the elevated anomaly density area is a CMUA or is due to another source (e.g., scrap metal). The JV will submit an Anomaly Selection Memo after the DGM grid data is collected to outline the anomaly selection criteria. The anomalies for intrusive investigation will be selected through an anomaly prioritization procedure using primary (e.g., peak response) and secondary (e.g., half amplitude width) anomaly attributes. The preliminary prioritization procedure will be outlined in the IVS Letter Report and the actual anomalies selected for intrusive investigation, and revisions to the prioritization procedure if needed, will be documented in an Anomaly Selection Memo. The goal of the anomaly selections will be to test the Null Hypothesis (i.e., the area is not a CMUA) and the Alternative Hypothesis (i.e., the area is a CMUA). See **Section 17.5.3** for further details. o If no munitions-related finds (i.e., MEC or MDAS) are found within a high anomaly density area, then it will be concluded that the high anomaly density area is not a CMUA. o All DGM anomalies exceeding anomaly selection criteria in randomly placed grids will be intrusively investigated. o Additional anomalies along DGM transects may be selected to further delineate MEC, if MEC is found near the RI/FS Investigation Area boundary or within non-CMUAs. o Intrusive results will be used in the MEC hazard assessment to determine the MEC hazard levels for the site. o The amount of randomly placed DGM grid surveys was determined to provide a 90% confidence that the non-CMUAs have less than 1.0 UXO/acre.

DQO Table Reference: Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA//G-4, EPA/240/B-06/001, February 2006

QAPP Worksheet #12: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Table 12-1: Measurement Performance Criteria

Measurement Performance Activity (or Definable Feature of Work [DFW])	Data Quality Indicator (DQI)	Specification	Activity Used to Assess Performance
DFW1: Pre-Mobilization Activities	Completeness	Project planning documents, including the QAPP, ESP, Dive Plan, Accident Prevention Plan, the GIS database is established and the project ftp site is created.	Acceptance of planning documents by USACE and concurrence by regulatory agencies. Verification that GIS database and ftp site are established. USACE provides notice to proceed with fieldwork.
DFW 2: Mobilization/Site Preparation	Completeness	All staff and equipment is mobilized to the site. Field personnel review documents and the SUXOS and UXOSO/UXOQC provide site specific training to all field personnel. A civil surveyor establishes survey control monuments.	SUXOS submits daily report documenting that mobilization is complete and site-specific training is accomplished. District Dive Coordinator provides notice to proceed with diving operations. Civil surveyor provides signed documentation of the locations of the control monuments.
DFW 3a: GSV (IVS)	Accuracy/ Precision/ Completeness	Instrument verification strip is developed and surveyed with DGM equipment twice on the initial day on site.	IVS Letter Report
DFW 3b: GSV (QC Blind Seeding)	Accuracy/Precision	All blind seeds placed in DGM grids must be detectable and located within areas that are subject to the survey. Blind seeds will be distributed such that the field team can be expected to encounter an average of one blind seed per day.	Verification of blind seed placement.
DFW 4: Detection surveys along DGM transects	Sensitivity	DGM anomalies selected using the anomaly detection threshold as defined in the IVS Letter Report to identify anomalies associated with MD and UXO for the purpose of performing VSP analysis.	IVS Letter Report and data verification.
DFW 4: NCMUA Sampling	Completeness	Sufficient number of acres investigated to provide 90% confidence that there is not more than 1.0 UXO/acre to a 90% confidence level.	Data verification/data validation
DFW4: Detection surveys in DGM grids	Accuracy/Completeness	100% of QC seed items are detected within the project specifications.	Data verification/data validation
DFW4: Detection surveys in CMUA grids	Sensitivity	All anomalies that meet the anomaly selection criteria, as documented in the IVS Letter Report and Anomaly Selection Memo, that are required to identify anomalies associated with MD and UXO for the purpose of prioritizing anomalies in potential CMUAs for intrusive investigation.	IVS Letter Report, Anomaly Selection Memo, Data verification / data validation
DFW4: Detection surveys in NCMUA grids	Sensitivity	Anomalies that meet the anomaly selection criteria, as documented in the IVS Letter Report and Anomaly Selection Memo, that are required to identify anomalies associated with UXO for the purpose of testing hypothesis that there is not more than 1 UXO/acre present.	IVS Letter Report, Anomaly Selection Memo, Data verification / data validation
DFW 5: Detection surveys along analog transects	Sensitivity	Analog anomalies with a response greater than a medium ISO to identify anomalies associated with MD and UXO for the purpose of performing VSP analysis.	Analog function test strip and field QC
DFW 6: Geostatistical Analysis	Completeness	Transect spacing achieves 90% confidence of traversing a circular target radius of 450 feet.	VSP analysis of transect data.

Measurement Performance Activity (or Definable Feature of Work [DFW])	Data Quality Indicator (DQI)	Specification	Activity Used to Assess Performance
DFW 7: Reacquire Anomalies	Accuracy/Completeness	All DGM anomalies selected for intrusive investigation are reacquired within the project MQOs.	Verification of reacquisition and intrusive investigation results.
DFW 8: Intrusive Investigation	Accuracy/Completeness	All DGM anomalies selected for intrusive investigation and all detected anomalies are intrusively investigation.	Verification of intrusive investigation results.
DFW 9: Anomaly Resolution	Completeness/Accuracy	Analog anomalies will be resolved (i.e., no metal left in the ground).	Verification of anomaly resolution digs.
DFW 10: Demobilization	Completeness	Field personnel and equipment are demobilized from the site and the site is returned to its original condition (e.g., temporary survey control monument is removed).	Final Daily Report from SUXOS.
DFW11: Final Report	Completeness	RI report written to document the field work completed.	Inspection/acceptance of data deliverables.

QAPP Worksheet #13: Secondary Data Uses and Limitations
(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Data type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Historical site use and previous visual surveys and investigations	INPR (USACE, 1993; and 2000 [revised])	The INPR summarizes the historical use of Passage Key ATGGR and provides details of a site visit performed in 1993 and 2000.	There are no known limitations on the information presented in the INPR.
	ASR (USACE, 2002)	The ASR summarizes the historical use of Passage Key ATGGR.	There are no known limitations on the information presented in this report.
	ASR Supplement (USACE, 2004)	The ASR Supplement summarizes the historical use of Passage Key ATGGR.	There are no known limitations on the information presented in this report.
	SI Report (USACE, 2008)	The SI summarizes work completed to confirm the site location and to evaluate the evidence for the presence of MEC and MD at the site.	There are no known limitations on the information provided for this project.

QAPP Worksheet #14/16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

The project schedule, including the specific task/activity and the person or group responsible for execution is provided in the following table. The complete schedule for this project timeline, including planning document preparation and field activities, report preparation, and meeting support, is presented in **Appendix H** of this QAPP. Note that the schedule is subject to updates and revisions based upon field conditions. A general schedule is provided below.

This worksheet introduces the project definable features of work (DFWs) and tasks that will be performed to meet the requirements and objectives of the RI. Refer to Worksheet #17 for further details on each DFW as shown on Table 14-1.

Table 14-1: Definable Features of Work and Project Tasks

Definable Features of Work	Project Tasks	QAPP Reference
DFW 1: Pre-Mobilization Activities	Prepare RI QAPP and appended documents Prepare Explosives Site Plan (ESP) Prepare Dive Plan Set up Geographic Information System (GIS) Set up project file transfer protocol (ftp) site Subcontractor and UXO Technician Procurement	Worksheet #17 (Section 17.2)
DFW 2: Mobilization/Site Preparation	Mobilize staff and equipment On-site document review Establish communication and logistics Site-specific training and verification Perform survey to establish control monuments	Worksheet #17 (Section 17.3)
DFW 3: Geophysical System Verification (GSV)	Establish IVS Perform initial IVS survey and prepare IVS Letter Report	Worksheet #17 (Section 17.4)
DFW 4a: DGM Transect Survey	Perform DGM data collection Process DGM data and prepare target list (SOP-01)	Worksheet #17 (Section 17.5)

Definable Features of Work	Project Tasks	QAPP Reference
DFW 4b: DGM Grid Survey	Perform DGM data collection Process DGM data and prepare target list	Worksheet #17 (Section 17.5)
DFW 5: Analog Geophysical Survey	Perform analog transect surveys in shallow water and on exposed sandbar (SOP-02)	Worksheet #17 (Section 17.6)
DFW 6: Geostatistical Analysis	Perform VSP Geostatistical Analysis of DGM and analog transects	Worksheet #17 (Section 17.7)
DFW 7: Reacquire Anomalies	Reacquire marine DGM anomalies selected for intrusive investigation (SOP-03)	Worksheet #17 (Section 17.8)
DFW 8: Intrusive Investigation	Excavation of anomalies Transportation of Explosives (SOP-04) Demolition of MEC (SOP-05) MEC, MPPEH, and MDAS Inspection and Disposal (SOP-06) Monitoring for T&E Species QC	Worksheet #17 (Section 17.9)
DFW 9: Anomaly Resolution	Verify recovered objects are consistent with predictions based on analog data (SOP -07)	Worksheet #17 (Section 17.10)
DWF 10: Demobilization	Tear-up/clean-up site Demobilize staff and equipment	Worksheet #17 (Section 17.11)
DFW 11: Final Report	Prepare RI/FS report	Worksheet #17 (Section 17.12)

Table 14-2: Project Schedule and Deliverables

Activity	Responsible party	Deliverable(s)	Deliverable due date
DFW 1: Pre-Mobilization Activities			
Final QAPP	Susan Burtnett, *JV PM*	Draft and Draft Final QAPP Submittals	One week after resolution of Draft Final comments and following USATCES and DoD Explosives Safety Board (DDESB) approval of the ESP.
DFW 2: Mobilization/Site Preparation			
Mobilization	Jeffrey Moleski, *JV SUXOS*	Field notes, DQCR	Weekly submittals due Friday of the week following for which the activity was performed.

Activity	Responsible party	Deliverable(s)	Deliverable due date
Site Orientation/Equipment Set up	Jeffrey Moleski, *JV SUXOS*	Field notes, DQCR	Weekly submittals due Friday of the week following for which the activity was performed.
DFW 3: GSV			
IVS	Steve Stacy, *JV Senior Geophysicist*	IVS Letter Report	Draft due within one week of completion of initial IVS.
DFW 4a: DGM Transect Survey			
Side Scan Sonar	Steve Stacy, *JV Senior Geophysicist*	Field notes, DQCR	Weekly submittals due Friday of the week following for which the activity was performed.
DGM Transects Data Collection and Processing	Steve Stacy, *JV Senior Geophysicist*	MEC Data Package Phase Ia, DGM Data	DGM data deliverables for each week's data collection are due by the following Friday.
DFW 4b: DGM Grid Survey			
DGM Grids Data Collection and Processing	Steve Stacy, *JV Senior Geophysicist*	MEC Data Package Phase Ib, DGM Data	DGM data deliverables for each week's data collection are due by the following Friday.
DFW 5: Analog Geophysical Survey			
Analog Transects	Jeffrey Moleski, *JV SUXOS*	MEC Data Package Phase Ic, Analog Data	Analog data deliverables for each week's data collection are due by the following Friday.
DFW 7: Reacquire Anomalies			
Reacquisition	Steve Stacy, *JV Senior Geophysicist*	MEC Data Package Phase II, Intrusive Investigation	Draft reacquisition results provided one day after data collected. Final data provided one week after completion of
DFW 8: Intrusive Investigation			
USACE Dive Inspector Review/Check-out Dives	Jeffrey Moleski, *JV SUXOS*	Field notes, DQCR	One week after completion of dive inspector review.
Intrusive Investigation Results of Target Anomalies	Jeffrey Moleski, *JV SUXOS*	MEC Data Package Phase II, Intrusive Investigation	One week after intrusive investigation complete per grid/transect.
Handling, Inspection, and Disposition of MEC, MPPEH, and MDAS	Jeffrey Moleski, *JV SUXOS*	Field notes, DQCR	Weekly submittals due Friday of the week following for which the activity was performed.
DFW 10: Demobilization			
Site Tear-up/Demobilization	Jeffrey Moleski, *JV SUXOS*	Field notes, DQCR	Weekly submittals due Friday of the week following for which the activity was performed.
DFW 11: Final Report			
Summarize Field Activities	Susan Burtnett, *JV PM*	Draft RI Report	Four weeks after completion of field activities.
TPP-2	Project Team	Field notes	One week after meeting.

