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FINAL REMEDIAL INVESTIGATION SAMPLING AND ANALYSIS PLAN UNEXPLODED ORDNANCE 16 (UXO 16) SOLID WASTE MANAGEMENT UNIT 4 (SWMU 4) ATLANTIC FLEET WEAPONS TRAINING AREA FORMER NAVAL AMMUNITION SUPPORT DETACHMENT VIEQUES ISLAND PUERTO RICO

07/01/2016

CH2M HILL INC

Final

UXO 16 Adjacent to Solid Waste Management Unit 4 Remedial Investigation Sampling and Analysis Plan

Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Contract Task Order 0019

July 2016

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

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

Prepared by

Virginia Beach, Virginia

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Executive Summary

This Sampling and Analysis Plan (SAP) is prepared to support the field sampling activities at the portion of UXO 16 adjacent to Solid Waste Management Unit (SWMU) 4, located at the former Naval Ammunition Support Detachment (NASD) located in the western portion of Vieques, Puerto Rico (**Figure ES-1**). This SAP includes 37 worksheets that detail various aspects of the investigation process and serves as a guideline for the field activities and data assessment. This SAP was developed in general accordance with two guidance documents: 1) United States Environmental Protection Agency (EPA) *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (EPA, 2002), and 2) EPA, *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) (EPA, 2005).

This SAP was prepared under the Department of the Navy (Navy) Comprehensive Long-Term Environmental Action (CLEAN) Contract N62470-11-D-8012, Contract Task Order 019 for submittal to the Naval Facilities Engineering Command (NAVFAC) Atlantic, EPA Region 2, the Commonwealth of Puerto Rico Environmental Quality Board (PREQB), Puerto Rico Department of Natural and Environmental Resources (PRDNER), and the United States Fish and Wildlife Service (USFWS). The Navy, EPA, PREQB, PRDNER, and USFWS work jointly as the Vieques Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Environmental Restoration Program (ERP) Technical Subcommittee.

SWMU 4 is known as the former Open Burn/Open Detonation (OB/OD) Site that was used for the thermal destruction of retrograde and surplus munitions, fuels, and propellants from 1969 through 1979 and may have periodically been used as far back as the late 1940s. The OB/OD operations were conducted in 16 man-made earthen bermed pits that have since become overgrown with vegetation (**Figure ES-2**). Fuels, propellants, and explosives waste material were burned and/or detonated. These OB/OD activities likely resulted in ejection of munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH) and related debris to the terrestrial and offshore environments; additionally, MEC/MPPEH and related debris may have been transported terrestrially and offshore via overland transport which is the conveyance of materials (e.g., soil, debris) along the ground surface under the influence of such forces as surface runoff.

UXO 16 is approximately 11,500 acres and comprises the offshore portions of Vieques including former ship anchor points and the area immediately surrounding Mosquito Pier where munitions may have been transferred; areas where munitions may have been inadvertently fired into the water from Naval gunfire training, air-to-ground bombing, and artillery and training ranges; and areas where OB/OD activities may have ejected munitions into the water. The offshore area adjacent to SWMU 4 is designated as UXO 16; this area is approximately 200 acres in size, generally defined by the explosive safety arc and projected extent of MEC. This SAP focuses the environmental investigation only within this portion of UXO 16.

An Expanded Site Inspection (ESI) was conducted for UXO 16 that included an underwater visual survey for potential MEC/MPPEH on the seafloor and an instrument-aided excavation of subsurface anomalies detected on the seafloor (CH2M, 2016). The ESI surveyed 14.6 miles of underwater transects and a total of 60 munitions related items were identified; three discarded military munitions (DMM) considered MEC and 57 munitions debris (MD). Based on the results of the ESI, this SAP has been prepared for the collection of offshore sediment samples and background sediment samples to evaluate the potential human health and ecological risks associated with munitions constituents that may have been released from MEC/MPPEH and former OB/OD operations.

A total of 21 sediment samples will be collected in UXO 16 where MEC/MPPEH have been found, in areas with higher densities of MD, in depositional areas, and to evaluate extent of potential munitions constituents contamination. Sediment samples will be evaluated for explosives, inorganics, grain size, potential of hydrogen (pH), total organic carbon (TOC), oxidation-reduction potential (ORP), and acid volatile sulfides/simultaneously extracted metals (AVS/SEM) (site samples only) (**Figure ES-3**). In addition, 16 sediment samples will be collected

from background areas outside of the site boundary for background comparison of inorganic constituents. The data will be used in preparation of the UXO 16 Adjacent to SWMU 4 Remedial Investigation (RI) Report.

This SAP will help ensure that environmental data collected or compiled are scientifically sound, of known and documented quality, and suitable for the intended uses (i.e., environmental characterization, human health and ecological risk assessment). The laboratory information cited in this SAP is for ALS – Kelso, APPL, Inc., and Test America - Burlington, which will provide analytical services for this investigation.

Resumen Ejecutivo

Se ha preparado este Plan de Muestreo y Análisis (SAP, por sus siglas en inglés) para apoyar las actividades de muestreo de campo en la porción de UXO 16 adyacente a la Unidad de Manejo de Desperdicios Sólidos (SWMU, por sus siglas en inglés) 4, ubicado en el antiguo Destacamento de Apoyo de Municiones Navales (NASD, por sus siglas en inglés), que se encuentra en la parte occidental de Vieques, Puerto Rico **(Figura ES-1)**. Este SAP incluye 37 hojas de trabajo que detallan diversos aspectos del proceso de investigación y sirve como una guía para la evaluación de las actividades de campo y de los datos que se obtengan. Este SAP se desarrolló en acuerdo general con dos documentos guía: 1) *Lineamientos para Desarrollar Planes de Garantía de Calidad del Proyecto de la* Agencia de Protección Ambiental de los EE.UU (EPA, por sus siglas en inglés), *EPA QA/G-5, QAMS* (EPA, 2002), y 2) *Lineamientos Estándares Federales para Desarrollar Planes de Garantía de Calidad de Proyectos de EPA* (UFP-QAPP) (EPA, 2005).

Se preparó este SAP bajo el Contrato a Largo Plazo de Acción Ambiental Global (CLEAN, por sus siglas en inglés) del Departamento de la Marina de los EE.UU. (Marina) N62470-11-D-8012, Orden de Trabajo del Contrato 019 para que se presente al Comando de Instalaciones de Ingeniería Naval (NAVFAC por sus siglas en inglés) del Atlántico, EPA región 2, la Junta de Calidad Ambiental del Estado Libre Asociado de Puerto Rico (JCA), el Departamento de Recursos Naturales y Ambientales de Puerto Rico (DRNA), y el Servicio de Pesca y Vida Silvestre de los EE.UU. (USFWS por sus siglas en inglés). La Marina, EPA, la JCA, el DRNA, y USFWS trabajan conjuntamente como el Subcomité Técnico del Programa de Restauración Ambiental (ERP, por sus siglas en inglés) bajo la Ley Integral de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA, por sus siglas en inglés).

A SWMU 4 se le conoce como el antiguo Sitio de Quema Abierta/Detonación al Aire Libre (OB/OD, por sus siglas en inglés), el cual se utilizó para la destrucción térmica de municiones retrógradas y excedentes, combustibles y propulsores desde 1969 a 1979 y puede que periódicamente se haya utilizado para este propósito desde finales de la década de los 1940s. Las operaciones OB/OD se llevaron a cabo en 16 fosas artificiales hechas en bermas de tierra que desde entonces quedaron cubiertas por vegetación (**Figura ES-2**). En éstas se quemaron y/o detonaron combustibles, propulsores y materiales de desecho relacionados a explosivos. Es probable que estas actividades OB/OD dieran lugar a la expulsión de municiones y explosivos de preocupación (MEC, por sus siglas en inglés)/material que potencialmente puede presentar un peligro de explosión (MPPEH, por sus siglas en inglés), y escombros relacionados a municiones en los ambientes terrestres y marinos; además, estos MEC/MPPEH y los escombros relacionados pudieron haber sido transportados por vía terrestre y por el mar incluyendo el transporte a través de escorrentía de aguas pluviales y la descarga de la corriente efímera.

UXO 16 tiene aproximadamente 11.500 acres y comprende las porciones de Vieques en alta mar, incluyendo los antiguos puntos de anclaje de embarcaciones y la zona que rodea inmediatamente a Mosquito Pier donde se pudieron haber transferido municiones; las áreas en las que las municiones pudieron haber sido disparadas accidentalmente al agua durante actividades de adiestramiento naval con armamento, bombardeos aire-tierra, artillería y desde los campos de tiro; y las áreas donde las actividades de OB/OD pudieron haber expulsado municiones al agua. La zona de alta mar adyacente a SWMU 4 está designada como UXO 16; esta área en particular es de aproximadamente 200 acres de extensión, generalmente está definida por el arco de seguridad de explosivos y el alcance de los MEC expulsados. Este SAP se centra solamente en la investigación ambiental de esta porción de UXO 16.

Se llevó a cabo una Inspección Ampliada del Sitio (ESI por sus siglas en inglés) para UXO 16, la cual incluyó una investigación visual debajo el agua para determinar la presencia potencial de MEC/MPPEH en el fondo marino, y una excavación asistida por un instrumento para determinar anomalías que se detecten debajo de la superficie del fondo del mar (CH2M, 2016). El ESI inspeccionó 14.6 millas de transeptos debajo el agua donde se identificaron un total de 60 artículos relacionados a municiones; tres municiones militares desechadas (DMM, por sus siglas en inglés) que se consideraron como MEC, y 57 escombros relacionados a municiones de escombros

(MD, por sus siglas en inglés). Basado en los resultados de ESI, se preparó este SAP para realizar muestreo de sedimentos marinos en alta mar y muestreo de sedimento de trasfondo que sirvan para evaluar el potencial que se presenten riesgos para la salud humana y riesgos ecológicos asociados con constituyentes de municiones que pudieron haber sido liberados a partir de los MEC/MPPEH y de las antiguas operaciones OB/OD.

Se obtendrá un total de 21 muestras de sedimento proveniente de UXO 16, en las áreas donde se encontró MEC/MPPEH, en las áreas con mayor densidad de MD y en las áreas de deposición, y para evaluar el alcance de la posible contaminación de constituyentes de municiones. Las muestras de sedimentos serán analizadas para explosivos, compuestos inorgánicos, tamaño del grano, el potencial de hidrógeno (pH, por sus siglas en inglés), carbono orgánico total (TOC, por sus siglas en inglés), el potencial de oxidación-reducción (ORP, por sus siglas en inglés), y ácidos sulfuros volátiles/metales extraídos simultáneamente (AVS/SEM, por sus siglas en inglés) (solamente muestras del sitio) (Figura ES-3). Además, se obtendrán 20 muestras de sedimentos en las áreas de fondo fuera de los límites del sitio para poder hacer una comparación con los componentes inorgánicos del trasfondo. Los datos se utilizarán en la preparación del Informe de la Investigación para la Remediación (RI, por sus siglas en inglés) de UXO 16 Adyacente a SWMU 4.

Este SAP ayudará a asegurar que los datos ambientales que se obtengan o recopilen son científicamente sólidos, de calidad reconocida y documentada, y adecuados para los usos previstos (es decir, la caracterización del ambiente, y las evaluaciones de riesgos para la salud humana y ecológico). La información de laboratorio citado en este SAP es para ALS – Kelso, APPL, Inc., y Test America - Burlington, quienes proporcionarán los servicios analíticos para esta investigación.