Activity	Responsible party	Deliverable(s)	Deliverable due date
Draft Final/Final RI Report	Susan Burtnett, *JV PM*	Draft Final/Final RI Report	Four weeks after receipt of Draft/Draft Final comments

Note: The project schedule, which includes actual and projected dates for project tasks/DFW, is included in Appendix H to the QAPP for reference.

Data Management

Data generated during the project will be stored in hard copy and electronic form by the JV. Data deemed critically important will have multiple electronic versions archived. Following completion of each deliverable, data will be transferred to USACE.

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #17: Project Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

The MEC RI field activities are intended to determine the nature and extent of MEC within the Passage Key ATGGR in areas where previous investigations have not adequately characterized the nature and extent of MEC in order to determine whether an unacceptable explosive hazard exists at the site. This worksheet describes the project definable features of work (DFWs) and tasks that will be performed to meet the requirements and objectives of the RI. The following sections provide the JV's technical approach for completing geophysical and MEC intrusive investigations to fully characterize the nature and extent of MEC within the RI/FS Investigation Area to the required confidence levels to determine whether there is an unacceptable explosive hazard.

17.1 Overall Approach Rationale

The JV's MEC technical approach for the Passage Key ATGGR RI/FS has been developed using VSP to ensure a high confidence in determining the nature and extent of MEC. The MEC technical approach is based on the statistical requirements contained within the PWS (**Appendix A**). The MEC objective of the RI is to adequately characterize the nature and extent of MEC within the RI/FS Investigation Area to determine if there is an unacceptable explosive hazard. If an unacceptable explosive hazard exists, then a FS will be used to develop remedial action alternatives to address the unacceptable hazard. If an unacceptable explosive hazard is not identified, a FS will not need to be prepared.

The JV will perform all of the necessary field activities to meet the objectives of this task and the DQOs established for the project (see Worksheet #11). Specifically, the JV's MEC approach includes the following field activities:

- DGM and analog transects designed in VSP to traverse and detect elevated anomaly density areas (*e.g.*, practice or high explosive [HE] impact/target areas) with a 90% confidence level;
- Geostatistical analysis of DGM transects to determine anomaly densities and distribution;
- Randomly placed DGM grids designed in the RI Module of VSP (using UXO Estimator equivalent settings) outside of identified high anomaly density areas to verify that the MEC density is less than 1.0 UXO/acre;
- Biased DGM grids within high anomaly density areas;
- Reacquisition and intrusive investigation of anomalies on DGM and analog transects and within DGM grids; and
- MD/MPPEH handling and explosives demolition.

17.1.1 Additional Performance Objectives

The JV will also meet the following performance objectives in compliance with the PWS:

- Boundaries of all identified MEC contaminated areas and areas likely to contain MEC will be delineated by the transect design to an accuracy of less than +/- 250 ft.
- Within elevated anomaly density areas, DGM grid surveys and intrusive investigations will ensure that a 90% confidence in the nature (type, density and potential depth) of MEC and MEC-related debris, for each high anomaly density area, is achieved.

- The potential depth of MEC will be bound to at least 90% confidence.
- DGM surveys and intrusive investigations within MEC impacted areas will ensure that remedial cost drivers are correctly estimated to +50% / -30% accuracy.

Table 14-1 presents the various DFW for this RI, the activities associated with each DFW, the SOPs where the procedures for these work elements are discussed, and other supporting documentation. RI field SOPs (*i.e.*, SOPs 1-7) are located in **Appendix K** of this QAPP. The below sections provide brief summaries of the DFWs and the associated activities.

17.2 DFW1: Pre-Mobilization Activities

17.2.1 Prepare QAPP

This QAPP will be prepared, finalized, and accepted by USACE prior to mobilizing to the project site.

17.2.2 Prepare ESP

The ESP will be prepared, finalized, and approved by the DDESB prior to starting intrusive work or handling explosives.

17.2.3 Prepare Dive Plan

The Dive Plan will be prepared, finalized, and approved by the District Dive Coordinator prior to conducting dive operations.

17.2.4 Prepare Accident Prevention Plan

All work conducted during the RI field activities at the former Passage Key ATGGR will be performed IAW the final APP and Site Specific Health Plan, found in **Appendix D.**

17.2.5 Set up GIS database

A project GIS database has been established and all relevant geospatial-related data and information will be maintained in this GIS database. See Worksheet #29 for GIS data management specifications.

17.2.6 Set up project ftp site

The JV has set up a project ftp site where documents will be made available to members of the project team. The site has password security with separate passwords for USACE and project stakeholders. Documents and data will be complete and placed on the website within a day of submittal of documents to USACE. The web address for the ftp site is: http://clientftp.arcadis-us.com/thinclient.

17.3 DFW2: Mobilization/Site Preparation

17.3.1 Mobilize Staff and Equipment

At the field start date, the geophysical team and UXOSO will deploy to Passage Key ATGGR after approval of the RI QAPP. The UXO team will deploy prior to diving operations commencing and after approval of the ESP. General mobilization activities include the following:

- Identify/procure, package, ship, and inventory project equipment;
- Coordinate with local agencies, including police, hospital, and fire department, as appropriate;
- Coordinate communications and logistical support (*e.g.*, establishing radio communication on the water and cellular communication with resources on land);
- Finalize operating schedules;
- Test and inspect equipment (See Worksheet #22 for details);
- Assemble and transport the work force;
- District Dive Coordinator (or designated dive inspector) review and acceptance of the dive team;
- Conduct site-specific training on the QAPP and MEC procedures and hazards; and
- Verify that all forms and project documentation are in order and JV personnel understand their responsibilities with regard to completion of project reporting requirements.

17.3.2 On-site Document Review and Communication/Logistics

The UXO and geophysical teams will review all documents prepared during Pre-Mobilization Activities (DFW 1) before commencing field activities. The site management team will also establish communication and logistics for project coordination.

17.3.3 Site-specific Training

Site-specific training will be conducted IAW **Table 17-1** and the SOPs included in **Appendix K**.

17.3.4 Location Surveys and Mapping Plan

Site preparation for the geophysical investigation is limited to performing a civil survey to establish survey control monuments that can be used as GPS base station locations throughout the project. George F. Young, Inc., a FL professional licensed surveyor (PLS), will establish two control monuments on Anna Maria Island. Horizontal control Class I, third order will be established for all new primary control monuments established by the FL PLS. Horizontal control is referenced to North American Datum of 1983 (NAD83), FL State Plane Zone West, with units of U.S. survey ft. The surveyed geographic position and State Plane coordinates will be referenced to the primary control monuments established for the project. Vertical control or topography will not be surveyed. For analog data collection (*e.g.*, analog transects), a Trimble GeoXT, or equivalent, hand-held GPS with sub-meter accuracy will be used to provide the data positioning accuracy required to meet the RI objectives.

The JV will use survey control points as RTK DGPS base stations within radio line-of-sight to the survey area. For survey in open areas, the RTK DGPS base station will be set up on one survey control point and the rover RTK DGPS will be used to reoccupy a second control point to confirm that the base station is set up properly and that the RTK DGPS is working within project requirements.

Survey control locations will be incorporated into the project GIS and submitted IAW DID WERS-007.01 and IGD 14-01 (EM 200-1-15).

Table 17-1: Personnel Training Requirements

Project Function by DFW	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records / Certificates
Pre-Mobilization Activities	MEC Safety Training	UXOSO, SUXOS	Prior to participation in field activities	Personnel entering exclusion zones	All JV UXO personnel working on site	The JV will maintain records on site.
	29 Code of Federal Regulations 1910.120 Training	Vendor	Prior to arriving on site	All personnel		
Mobilization/Site Preparation	Site orientation and UXO avoidance	SUXOS	Upon arrival at site			
	Accident prevention and first aid	UXOSO				
	Overview of project plans and ESP	Senior Geophysicist/ SUXOS				
DGM Data Collection and Data Processing	SOPs for Underwater DGM	NAEVA / 3Dgeophysics Project Manager	Prior to participation in field activities	Geophysical field team	All NAEVA / 3D geophysics DGM data collection field team members.	
Target Reacquisition	SOPs for target reacquisition	NAEVA / 3Dgeophysics Project Manager	Prior to participation in field activities	Geophysical field team	All NAEVA / 3D geophysics DGM reacquisition field team members.	
Intrusive Investigation	Refer to Dive Plan in **Appendix J**	SUXOS	Prior to participation in field activities	UXO teams	All JV UXO personnel working on site	

17.4 DFW3: GSV

The JV will implement the GSV process IAW the Final Geophysical Systems Verification Report [Environmental Security Technology Certification Program (ESTCP), 2009]. The GSV is a key component of ensuring that the DGM data quality is sufficient to meet the project DQO requirements and is used to monitor and verify DGM sensor functionality during the RI geophysical mapping activities. On terrestrial sites, the GSV approach uses an IVS and a blind seeding program in production DGM grids and transects. Due to the inherent difficulties in ensuring that blind seeds are traversed in the marine environment, blind seeding will not be performed on the DGM transects at Passage Key.

17.4.1 GSV Objectives

The GSV objectives include:

- Demonstrate that the geophysical investigation system/equipment, are operating properly;
- Verify or establish final DGM performance metrics;
- Verify IVS seed item detection;
- Identify an EM61-Flex3 time gate from the leveled responses for the two channels (*e.g.*, Gate 2 recommended);
- Confirm IVS seed item amplitude repeatability;
- Confirm IVS seed item position reproducibility;
- Establish dynamic background root mean square (RMS) noise levels for the late time gate; and
- Establish initial anomaly selection threshold (typically 5 to 7 times the RMS noise value to ensure good signal to noise ratio).

17.4.2 IVS Design

The JV will determine the approximate IVS location prior to the start of field activities in a marine area that is protected from significant wave action. The IVS will be established in an easily accessible marine portion of the site that is relatively free of background anomalies. NAEVA Geophysics, Inc. (NAEVA), assisted by 3D Geophysics, Inc. (3Dg), will use a marine EMI sensor to select a final IVS location that is sufficiently free of background anomalies, including a line for seed items and a line for dynamic background noise measurements. Once the IVS site is located, NAEVA and 3Dg will collect and process a background EMI survey to document background conditions. The IVS will be constructed in an area with water depths less than approximately 10 ft at low tide.

The IVS will be linearly seeded with two25-pound weights positioned on the underwater sediment floor surface IAW **Table 17-2**.

Table 17-2: Marine IVS Seed Items

Item	Identifier (ID)	Distance (ft)	Depth to Center (in)	Orientation
1	25-lb weight	0	0	Horizontal
2	25-lb weight	50	0	Horizontal

The seeds will be placed in the IVS and distributed approximately 50 ft apart to prevent overlapping signals. The proposed IVS seed locations are presented on **Table 17-2** as distances along the length of the IVS centerline. The items will be placed horizontally. The IVS seeds will not be placed near anomalies identified during the background survey.

Seed locations will be surveyed with the RTK DGPS using a base station established by George F. Young and a GPS rover on the boat. The seed items will be emplaced by putting a rigid pole vertically in the water and dropping the 25-lb weights down the pole. The weights will have an opening in the middle of the weight and will be dropped around the outside of the pole. The pole will be positioned using a tilt-meter to ensure it is vertical and the RTK DGPS rover will be used to measure the horizontal location of the top of the pole. The JV will measure the depth of water using the rigid pole with depths listed on the pole to determine the depth of water to the item. Depth measurements will be made with the echo sounder at the time of IVS data collection on a daily basis. The item parameters (*i.e.*, the surveyed location, size, water depth, and orientation) will be recorded and entered into the project's Microsoft Access Database. The locations of the seed items will be recorded in order to navigate to the same location every day to conduct the IVS.

17.4.3 Marine DGM Geophysical Equipment

NAEVA and 3Dg will collect marine DGM data using an UUTA developed by 3Dg. The UUTA includes a sensor support platform (whale tail) and a rigid down-rigging system and uses a high-power EM61-Flex3 system, which is based on the Geonics EM61-MK2 metal detector. The EM61-Flex3 consists of two air-cored 1.0 x 0.5 meter receiver coils arranged side-by-side with the long axis oriented in the across-line direction inside a 2.0 x 0.5 meter transmitter coil. The maximum survey depth for the UUTA is 45 ft; however, survey speeds slow to approximately 1 mile per hour at this depth. In addition, surveys might need to be performed in a single direction with the tides during periods of tidal flux. Specification for the UUTA and EM61-Flex 3 are included in the SOP for Underwater DGM (see SOP-01 in **Appendix K**).

17.4.4 IVS Procedure

On the first day of data collection, NAEVA and 3Dg will collect IVS data over the seed items and along an RMS noise line in three passes to enable calculation of an average response. The JV will evaluate the marine IVS data from the first day to determine a baseline response and target location for each seed item. Background noise information, to compare against the production surveys, will also be used.

After the initial IVS survey, NAEVA and 3Dg will not need to collect daily IVS data. Instead, they will collect morning and evening static tests to document that the instrumentation is operating as intended. NAEVA and 3Dg will process the data similarly to the production mapping data. The noise levels in the DGM data will be monitored throughout the day to ensure that the noise is consistent with that recorded during the morning static test.

The JV will then evaluate the first day's marine IVS data to:

- Verify seed item response – establishes baseline response for subsequent daily checks;
- Verify positioning accuracy for the marine navigational system; and
- Establish dynamic RMS noise levels (RMS Noise Line).

NAEVA and 3Dg will process and analyze the DGM data using Geosoft's Oasis Montaj, including the UX-Detect module. This will include performing sensor drift removal and latency corrections where appropriate.

An MS Access database IAW DID WERS-004.01 will be used to track all data files. The JV will analyze the IVS data for peak seed item responses on the late time gate. The background line will be analyzed for RMS noise value for each time gate. The RMS noise values will be compared to the peak seed item responses to assess their detectability (*e.g.*, signal peak response to background noise ratio). The JV will present in the IVS Letter Report the initial threshold (typically five to seven times the background RMS noise value) to select anomalies that will maximize the IVS seed item detections while minimizing background noise anomaly selections.

The project field team will review the marine IVS results with the rest of the JV and if all objectives and performance metrics have been met, then a consensus will be made to transition immediately to production DGM. If any objective or performance metric cannot be achieved or agreed upon, a corrective action will be performed and the IVS redone until consensus is reached to proceed to production DGM.

If any marine instrument does not meet the standard set at the IVS, it will be repaired or replaced. Operational and test procedures will conform to manufacturer's standard instructions. All marine geophysical instruments and equipment used to gather and generate field data are maintained and checked with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Prior to starting dive operations, the reacquisition team will reacquire IVS targets using the procedures outlined in the target reacquisition SOP-03 (see **Appendix K**). Each IVS seed item will be reacquired and evaluated regarding location accuracy. The reacquired location will be compared to the original location as measured to evaluate the effectiveness of the marine reacquisition process.

17.4.5 Blind Seeding

The marine geophysical transects will not be seeded with BSIs due to the difficulty guaranteeing that the geophysical survey will directly pass over the BSI and because seed items may migrate due to wave action over much of the marine production area. For marine geophysical transects, the dynamic repeatability will be tested daily at the IVS IAW Worksheet #12 of this QAPP.

Blind seeds will be placed at a frequency of at least one blind seed per day of DGM grid data collection and it is anticipated that three blind seeds will be placed in the 100% coverage DGM grids. The blind seeds will consist of 25-lb weights. If the seeds are placed in shallow water, the seeds will be placed and the horizontal position recorded with an RTK DGPS using the same procedures as the IVS seeds (see **Section 17.4.2**). If the seed locations are placed in DGM grids in water too deep to measure water depth with a pole, the blind seeds will be placed on the sediment floor and be tied to a buoy line. The buoy line will be pulled tight so that it's straight and a GPS location will be recorded with the RTK DGPS.

17.4.6 GSV Results

The initial results of the marine IVS will be discussed between the Senior and Site Geophysicists and the USACE QA Geophysicist. The average noise and background values across the unseeded RMS noise line will be calculated and monitored after the initial IVS. The GSV results will be included in the digital geophysical data packages.

After the IVS fieldwork has been completed and a consensus has been reached to transition into production DGM, the Senior Geophysicist will prepare an IVS data package and an IVS Letter Report including the following:

- As-built drawing of the marine IVS;
- All raw and processed geophysical data, including maps and IVS seed item response profiles;
- Pictures of the seeds;
- Proposed threshold for QC checks
- Proposed anomaly selection criteria; and
- Summary of the IVS results, including daily instrument check results.

The IVS Letter Report will be submitted in draft form within one week of the IVS fieldwork and the final IVS Letter Report will be provided two weeks after receipt of comments on the draft report. The final IVS Letter Report will be included as an appendix to the RI Report.

17.4.7 Analog Instrument Functionality Tests

Analog geophysical processes do not use the IVS; therefore, UXO technicians will establish an instrument test strip (ITS) to demonstrate the functionality of analog detection equipment being used during the MEC investigation and the ability of the equipment operator to detect subsurface anomalies.

The ITS will be linearly seeded with one small ISO and one medium ISO. The seed items will be buried by the UXOQC.

The ISOs listed in **Table 17-3** are Schedule 80 pipe nipples, threaded on both ends, made from black welded steel and manufactured to an ASTM specification. The seed items will be buried IAW **Table 17-3**. IAW DID WERS-004.01, the seed items will be buried between 95-100% of the maximum detection depth of the EM61-MK2. The burial depths presented in **Table 17-3** are approximately 95% of the maximum detection depth for Channel 3 of the EM61-MK2, assuming a 3 mV detection threshold.

Table 17-3: Analog ITS Seed Items

Item	Identifier (ID)	Distance (ft)	Depth to Center (in)	Orientation
1	Small ISO	0	6.7	Horizontal Across Track
2	Medium ISO	10	22	Horizontal Across Track

The ISO seeds will be placed in the ITS and distributed approximately 10 ft apart to prevent overlapping signals. The proposed ITS seed locations are presented on **Table 17-3** as distances along the length of the centerline. The seeds will not be placed near anomalies identified during the background survey.

The JV will measure the depth of each seed item using a measuring tape. The item parameters (*i.e.*, the location, size, depth, and orientation) will be recorded and entered into the project's Microsoft Access Database.

The ITS will be swept at the beginning of fieldwork activities each day. A White's XLT all-metals detector (or equivalent) or SubSurface Instruments, Inc. ML-3 hand-held magnetometer, depending on the amount of ferrous items, will be the selected analog instrument. If an instrument is found not to be functioning properly during the daily function test, it will be replaced and not used during the field activities until it has been repaired and passes the function test. The SUXOS and UXOQCS/UXOSO will perform additional training if a technician does not successfully demonstrate the required level proficiency at the ITS on a daily basis.

17.5 DFW4: DGM Survey

Marine DGM transect and grids as well as analog transect surveys (discussed in **Section 17.9**) are planned for the Passage Key ATGGR RI/FS field investigation. These are described in the subsections that follow.

17.5.1 DFW4a: Marine DGM Transect Data Collection

NAEVA and 3Dg will collect approximately 13.2 miles (10.5 acres) of marine DGM transects using an UUTA developed by 3Dg and EM61-Flex3 system along transects spaced 403 ft apart. **Map B-5** in **Appendix B** shows the transect locations for Passage Key ATGGR RI/FS Investigation Area.

The JV used VSP to determine the transect spacing required to ensure a 90% confidence level of identifying a circular impact area (*e.g.*, areas with elevated anomaly densities relative to background) that has a radius less than 450 ft. Based on the ASR (2002), 100-lb general purpose and 100-lb photoflash bombs were found in 1998. These are the most conservative (*i.e.*, smallest fragmentation distance) HE munitions likely used at Passage Key. VSP's default target area radius for these munitions is 714 ft. Using the default value for HE munitions would lead to a transect design that had a transect spacing greater than 500 ft apart and, therefore, would not meet the PWS requirements of delineating the target area boundary with an accuracy of +/- 250 ft. For this reason, the JV decreased the target area radius to 450-ft to obtain more closely spaced transects to factor in site characteristics and the PWS requirements. The JV will collect DGM data along 2-m wide transects spaced 123 meters, or 403.5-ft, apart on centers. **Table 17-4** shows the VSP transect design parameters that were used to design the RI survey. After the RI transects are collected, the actual transect survey paths will be evaluated in VSP to assess the post-survey probability of traversal of potential target areas.

Table 17-4: VSP Transect Design

Summary of Sampling Design	
Primary Objective of Design	Ensure high probability of traversing and detecting a target area that has a specific size and shape
Required Probability of Traversing the Target	100%
Target Area and Transect Inputs	
Type of Sampling Design	Transects
Transect Pattern	Parallel

Transect Width	1 meters
Area of Target Area	647 acres
Shape of Target Area	Circular
Radius of Target Area	450 feet
Simulation Parameters for Probability of Detection	
Formula for calculating the probability of traversing and detecting target area	Monte Carlo simulation
Background Density of the Site	10 anomalies/acre
Expected target area Density above Background	40 anomalies/acre target average
Distribution of target area density above background	Bivariate Normal
Transect spacing evaluation range	45 to 206 meters
Minimum precision	0.03
Maximum error	0.01
Search window diameter	246.888 meters
Proposed Transect Design	
Number of Selected Sample Areas	1
Specific sampling area	812,0940,454 in^2
Computed spacing between transects	121 meters
Computed spacing between transect centers	123 meters
Number of transects to be surveyed	15
Transect Coverage	1.62% of total site area
Linear Transect Coverage	13.2 miles
Area of Transect Coverage	10.496 acres

As shown on **Map B-2** (**Appendix B**), a small sand bar is present and is located approximately at the northwest corner of and along the western FUDS boundary. Given the amount of time that has passed since the bombing range was used, and the known movement of the key, the JV will collect DGM data along the transects of the RI/FS Investigation Area to ensure that the nature and extent of MEC is determined during the RI. The JV anticipates collecting most of the transect data using the marine DGM approach; however, data collection in the near-shore (less than three ft deep) areas and along the exposed portion of the sand bar will be conducted using an analog geophysical approach (see Section 17.7). Marine DGM transect data will be collected using the procedures outlined in **SOP-01** (see **Appendix K**).

17.5.2 DFW4b: Marine DGM Grid Data Collection

The JV used the RI module in VSP to determine the amount of DGM grids to conduct to show that there are less than 1.0 UXO/acre to a 90% confidence level outside of MEC impacted areas (*i.e.*, NCMUAs). The JV will collect a total of 2.28 acres, or 10 200-ft x 50-ft, of randomly placed grids in NCMUAs. In addition, the JV will collect up to two 200-ft x 50-ft grids within potential CMUA(s) to determine the nature and extent of MEC within the CMUA(s). Intrusive investigation will also be conducted along transects in potential CMUA(s) to further delineate the nature and extent of MEC. The proposed non-target area grid locations are shown on **Map B-5** (**Appendix B**); however, these grid locations are subject to change based on the geostatistical analysis results of the DGM and analog transect data. Target area grid locations will be determined based on the transect data and are not shown on the figure. NAEVA and 3Dg will collect the DGM data using the UUTA and EM61-Flex3 that are described in **Section 17.4.3** and in SOP-01 (see Appendix K). DGM data will be collected across each DGM grid using lines spaced 1.25-m (4.101-ft) apart for the 2-meter (6.56-ft) wide platform to ensure overlapping data is collected. DGM grid corners will be established in the project GIS and loaded into the navigation system of the UUTA. Lines will be collected until at least 90% of the grid has been covered with the project line spacing IAW the MQOs listed in Worksheet #12.

17.5.3 DGM Data Processing

17.5.3.1 Introduction

The JV will use Geosoft's Oasis Montaj, including the UX-Process and UX-Detect Modules, to process and analyze DGM data. The JV will perform daily QC and data processing of all data sets in the same manner as demonstrated and established at the IVS. This section is not applicable to analog geophysical transects. The DGM data will be processed and anomaly selection criteria will be established to determine anomalies potentially representative of UXO. These selection criteria may include anomaly characteristics, such as: anomaly magnitude; anomaly size; signal to noise ratio; time constant ranges; anomaly decay curve analysis; and other pertinent anomaly characteristics. The JV will implement a sequential anomaly selection and excavation feedback process to refine the anomaly selection process, if needed, throughout the project. The JV will use Geosoft Oasis Montaj for data processing, interpretation, and presentation. The DGM data will be acquired, processed, and QC checked IAW DID WERS-004.01 and EM 200-1-15.