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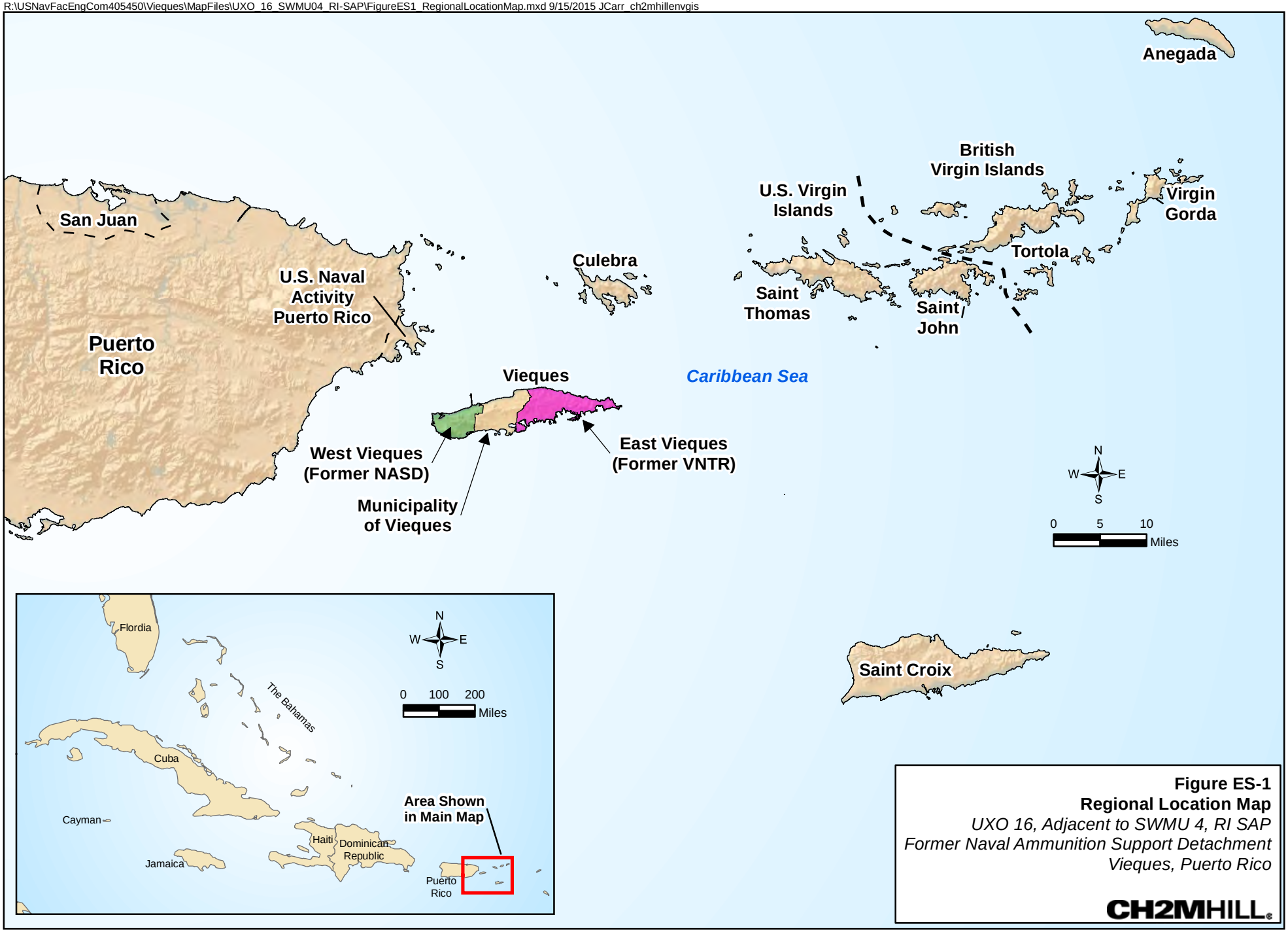

Figure ES-1
Regional Location Map
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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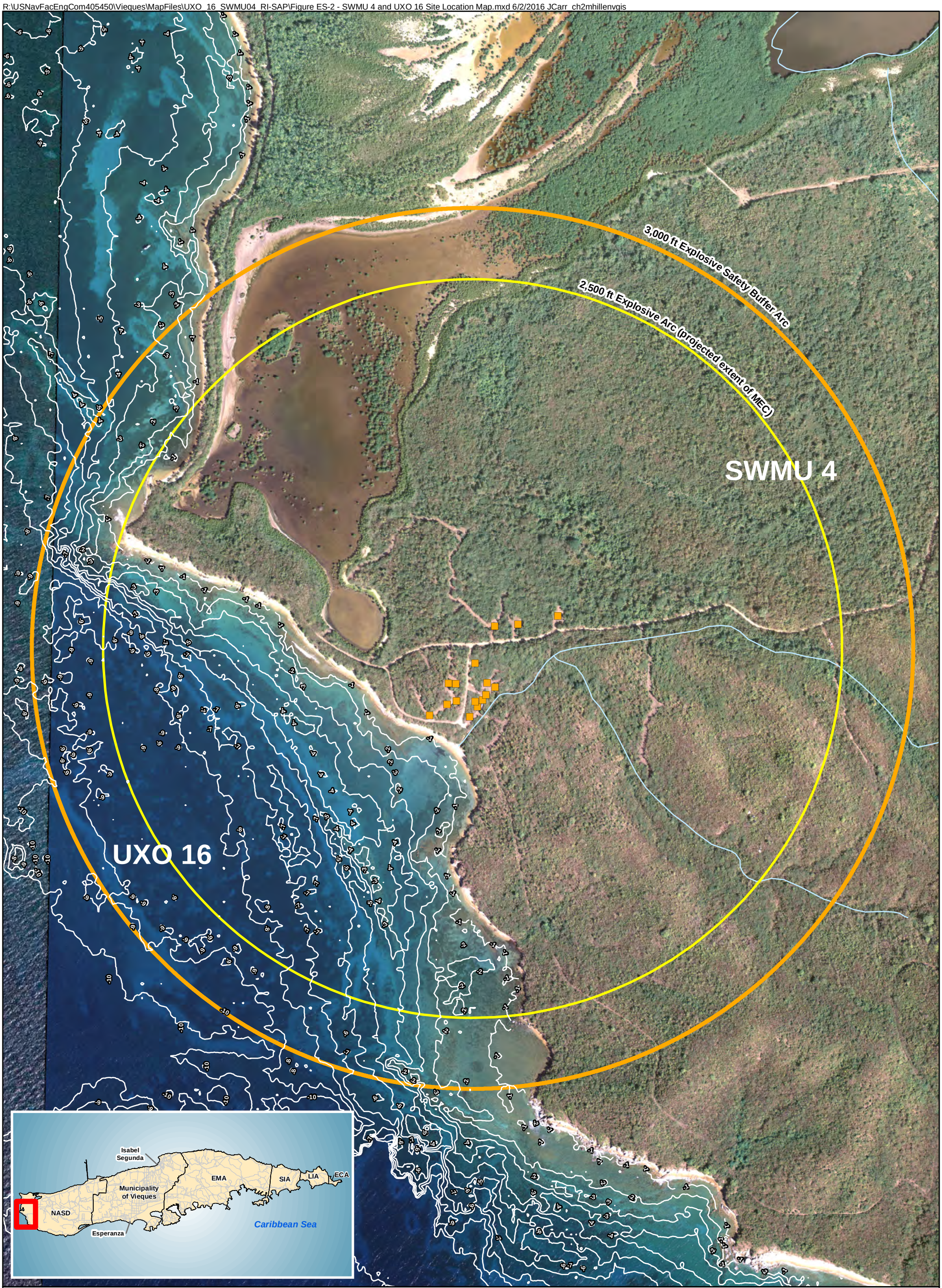

Legend

- OB/OD Pits
- Bathymetry Contour (meters)
- Ephemeral Stream

N
W E
S

0 500 1,000
Feet

Figure ES-2
SWMU 4 and UXO 16 Site Location Map
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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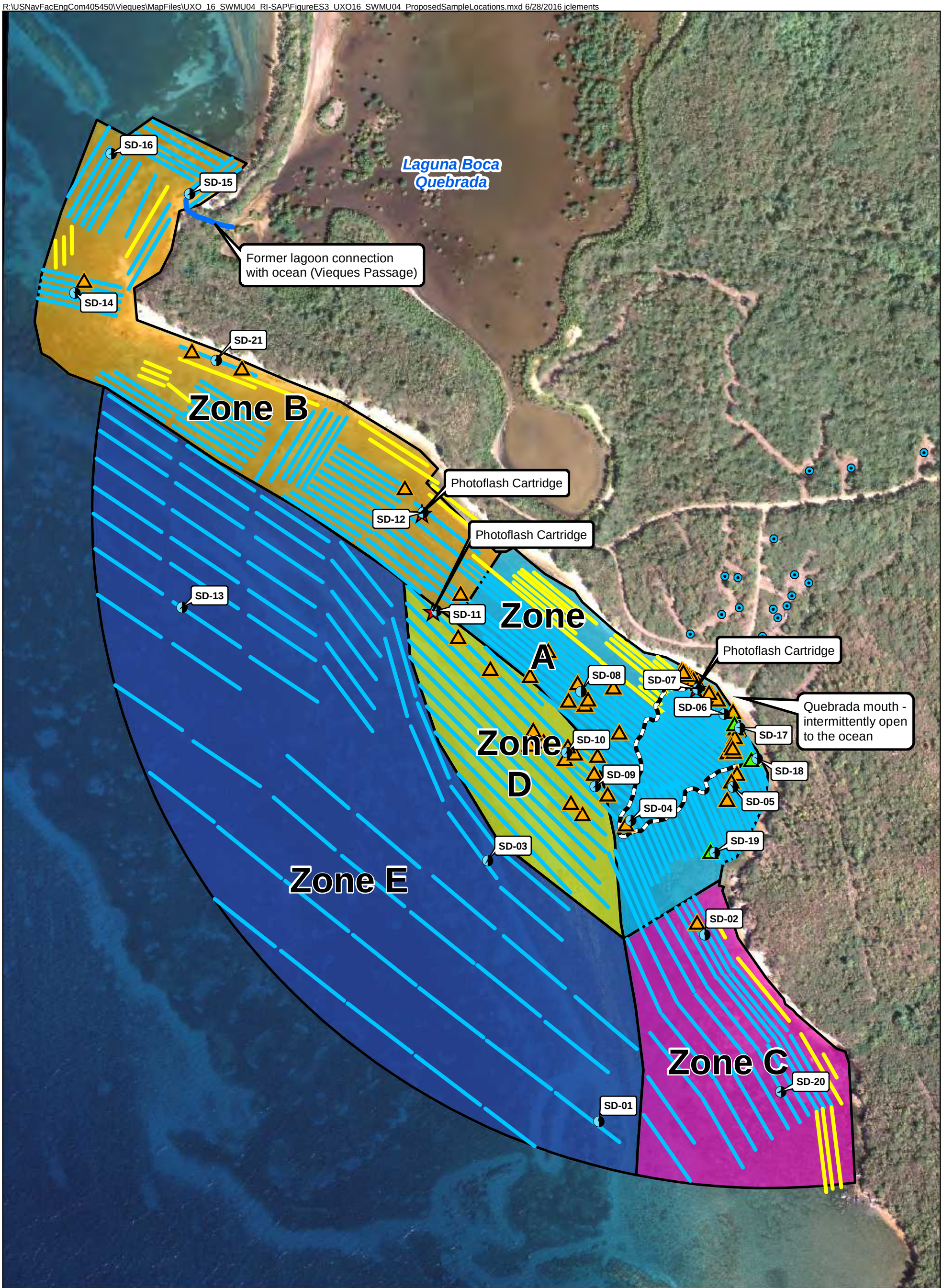

Proposed Sediment Locations
OBOD Pits
MPPEH (2012 Site Investigation)
DMM
MD
General boundary of sand fan associated with quebrada
Transect not surveyed. Area of shallow reef, sensitive coral species, jagged rock, and/or strong surf making conditions unsuitable for diving or boating.
Completed survey transect

Zone A
Zone B
Zone C
Zone D
Zone E

N
W E
S

0 165 330 660 Feet

Figure ES-3
Proposed Sample Locations
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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Acronyms and Abbreviations