17.5.3.2 Data Processing

Initial field pre-processing and standard data processing procedures are outlined in the SOP for Underwater DGM (see SOP-01 in **Appendix K**).

17.5.3.3 Anomaly Identification and Dig Selection Criteria

The JV will determine the optimum anomaly selection criteria (*e.g.*, time gate, selection threshold, half-amplitude width), data gridding method, search criteria, and contour level selection with background shading and analysis based on the IVS data and feedback from the intrusive process. The selection criteria will be provided to USAESCH in the IVS report for concurrence. Any changes to the selection criteria will require a field change request. The JV expects that all signal peaks that exceed the threshold on the processed late time gate 2 (*i.e.*, time gate 2), as finalized at the marine IVS, will be targeted as anomalies potentially representative of anticipated MEC. IVS seed item anomaly peaks, sensor response curves for the expected munitions items, and noise measurements will be used to confirm or refine these preliminary anomaly selection criteria.

The Senior Geophysicist will review all DGM survey data to ensure that all anomalies selected for investigation are included on the dig list.

17.5.3.4 Anomaly Selection Criteria

The Senior Geophysicist will develop an anomaly prioritization protocol in the IVS Letter Report to document how anomalies will be prioritized for anomaly selection and placement on the dig list. All anomalies exceeding the anomaly selection threshold will be placed on the anomaly dig list. Additional anomaly selection criteria may be included in the anomaly prioritization procedure may include: time constant ranges, full width at half maximum, spatial distribution factors, etc. These other criteria will be evaluated as the feedback process develops. The anomalies selected for intrusive investigation will be annotated as such and target databases will be provided to USACE for concurrence. Anomaly selections, dig selections and intrusive investigation results will be included in the Microsoft Access Database.

Anomalies will be selected for intrusive investigation as follows:

- Randomly placed DGM grids (in NCMUAs): All DGM anomalies exceeding anomaly selection criteria will be intrusively investigated.
- Biased DGM grids (in potential CMUAs) and marine DGM transects: DGM grid anomalies exceeding anomaly selection criteria will be intrusively investigated. DGM transect anomalies may also be selected for intrusive investigation to characterize the nature and extent of MEC and MD within the potential CMUA. Anomalies will be selected for intrusive investigation based on an anomaly prioritization protocol using peak amplitude response and secondary anomaly attributes (*e.g.*, half amplitude width [HAWID]). The preliminary prioritization protocol will be documented in the IVS Letter Report and the actual anomalies selected for intrusive investigation, and modifications, if necessary, will be documented in an Anomaly Selection Memo once the DGM grids have been collected. This anomaly selection method will ensure anomalies are selected from the entire spectrum of anomaly attributes (*e.g.*, low to high response; small to large HAWID) to characterize the vertical extent of anomalies.
- All analog: All analog anomalies will be intrusively investigated.

Up to 250 DGM anomalies are anticipated to be investigated plus all anomalies along the analog transects. The exact number of anomalies that will be investigated will be determined after the DGM grids and transects have been fully mapped and the total number of anomalies is determined.

17.5.3.5 Dig Sheet Development

Dig sheets will be constructed IAW USACE protocol and will be augmented to include all anomaly selection parameters on grid surveys. As noted in the previous section, the anomalies selected for intrusive investigation will be annotated as such and target databases will be provided to USACE for concurrence. Anomaly selections, dig selections and intrusive investigation results will be included in the Microsoft Access Database.

The Site Geophysicist will export the target database from Geosoft Oasis Montaj to Excel and will verify the Excel file is in the proper format and is populated with the correct dig list results, including at a minimum: a unique anomaly ID; X location; Y location; peak value in mV; and any additional anomaly selection parameters. Note that anomaly locations for data positioned with line/station/fiducials will be reported in both local and project coordinates. The Senior Geophysicist will review the dig list for completeness and format and deliver it to the GIS department for incorporation into the project database. The GIS department will ensure that all anomaly locations are appropriate and useful and will create target maps. The Senior Geophysicist will review all target maps and then deliver the dig list and target maps to the task leader for incorporation into project submittals.

This section is not applicable to analog transects.

17.6 DFW5: Analog Geophysical Survey

Analog (mag and dig) transects will be conducted by UXO technicians using submersible hand-held metal detectors in areas inaccessible to the marine DGM instrument. These areas are anticipated to be limited to the shallow water (*i.e.*, depths less than 3 ft) and on land (*i.e.*, the sand bar) when exposed, which has a degree of wave action that precludes the marine DGM instruments from gaining access. The analog transect lengths and acreage are included with those listed for the marine DGM transects since the actual determination of analog transect segments will be made in the field by the UXO and DGM teams. Specifications on the mag and dig procedures are provided in SOP-02 in **Appendix K**.

17.7 DFW6: Geostatistical Analysis

The anomaly data collected during DFWs 4a and 5 will be evaluated using geostatistical analysis tools in VSP to determine the locations of potential CMUAs. The anomaly locations and geophysical transect swaths will be used to produce an anomaly density map, to define the background anomaly density, and to identify potential CMUAs. The project team will use geostatistical tools to determine a background density above which areas will be identified as potential CMUAs. The RI/FS Investigation Area Boundary will be divided into high anomaly density (*i.e.*, potential CMUAs) and background anomaly density (*i.e.*, NCMUAs). Ten randomly placed 200-ft x 50-ft DGM grids will be placed within the NCMUA and up to two 200-ft x 50-ft DGM grids will be biased within the CMUA.

17.8 DFW7: Reacquire Anomalies

Marine anomaly reacquisition is discussed in SOP-03, included in **Appendix K**.

17.9 DFW8: Intrusive Investigation

Intrusive investigation procedures for the investigation of marine anomalies are discussed in the dive plan (see **Appendix J)**, and the analog "mag and dig" procedures are included in SOP-02 (see **Appendix K**).

17.9.1 MEC Location and Identification

Marine MEC location and identification is discussed in the Dive Plan, included in **Appendix J**.

17.9.2 Excavation Procedures

Marine excavation procedures are discussed in the diving SOPs (DSOPs) of the Dive Plan (**Appendix J**).

17.9.3 Munitions with the Greatest Fragmentation Distance

Refer to the ESP in **Appendix I** for information on the munitions with the greatest fragmentation distance selected for intentional and unintentional detonations.

17.9.4 Minimum Separation Distances

Refer to the ESP, provided in **Appendix I**, for specifics on the minimum separation distances (MSDs) that will be enforced during intrusive operations.

17.9.5 MEC Removal

Marine MEC removal is discussed in the DSOPs of the Dive Plan (**Appendix J**).

17.9.6 Inspection of Material Potentially Presenting an Explosive Hazard

Inspection of MPPEH is discussed in SOP-06, included in **Appendix K**.

17.9.7 MEC Disposal

Planned detonation of explosives will be conducted IAW the requirements outlined in DoD 6055-9-M and the approved Final ESP, provided in **Appendix I**, and any subsequent amendments. MEC and MPPEH will be disposed by detonation using standard demolition procedures as outlined in TM 60A-1-1-31 and SOP-05, included in **Appendix K,** and the DSOPs, located in the Dive Plan (**Appendix J**).

17.9.7.1 Fragmentation Distance

Fragmentation distances and overpressure distances are based on the net explosive weight of a single demolition item plus the donor charge, as outlined in the ESP (**Appendix I** of the QAPP), the MSD calculations in **Appendix I**, and DoD 6055.9-M V7.E4.5.8.3.5.2.1.1. The calculation of fragmentation and overpressure distances is important in order to ensure the safety of not only the site personnel, but also the public. These distances were calculated using DDESB TP 16. The fragmentation ranges are for open, un-barricaded shots.

Detonating multiple shots will be sequentially timed to ensure they are not simultaneous. The JV ensures that all shots are within the appropriate fragmentation and K328 range. If this is not possible, the use of tamping or other engineering controls will be used.

17.9.7.2 Blow-In-Place Procedures

The approved Final ESP (**Appendix I** of the QAPP) provides several alternatives for MEC disposal for items found on land and underwater. MEC/MPPEH identified within the land portion of the MRS will be BIP using engineering controls to mitigate the hazard posed by fragments. If an underwater anomaly is verified as UXO and requires demolition, and if deemed acceptable to move by the SUXOS and UXOSO, the item may be remotely raised and transported further from shore and disposed by detonation. If the item is determined to be unacceptable to move, the item will be BIP in the position found. If an unacceptable to move item is located in a sensitive habitat or if threatened and endangered species are present that cannot be relocated, then the item may be remotely raised, transported further from shore, and detonated. Land-based BIP procedures are discussed in SOP-5, included in **Appendix K**. Marine BIP procedures are discussed in the DSOPs in the Dive Plan, included as **Appendix J**. If BIP cannot be accomplished for some reason (*e.g.*, presence of protected species, larger than anticipated item found, other safety concerns, etc.), the PDT will be notified, and other options will be considered and discussed.

17.9.7.3 Operations in Populated/Sensitive Areas

While considered unlikely, some operations associated with the proposed work (*e.g.*, demolition of certain UXO items) may require coordination with the local community. The JV will notify and coordinate with the USACE and Manatee County Sheriff's Department prior to notifying the community. Additionally, coordination with the local community will take place prior to any such operations at the site.

Evacuation of the public during the demolition of a UXO item is a last resort if all other engineering controls are not adequate. The JV will conduct demolition operations only after all personnel protective measures have been completed and reported to the SUXOS. The JV will take property protective measures, such as, but not limited to, sandbagging, tamping with earth, and barricading. Personnel, and the public if applicable, will be allowed to re-enter the area only after the demolition point has been inspected and the "all clear" has been given by the SUXOS.

17.9.8 Transportation of Explosives

Explosives will be delivered to the support zone on a just-in-time basis IAW SOP-04, included in **Appendix K**. Explosives will then be transported to the location where the BIP is to be performed as discussed in the Dive Plan (**Appendix J**).

17.9.9 Avoidance and Monitoring of Cultural and Natural Resources

While cultural resources are not anticipated to be encountered, project personnel will be briefed during the site orientation on the procedures to follow in the unlikely event they are found. Specifically, project personnel, including UXO-qualified divers and subcontractors, will not remove or disturb any historical or archeological items within the Passage Key ATGGR area. The JV will avoid impacts to archeological or cultural resources and will coordinate with USACE and local agencies should they be discovered during the RI field activities.

As part of site orientation, the JV's biologist will provide onsite training to all personnel regarding the local habitats, protected species, and avoidance and monitoring activities that will be required during the RI field activities. The JV's biologist will provide site-specific training to personnel who will serve as marine mammal and sea turtle monitors during all on-water work. The JV's PM and biologist will also assist with natural resource agency coordination for the RI field activities.

Additionally, agency support will be provided by FWC to monitor for protected species by boat and fixed-wing aircraft during demolition activities where the potential to impact marine species is the greatest. Coordination with FWC, USFWS, USCG, National Oceanic and Atmospheric Administration / National Marine Fisheries Service (NOAA/NMFS), and other agencies began early in the planning process and will continue throughout the field effort.

17.9.10 Agency Control, Site Control, and Evacuation

17.9.10.1 Agency Control

Agency coordination began early in the project and will continue for its duration to ensure agency support is available and activities requiring agency assistance, such as evacuations, securing the exclusion zone, and natural resource monitoring, are well coordinated. In addition, the JV will notify the following agencies in advance of performing any demolition operations:

- Federal Aviation Administration Coordination Facility for a Notice to Airmen on flight restriction above the demolition area. (1-877-487-6867, www.nes.notams.faa.gov)
- USCG Navigation Center for a Notice to Mariners on boating restrictions within the demolition area. (District 7, 1-305-536-5621, www.navcen.uscg.gov)
- Manatee County Sherriff's Department for assistance with road closures, beach closures, and evacuations, if needed. (1-941-747-3011, http://www.manateesheriff.com/)
- USFWS, FWC, NOAA/NMFS, and other agencies, as applicable, to coordinate avoiding or minimizing impacts to natural resources and protected species and marine species monitoring (*e.g.*, marine mammals and reptiles).

17.9.10.2 Site Control

Depending on the location of MPPEH and its associated exclusion area, it may be necessary to use engineering controls and/or evacuations to protect non-essential personnel during intrusive investigations. All site control procedures will be IAW JV SOPs. Control of the demolition site must be maintained

during demolition operations. All personnel who are not essential to demolition operations will be evacuated to a safe area. Waterways within the blast area will be blocked during explosive disposal operations to ensure that unsuspecting individuals are not placed in jeopardy by the explosion. The JV will ensure the area is clear of unauthorized personnel and equipment prior to permitting attachment of the initiation devices to the priming charge. Likewise, marine mammal and reptile spotters will be used to ensure there are no protected species present within the blast area.

Evacuation of the public during the demolition of a UXO item is a last resort if all other engineering controls are not adequate. If evacuation of residents (*e.g.*, from Anna Maria Island) is required, the procedures outline in the section below will be followed. The JV will conduct demolition operations only after all personnel protective measures have been completed and reported to the SUXOS. Personnel, and the public, if applicable, will be allowed to re-enter the area only after the demolition site has been inspected and the “all clear" has been given by the SUXOS.

17.9.10.3 Evacuations

The safety of residents and recreational users is of paramount importance for the RI/FS project should evacuations be required during intrusive and/or demolition operations. Communication with residents, businesses, and recreational users, which will be facilitated by the USACE, will be done in a manner consistent with the Community Relations Plan and USACE public relations efforts. Information will be disseminated by USACE to area residents, businesses, and visitors in multiple ways including the FUDS project website, Manatee County website, public workshops, news releases, mailings, telephone calls, and door hangers.

If evacuation of residents from portions of Anna Maria Island is required during intrusive and/or demolition operations, the JV will coordinate with the USACE and residents to provide individual resident notifications, make reservations for accommodations for people and pets, and coordinate transportation to the accommodations and provide meals. The JV will support USACE with coordination with local law enforcement agencies to assist with the evacuations and close off the area, as needed. In addition, the JV will provide on-site bilingual support during RI/FS activities, as well as for evacuations if they are needed. Provisions will be made for re-entry control and for general site security to protect public safety. The JV will provide logistics for required evacuations, including setting up a hospitality suite at a nearby hotel, transportation to the hotel, lodging reservations (if multiple days of work are required at a particular area), food and drink, as well as arranging for kenneling of pets.

17.10 DFW9: Anomaly Resolution

Anomaly resolution will not be performed on marine DGM anomalies; however, it will be performed on the analog transects that are conducted on land IAW SOP-07 in **Appendix K** and in a frequency IAW Worksheet #12. Additionally, during the intrusive investigation, divers will perform a circle line search using a radius between 10 to 30 feet depending on the anomaly density at each anomaly location. If the item cannot be found after two attempts, it will be noted as a no find. If more than 15% of DGM anomalies are “no finds” (*i.e.*, where no metallic source can be found, but an anomaly was detected), the JV will perform a root cause analysis (RCA) and recommend a corrective action be implemented, if necessary.

17.11 DFW 10: Demobilization

The UXO team will demobilize once all field activities are complete. All wastes will be removed from the site immediately upon completion of each day's field activities. Therefore, no post-activity clean up should be required. A post-activity inspection will be conducted by the UXOQCS to ensure the location is left clean.

17.12 DFW 11: Final Report

At the completion of the field activities, the JV will prepare a RI/FS report IAW guidance documents. Once the RI/FS are approved, a Proposed Plan will be developed with the recommended alternative from the FS and presented to the public for review. The selected and recommended alternative will be documented on the Decision Document.

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.1 and 2.3.2)

The DGM Team will reacquire anomalies listed on the approved dig list IAW procedures outlined in Worksheet #17, Section 17.7 of this QAPP. No samples will be collected since MC sampling is not planned given the lack of a concentrated source of munitions.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #20: Field QC Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

This worksheet shows the QC procedures to be implemented during MEC activities. Each DFW will be monitored and documented, either in a bound field logbook, on prescribed forms (*e.g.*, dig sheets), or digitally in a PDA. Non-conformance reports will be issued when an activity is not performed IAW the QAPP or when results are not within a specified tolerance. In these situations, the PM and QC personnel will conduct a root cause analysis and develop a corrective measure for implementation. Acceptable tolerances may be adjusted based on the outcome of the QC process and unexpected field conditions. These "adjustments" will be submitted to the USACE for concurrence, and documented, as necessary on a Field Change Request.

QC checks of every aspect of work are conducted routinely. The procedures will be used for all phases of fieldwork. The UXOQCS reports directly to the Corporate Quality Manager. QC processes and procedures are associated with personnel, data collection/analysis, instruments/sensors and other equipment, data deliverables and for measuring the effectiveness of MEC removal actions. The QC processes provide for:

- Testing and calibrating equipment used to perform work,
- Monitoring/measuring the effectiveness of work performed,
- Inspecting the maintenance and accuracy of site records,
- Determining compliance with site safety, environmental, and operational plans, and
- Ensuring the accuracy, timeliness, and completeness of data deliverables.

Work progress and field data will be presented in weekly and monthly progress reports with accompanying maps, IAW applicable DIDs, QC Plan, and specific requirements of the PWS. The JV will maintain a project GIS database. The GIS database will be updated daily during field activities and current maps will be provided with the weekly progress report. The JV will apply the OE GIS standard for the creation of datasets that identify coordinates and identification numbers, dates of field activities, dates of QC and QA inspections, and locations that contain MEC, MPPEH/MD, and/or UXO. Additionally, GPS-related QC test results will be documented in the Microsoft Access Database.

QC Inspection

QC inspections may be performed periodically to ensure systems are functioning as planned. By or under direction of the Corporate Quality Manager, management surveillance of the QC program ensures that operations are performed IAW approved plans. The inspections include a review of procedures, logs, records, etc. Management reviews help determine discrepancies in information collected or if conditions and practices create the potential for QC problems, so that corrections can be implemented before problems occur.

Listed below are QC processes and procedures associated with personnel, data collection/analysis, instruments/sensors and other equipment, data deliverables, and for measuring the effectiveness of MEC investigations. The JV QC processes provide for:

- Each geophysical component will be noted according to make, model, and serial number in the field logbooks and/or in the digital data logger for the respective instruments;
- Testing and calibrating equipment used to perform work;

- Functional instrument tests for the system will be digitally recorded and available for review by QA personnel;
- All instruments and equipment that require calibration will be checked prior to the start of each workday;
- Batteries will be replaced as needed, and the instruments will be checked against a known source;
- Instrument-specific functional testing procedures will be performed IAW GSV and Instrument Standardization QC Requirements methods;
- QC procedures will be implemented to ensure data acquisition, data processing, and interpretation methods are monitored at a sufficient level to meet the overall program objectives;
- Monitoring/measuring the effectiveness of work performed;
- The UXOQCS is responsible for ensuring that personnel accomplish all QC checks and that the appropriate log entries are made. The UXOQCS performs random, unscheduled checks to ensure that personnel accomplish all work specified in the QAPP and submits a report of their findings to the SUXOS;
- Project deliverables, such as the QAPP and RI/FS documents, will be prepared by the JV PM and reviewed by the Corporate Quality Manager prior to submittal to USACE. Documentation of internal reviews will be maintained in the project file;
- QC journals and digital dig sheet data will be submitted to the SUXOS on a weekly basis. These records include descriptions of the areas checked and the results of the QC checks. Non-conformance reports will be submitted to the JV PM and Corporate Quality Manager. Records of these daily inspections will be consolidated and submitted at the end of the project.

Geophysical QC Procedures

The JV's Senior Geophysicist is responsible for implementing the QC program IAW this QAPP, DID WERS-004.01, and the SOPs (contained in **Appendix K** of this QAPP) to ensure that data quality is sufficient to meet the projects DQO requirements.

Components of the QC program include the following instrument checks to ensure that the MQOs, as established in **Tables 12-1** and **12-2** (found in Worksheet #12), are met:

- Instrument function checks
- Equipment Warm-Up
- Morning Static Checks for
    - Background
    - Spike (response to known object)
    - Return to Background
- Cable Shake
- Personnel Check

- Morning RTK DGPS Reoccupation Check
- GSV

Each of the instrument checks is outlined in detail within SOPs included in **Appendix K**, while the GSV procedures are document in Section 17.4 in Worksheet #17 of this QAPP. These measures will be reviewed regarding their project-specific implementation, metrics, and frequency. The Senior Geophysicist will process and analyze these instrument checks and records the results, comparing results with required project performance metrics. Results that fail to meet project requirements are flagged and reported to the Senior Geophysicist. A root cause analysis will be performed and a corrective action will be implemented. Instrument checks are repeated to confirm that the corrective action returned the equipment to acceptable performance.

In addition to the instrument standardization QC checks, the JV will perform daily QC audits of the field geophysical team to ensure overall project DQOs are being met. The instrument QC tests will be performed and documented by the designated individual during the data collection process and reviewed by a qualified geophysicist. All documentation will be submitted to the Senior Geophysicist.

All geophysical instruments and equipment used to gather and generate field data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. Calibration, repair, or replacement records will be filed and maintained by the site geophysicist and may be subject to audit by the Senior Geophysicist.

The Senior Geophysicist will also use UX-Process geophysical analysis software, as well as Oasis Montaj UX-Detect©, to perform QC of the geophysical data. The Senior Geophysicist will perform QC and independent processing of at least 10% of the data collected to ensure DQOs are being met and SOPs are being followed. The Senior Geophysicist will also determine whether the data meets the minimum performance requirements, as listed in **Tables 12-1** and **12-3**. Failure to meet the minimum performance requirements will require either corrective measures or re-collection of the failed dataset.

Other QC functions performed by the Senior Geophysicist include:

- Monitor all Instrument Check results and DGM performance metrics are being maintained,
- DGM data deliverables are being made in accepted formats and on schedule, and
- Participate in any/all Root Cause Analysis, if any failure is identified, and the implementation of any corrective actions.

The Army is responsible for QA conducted on this project. This includes implementation of an internal quality program, such as insuring acceptable documents are submitted and the project is progressing in a manner to achieve milestones. QA may also be completed during the field work effort.

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

Table 21-1: Field SOPs for Passage ATGGR

SOP# or Reference	Title, Revision, Date and URL (if available)	Originating Organization	SOP Option of Equipment Type (if SOP provides different options)	Modified for Project Work? (Yes/No)	Comments
SOP 1	Underwater Digital Geophysical Mapping (Data Collection and Processing)	NAEVA/3D Geophysics	EM61-Flex3	Yes	Field SOPs are included in **Appendix K** to this QAPP.
SOP 2	Analog Geophysical Survey	JV	White's All-Metals Submersible Detector or equivalent (for analog)	Yes	
SOP 3	Target Reacquisition	NAEVA/3D Geophysics	NA	Yes	
SOP 4	Transportation of Explosives	JV	NA	Yes	
SOP 5	Demolition of MEC	JV	NA	Yes	
SOP 6	Inspection/Disposition of MEC/MPPEH	JV	NA	Yes	
SOP 7	Anomaly Resolution	JV	White's All-Metals Submersible Detector or equivalent (for analog)	Yes	
SOP 8	MEC QC	JV	NA	Yes	
DSOP 1	Underwater Excavation Operations	JV	NA	Yes	DSOPs are included in the Dive Plan (**Appendix J**).
DSOP 2	Underwater Demolition Operations	JV	NA	Yes	
DSOP 3	Underwater Explosive Disposal Dive Operations	JV	NA	Yes	