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AAUS	American Academy of Underwater Sciences
AFWTA	Atlantic Fleet Weapons Training Area
AM	Activity Manager
AVS/SEM	acid volatile sulfides/simultaneously extracted metals
bgs	below ground surface
CA	corrective action
CCB	continuing calibration blank
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CLEAN	Comprehensive Long-term Environmental Action-Navy
COPC	constituent of potential concern
CSM	Conceptual Site Model
DDESB	Department of Defense Explosives Safety Board
DL	detection limit
DMM	discarded military munitions
DoD	Department of Defense
DOI	Department of the Interior
DQE	data quality evaluation
DQI	data quality indicator
DQO	data quality objective
EB	equipment blanks
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
ESI	Expanded Site Investigation
ESV	ecological screening value
EXPLO	explosives
FD	field duplicate
FFA	Federal Facilities Agreement
FRC	Federal Records Center
FS	Feasibility Study
FTL	Field Team Leader
GPS	global positioning system
H&S	health and safety
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HQ	hazard quotient

ICAL	initial calibration
ICB	initial calibration blank
ICS	interference check solutions
ICV	initial calibration verification
ID	identification
IDW	investigation-derived waste
IR	Installation Restoration
IS	internal standard
LC-MS/MS	Liquid Chromatography and Tandem Mass Spectrometer
LCS	laboratory control sample
LD	laboratory duplicate
LDR	linear dynamic range
LIMS	Laboratory Information Management Systems
LOD	limit of detection
LOQ	limit of quantitation
LRB	laboratory reagent blank
MC	munitions constituent
MD	munitions debris
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mm	millimeter
MOV	Municipality of Vieques
MPC	measurement performance criteria
MPPEH	material potentially presenting an explosive hazard
MS/MSD	matrix spike/matrix spike duplicate
MSA	method of standard addition
MSOPPP	Master Standard Operating Procedures, Protocols, and Plans
N/A	not applicable
NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NETOPS	Naval Engineering Training and Operating Procedure Standard
NIRIS	Navy Installation Restoration Information System
NMFS	National Marine Fisheries Services
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
OB/OD	open burn/open detonation
ORP	oxidation reduction potential
OU	Operable Unit
PA/SI	Preliminary Assessment/Site Inspection
PAL	project action limit
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PC	Project Chemist
PCT	percent
PCT_P	percent passing
PDS	post-digestion spike
pH	potential of hydrogen
PIL	project indicator limit

PJLA	Perry Johnson Laboratory Accreditation, Inc.
PM	Project Manager
POC	point of contact
PPE	personal protective equipment
PQL	project quantitation limit
PQO	project quality objective
PRCT	Puerto Rico Conservation Trust
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
QA	quality assurance
QAMS	Quality Assurance Management Section
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual
RAB	Restoration Advisory Board
RI	Remedial Investigation
ROV	remotely operated vehicle
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RSL	regional screening level
RT	retention time
SAP	Sampling and Analysis Plan
SD	sediment sample
SI	Site Inspection
SOP	standard operating procedure
SSC	Site Safety Coordinator
SWMU	Solid Waste Management Unit
SWO	safe work observation
TAT	turnaround time
TBD	to be determined
TOC	total organic carbon
UFP	Uniform Federal Policy
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VNTR	Vieques Naval Training Range
VOC	volatile organic compound
WCHEM	wet chemistry

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SAP Worksheet #1—Title and Approval Page

Final
UXO 16 Adjacent to Solid Waste Management Unit 4
Remedial Investigation Sampling and Analysis Plan

Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

July 2016

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SAP Worksheet #2—Sampling and Analysis Plan Identifying Information

Site Name/Number: UXO 16, Adjacent to Solid Waste Management Unit 4 (SWMU 4), Former Naval Ammunition Support Detachment (NASD), Vieques, Puerto Rico.

Operable Unit: Not Applicable

Contractor Name: CH2M HILL

Contract Number: N62470--11-D-8012

Contract Title: Comprehensive Long-term Environmental Action-Navy (CLEAN) Program

Work Assignment Number (optional):

1. This Sampling and Analysis Plan (SAP) was prepared in general accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (EPA, 2005) and *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5*, Quality Assurance Management Section (QAMS) (EPA, 2002).
2. Regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
3. This SAP is a project-specific SAP.
4. Dates of scoping sessions:

Scoping Session	Date
Vieques Environmental Technical Subcommittee Meeting – San Juan, Puerto Rico	July 6, 2015

5. Dates and titles of any SAP documents written for previous site work that are or may be relevant to the current investigation.

Title	Date
Master Standard Operating Procedures, Protocols, and Plans	April 2010

6. Organizational partners (stakeholders) and connection with lead organization:
   - **EPA Region 2** - Regulatory stakeholder overseeing CERCLA Vieques Environmental Restoration Program (ERP) implemented by lead organization.
   - **Puerto Rico Environmental Quality Board (PREQB)** - Regulatory stakeholder overseeing, on behalf of the Commonwealth of Puerto Rico, CERCLA Vieques ERP implemented by lead organization.
   - **Puerto Rico Department of Natural and Environmental Resources (PRDNER)** – The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico.
   - **United States Fish and Wildlife Service (USFWS)** - Land owner of all Department of the interior (DOI) land on which CERCLA Vieques ERP actions are being taken. Regulatory stakeholder on actions which may affect vegetation or wildlife on their properties.
   - **National Oceanic and Atmospheric Administration (NOAA)** – Marine habitat stakeholder and technical advisor to EPA.
   - **National Marine Fisheries Services (NMFS)** – Part of NOAA responsible for stewardship of the nation's ocean resources and their habitat; specifically for the UXO 16 Remedial Investigation, responsible for marine threatened and endangered species that may be affected by the sampling activities. Regulatory stakeholder for input regarding marine threatened and endangered species.

SAP Worksheet #2—Sampling and Analysis Plan Identifying Information (continued)

7. Lead organization (see **Worksheet #7** for detailed list of data users):
   - U. S. Department of the Navy (Navy)
8. The omitted SAP elements excluded and provide an explanation for their exclusion below:
   - Crosswalk table is excluded because all SAP elements (i.e., worksheets) are provided in this SAP; refer to **Worksheet #21** for a listing of SOP references.

SAP Worksheet #3—Distribution List

SAP Recipients	Title	Organization	Telephone Number (optional)	E-mail Address or Mailing Address	Draft	Draft Final	Final
Kevin Cloe	Vieques Remedial Project Manager (RPM)/ Lead Agency Point of Contact (POC)	Navy	757-322-4736	kevin.cloe@navy.mil	A		A
Daniel Hood	Vieques RPM/No project-specific role	Navy	757-322-4630	daniel.r.hood@navy.mil	CL		CL
Madeline Rivera	Vieques Environmental Restoration Program Site Manager /On-island Coordination	Navy	757-286-6457 (c)	llamasmad@gmail.com	A		A
Bonnie Capito	Librarian and Records Manager/ Final document archiving	Navy	757-322-4785	bonnie.capito@navy.mil			A
Lora Pride	Field Team Leader (FTL)/Site Safety Coordinator (SSC)/Scientific Dive Safety Officer (DSO)	CH2M HILL	985-688-8562	lora.pride@ch2m.com	A		A
George DeMetropolis (or his designee)	Munitions Dive Lead	CH2M HILL	619-319-7239	george.demetropolis@ch2m.com	A		A
Bill Hannah	Project Manager (PM)	CH2M HILL	757-671-6277	bill.hannah@ch2m.com	A	A	A
Mike Zamboni	Project Chemist	CH2M HILL	703-376-5301	mike.zamboni@ch2m.com			CD
Anita Dodson	Program Chemist	CH2M HILL	757-671-6218	anita.dodson@ch2m.com			CD
Brett Doerr	Contractor Activity Manager (AM)/Navy contractor primary POC	CH2M HILL	757-671-6219	brett.doerr@ch2m.com	A	A	A
Renee Hunt	Environmental Investigation Lead	CH2M HILL	414-847-0349	renee.hunt@ch2m.com			CD
Cynthia Clark	Analytical Laboratory/Project Manager	APPL, Inc.	559 275-2175				CD
Don Dawicki	Analytical Laboratory/ Project Manager	Test America - Burlington	802-660-1990				CD
Howard Holmes	Analytical Laboratory /Project Manager	ALS- Kelso	360-577-7222	howard.holmes@alsglobal.com			CD
Laura Maschoff	Project Manager	DataQual Environmental Services, LLC	314-330-1327	dataqual@charter.net			CD
Angela Carpenter	EPA Special Projects Branch	EPA	212-637-4435	carpenter.angela@epa.gov	CL		CL
Daniel Rodriguez	Vieques RPM/Regulatory agency POC	EPA	787-741-5201 787-671-9879 (c)	rodriguez.daniel@epa.gov	A		A
Jose Font	Caribbean Environmental Protection Division Director	EPA	787-977-5814	font.jose@epa.gov	CL		CL
Sergio Lopez	Quality Control (QC) Specialist/ Technical input and draft document review	EPA	732-321-6778	lopez.sergio@epa.gov	A		A

SAP Worksheet #3—Distribution List (continued)

SAP Recipients	Title	Organization	Telephone Number (optional)	E-mail Address or Mailing Address	Draft	Draft Final	Final
Michael Sivak	Human Health Risk Assessment (HHRA) Lead/Technical input and draft document review	EPA	212-637-4310	sivak.michael@epa.gov	A		A
Mindy Pensak	Ecological Risk Assessment (ERA) Lead/Technical input and draft document review	EPA	732-321-6705	pensak.mindy@epa.gov	A		A
Bradley Martin	Technical Support Consultant for EPA/EPA contractor primary POC	TechLaw	312-345-8960	bmartin@techlawinc.com	A		A
Weldin F. Ortiz Franco	Executive Director/No project-specific role	PREQB	787-767-8056	weldinortiz@jca.gobierno.pr	CL		CL
Gloria Toro	Vieques RPM/ Regulatory agency POC	PREQB	787-767-8181 x3586 (w)	gloriatoro@jca.gobierno.pr	A		A
Tim Reilly	Technical Support Consultant for PRDNER/PRDNER Contractor Project Manager (PM)	LTCI	978-290-1242 (c)	treilly@lighthousetechnical.com	A		A
Craig Lilyestrom	Puerto Rico Natural Resource Coordinator/technical input and document review	PRDNER	787-999-2200, x2689 (w)	craig.lilyestrom@drna.gobierno.pr	A		A
Katarina Rutkowski	Technical Support Consultant for PREQB/PREQB contractor primary POC	TRC	860-298-6202	krutkowski@trcsolutions.com	A		A
Elizabeth Denly	Technical Support Consultant for PREQB/PREQB contractor PM	TRC	978-656-3577 (w) 978-328-2551(c)	edenly@trcsolutions.com	HC		HC
Mike Barandiaran	Refuge Manager/No project-specific role	USFWS	787-741-2138	mike_barandiaran@fws.gov			A
Susan Silander	Vieques RPM/ Caribbean Islands Refuges Supervisor	USFWS	787-851-7258 x38	susan.silander@fws.gov	CL		CL
Richard Henry	Technical Support for USFWS	USFWS	732-906-6987	richard_henry@fws.gov	A		A
Diane Wehner	Regional Resource Coordinator/ Technical input and draft document review	NOAA	732-872-3030	diane.wehner@noaa.gov	A		A
Lisamarie Carrubba	Technical Project Manager/Review of SAP and coordination of any necessary threatened and	NMFS	787-851-3700	lisamarie.carrubba@noaa.gov	A		A

SAP Worksheet #3—Distribution List (continued)

SAP Recipients	Title	Organization	Telephone Number (optional)	E-mail Address or Mailing Address	Draft	Draft Final	Final
	endangered species protection standard operating procedures						
Luther W. Landrum	N/A	Restoration Advisory Board (RAB)	772-519-2635	landrumjune@gmail.com		HC	
Linda LaViolette	N/A	RAB	917-620-3796	lalaviolette@hotmail.com		CD	
Colleen McNamara	N/A	RAB	787-380-2545	lacolina@hughes.com		CD	
Stacie D. Notine	N/A	RAB	847-922-0962	N/A		HC	
Jorge Fernandez Porto	N/A	RAB	787-726-2839	jfporto@onelinkpr.net		CD	
Lirio Marquez D'Acunti	N/A	RAB	787-726-2839	liriomarquez@gmail.com		N	
Myrna Pagan	N/A	RAB	818-963-2344	paganveda@aol.com		HC	
James E. Larkins	N/A	RAB	787-635-4950	jelarkins1@gmail.com		HC	

Notes:

A=All	CL=Cover Letter
D=Draft	CD=Compact Disc
DF=Draft Final	HC=Hard Copy
F=Final	N=None

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SAP Worksheet #4—Project Personnel Sign-Off Sheet (used for internal distribution)

Name	Organization/Title/Project Role	Telephone Number (optional)	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Anita Dodson	CH2M HILL/Navy Program Chemist/ SAP review	757-671-6218			
Brett Doerr	CH2M HILL / Contractor Activity Manager/ Navy contractor primary POC, Quality Assurance Officer (QAO)/SAP review	757-671-6219			
Bill Hannah	CH2M HILL /Contractor PM/Logistics and Administration	(757) 671-6277 x46277 (c)			
Carl Woods	CH2M HILL /Contractor Health and Safety (H&S) Lead/ H&S Officer	(513) 889-5771 (w) (513) 319-5771(c)			
Lora Pride	FTL/SSC	(985) 688-8562 (c)			
George DeMetropolis (or his designee)	Munitions Dive Lead	619-319-7239			
Mike Zamboni	CH2M HILL /Project Chemist	703-376-5301			
Cynthia Clark	APPL, Inc. Analytical Laboratory/Project Manager	559-275-2175			
Don Dawicki	Test America- Burlington Analytical Laboratory)/Project Manager	802-660-1990			
Howard Holmes	ALS- Kelso Analytical Laboratory/Project Manager	360-577-7222			
Laura Maschoff	DataQual Environmental Services, LLC/Project Manager	314-330-1327			

Note: CH2M HILL will maintain the signed signature page with the project files.

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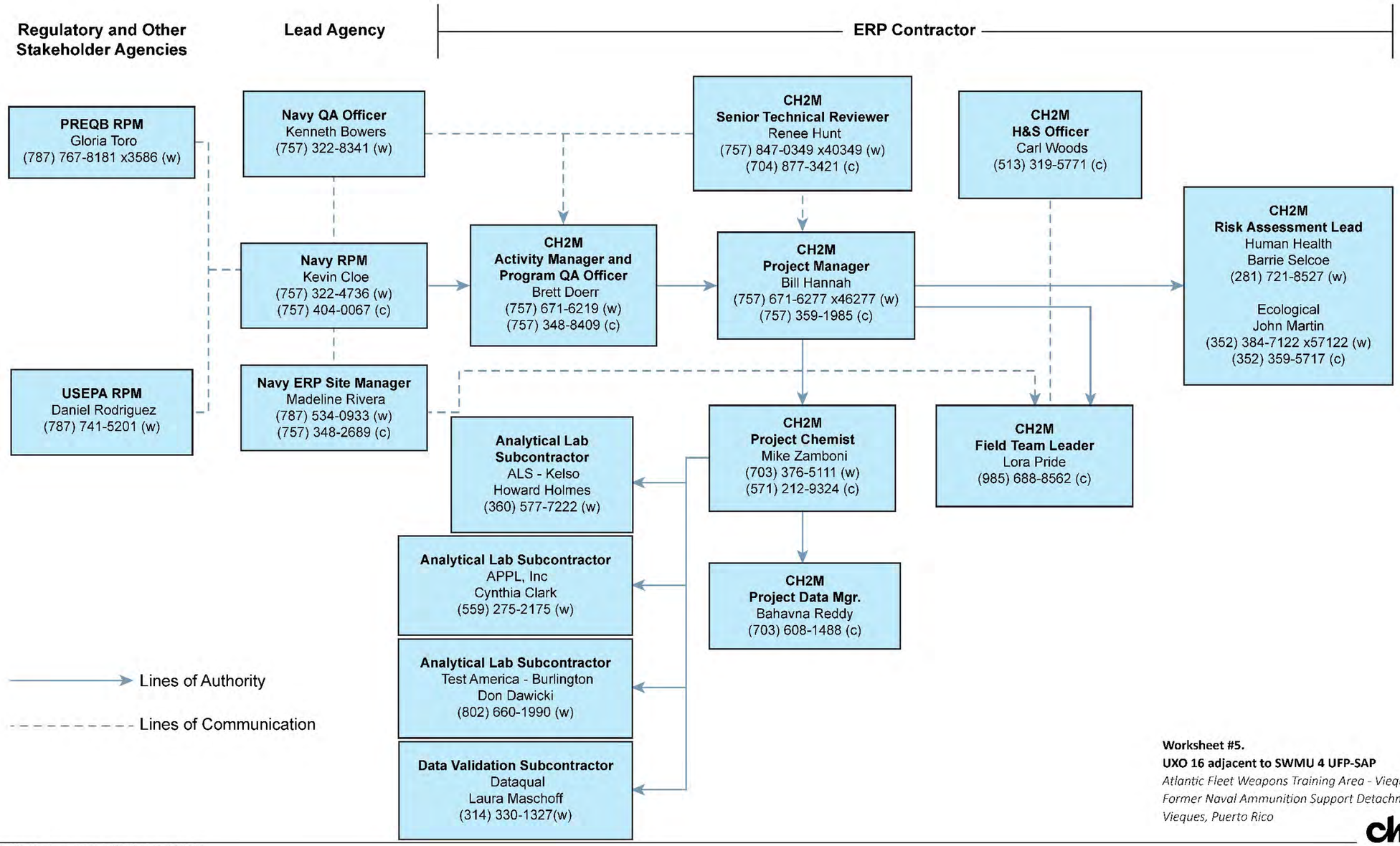
SAP Worksheet #5—Project Organizational Chart



Worksheet #5.
UXO 16 adjacent to SWMU 4 UFP-SAP
Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

ch2m

ES083011092144ORL UXO 16 adjacent SWMU 4 UFP-SAP v2 09-02-2015 BP

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SAP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Communication to/from Navy (e.g., submission of SAP for review; receipt of regulatory comments, etc.) Stop work notices to regulators, notifying regulators of SAP changes or deviations, significant issues and necessary corrective actions by phone or e-mail within 2 weeks of notification of Navy RPM.	Navy RPM	Kevin Cloe	757-322-4736	Primary POC for Navy (via e-mail, telephone, hardcopy, or in-person, as warranted); can delegate communication to other internal or external points of contact.
Communication to/from EPA (e.g., receipt of SAP for review; submission of EPA comments)	EPA RPM	Daniel Rodriguez	787-741-5201	Primary POC for EPA (via e-mail, telephone, hardcopy, or in-person, as warranted); can delegate communication to other internal or external points of contact.
Communication to/from PREQB (e.g., receipt of SAP for review; submission of PREQB and other Puerto Rico Commonwealth Agency comments)	PREQB RPM	Gloria Toro	787-767-8181 x3586 (w)	Primary POC for PREQB and other Puerto Rico Commonwealth Agencies (via e-mail, telephone, hardcopy, or in-person, as warranted); can delegate communication to other internal or external points of contact.
Communication to/from USFWS (e.g., receipt of SAP for review; submission of USFWS comments)	USFWS RPM	Susan Silander	787-851-7258 (x 238)	Primary POC for USFWS (via e-mail, telephone, hardcopy, or in-person, as warranted); can delegate communication to other internal or external points of contact.
Communication to/from NOAA (e.g., receipt of SAP for review; submission of NOAA comments to EPA)	NOAA POC	Diane Wehner	732-872-3030	Primary POC for NOAA (via e-mail, telephone, or in-person, as warranted); communication primarily though EPA.
Communication to/from NOAA (e.g., receipt of SAP for review; submission of NMFS comments; input regarding marine threatened and endangered species)	NMFS POC	Lisamarie Carrubba	787-851-3700	Primary POC for NMFS (via e-mail, telephone, or in-person, as warranted).
Navy QA/QC input	Navy QAO	Kenneth Bowers	757-322-8341	Provides review comments to Navy contractor on pre-draft SAP via e-mail through Kevin Cloe. Provides overall Navy guidance via direct communication with Navy contractor QAO, as warranted.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Communication to/from Navy contractor (e.g., submission of SAP for review; receipt of regulatory comments, updates on project progress, communication of stakeholder expectations, etc.). Stop work notices to Navy RPM, notifying Navy RPM of SAP changes or deviations, significant issues or corrective actions.	CH2M HILL Activity Manager	Brett Doerr	757-671-6219	Primary POC for Navy contractor (via e-mail, telephone, hardcopy, or in-person, as warranted); can delegate communication to other contractor staff, as appropriate.
Technical support and reporting	CH2M HILL Technical Consultant	Renee Hunt	414-847-0349	Direct communication with Activity Manager on technical issues related to the fieldwork and report preparation along with update presentations to the Technical Subcommittee.
Project administration and logistics	CH2M HILL PM	Bill Hannah	757-671-6277	Direct communication (via e-mail, telephone, hardcopy, or in-person, as warranted) to/from Navy contractor project staff to ensure appropriate project implementation.
H&S expectations and procedures	CH2M HILL H&S Officer	Carl Woods	513-889-5771 (w) 513-319-5771 (c)	Review of Health and Safety Plan (HASP). Direct communication (via e-mail, telephone, hardcopy, or in-person, will be notified within 24 hours of incident) to/from Navy contractor project staff to ensure implementation of appropriate health and safety procedures.
Implementation of sampling activities; SAP changes in the field; ensure staff health and safety in the field (science divers)	CH2M HILL FTL/SSC/DSO	Lora Pride	985-688-8562 (c)	Documentation of deviations from work plan made in field logbooks and rationale for deviations, made within 24 hours of deviation; deviations made only with approval from contractor PM and/or environmental manager. The Navy RPM, EPA, and PREQB RPMs will be notified within 24 hours of significant SAP changes in the field. Daily safety tailgates; daily observations; real-time discussions of observations and changes to be implemented with scientific dive team.
Field corrective actions	CH2M HILL FTL	Lora Pride	985-688-8562	See **Worksheet #32** Assessment Findings and Corrective Action (CA) Responses and **Worksheet #32-1** CA Form. The Navy RPM, EPA, and PREQB RPMs will be notified within 24 hours of significant field corrective actions.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Daily field progress reports	CH2M HILL FTL	Lora Pride	985-688-8562	FTL will e-mail or fax daily field progress reports to contractor PMs weekly; telephone communication with PMs on as-needed basis
Ensure staff health and safety of munitions divers in the field	CH2M HILL Munitions Dive Lead	George DeMetropolis (or his designee)	619-319-7239	Daily safety tailgates; daily observations; real-time discussions of observations and changes to be implemented with munitions dive team.
Stop Work Order	CH2M HILL DSO/Munitions Dive Lead	Lora Pride/George DeMetropolis (or his designee)	985-688-8562	Any field member can immediately stop work if an unsafe condition which is immediately threatening to human health is observed. The field staff, FTL, SSC, DSO, or Munitions Dive Lead should notify the CH2M HILL PM and AM immediately along with the Navy RPM. Ultimately, the FTL, PM, and AM can stop work for a period of time. NAVFAC Mid-Atlantic can stop work at any time.
Data tracking from collection through upload to database	CH2M HILL Project Chemist	Michael Zamboni	703-376-5301	Chemist will track data from sample collection through upload to database, ensuring Quality Assurance Project Plan (QAPP) requirements are met by laboratory and field staff. Tracking involves receipt of electronic and hardcopy data from laboratory and data validator. Chemist communicates with laboratory PM, and data validator PM, as warranted, to ensure adherence to project analysis and validation requirements. Should analytical laboratory issues affect data usability by rendering a significant amount of rejected or unusable data such that the project completeness goal cannot be obtained, the project chemist will notify the project team including the Navy RPM and Navy QAO. Chemist also coordinates data upload with contractor database manager.
Uploading project data and maintaining the database to ensure data are stored properly and can be retrieved by the Project Chemist	Database Manager	Bhavana Reddy	703-608-1488	Once contractor chemist ensures data are appropriate for upload to database, chemist submits data electronically to contractor database manager, who uploads data to database.
Reporting lab data quality issues	APPL, Inc. Analytical Laboratory /PM	Cynthia Clark	559-275-2175	All QA/QC issues with project field samples will be reported by the lab to the Project Chemist, and Contractor QAO via e-mail within 2 business days.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Reporting lab data quality issues	Test American Burlington Analytical Laboratory / PM	Don Dawicki	802-660-1990	All QA/QC issues with project field samples will be reported by the lab to the Project Chemist, and Contractor QAO via e-mail within 2 business days.
Reporting lab data quality issues	ALS- Kelso Analytical Laboratory)/ PM	Howard Holmes	360-577-7222	All QA/QC issues with project field samples will be reported by the lab to the Project Chemist, and Contractor QAO via e-mail within 2 business days.
Quality control on laboratory data	CH2M HILL Project Chemist	Michael Zamboni	703-376-5301	See **Worksheets #24, #25,** and **#28** for analytical CAs.
Validated data	Data Validator PM	Laura Maschoff	314-330-1327	Data validator provides data validation reports (electronic and hardcopy) that provide the data qualifiers and associated explanations.
Release of analytical data for upload to database	CH2M HILL Project Chemist	Michael Zamboni	703-376-5301	Upon review of validated data to ensure adherence to project requirements, project chemist communicates via e-mail to PM that data are ready for release (i.e., upload to database).