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

Table 22-1: DGM Measurement Quality Objectives

Requirement	Limited Applicability (Specific to Collection Method/Use)	Procedures	Performance Standard	Frequency	Consequence of Failure[1]
Static Repeatability (Instrument Functionality)	All	Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for (minimally) a 1-minute period. During this time, the instrument will be held in a fixed position without a spike (small ISO) and then with a small ISO spike. The static background and static spike test will be conducted at the beginning and end of each survey operation.	Response (mean static spike minus mean static background) within +/- 20%	Beginning and End of the day	Day's data fails unless dataset is enclosed by two acceptable static tests.
Pressure Sensor Test (Positioning Functionality)	All	Prior to data collection the accuracy of the pressure sensor (*i.e.*, EM sensor platform depth) will be tested. Two data points will be recorded during the test to verify the functionality of the pressure sensor. The test will be conducted with the boat held in a fixed position. The pressure sensor's depth results are required to be within 3 inches of the known depth.	The pressure sensor's depth results are required to be within 3 inches of the known depth.	Beginning of the day	Day's data fails.
Downline Data Density	All	The downline data separation will be calculated in Geosoft Oasis Montaj to determine if the performance standard has been met.	98% <= 25 cm along line	By transect/grid or dataset	Dataset submittal fails
Dynamic Detection Repeatability (IVS)	IVS	Seed items will be placed in the IVS using the procedures in Section 17.4 of this QAPP. The test will be conducted by following the GSV procedures outlined in Section 17.4 of this QAPP.	Response is greater than minimum anomaly selection threshold as determined by results of initial IVS	Beginning of the day	Day's data fails.
Dynamic Detection Repeatability (DGM)	DGM Grids[2]	Seed items will be placed in grids using the procedures in Section 17.4 of this QAPP. The results of the DGM grid data will be compared to the blind seed anticipated response from the IVS, after accounting for horizontal and vertical positioning error.	Response is greater than minimum anomaly selection threshold as determined by results of initial IVS	By day of data collection	Day's data fails.
Dynamic Positioning Repeatability (IVS)	IVS	Seed items will be placed in the IVS using the procedures in Section 17.4 of this QAPP. The test will be conducted following the GSV procedures outlined in Section 17.4 of this QAPP.	Position offset of seed item targets <= 2.0 m	Beginning of the day	Day's data fails.
Dynamic Positioning Repeatability (DGM)	DGM Grids[2]	Seed items will be placed in the grids using the procedures in Section 17.4 of this QAPP. The results of the DGM grid data will be compared to the blind seed location	Position offset of seed item targets <= 2.0 m	By day of data collection	Day's data fails.
Survey Coverage (horizontal)	All	The horizontal survey coverage for 100% coverage grids will be calculated in Oasis Montaj. The surveyed DGM transects will be compared to the proposed transects in GIS to determine if the performance metric has been met.	**Grids:** >90% coverage at line spacing. **Transects:** Transect spacing will not vary greater than 20% from intended spacing unless obstructions cause the separation.	By transect/grid or dataset	Grids - Dataset submittal fails unless gaps filled, additional data collected. Transects - Redo affected work or add additional transects to fill data gap.
Survey Coverage (vertical)	All	A pressure transducer will be attached to the DGM survey equipment to determine the depth of the sensor from the top of the water and an echo sounder will be used to calculate the water depth. The altitude of the sensor will be calculated by subtracting the water depth from the pressure transducer depth measurement.	98% of data at an altitude of less than or equal to 5 feet, or 1.52 meters, above the sea floor.	By transect/grid or dataset	Submittal fails.
Target Selection	All	The Senior Geophysicist will review the dig list to ensure that all anomalies selected for intrusive investigation are on the dig list.	All dig list targets are selected according to project design	By transect/grid or dataset	Submittal fails.

Requirement	Limited Applicability (Specific to Collection Method/Use)	Procedures	Performance Standard	Frequency	Consequence of Failure[1]
Geodetic Equipment Functionality	All	The DGM team will reoccupy a known control point with the RTK DGPS rover and collect a GPS point on the know location. The data processor will calculate the offset between each recorded position and the control point location and determine if it meets the performance metric.	Position offset of known/temporary control point ≤ 10 cm.	Daily	Redo affected work or reprocess affected data.
Geodetic Accuracy	Points used for RTK base station	The civil surveyor will re-occupy the control monument locations if the DGM surveys last more than one month.	Project network must be tied to HARN, CORS, OPUS or other recognized network. Project control points that are used more than once must be repeatable to within 5 cm.	For points used more than once, repeat occupation of each point used, either monthly (for frequently used points) or before re-use (if used infrequently).	Reset points not located at original locations or resurvey point following approved QAPP.

Notes:

(1) All failures require a root cause analysis. If the failure cannot be corrected after the root cause analysis is completed and the data is determined to be unusable to meet the project DQOs, then failed data will be re-collected at no cost to the government.

(2) Blind seeding on DGM transects will not be conducted due to the inherent difficulties in ensuring traversal of the seed item during the DGM survey.

Table 22-2: Analog (Mag and Dig) Measurement Quality Objectives

Requirement	Limited Applicability (Specific to Collection Method/Use)	Procedures	Performance Standard	Frequency	Consequence of Failure
Repeatability (instrument functionality)	All	UXO technicians will sweep the test strip with the handheld instrument and note where detected subsurface anomalies are located. The UXOQCS will verify that all UXO technicians are tested at the instrument test strip at the beginning of the day and that each has detected the test strip seed items.	All items in test strip detected (trains ear daily to items of interest)	Min 1 daily	Remedial training and additional remedial measures if due to operator error, or replacement of faulty equipment.
Dynamic repeatability	Analog Mag and Dig Transects	The UXOQCS will repeat the required amount of transects after the dig team has completed the transect and will intrusively investigate each detected anomaly and record its location and nature in a handheld GPS.	Repeat a segment of transect and show extra flags/digs not greater than the greater of 20% or 8 flags/digs, or within range of adjacent segments.	Second party repeat of 2% per lot	Redo lot
Anomaly resolution	Verification checking of analog (mag and dig) transects (checked with handheld electromagnetic induction [EMI] instrument)	The UXOQCS will perform anomaly resolution sampling using the handheld EMI sensor by moving it over the anomaly location to verify that the source of the anomaly has been removed or that there is an explanation for the remaining anomaly.	70% confidence <10% unresolved anomalies Accept on zero.	Rate varies depending on lot size. See DID WERS-004.01 for Acceptance Sampling Table for Anomaly Resolution amounts	Redo lot

Notes:

(1) All failures require a root cause analysis. If the failure cannot be corrected after the root cause analysis is completed and the data is determined to be unusable to meet the project DQOs, then failed data will be re-collected at no cost to the government.

QAPP Worksheet #23: Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Information on MEC handling, custody, and disposal is included in Worksheet #17. Field SOPs are included in **Appendix K**; DSOPs are included in the Dive Plan in **Appendix J**.

QAPP Worksheet #28: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

This worksheet is NA as there is no MC investigation.

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

This worksheet provides the minimum specifications for all data management tasks and deliverables, as well as procedures for controlling project documents, records, and databases. Its purpose is to ensure data completeness, data integrity, and ease of retrieval. All project documents and records will be prepared IAW the applicable WERS DID.

29.1 Data Management Specifications

29.1.1 GIS Database

A project-specific GIS will be used to store and manage all relevant geospatial-related data and information. All geospatial data will conform to the Federal Geographic Data Committee (FGDC) Geospatial Positioning Accuracy Standards, Part 2: National Standard for Spatial Data Accuracy, and Part 4: Standards for Architecture, Engineering, and Construction (A/E/C) and Facility Management. Each GIS data set will be accompanied by metadata conforming to the FGDC Content Standard for Digital Geospatial Metadata and provided in a database that complies with the Spatial Data Standards for Facilities, Infrastructure, and Environment. The final GIS submittal will contain all required ArcGIS .mxd files and layout files for map contained in the final plans and report.

Land surveyor control monuments will meet or exceed the Third Order, Class II specification. Horizontal positioning accuracy of geophysical data positioned with RTK DGPS will meet the performance metrics outlined in Worksheet #12. The horizontal accuracy of GIS data will be tested IAW the National Standards. In addition, the location, identification, coordinates, and elevations of all established control points will be plotted on one or more site maps. Each control point will be identified on the map by its name and number and the final adjusted coordinates. The RTK DGPS base station will be placed on top of a temporary control monument established by a FL-licensed PLS and will broadcast positional corrections to the GPS rover in real time.

Environmental System Research Institute, Inc. – compliant formats (shapefiles, coverages, or geodatabases) will be used to present GIS data, with supporting tabular data provided in Microsoft Excel, Microsoft Access, or both, as needed.

29.1.2 DGM Data Management

All raw and processed data is uploaded to the project FTP site daily. At the completion of the project all data is submitted to the client via CD or DVD. Additionally, NAEVA weekly archives the data to magnetic tapes. DGM data will be provided to USACE within the timeframes contained in Attachment C of DID WERS-004.01.

29.1.3 Analog Access Database

Spreadsheets and/or a database will be used to track all data files. The daily equipment results will be recorded and entered into the project's Microsoft Access Database. A log entry of the anomalies located will be made in the Microsoft Access database indicating identification, condition, depth, and disposition. Additionally, GPS-related QC test results will be documented in the database. All data will be compatible with the existing project database protocols and Access database requirements, as set forth in DID WERS-004.01.

In addition to the checks described above, the JV will review field data sheets and log forms for completeness. The results of all applicable QC checks will be entered into the Access database. The JV has the final decision-making responsibility on all QC issues. If a QC procedure shows a potential problem, the JV UXOQCS and PM will oversee the appropriate corrective actions.

29.1.4 Computer Files and Digital Data

All final document files, including reports, maps, figures, and tables, will be submitted in electronic format (both Microsoft Office and portable document format (.pdf)) on CD-ROM. CDs containing .pdf files will also include Adobe™ Acrobat Reader®, if needed.

29.1.5 Project Website

All interim and final project documents will be made available to members of the project team on the secure project ftp website: http://clientftp.arcadis-us.com/thinclient/.

29.2 Control of Documents, Records, and Databases.

All project documents and records will be generated, verified, and retained as shown in **Table 29-1**.

Table 29-1: Field Records/Data

Record	Responsible JV Party for Generation	Responsible Party for Verification	Frequency	Format/Storage Location/Archive Requirements
Project planning documents (including, but not limited to, Project Management Plan, QAPP, ESP, Dive Plan, Community Relations Plan)	PM	Program Manager and Corporate Quality Manager	Draft, Draft Final, Final	Various formats / JV Server Network and secure ftp site. Server in Tampa, FL will be the primary location for project files.
Project management documents (schedule, minutes, monthly status reports, invoicing backup)	PM	Program Manager and Corporate Quality Manager	Monthly and as needed for minutes	Various formats / JV Server Network
Geophysical Logbook	Field Geophysicists	Senior Geophysicist	Daily during geophysical operations	Various formats/ JV Server Network
QC/Safety Daily Reports (including QC audits)	UXOQCS/ UXOSO	PM	Daily	Various formats / JV Server Network
QC/Safety Weekly Reports (including QC audits)	UXOQCS/ UXOSO	PM	Weekly	Various formats / JV Server Network
Daily Reports	SUXOS	PM	Daily	Various formats / JV Server Network
Weekly Reports	SUXOS	PM	Weekly	Various formats / JV Server Network
Photo Documentation	SUXOS, Field Geophysicists	PM	Daily	jpg / JV Server Network

QC Seed Types, Depths, Location	Dive Team	UXOQCS	Daily during QC seeding	Various formats / JV Server Network
Instrument Assembly Checklists	Field Geophysicists	Senior Geophysicist	On initial use of equipment	Various formats / JV Server Network
IVS Letter Report	Senior Geophysicist	USACE Geophysicist	After completion of IVS	Various formats / JV Network and Secure ftp site
Geophysical Data	Field Geophysicists	Senior Geophysicist	Daily during DGM operations	Various formats / JV Network and Secure ftp Site
Nonconformance, root-cause analysis and correction action reports	UXOQCS, Senior Geophysicist, PM	Corporate Quality Manager	As needed	Various formats / JV Network and Secure ftp site
Equipment and Instrument Check Logs	Field Geophysicists / UXO Team Leader	Senior Geophysicist	As appropriate	Various formats / JV Network and Secure ftp site
Project Reports (*i.e.*, RI, FS, Proposed Plan, Decision Document)	PM	Program Manager and Corporate Quality Manager	Draft, Draft Final, Final	Various formats / JV Server Network and Secure ftp site

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action (UFP-QAPP Manual Sections 4.1.1 and 4.1.2) (EPA 2106-G-05 Section 2.4 and 2.5.5)

This worksheet is used to document responsibilities and procedures for conducting project assessments, documenting assessments, responding to assessment findings, and implementing corrective action. Appropriately scheduled assessments allow management to implement corrective action in a timely manner; thereby correcting non-conformances and minimizing their impact on DQOs/PQOs.

For this RI/FS project, field activities will be grouped as follows:

1) Site preparation (DFW 1-2) ,
2) Detection survey (DFW 3-5) , and
3) Intrusive investigation (DFW 6-8).