SAP Worksheet #7—Personnel Responsibilities Table

Name	Title	Organizational Affiliation	Responsibilities
Kevin Cloe	Vieques RPM	Navy	ERP activities implemented under this SAP
Kenneth Bowers	QAO	Navy	Navy review of SAP and QA input
Madeline Rivera	Vieques ERP Site Manager	Navy	On-island Navy liaison; provides logistical support for implementation of environmental restoration program activities under this SAP
Brett Doerr	Activity Manager	CH2M HILL	Responsible for ERP at Vieques; primary Navy contractor POC; assists in data evaluation and interpretation; reviews report
Bill Hannah	PM	CH2M HILL	Project administration; coordinates staffing; monitors project performance; directs and oversees project staff
Renee Hunt	Investigation Lead	CH2M HILL	Technical support related to data collection and evaluation
Mike Zamboni	Project Chemist	CH2M HILL	Establishes laboratory scope of work; ensures selected laboratory can meet project-required analytical protocol; primary communications with laboratory and data validator; performs data quality evaluation to determine availability of analytical data
Carl Woods	H&S Officer	CH2M HILL	Responsible for overall Navy CLEAN program health and safety performance; reviews project-specific HASP; interacts with SSC to ensure project-specific safety of field personnel
Lora Pride	FTL/SSC/DSO	CH2M HILL	Supervises sampling and coordinates all field activities; ensures onsite compliance with work plan; oversees and ensures safety of onsite personnel
George DeMetropolis (or his designee)	Munitions Dive Lead	CH2M HILL	Oversees and ensures safety of onsite munitions diver personnel
TBD	SSC	CH2M HILL	Oversees and ensures safety of onsite personnel
Bhavana Reddy	Database Manager	CH2M HILL	Uploads validated data to environmental database
Howard Holmes	Analytical Laboratory Project Manager	ALS Kelso for oxidation reduction potential (ORP) and acid volatile sulfides/ simultaneously extracted metals (AVS/SEM)	Laboratory POC and overall manager for analytical work
Don Dawicki	Analytical Laboratory Project Manager	Test America-Burlington for Grain Size	Laboratory POC and overall manager for analytical work
Cynthia Clark	Analytical Laboratory Project Manager	APPL, Inc. for explosives, inorganics, potential of hydrogen (pH), TOC, ORP	Laboratory POC and overall manager for analytical work
Laura Maschoff	Project Manager and Data Validator	Data Qual	Responsible for validating analytical data in accordance with project-specific UFP-SAP

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SAP Worksheet #8—Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
All site activities	Recognize, Retreat, and Respond (known as "3R") Training for explosives	Munitions Response Personnel	Personnel files	FTL, field team members, and SSC	All field team members from CH2M HILL	CH2M HILL, NAVFAC
Underwater dive operations	Munitions Divers Training specified by Naval Engineering Training and Operating Procedure and Standard (NETOPS) #4-Dive Safety EM 385 1-1 Science Divers American Academy of Underwater Scientists (AAUS), with addition of bailout bottles All Divers Annual Diving Physical Qualification/Training Dives, as applicable	---	Prior to investigation activities	Dive team	CH2M HILL	CH2M HILL, NAVFAC
Underwater dive operations	Identification of Federally Listed Species and Sensitive Habitat as per SOP-2	CH2MHILL Biologist or NMFS Biologist	During initial days of field investigation	Science Dive team	CH2M HILL	Demonstrated experience and/or training
Underwater identification of MEC/MPPEH for avoidance	UXO Qualified Technician (DDESB Technical Paper 18)	---	Prior to investigation activities	Munitions Dive Team	CH2M HILL	Resume, demonstrated experience, and/or qualifications

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SAP Worksheet #9—Project Scoping Session Participants Sheet

Project Name: Navy Clean - Vieques	**Site Name:** UXO 16 Adjacent to SWMU 4
Projected Date(s) of Sampling: May 2016	**Site Location:** UXO 16 offshore of SWMU 4, Former NASD
Project Manager: Bill Hannah	
Date of Session: July 6, 2015	
Scoping Session Purpose: Concur on path forward for the portion of UXO 16 adjacent to SWMU 4	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Julio Vazquez	West Vieques RPM	EPA	212/637-4323	Vazquez.Julio@epa.gov	No project specific role
Diane Wehner	Regional Resource Coordinator	NOAA	240/338-3411	Diane.wehner@noaa.gov	No project specific role
Dan Waddill	Navy Activity Manager	Navy	757-322-4815	Dan.waddill@navy.mil	Navy Vieques Coordinator
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC
Daniel Hood	Vieques RPM	NAVY	757-322-4630	Daniel.r.hood@navy.mil	Navy POC
Daniel Rodriguez	East Vieques RPM	EPA	787-741-5201 or 787-671-9879 (c)	Rodriguez.daniel@epamail.gov	Primary EPA POC
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 x 226	Felix_lopez@fws.gov	No project-specific role
Brett Doerr	Activity Manager	CH2M HILL	757-671-6219	Brett.doerr@ch2m.com	Scope development and technical review, primary CH2M HILL POC
Bill Hannah	Environmental Investigation Lead	CH2M HILL	757-671-6230	Bill.Hannah@ch2m.com	No project specific role
Angela Carpenter	Technical Support EPA Special Projects Branch	EPA	212-637-4435	Carpenter.angela@epa.gov	No project specific role
Mindy Pensak	Ecological Risk Assessment Lead	EPA	732-321-6705	Pensak.mindy@epa.gov	Technical input and draft document review
Susan Silander	Vieques RPM/ Caribbean Islands Refuges Supervisor	USFWS	787-851-7258 (x 238)	Susan.silander@fsw.gov	USFWS POC
Mike Barandiaran	Refuge Manager	USFWS	787-741-2138	Mike_barandiaran@fws.gov	No project specific role
Marelisa Rivera	Deputy Field Supervisor	USFWS	787-851-7297 x206	Marelisa.rivera@fws.gov	Secondary USFWS POC
Gloria Toro	Vieques RPM	PREQB	787-767-8181 x3586	GloriaToro@jca.gobierno.pr	PREQB POC
Michael Sivak	EPA Human Health Risk Assessor	EPA	212-637-4310	Sivak.Michael@epa.gov	Technical input and draft document review

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

Project Name: Navy Clean - Vieques	**Site Name:** UXO 16 Adjacent to SWMU 4
Projected Date(s) of Sampling: May 2016	**Site Location:** UXO 16 offshore of SWMU 4, Former NASD
Project Manager: Bill Hannah	
Date of Session: July 6, 2015	
Scoping Session Purpose: Concur on path forward for the portion of UXO 16 adjacent to SWMU 4	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Rich Henry	Contaminant Specialist	USFWS	732-906-6987	Richard_Henry@fws.gov	Technical input and draft document review
Craig Lilyestrom	Vieques RPM	DNER	787-772-2022	Craig.lilyestrom@drna.gobierno.pr	DNER POC
Tom Hall	Munitions Technical Support	TechLaw	501-753-7987	thall@techlawinc.com	501-753-7987
Sergio Lopez	QA/QC	EPA	732-321-6778	Lopez.Sergio@epa.gov	732-321-6778

Key Discussion Points

Brett Doerr/CH2M HILL provided a brief "seed file" to discuss the conceptual site model and proposed sampling approach at UXO 16, offshore of SWMU 4. The potential source of contamination is from the potential kick out of MEC from OB/OD pits to offshore and from transport of MEC via overland runoff and the ephemeral stream to offshore. A Site Inspection (SI) was conducted offshore in 2012 that covered the area immediately adjacent to the OB/OD pits and where the main ephemeral stream historically discharged (and may periodically during storm events) to the ocean. The Expanded Site Inspection (ESI) conducted from April 1, 2015 to May 18, 2015 surveyed a larger area, covering 14.6 miles of underwater transects. A total of 63 munitions-related items were found during both the SI and ESI: 57 Munitions Debris (MD), 3 Material Potentially Presenting an Explosive Hazard (MPPEH), and 3 Discarded Military Munitions (DMM). The majority of the items were identified closest to shore, immediately adjacent to the OB/OD pits and where the ephemeral stream discharges into the open water.

To determine if there has been releases from the offshore munitions, 19 sediment samples are proposed to characterize nature and extent of munitions constituents in sediment offshore. Discrete sediment samples (0-6 inches in depth) will be collected and analyzed for explosives and inorganics. Sediment samples are proposed where DMM and MPPEH items have been found, in areas with higher densities of munitions-related items, in depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present. Due to the low concentrations of munitions constituents observed in the terrestrial and lagoon environments, and the significant capacity and movement of ocean water, no surface water samples are proposed. Sixteen background sediment samples are proposed for inorganics. All sediment samples are proposed from the top 6 inches.

Diane Wehner/NOAA commented that at Culebra sediment samples were also collected from 0-6 inches and that a background data set was also collected. Marelisa Rivera/USFWS commented that future researchers could also be potential receptors.

Consensus – The Technical Subcommittee concurred in general with the RI approach and to include the ESI Report as an appendix to the RI SAP instead of a standalone document because it will save significant time (i.e., accelerate the CERCLA process in this area).

SAP Worksheet #10—Conceptual Site Model

This worksheet provides a summary of site background and key elements of the conceptual site model (CSM).

Background

Vieques is located in the Caribbean Sea approximately seven miles southeast of the eastern tip of the main island of Puerto Rico and 20 miles southwest of St. Thomas, United States (US) Virgin Islands (**Figure 1**). It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles).

The Navy purchased large portions of Vieques in the early 1940s to conduct activities related to military training. The Atlantic Fleet Weapons Training Area (AFWTA) was historically divided into two portions – the NASD and Vieques Naval Training Range (VNTR). Site operations on the western end of Vieques (former NASD), consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and OB/OD. The eastern end of Vieques (former VNTR) was used for various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities, Camp Garcia.

The former NASD was apportioned and transferred to the DOI, the Municipality of Vieques (MOV), and the Puerto Rico Conservation Trust (PRCT) in 2001, in accordance with Public Law 106-398. The property owned by DOI is managed by USFWS as part of the Vieques National Wildlife Refuge. The former VNTR was transferred to the DOI to be operated by USFWS as a National Wildlife Refuge in 2003, in accordance with Public Law 107-107. PRDNER has jurisdiction over a 1,000 meter wide belt of all Puerto Rico's coastal lands (and additional distances where needed to protect key coastal natural systems), and the territorial waters, including submerged lands beneath them, extending 9 nautical miles offshore.