For each activity (or group of activities), assessment activities will occur during the following phases:

- Preparatory Phase (PP): Comprises the planning and design process leading up to field activities. The UXOQCS will perform a Preparatory Phase assessment before beginning each group of activities. The purpose of this assessment is to review applicable specifications and plans to verify that the necessary resources, conditions, and controls are in place and comply with specifications before field work begins.
- Initial Phase (IP): Occurs at the startup of field activities. The purpose of this phase is to check preliminary work for compliance with specifications, check for omissions, and resolve differences of interpretation.
- Follow-up Phase (FP): Covers the routine, day-to-day activities at the site. One or more follow-up assessments will be conducted during each related group of activities, depending on the duration of field activities, and the nature of any assessment findings.

Table 31-1 presents the assessment schedule for Groups 1 through 3. Assessment checklists applicable to DGM and analog surveys are presented in the SOPs, which are included in **Appendix K** of this QAPP. The assessments will be documented on the Three-Phase Inspection Checklist and will include a list of action items to correct activities that do not meet the project's QC requirements.

Table 31-1: Assessment Schedule

Assessment Type	Responsible Party	Schedule	Assessment Deliverable	Deliverable due date
Site Preparation *Preparatory phase*	UXOQCS	Prior to field mobilization	Preparatory Phase Inspection Checklist	Prior to field mobilization
Site Preparation *Initial phase*	UXOQCS	Within first two days of each activity within the group.	Initial Phase Inspection Checklist	24 hours after start of each activity within the group.
Site Preparation *Follow-up phase*	UXOQCS	Throughout the project, as required	Follow-up Phase Inspection Checklist	24 hours after completion of follow-up phase inspection

Assessment Type	Responsible Party	Schedule	Assessment Deliverable	Deliverable due date
Detection Survey *Preparatory phase*	Senior Geophysicist	Prior to field mobilization	Preparatory Phase Inspection Checklist	Prior to field mobilization
Detection Survey *Initial phase*	Senior Geophysicist	Within first two days of each activity within the group.	Initial Phase Inspection Checklist	24 hours after start of each activity within the group.
Detection Survey *Follow-up phase*	Senior Geophysicist	Throughout the project, as required	Follow-up Phase Inspection Checklist	24 hours after completion of follow-up phase inspection
Intrusive Investigation *Preparatory phase*	UXOQCS	Prior to field mobilization	Preparatory Phase Inspection Checklist	Prior to field mobilization
Intrusive Investigation *Initial phase*	UXOQCS	First day of each activity within the group.	Initial Phase Inspection Checklist	24 hours after start of each activity within the group.
Intrusive Investigation *Follow-up phase*	UXOQCS	Throughout the project, as required	Follow-up Phase Inspection Checklist	24 hours after completion of follow-up phase inspection

DEFICIENCY MANAGEMENT

All deficiencies or nonconforming conditions discovered during inspections or other QC functions will be noted on a deficiency notice (DN) or a non-conformance report (NCR), as appropriate. DNs are used to document the failure to develop, document, or implement effectively any applicable element of approved plans or to follow established procedures. A deficiency could lead to a non-conformance. An NCR documents a deficiency that renders the quality of an item, process, or product that has been defined in the specifications or drawings as unacceptable or indeterminate. The DN or NCR will identify, at minimum, any corrective action identified, the individuals reviewing and approving of the actions, and the actions taken to prevent recurrence. DN and NCR logs will be maintained to document and track corrective actions to closure.

The Corporate QA Manager will be responsible for tracking deficiencies to closure and reporting their status on daily reports and log forms. The Corporate QA Manager will discuss deficiencies with the project team during the weekly QC meeting and memorialize all issues in the RI Report. If a deficiency has the potential to result in a need for re-work or jeopardizes the quality of future work to the extent that re-work may be required, the Corporate QA Manager will be expected to stop work or recommend and implement immediate corrective action to address the deficiency.

CORRECTIVE ACTION

Once a process displays a characteristic out of specification with those required for the project or quality objectives, corrective action must be conducted to identify the cause of the deficiency or non-conformance. When the cause of the problem is identified, appropriate corrective action can be instituted and then monitored for effectiveness.

ROOT CAUSE ANALYSIS

Determining the root cause of a non-conformance is an integral part of the QC process. The depth and extent of the root cause analysis depends on the situation; the root cause may be as simple (minor) as an overlooked step or procedure or it may be complicated. Root cause analysis is the responsibility of the functional manager or a designee. Input can be obtained as necessary from field personnel and technical advisors in order to identify the factors that led to the problem. The root cause is almost always "upstream" from where the problem is detected.

A two-step strategy will be employed for determining the root cause of a deficiency or nonconformance for this project. First, the problem will be traced back to the source. Second, the cause will be evaluated using basic questions such as who, what, when, where, why, and how. This process will be repeated until the cause is identified.

IMPLEMENTATION OF CORRECTION ACTION

Following the root cause analysis, the project personnel will undertake the most effective remedy to correct the problem. Potential remedies to be considered may include the following:

- Supplemental personnel training
- Changes of equipment or modification of equipment currently in use
- Acquisition of supplemental equipment
- Implementation of new procedures or modification of existing procedures
- Changes in QC procedures

Successful implementation of corrective action will be documented on the DN or NCR. Through follow-up phase surveillance, the UXOQC will verify that the corrective action implemented has rectified the non-conforming condition and is sufficient to prevent recurrence. The results of the corrective action will be presented in the RI Report.

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

This worksheet is used to list the inputs that will be used during data verification and validation. Inputs include all requirements documents (*e.g.*, contracts, SOPs, planning documents), field records (both hard-copy and electronic), and interim and final reports. Data verification is a completeness check that all specified activities involved in data collection and processing have been completed and documented and that the necessary records (objective evidence) are available to proceed to data validation. Data validation is the evaluation of conformance to stated requirements, including those in the contract, methods, SOPs, and the QAPP. Required documents as well as records subject to verification and validation are listed below. See **Appendix K** for the field SOPs.

Table 34-1: Data Verification and Validation Inputs

Item	Description	Verification (completeness)	Validation (conformance to specifications)
	Planning Documents/Records		
1	Approved QAPP	X	
2	Contract	X	
3	Field SOPs	X	
	Field Records		
4	Field logbooks	X	X
5	Photographs	X	
6	Equipment calibration records	X	X
7	Chain-of-Custody Forms	X	X
8	Diagrams/surveys	X	X
9	Data Collection QC Checklist	X	X
10	Data Processing QC Checklist	X	X
11	Digital Field Notes	X	
12	Daily reports/DQCRs	X	
13	Relevant Correspondence	X	X
14	Change orders/deviations	X	X
15	Field audit reports	X	X
16	Field corrective action reports	X	X
	Data Package		
17	Communication records	X	X

Item	Description	Verification (completeness)	Validation (conformance to specifications)
18	Instrument calibration records	**X**	**X**
19	Results reporting forms	**X**	**X**
20	QC sample results	**X**	**X**
21	Corrective action reports	**X**	**X**
22	Raw data	**X**	**X**
23	Electronic data deliverable	**X**	**X**

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

This worksheet documents procedures that will be used to verify project data. Data verification is a completeness check to confirm that all required activities were conducted, all specified records are present, and the contents of the records are complete. Verification is often performed at more than one step by more than one person.

Table 35-1: Data Verification Procedures

DFW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Person(s) Responsible for Performing Audit	Pass/Fail Criteria	Action if Failure Occurs
Pre-mobilization Activities	QAPP and appended documents	Verify the QAPP, including Dive Plan, APP, and ESP, has been developed and approved	PP	Once	Corporate Quality Manager	QAPP has been prepared and approved, all parties agree to the technical and operational approach.	Do not proceed with field activities until criterion is passed.
	GIS Setup	Verify GIS system is functional and ready for site data	PP	Once	Corporate Quality Manager	GIS system has been set up and is ready for site data.	Do not proceed with field activities until criterion is passed.
	Subcontractor and UXO Technician Procurement	Ensure procurement of subcontractors and verify qualifications, training, licenses of UXO team	PP/IP	Once	PM for Subcontractors, SUXOS and UXOSO for UXO Technicians	UXO Technicians and subcontractors' qualifications, training, and licenses are up to date and acceptable.	Update qualifications, training, and/or licenses or replace failing UXO technicians / subcontractor.

DFW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Person(s) Responsible for Performing Audit	Pass/Fail Criteria	Action if Failure Occurs
Mobilization/ Site Preparation	Onsite Document Review	Verify QAPP and appended documents are approved and review with project team and get appropriate signatures	PP/IP	Once	UXOQCS	Document is approved and has been reviewed and acknowledged by appropriate project team members.	Personnel who are not familiar with the QAPP 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	UXOQCS	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
	Verify site-specific training	Verify that all site-specific training has been performed and acknowledged	PP/IP	Once	SUXOS, UXOQCS, UXOSO, and Senior Geophysicist	Site-specific training is performed and acknowledged.	Do not proceed with field activities until criterion is passed.
DGM Survey	Daily UXO Safety Briefing	Confirm that the UXOSO or his representative conducted a daily safety briefing and all field personnel acknowledged by signature	PP/IP/ FP	Daily	SUXOS	The UXOSO or his representative conducted a daily safety briefing and all field personnel acknowledged it by signature.	Those personnel not receiving a safety briefing are not authorized in the exclusion zone until it is received and acknowledged by signature.

DFW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Person(s) Responsible for Performing Audit	Pass/Fail Criteria	Action if Failure Occurs
DGM Survey	Personnel are wearing proper personal protective equipment (PPE) for the task to be performed	Team Leader to confirm personnel are wearing appropriate PPE for the assigned task. QC or the UXOSO to perform daily spot checks.	PP/IP/ FP	Daily	Geophysical FTL	Personnel are wearing appropriate PPE for the assigned task. QC has filled out the QC Inspection checklist documenting the spot check(s).	Stop the activities until personnel are wearing the proper PPE. Make the logbook entries. Notify the UXOSO of the violation.
	Assemble sensor	Observe assembly and initial function testing of EM61-Flex3 and completion of checklist	PP	Once	Geophysical FTL	System assembled IAW SOP.	Do not proceed with IVS until system is properly assembled
	IVS Construction	Verify that IVS is constructed IAW QAPP	PP	Once	Geophysical FTL	IVS constructed IAW QAPP.	Do not proceed with IVS until IVS is properly constructed or alternate construction is approved by USACE.

DFW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Person(s) Responsible for Performing Audit	Pass/Fail Criteria	Action if Failure Occurs
DGM Survey	IVS Performance	Verify that IVS related MPC are being met	IP/FP	Once / Daily /As Required	Senior Geophysicist	MPCs are being met.	RC/CA
	Data Collection	Verify that data collection related MPCs are being met	IP/FP	Once / Daily /As Required	Senior Geophysicist	MPCs are being met.	RC/CA.
	Process and Interpret Data	Verify that processing related MPC are being met	IP/FP	Daily	Senior Geophysicist	MPCs are being met.	RCA and CA.
Analog Survey	Daily UXO Safety Briefing	Confirm that the UXOSO or his representative conducted a daily safety briefing and all field personnel acknowledged by signature.	PP/IP/ FP	Daily	UXOSO	The UXOSO or his representative conducted a daily safety briefing and all field personnel acknowledged it by signature	Those personnel not receiving a safety briefing are not authorized in the exclusion zone until it is received and acknowledged by signature.
	ITS	Verify ITS related MPC are being met	IP/FP	Once / daily/ as required	Senior Geophysicist	MPCs are being met.	RCA and CA.
	Analog survey	Verify analog survey related MPC are being met	IP/FP	Once / daily/ as required	Senior Geophysicist	MPCs are being met.	RCA and CA.
Target Reacquisition	Reacquisition	Verify target locations	IP/FP	Weekly	Senior Geophysicist	Targets reacquired IAW SOP.	RCA and CA.

DFW	Task with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Person(s) Responsible for Performing Audit	Pass/Fail Criteria	Action if Failure Occurs
Intrusive Investigation	Intrusive Investigation	MEC identification, excavation procedures, handling/disposal of MEC	IP/FP	Once daily per team	Senior Geophysicist	Intrusive investigation is followed IAW SOP.	RCA and CA.
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	SUXOS	All personnel and equipment have been demobilized and the site is in pre-construction condition.	Notify subcontractor if equipment is left behind; subcontractor will be responsible for equipment or materials left behind after completion of field work.
	Remove the IVS (upon completion of project)	UXOQCS to verify that the IVS was removed. QC to document the verification in the logbook.	FP	Once	UXOQCS	The IVS was removed. QC has made the logbook entries.	Complete the action as required.