On February 11, 2005, Vieques was placed on the National Priority List (NPL) as the former Atlantic Fleet Weapons Training Area - Vieques, which required all subsequent environmental restoration activities for Navy Installation Restoration (IR) sites on Vieques be conducted under CERCLA unless and until removed from CERCLA authority. The Navy, DOI, EPA, and PREQB executed a Federal Facility Agreement (FFA) on September 7, 2007 that established the procedural framework and schedule for implementing the CERCLA response actions for Vieques.

UXO 16 and SWMU 4

UXO 16 is approximately 11,500 acres and comprises the offshore portions adjacent to the former VNTR and NASD, three former ship anchor points, and the area immediately surrounding Mosquito Pier where munitions may have been transferred. The areas adjacent to the former VNTR and NASD are areas where munitions may have been inadvertently fired into the water from Naval gunfire training, air-to-ground bombing, and artillery and training ranges (former VNTR), and areas where OB/OD activities may have ejected munitions into the water (SWMU 4 within the former NASD). The offshore area investigated adjacent to SWMU 4 is part of UXO 16 and is approximately 200 acres in size (**Figure 2**).

SAP Worksheet #10 — Conceptual Site Model (continued)

Investigation History

Site Inspection

SI field activities were conducted from July 9 to July 15, 2012, in a 14-acre area immediately offshore of SWMU 4 to support the determination of whether there was a release of MEC to the underwater environment (**Figure 3**). The SI was not intended as a full-scale study of the nature and extent of contamination or explosives hazards, rather it was conducted to assess whether or not there was a potential presence of MEC in the area. The underwater investigation generally included diver surveys (visual and magnetometer aided) along transects focused in the near shore area closest to the OB/OD pits and the confluence with the large ephemeral stream that discharges at the beach. 14 transects were surveyed, each spaced approximately 50 feet apart and extending from 600 to 800 feet from the shore. Three MPPEH were identified including a 20-mm projectile, an expended M123 series photoflash cartridge base section, and a 40-mm flare base section, all of which were removed. In addition, 72 metallic anomalies (non MEC/MPPEH) were observed, none of which were identified as MD..

Biological oversight was conducted during the SI to prevent diver survey activities from damaging sensitive or protected habitats or species. In addition, a qualitative survey of the marine habitat types was conducted throughout the underwater area of UXO 16 adjacent to SWMU 4, the results of which are illustrated in **Figure 4.** A wide range of habitat types occur including, in order of highest to lowest percent cover, seagrass, coral reef and colonized pavement (low relief solid carbonate rock), sand colonized with macroalgae, coral reef and colonized bedrock (exposed bedrock contiguous with the shoreline), and bare sand. The greatest density and diversity of hard and soft coral occurs within the coral reef and colonized pavement habitat in the northern half of the UXO 16 area.

Expanded Site Inspection

An ESI was conducted from April 1 to May 18, 2015 that included an underwater visual survey for the presence of potential MEC/MPPEH on the seafloor and an instrument-aided survey and excavation of subsurface anomalies detected on the seafloor, across nearly 200 acres (the entire area within the 2,500-foot arc and additional area around the historical confluence of the mouth of the lagoon and the ocean) of UXO 16 offshore of SWMU 4 (CH2M, 2016). The ESI was conducted to provide a more comprehensive assessment of if/where a release of MEC/MPPEH occurred and to determine if further investigation is warranted.

The ESI approach included five zones (Zones A through E), with varying transect coverage and spacing based on exposure potential, as follows (**Figure 5**).

- Zone A has the highest exposure potential because of ready beach access and shallow sandy areas potentially supportive of wading; approximately 25% zone coverage with generally 30-foot transect spacing.
- Zone B has a moderate exposure potential because of lower beach accessibility and rocky, coral bottom, which would limit wading; approximately 15% zone coverage with generally 50-foot transect spacing.
- Zone C has relatively low exposure potential because the beach is not readily accessible due to the long distance from the road and being bounded by high cliffs. Recreational snorkeling/diving could occur, but wading would be difficult due to the abundance of jagged rock and coral. Approximately 10% zone coverage with generally 80-foot transect spacing.
- Zone D has relatively low exposure potential because it occurs greater than 400 feet offshore and is beyond the depth of where water depth is typically greater than 12 feet; therefore, snorkeling/diving from a boat may occur, swimming/snorkeling from shore would not be likely, and wading would not occur. Approximately 10% zone coverage with generally 80-foot transect spacing.
- Zone E has very low exposure potential because it extends from approximately 300 to 2,000 feet offshore, with depths approximately 15 to 30 feet. Snorkeling /diving from a boat may occur, swimming/snorkeling from shore would not be likely, and wading would not occur. This zone occurs outside of the depth of closure; approximately 5% zone coverage with generally 130-foot transect spacing.

SAP Worksheet #10 — Conceptual Site Model (continued)

Approximately 14.6 miles of transects were surveyed by underwater divers using an Underwater All-Metals detector, swept across an 8 foot swath along each transect. Transects were initially established based on aerial photographs and existing maps of underwater features and were not placed in areas with obvious shallow reefs that could either be damaged during surveying or pose a hazard to divers. During the field activities, some targeted transects were found to contain shallow reefs, sensitive corals, jagged rock, and/or strong surf, making conditions unsuitable for diving, snorkeling, or boating. However, the final transect coverages were still greater than the targeted coverage within each zone. Transect spacing conducted within UXO 16 was greater coverage than what has been completed at other underwater RIs, such as at Culebra, Puerto Rico and the Former Raritan Arsenal in Edison, New Jersey (CH2M, 2016).

Three DMM (photoflash cartridges) were identified during the ESI, close to shore within Zones A, B, and D. A photoflash cartridge is a pyrotechnic cartridge designed to produce a brief/intense illumination for low altitude night-time photography. In addition, 57 MD were identified, primarily within Zones A and D (**Figure 5**). No MEC/MPPEH or MD were identified within Zone E and only one MD was found in Zone C, in the far northern end, immediately adjacent to Zone A (**Figure 5**).

The findings are supportive of the CSM developed for the ESI and demonstrate that the nature and extent of munitions have been sufficiently delineated (CH2M, 2016).

Conceptual Site Model

The CSM for UXO 16 is shown in **Figure 6** and described in detail below. The CSM is based on the one developed for the ESI (since the ESI findings supported that CSM), modified to address potential chemical contamination in addition to munitions and munitions-related items. Since the nature and extent of MEC/MD have been sufficiently delineated and the purpose of the investigation covered by this SAP is to characterize the nature and extent of potential chemical contamination, the discussion below focuses primarily on the aspect of the CSM associated with potential chemical contaminants in the marine environment.

Source and Release Mechanisms

As noted previously, the sources of MEC/MD and potential munition-related contamination within UXO 16 are the disposal activities that took place within the OB/OD pits. As the primary release mechanism from the OB/OD pits to UXO 16 would have been ejection of MEC/MPPEH and related debris directly into the water, the primary release mechanism of potential contaminants would be deterioration of MEC/MPPEH/MD in UXO 16 and subsequent release of related chemicals. Corrosion of metal munitions casings are affected by wall thickness, metal type, and potential electrolysis of dissimilar metal components of munitions (Craig et al., 2011).

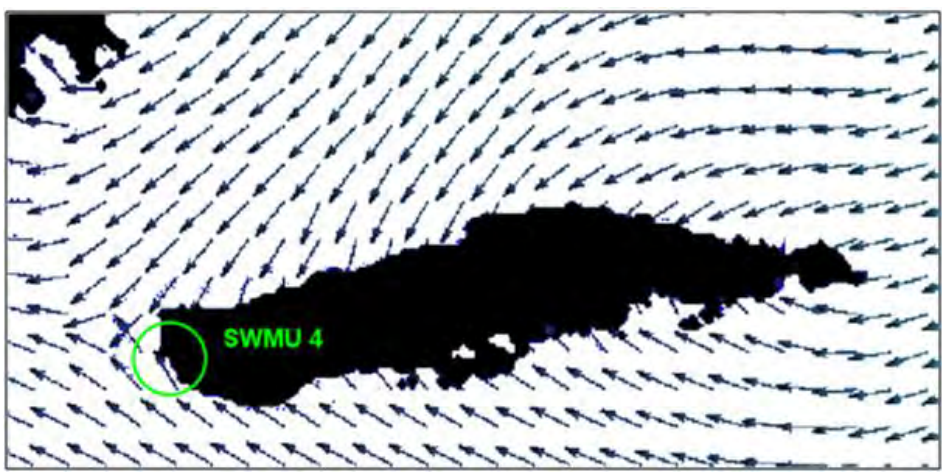
The physical and chemical properties and state of the munitions impact the total magnitude and rate of MC release into the surrounding environment (i.e., lying on top of the sediment, entirely buried in sediment, or as a low-order detonation) (SERDP, 2010 and SPAWAR, 2013). Currents of the overlying water can significantly increase corrosion, along with size of the breach, dissolution rate, and mass of MC remaining inside. For buried munitions, the deterioration of the munitions into sediments is affected by the munitions casing, depth of burial in sediment, sediment type, and oxidation-reduction conditions (Craig et al., 2011).

SAP Worksheet #10 — Conceptual Site Model (continued)

Although contaminant release to UXO 16 could also be associated with overland runoff and groundwater discharge from SWMU 4, the soil, groundwater, surface water and sediment data collected during the SWMU 4 RI indicate this release mechanism is insignificant. As discussed in SWMU 4 RI/FS Report (CH2M, 2012), sporadic and very low levels of explosives were found in soil and groundwater at SWMU 4, especially with distance from the OB/OD pits, and metals concentrations were primarily attributable to background. In addition, observations regarding Laguna Boca Quebrada, which would receive potential contaminants (i.e., MEC and munitions constituents) in a comparable manner to UXO 16 (i.e., kick-out, runoff, and groundwater discharge), indicate runoff and discharge mechanisms (and potentially from deterioration of kick-out) are insignificant contributors of contaminants. This water body is significantly smaller and less dynamic than UXO 16, yet no explosives were detected in surface water, only low, sporadic detections of explosives were identified in sediment, and metals concentrations were attributed to background. While Laguna Boca Quebrada could periodically open to the ocean (e.g., during hurricanes or tropical storms), the data collected from the lagoon and the infrequency of its opening to the ocean suggest this release mechanism is also insignificant relative to deterioration of items ejected directly into UXO 16.

Physical Characteristics and Transport Mechanisms

UXO 16 is located within the Caribbean Sea and Vieques Sound. Munitions-related items offshore of SWMU 4 (and the associated chemicals contained therein) may move due to the effects of waves (which predominantly move south to north) and the dynamic nature of the sediment (including the beach). The wave climate in Vieques is typically with predominant easterly Trade Winds. As these waves travel to shallow water and approach SWMU 4, the direction of the waves is modified by refraction due to the bathymetry and diffraction from headlands, as shown below (CariCOOS).



Beyond the depth of closure (depth beyond which wave action would not affect sediment transport), waves would not affect munitions-related item movement except under extreme conditions. This depth is approximately 10 to 12 feet adjacent to SWMU 4. The depth of closure at SWMU 4 was estimated using a formula by Hallermeier (1981) with estimates from wave measurements from a comparable locale (St. Thomas) and wave transformation coefficients derived from observations during a site visit.

Other physical and/or transport mechanisms potentially affecting sediment or munitions related items include ocean currents and upland erosion. Prevailing current at the site is from the southwest (Figure 6) which could transport and deposit suspended particles. The ephemeral stream associated with SWMU 4 can intermittently deposit sediment in the area during storm events. Movements of sediment can either cover or expose MEC/MPPEH/MD.

SAP Worksheet #10 — Conceptual Site Model (continued)

While it is possible that, once released, contaminants associated with munitions could be transported as described above, the very low amount of munitions-related items (relative to the size of the UXO study area) and the large volume and movement of ocean water across the area indicate that concentrations of transported munitions-related contaminants would likely be low. In addition, detections of contamination and potential effects on receptors are anticipated to be limited to the immediate vicinity of corroded, or breached munitions, as has been documented in various studies (Lotufo et. al., 2013, and Rosen and Lotufo, 2010).