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

RI actions will be documented and submitted for an overall data package certification. A certification package is prepared by the JV for review by USACE. This package will document the steps taken to ensure the quality of the information relied upon to determine the nature and extent of MEC at Passage Key ATGGR.

The JV's certification process encompasses five steps to ensure data quality:

- Step I documents and reviews the preparatory QC activities, including personnel training and qualifications as well as IVS certification.
- Step II summarizes and reviews the initial and follow-up phases of QC inspections and certification.
- Step III reviews documentation of pre-intrusive surface clearance and the specific quality requirements for geophysical processing and interpretation.
- Step IV is a review of MEC intrusive operations, including review of follow-up phase QC checklists and compliance with the QAPP surveillance requirements.
- Step V documents the JV's actions to ensure that all targets selected for intrusive investigation have been cleared.

The data validation team is comprised of the UXOQCS, the Senior Geophysicist, and the SUXOS. The team will certify each step of the quality process has been completed and forward the package for approval by the JV's PM and Corporate Quality Manager. As part of the data validation process, data will be checked against the assumptions made during the planning phase of the project. This includes reviewing the data and data findings and comparing them to the initial CSM assumptions, as well as validating that the date is appropriate to meet project DQOs.

The process steps are more fully discussed in the following sections.

36.1 QC STEP I: PRE-OPERATIONAL TEAM TRAINING AND IVS CERTIFICATION

Step I of the data package certification process includes validation of training, personnel qualifications, and IVS certification testing of all DGM teams and equipment, as well as certification of the UXO teams and equipment. Surveillance checks ensure the completion and documentation of mandatory pre-operational preparation. For each production team, a Preparatory Phase Checklist will be used to document training, personnel qualifications, and equipment status. A Three-Phase Inspection Checklist has been developed for the field SOPs (**Appendix K**). Appropriate SOP checklists will be completed by each project field team prior to the actual performance of the RI. The Three-Phase QC Checklist incorporates the Preparatory, Initial, and Follow-Up QC inspection phases into one combined checklist. The Preparatory Phase portion of the checklist will be used during the pre-operational training step of project operations. This QC checklist will document that all the pre-operational actions delineated in the SOPs have been met and that each field team is prepared to conduct MEC clearance operations. A punch list of individual team deficiencies discovered during the Preparatory Phase will be provided to the JV PM, Corporate Quality Manager, Senior Geophysicist, UXOQCS, and the SUXOS for corrective action. A record of the completed checklists will be maintained on the project server and reported in the DQCR.

Geophysical field teams will be tested through the IVS prior to commencing actual field operations. UXO field teams will be tested at an ITS and an ITS Certification Form, documenting UXO team

members by name and search equipment serial numbers, will be maintained on site as well as on the project server. The success of each DGM team member/equipment will be documented in the project database. Each UXO field team must identify all ITS seed items to achieve ITS certification.

36.2 QC STEP II: INITIAL AND FOLLOW-UP PHASE OF QC INSPECTION AND SURVEILLANCE

Step II of the Certification/QC process documents that the DFW were completed IAW the contract specification, QAPP, and SOPs. The Initial and Follow-Up Phase checklists will be incorporated into the Three-Phase QC Inspection Checklist process within each SOP. The Initial and Follow-Up Phase checklists will be used to document that all aspects of the RI are completed IAW the applicable procedures. The combined checklists are designed to verify that the SOP-specific sampling and analysis, geophysical surveying, and MEC clearance procedures are being followed during the performance of RI field operations. Information to be included in the SOP-specific three-phase checklists consists of:

- Teams performing geophysical and intrusive UXO work at project field sites were, respectively, successfully IVS or ITS certified for the entire time that they performed the field work.
- QC surveillance forms for geophysical and UXO field teams have documented that each team has followed the appropriate SOP for the fieldwork being conducted.
- The entire transect or grid has been either DGM or analog surveyed by an EM61-Flex3 or White's All-Metals submersible detector or equivalent, respectively, IAW this plan and verified by database-generated maps.
- Inspections of UXO dig sheets to verify that all target anomalies have been investigated.
- All MEC found have been properly BIP by the JV IAW this plan and procedures outlined in the ESP.

A record of the completed checklists will be maintained on the project server and reported in the DQCR.

36.3 QC STEP III: PRE-INTRUSIVE OPERATIONS AND QC OF GEOPHYSICAL SAMPLING

Step III verifies the geophysical target list is complete. The UXOQCS will repeat a percentage of analog mag and dig transects IAW Worksheet #12 to ensure that the UXO Teams have identified all anomalies. This QC is separate from QA that may be performed by UACE OESS.

The UXOQCS will perform this validation IAW Worksheet #12 for each lot of analog data. The UXOQCS will generate a GPS file that contains the path walked and the location of identified anomalies and the Senior Geophysicist, or his designee, will compare it with the anomaly counts from the UXO team to ensure the performance metrics outlined in Worksheet #12 are met.

For the RI DGM data, the Senior Geophysicist will ensure independent validation of DGM processing and interpretation of each DGM dataset. The Senior Geophysicist, or his designee, will initially verify 100% of the data collected during the first week of DGM data collection by generating a dig sheet and comparing it with DGM data processor's dig sheet. If discrepancies between the two target sets exist, the Senior Geophysicist, and the data processor will compare processing techniques.

A QC discrepancy is defined as:

- 20% differential in picks between the two teams; and
- Recovery of a munition of concern in a QC or QA pick.

It is anticipated that this combined DGM effort will start during IVS testing and will continue through the first week of data collection. Any additional targets found by the Senior Geophysicist will be uniquely identified and added to the dig list prior to the delivery of the pick list to the USACE PM for comparison and will be documented in the DQCR. This initial duplicative process will ensure that geophysical interpretation criteria, as it relates to DQOs, will be consistent and, potentially improve whenever differences arise in an effort to exceed performance standards. The Corporate Quality Manager, in concert with USACE, has the ability to lower the percentage of targets/grids that are to be reprocessed by the Senior Geophysicist if it becomes apparent that both the DGM data processor and Senior Geophysicist are consistently operating without a QC discrepancy.

Following a period of no less than one week's worth of data collection, the Corporate Quality Manager can petition USACE for a reduced QC state. The reduced state is invoked after one week of data is reprocessed by the Senior Geophysicist and there are no discrepancies. At that time, the number of transects/grids that must be reprocessed will decrease by 50% until, at the very least, 10% of the DGM data are being reprocessed. Conversely, if a discrepancy is found, the percentage of DGM data that will be processed by the Senior Geophysicist will automatically increase to 100% QC for a minimum of one week. All DGM data of the preceding week will likewise be 100% processed by the Senior Geophysicist. The amount of DGM data to be processed by the Senior Geophysicist may decrease by the 50% interval again as long as no discrepancies are found in the next set and approved by the USACE PM.

A record of additional QC targets found by the independent validation team will be maintained in the grid QC file and reported in the DQCR.

36.4 QC STEP IV: INTRUSIVE MEC CLEARANCE

Step IV operations will be a continuation of Step II. An SOP specific Follow-Up checklist, along with appropriate QC surveillance forms, will document that the UXO teams are properly conducting MEC operations IAW the approved procedures. QAPP Worksheet #31, 32, &33 provides the frequency of inspection for the DFW. A copy of each QC surveillance report will be filed on the project server and reported on the DQCR.

36.5 QC STEP V: FINAL QC INSPECTION

The transects and grids will have QC activities performed to ensure the effectiveness of the MEC intrusive investigations. Details regarding the steps taken during the transect certification process are provided in the following sub-sections.

36.5.1 QC INSPECTION CRITERIA

During the Intrusive QC Inspections, any finding other than "no anomaly/target remains" or "Anomaly deeper than 4 ft bgs" means that there is a potential quality issue with the work. A QC failure will occur if, during the conduct of the post-investigation QC survey or QA survey (by the anomaly resolution team) of any grid:

- A piece of ferrous metal equivalent in size to a small ISO is found; or
- If any munition of concern is discovered at detectable depth (but not to exceed the depth to bedrock or 4.0 ft bgs).

The UXOQCS will perform anomaly resolution as outlined in Worksheet #17 and IAW SOP-07, which is contained in **Appendix K**. If a QC failure occurs, then the entire lot of transects becomes a potential critical non-conforming unit, and the JV will present a root cause analysis to USACE along with planned corrective actions and/or recommendations, if needed. It should be noted that a critical non-conforming unit does not mean that the entire lot will automatically have to start from the beginning again. It is anticipated that the root cause analysis will be used to pin-point exactly where the system failed. Work that has been conducted up to the point of system failure will be accepted, and once corrective actions have been taken, work should only be redone from the point of system failure on.

36.5.2 INTRUSIVE QC

After each grid and transect is completed, the Corporate Quality Manager (or designee) will ensure that the following QC checks are performed:

- The UXOQCS (or designee) checks each no-find to ensure that no target was missed.
- The UXOQCS (or designee) has performed anomaly resolution IAW with this QAPP and SOP.

If any anomalies or inconsistent data are identified during the intrusive QC investigation, the characteristic of the failure will be evaluated.

36.5.3 UXO INVESTIGATION APPROVAL

Once all targets within each lot of data have passed QC, the Corporate Quality Manager and his/her team will formally document the QC efforts for the Passage Key ATGGR and recommend that it either pass QC or will recommend additional activities necessary for it to pass QC. The JV PM will then be informed that Passage Key ATGGR is ready for review by USACE.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3)
(EPA 2106-G-05 Section 2.4)

This worksheet documents procedures that will be used to perform the data usability assessment. The data usability assessment is performed at the conclusion of data collection activities, using the outputs from data verification and data validation (Worksheets #35 and #36). It involves a qualitative and quantitative evaluation of data against the MPCs and DQOs to determine if the project data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective review of the systematic planning process to evaluate whether underlying assumptions are supported, sources of uncertainty have been managed appropriately, data are representative of the population of interest, and the results can be used as intended with an acceptable level of confidence.

Personnel responsible for participating in the data usability assessment preparation or review:

Name	Title	Organization	Role in Usability Assessment
Rebecca Terry	USACE COR	USAESCH	Reviewer
Frank Araico	USACE PM	CESAJ	Reviewer
Mary Young	USACE Technical Manager	USAESCH	Reviewer
Kelly Enriquez	USACE Geophysicist	USAESCH	Reviewer
Susan Burtnett	PM	JV	Preparation
Steve Stacy	Senior Geophysicist	JV	Preparation
Al Larkins	Corporate Quality Manager	JV	Preparation
TBD	Field Geophysicists	JV NAEVA / 3Dg	Preparation

Documents used as input to the data usability assessment:

- Quality Assurance Project Plan
- Contract Specifications
- Quality Assurance Surveillance Plan
- QC Reports
- Corrective Action Reports
- Production Area Seed Report
- IVS Letter Report
- Prioritized Target "Dig" List

- Target Classification Report
- Dig Results

The data usability report will be included as an appendix to the Final RI Report. The steps included in performing the data usability assessment will include the following:

Step 1	**Review the project's objectives and sampling design** Review the data quality objectives. Are underlying assumptions valid? Were the project boundaries appropriate? Review the sampling design as implemented for consistency with stated objectives. Were sources of uncertainty accounted for and appropriately managed? Summarize any deviations from the planned sample design.
Step 2	**Review the data verification/validation outputs and evaluate conformance to MPCs documented on Worksheet #12** Review the site-specific project library for completeness. Review available QA/QC reports, including weekly QC reports, assessment reports, and corrective action reports. Evaluate the implications of unacceptable QC results. Evaluate conformance to MPCs documented on Worksheet #12. Summarize the impacts of non-conformances on data usability.
Step 3	**Document data usability, update the CSM, and draw conclusions** Determine if the data can be used as intended, considering implications of deviations and corrective actions. Assess the performance of the sampling design and Identify any limitations on data use. Update the conceptual site model and document conclusions.
Step 4	**Document lessons learned and make recommendations** Summarize lessons learned and make recommendations for changes to DQOs or the sampling design for future similar studies. Prepare the data usability summary report.

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