Potential Receptors and Exposure Pathways

The potential receptors to munitions constituents at UXO 16 comprise both human and ecological. Potential human receptors are recreational users, researchers, and fish/shellfish consumers (such as beach users, divers/snorkelers, and fishermen) with exposure via dermal contact with sediment and ingestion of edible fish/shellfish living on/in the sediment. Ecological receptors are aquatic plants and benthic invertebrates with direct exposure to the sediment, and birds (e.g., brown pelican), mammals (e.g., West Indian manatee and bottlenose dolphin), and reptiles (e.g., hawksbill turtle and loggerhead turtle) through food web exposure. While these are the ecological exposures anticipated for evaluation, additional ecological exposure pathways may be evaluated if other relevant ones are identified. Sediment exposure via dermal contact and incidental ingestion may occur for some marine mammals and reptiles. These pathways will be evaluated as appropriate but may be limited by the exposure parameter data available in literature.

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

General Problems to Address

The objectives of the RI activities under this SAP are to determine the nature and extent of potential munitions constituents contamination, if present, and to determine whether there are potentially unacceptable risks to human and ecological receptors within UXO 16, adjacent to SWMU 4, associated with the historical OB/OD operations.

Environmental Questions to be Answered by the Sediment Sampling

To achieve the objective stated above, the following environmental questions will be answered via implementation of this SAP:

1. **Has there been a release of chemical constituents to sediment from munitions associated with the former site activities and, if so, do the data sufficiently represent the nature and extent of contamination?**

   This question will be answered by collecting a minimum of 21 sediment samples for analysis of MC (explosives and inorganics) at the general locations where MEC/MPPEH were identified and removed (3 DMM identified during the ESI that were generally intact but corroded, and 3 MPPEH fragments identified during the SI), in areas with higher densities of munitions-related items were identified and removed, in depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present, as shown in **Figure 7**. Additional samples may be collected if the data from the 21 samples indicate the nature and extent of contamination have not been sufficiently delineated. As long as the additional samples to be collected are of the same medium and for the same analyses as the 21 planned samples, it should not be necessary to prepare a SAP addendum. Additional samples would be collected under the existing SAP. If additional samples are of a different media or for different analyses, a SAP addendum would be necessary. In that case, a meeting or call will be held among the Vieques Technical Subcommittee to discuss the findings and recommendations and concur on the additional sample locations. Meeting minutes and updated figures showing sampling locations will constitute the necessary documentation for collecting the additional samples and they will be collected under this SAP. This process will ensure the RI is completed in the most expeditious manner possible to facilitate future planned land use. Samples will also be analyzed for grain size, pH, TOC, ORP, and AVS/SEM (site samples only) to assist in data interpretation and evaluation.

   To help distinguish inorganics present as a result of background or non-site-related influence from those potentially present due to releases from munitions, 16 background sediment samples will be collected from areas outside of the influence of the all SWMU 4 related activities including OB/OD (i.e., southeast of the OB/OD explosives safety buffer arc and upstream with respect to ocean current, as shown in **Figure 8**). These background sediment samples will be analyzed for inorganics, grain size, pH, TOC, and ORP.

2. **What are the potential human health and ecological risks posed by contamination attributable to former site activities?**

   Once the nature and extent of contamination have been sufficiently delineated (via the process described in the previous Environmental Question), the analytical results will be evaluated for the receptors listed in Worksheet #10 in a human health risk assessment (HHRA) and ecological risk assessment (ERA) performed, if necessary, in accordance with the Master HHRA (CH2M, 2010) and Master ERA Protocol, including Addendum 1 (CH2M, 2015a), modified to include the ecological receptors identified in the CSM (Worksheet #10). If the only constituents exceeding human health or ecological risk-based screening values are inorganics and their concentrations are attributable to background, risk assessments will not be necessary.

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

3. Based on the data collected and the results of the HHRA/ERA, what is the appropriate path forward for the site?

The nature and extent of contamination and the results of the HHRA and ERA will be used, in conjunction with risk management considerations (e.g., land uses, control mechanisms, remedy feasibility), to determine (1) if remedy/removal actions are warranted, or (2) if no further action other than land use controls (due to the potential presence of MEC) is warranted as part of the normal CERCLA process.

- Who will use the data and what will the data be used for?
  - The Navy, EPA, PREQB, USFWS, and PRDNER will use the data collected (from the SI, ESI, and RI) to assess the nature and extent of munitions and munitions constituent contamination within UXO 16, offshore of SWMU 4, and evaluate if there are explosive hazards and/or potentially unacceptable risks to human health and the environment. This information will then be used to determine the appropriate path forward for the site consistent with potential or planned future use.
- What are the Project Action Limits (PALs)?
  - The Human Health and Ecological PALs are listed, by matrix (sediment) and constituent group, in **Worksheet #15**.
  - Vieques human health screening values for sediment are the current (as of the time the RI is being conducted) Regional Screening Levels (RSLs) (adjusted for a hazard quotient [HQ] of 0.1 for non-carcinogens) provided by EPA.
  - Ecological screening values for marine sediment are derived from multiple sources, which are listed in the Vieques Master ERA Protocol (CH2M, 2010 and CH2M, 2015a).
  - Results for screening data (i.e., general chemistry parameters such as total organic carbon [TOC], potential of hydrogen (pH), acid volatile sulfide/simultaneously extracted metals [AVS/SEM], etc.) collected to support data evaluation will not be compared to strictly-defined PALs, but will be evaluated qualitatively. These parameters are identified in **Worksheet #15**.
- What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?
  - Sediment samples will be submitted to an offsite laboratory for analysis. (APPL, Inc. Clovis, CA, Test America-Burlington, CT; ALS- Kelso, WA).
  - **Worksheets #10, #15**, and **#18** define the specific target analytes.
- How "good" do the data need to be in order to support the environmental decisions?
  - The analytical data will be "good" enough to make determinations of whether an exceedance of the PALs exists at any of the sampling locations, evaluate nature and extent of contamination, and assess risks. Ensuring data are "good" enough for this purpose is done via employing appropriate sampling and analytical protocol, validating the resulting data, including QA/QC samples, to verify proper sampling and analytical protocol, and performing a data quality evaluation (DQE) to assess the availability and usability of the data for the intended purpose. Laboratory methods will meet CERCLA, EPA Region 2, and Navy guidance and the data will be validated per Region 2 guidelines, methodology, and laboratory standard operating procedures (SOPs) as described in **Worksheet #36**.
  - The laboratory will follow the Measurement Performance Criteria (MPC) in **Worksheet #28** for field and laboratory QC samples. These MPC are consistent with the Department of Defense (DoD) Quality Systems Manual (QSM) as applicable and laboratory in-house limits where QSM does not apply.

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

- Validation of data increases the level of confidence in a data set for a particular data use. Offsite laboratory data will be validated by an independent, third part data validator using guidance from the validation criteria outlined by EPA. Use of an independent, third party validator may serve to increase the public's confidence in the data because the validator provides an assessment of the data quality outside of any perceived influence by the stakeholder parties. The validation criteria and guidance documents are listed in **Worksheet #36**. These documents will help the validator create a thorough and systematic approach to the validation process. The data validator will also recalculate 10 percent of the results from the raw laboratory data, which may identify laboratory errors in identification and quantification, if present.
- QA/QC samples for explosives and metals will be collected with the target sediment samples as a check on sampling and analytical protocol. Like data validation, the appropriate type and quantity of QA/QC samples is not an absolute. Field duplicates will be collected at a frequency of 2 per 20 field samples (i.e., 10 percent). Field duplicates help assess sample collection techniques and laboratory precision. Matrix spike/matrix spike duplicates (MS/MSDs) are collected at a frequency of 1 pair per 20 field samples (i.e., 5 percent). The frequency is such that there is one MS/MSD pair per laboratory analytical batch. MS/MSD samples are often required by the analytical method and/or data validation guidance. Equipment blanks will be collected at a frequency of once per day collected when non-disposable equipment is used. Equipment blanks help assess equipment decontamination techniques and identify when contamination may have been carried over from one sample location to another. Equipment blanks will be collected in the field such that they are also subject to ambient field contamination. Trip blanks will not be collected at UXO 16 as no samples will be analyzed for volatile organic compounds (VOCs).
- In order to support the environmental decisions, each result must be available and usable for the project team. All data sets will undergo a DQE prior to using the data to make site-specific determinations. The terms data availability and data usability and the DQE process in general are described in **Worksheet #37**.

- <u>How much data should be collected (number of samples for each analytical group, matrix, and concentration)?</u>
  - **Worksheet #18** contains the number of sediment samples per analyte for UXO 16. **Worksheets #15** contain the particular analytes, PALs, and limits of detection (LODs). **Worksheet #17** provides the rationale for the particular sampling at the site.
  - 21 sediment (plus two QC samples) from the UXO 16 adjacent to SWMU 4 area and 16 sediment samples (plus two QC samples) collected from background locations.
- <u>Where, when, and how should the data be collected/generated?</u>
  - Samples will be collected during one field mobilization planned to occur in spring 2016.
  - Data will be collected and generated in accordance with the procedures outlined in this SAP (e.g., **Worksheet #14**).
- <u>Who will collect and generate the data? How will the data be reported?</u>
  - CH2M HILL field staff will collect the samples.
  - Laboratory analysis will be performed by ALS-Kelso, Test America- Burlington, and APPL, Inc.
  - The data will be reported in the RI Report.

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

- How will the data be archived?
  - The data will be archived in accordance to procedures dictated in the Navy CLEAN program/contract. At the end of the project, archived data will be returned to the Navy.
- List the project quality objectives (PQOs) in the form of if/then qualitative and quantitative statements

The overall decision analysis process for the UXO 16 (adjacent to SWMU 4) RI (**Figure 9**) is similar to the process developed as part of the Vieques Master Sampling and Analysis Plan (CH2M, 2013). The six-step decision analysis and associated PQOs are described below.

Step 1 (Munitions Constituent [MC] and MEC)—MEC Nature and Extent Determination to Facilitate MC Nature and Extent Determination

Determination of the nature and extent of MEC has two purposes. The first is to make explosive safety hazards and associated remedy determinations for the MEC itself. The second is to provide sufficient information on the distribution of MEC such that MC characterization can be performed.

Based on these objectives, the following are the PQOs for this step:

- If the MEC nature and extent have been sufficiently delineated to adequately assess the associated explosive safety hazard consistent with the potential or planned land use, make final MEC remedy determinations for the site (via the feasibility study, proposed plan, record of decision process); otherwise, conduct additional MEC delineation activities until sufficiently delineated.
- If the MEC nature and extent have been sufficiently delineated to assess the nature and extent of MC, perform the MC RI; otherwise, conduct additional MEC delineation until sufficiently delineated to perform the MC RI.

It is important to note that it is necessary only to delineate the nature and extent of MEC until MEC remedy decisions for the site and conservative MC characterization determinations can be made with confidence. In other words, MEC is sufficiently delineated once the remedial actions necessary to protect human health from potential explosive safety hazard posed by MEC for the potential or intended land use can be appropriately evaluated and selected. Similarly, with respect to MC characterization, MEC will have been sufficiently delineated once MC sampling locations representative of the nature and extent of contamination can be appropriately selected.

As discussed in **Worksheet #10**, the nature and extent of MEC has been determined sufficiently to satisfy the PQOs listed above.

Step 2 (MEC)—Determination of Additional MC Data Needs based on Additional MEC Delineation

This step is not applicable since the Step 1 (MEC) PQOs were met by the ESI (i.e., the answer to the Step 1 (MEC) question in **Figure 9** is “Yes.”)

Step 2 (MC)—Data Quality Evaluation

The purpose of this step is to determine if the DQE indicates the dataset as a whole is available and useful for its intended purpose. The DQE assesses the effect of the overall analytical process on the “availability” of the analytical data. “Availability” in this context refers to whether results can be used by the project team based on their analytical soundness. If a result is analytically sound, it is available for use for evaluating potential releases and whether further investigation or action is warranted. However, a particular result or group of results may not be “usable” for these purposes if other conditions apply.

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

The three major categories of data availability evaluation are laboratory performance, field collection performance (i.e. blank contamination), and matrix interferences. The data evaluation and validation is a multi-tiered approach. The process begins with an internal laboratory review, continues with an independent review by a third-party validator, and ends with an overall review by the CH2M HILL project chemistry team. While only the data validator is allowed to apply qualifiers to the data, the process provides a medium for essential communication between the laboratory, validator, and project team, and allows for data quality to be thoroughly evaluated.

The data usability evaluation comprises critical assessment of the data with respect to the project objective. Given that the primary objective of the MC characterization part of the RI is to determine the nature and extent of contamination and associated risks, the comprehensive dataset will be reviewed to determine if it is adequate for making the project-specific determinations. Another aspect of the data usability evaluation is whether PALs were met for non-detect results and, if not, what the effects are on the project-specific determinations. Not achieving PALs does not necessarily mean project-specific determinations cannot be made; it may lend some uncertainty to those decisions and may mean additional lines of evidence are necessary to make the decisions conclusively, which will be discussed in the data usability evaluation.

The associated PQO statement for this step is:

- If the DQE indicates the data are available and useful for the intended purpose, evaluate the nature and extent of contamination and assess potential risks; otherwise, collect sufficient additional samples to achieve an available and useful data set.

Step 3 (MC)—Release, Nature and Extent, and Risk Assessments

The purpose of this step is to determine if there has been a potential CERCLA-related release and, if so, a conservative representation of the nature and extent of contamination. A “CERCLA-related release” is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response as defined in CERCLA Sections 101(14) and 101(33).

A potential release is suspected if any inorganic constituents inconsistent with background (including use of background data) are detected or if any explosives are detected.

It is important here to emphasize the distinction between the use of background in a “release assessment” versus a “risk assessment.” In determining whether there has been a CERCLA-related release, it is critical that background be considered upon initial evaluation of site-specific data. In other words, whether a potential release occurred can be determined only if site-specific data are evaluated relative to background (and potentially other lines of evidence as indicated above). On the other hand, when a risk assessment is performed, a release has already been determined to have occurred and the risk assessment is performed to evaluate the potential risks based on the nature and extent of the contaminant release. In that circumstance, background is considered only after the potential risks posed by all constituents of potential concern (COPCs) are evaluated, in accordance with EPA policy.

The associated PQO statement for this step is:

- If any inorganics not attributable to background or explosives are detected, use the data to evaluate the nature and extent of contamination and assess potential human health and ecological risks; otherwise, make a final evaluation of the adequacy of the data set (see Step 5) prior to preparation of the RI Report. Inorganics detected within background will be addressed in the human health risk assessment; however, if the only chemicals exceeding RSLs or ecological screening values are inorganic constituents within background levels, a HHRA and ERA will not be necessary.

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

Step 4 (MC)—Applicability Determination

Once the data set has been used to conservatively assess the nature and extent of contamination and associated risks, an assessment will be made as to whether those findings are appropriate to apply to various areas of the site not sampled. This step is performed to ensure scaling up the conservative results does not potentially result in unintentional or unnecessary remedial action or controls for areas of the site where it may not be warranted. In this case, additional sampling may be performed to refine the understanding of the nature and extent of contamination and associated risks in order to better evaluate and ultimately select any necessary remedial action or control.

The associated PQO statement for this step is:

- If the results of the nature and extent of contamination determination and associated risk assessments suggest they are not appropriate to apply to other areas of the site because, for example, they do not reflect actual site conditions, are determined to be too conservative, or may result in unintentional or unnecessary remedial actions or controls at the site, collect additional samples to refine the findings; otherwise, make a final evaluation of the adequacy of the data set (see Step 5) prior to preparation of the RI Report.

Step 5 (MC)—Evaluation of Historical Site Information and Spatial Distribution

As a final check before preparing the RI Report, the historical site information, spatial distribution of constituents and constituent concentrations, and risk assessments are collectively evaluated to ensure the site has been sufficiently characterized to make remedy determinations for MC.

The associated PQO statement for this step is:

- If the historical information, nature and extent of contamination determination, and associated risk assessments suggest the site has been sufficiently characterized to make remedy determinations, prepare the RI Report; otherwise, collect additional samples and return to Step 2 (MC).

Step 6 (MC and MEC)—RI Report and Feasibility Study (FS) Report Preparation

Once it has been determined that the nature and extent of MEC and MC have been sufficiently characterized and the associated risks assessed appropriately for the intended or potential land use, the RI and FS Reports will be prepared.

The associated PQO statement for this step is:

- If the RI Report concludes: (1) there is an explosive hazard associated with the intended or potential land use, or (2) a CERCLA-related release occurred that poses an unacceptable human health and/or ecological risk, prepare an FS Report that evaluates remedial alternatives to address the explosive hazard and/or MC exposure risks, as applicable.

As shown above, the 6-step decision process is potentially iterative, whereby the findings based on a particular data set may result in collection of additional data. For efficiency, it is anticipated that concurrence will be reached by the Navy, EPA, PREQB, PRDNER, and USFWS at critical steps in the decision process (i.e., data grouping, determining if a data set is adequate for its intended purpose, determining the scale-up applicability) and at iterative junctures (i.e., selection of additional data collection media and locations). Concurrence will be accomplished via conference call(s), Technical Subcommittee meeting(s), and documented in minutes and figures, as warranted, to ensure the RI is conducted in an expeditious manner.

SAP Worksheet #12—Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2)

All field QC sample information is provided within **Worksheet #28** and **Worksheet #12** is not applicable.

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SAP Worksheet #13—Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
UXO 16 SI	UXO 16 Adjacent to Solid Waste Management Unit 4 Expanded Site Inspection (CH2M, 2016)	USAE, munitions, 2012	To help identify nature and extend of munitions and related items To help identify sediment sampling locations	none

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SAP Worksheet #14—Summary of Project Tasks

The technical approach for the proposed field activities at UXO 16 is detailed below. Protocols and SOPs are included in **Attachment B** for those not in the current version of the Master Standard Operating Procedures, Protocols, and Plans (MSOPPP) (CH2M, 2010).

Mobilization

Prior to mobilization, the Navy, EPA, PREQB, PRDNER, USFWS, and NMFS will be notified to allow for appropriate oversight and coordination.

As part of the field mobilization, CH2M HILL will procure the following subcontractors to support investigation activities:

- Analytical laboratory
- Data validation

Mobilization for the field effort includes procurement of necessary field equipment and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Prior to beginning any phase of work, CH2M HILL and its subcontractors will have meetings and/or calls to discuss the work items and worker responsibilities, and to familiarize workers with the SAP.

Anomaly Avoidance

Anomaly avoidance will be conducted at all times during field activities. Any anomaly detected will be avoided as specified by the UXO safety officer or sampling may be conducted by the UXO technician/diver. Anomaly avoidance will be followed in accordance with the Vieques Master Environmental Health and Safety Plan and/or Master Dive Plan.

Sediment Sampling Methods

The sediment sampling event will include the collection of 21 sediment samples within the portion of UXO 16 adjacent to SWMU 4 (**Figure 7**), and the collection of 16 background sediment samples (**Figure 8**) (discussed in more detail in **Worksheet #17**). Sampling locations will be initially located by boat and using a hand-held Trimble (or similar) Global Positioning System (GPS) unit with sub-meter accuracy. A weighted line with float will be lowered to mark the targeted location. An underwater inspection by munitions divers will be conducted by sweeping the location with a metal detector to verify that it is safe to collect intrusive sediment samples. If required for safety, the marker will be move to the nearest cleared location. After final inspection, the marker line will be adjusted to position the float directly over the sample location, and a final GPS coordinate will be taken. However, it should be noted that where samples will be collected at the locations of items found during the SI/ESI, the samples will be collected in the general vicinity of the former locations of those items due to the practical constraints associated with recording (and re-acquiring) coordinates of objects on the sea floor using GPS units on the sea surface. However, as the objective of the RI is to establish sediment chemical characteristics that represent UXO 16 (offshore of SWMU 4) as a whole, and that multiple samples will be collected across this area, this level of accuracy is sufficient to meet the objective. For other samples intended to satisfy spatial distribution objectives, map coordinates will be used to identify the sampling locations. Background sediment samples will be collected within the areas shown in **Figure 8**, at locations to be determined as representative of the sediment type sampled at UXO 16 adjacent to SWMU 4. Specific background locations will be established by a biologist familiar with Caribbean marine ecosystems, and who was directly involved with characterizing habitats at the UXO 16 sampled locations (discussed further in **Worksheet #17**).

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

During the sampling effort, the field team will document the following information:

- Sediment sample description
- Habitat type and underwater photographs at sample location
- Photograph of sediment sample
- Water depth at sample location
- Coordinates of sample location

During all water related activities, procedures described in "Standard Operating Procedures for Protection of Federally Listed Species and Sensitive Habitat, UXO 16 Wide Area Assessment" will be followed (**Attachment C**).Sediment samples will be collected following the modified SOP G-2, Sediment Sampling included in **Attachment B**. Discrete sediment samples will be collected from within the 0-to-6-inch interval (approximately) below ground (seafloor) surface (bgs), either by diver, remotely operated vehicle (ROV), and/or via a boat. The sampling depth is approximate due to the practical limitations of sampling the sea floor.

Sediment sampling methods may include collection with a coring device, scoop/jar, remotely-operated vehicle (ROV) with sampler, and/or ponar dredge. Regardless of which method is used, the sediment will be collected from approximately the top 6 inches of sea floor. Sampling will require the use of boats in this offshore environment. Various environmental factors can influence the actual method employed at each sampling location. Examples include sea conditions, water depth, compactness of sediment, density of algal or seagrass growth on the sediment, presence of large stone or shell material in the sediment, shallow sediment depth, and proximity to protected or sensitive species such as corals. Best professional judgement by field scientists will be used select the optimal sampling method at each location. Potential sediment sampling methods are as follows:

- Divers will be deployed to collect sediments where an ROV or ponar dredge is not practical. A sediment coring device such as a "push tube" (i.e., Lexan tube), or a short stainless steel sediment auger with a Lexan tube insert, may be used to collect 0-6 inch (approximate) sediment samples. The samples may be transferred to sampling jars at the location of collection or the ends of the coring device or tube will be covered underwater to retain the sediment for transport to the surface where the sediment will be transferred to laboratory containers. If sediment cannot be adequately collected or retained using a coring technique, such as in areas with very shallow sediment or having loose sediment that cannot be retained in the core, sediment will be collected using a spoon or scoop and placed directly into a sample jar. Sediment samples will then be taken to the boat and processed as appropriate, including transfer to laboratory containers (if not already placed in laboratory containers at the sampling location) and properly preserved.
- An ROV with an attached sampler capable of collecting sediment samples may be used. The ROV (with live video feed) will be maneuvered in the water to the marked sediment sample location. The sampler will "scoop" the sediment sample, and be returned to the boat for sample retrieval; multiple trips may be required to collect sufficient sample volume. Sediment samples will then be processed as appropriate, including transfer to laboratory containers and properly preserved.
- A Ponar dredge is a "clamshell" type device designed to sample in areas soft enough for the dredge to penetrate approximately 6 inches into the sediment. The Ponar, locked in an open position, will be lowered with a rope to the sediment surface at a marked sampling location. An automatic release then allows the "clamshell" to close and retain sediment as it is retrieved to the boat. Sediment samples will then be processed as appropriate, including transfer to laboratory containers and properly preserved.

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

Site sediment samples will be analyzed for explosives, inorganics, grain size, pH, TOC, ORP, and AVS/SEM. Background sediment samples will be analyzed for inorganics, grain size, pH, TOC, and ORP. Sediment samples will be transferred to a decontaminated stainless steel bowl, homogenized (except AVS/SEM), and placed laboratory-prepared sample bottles and packed on ice. QA/QC samples comprise field duplicates, MS/MSDs, and equipment blanks.

Equipment Decontamination

Equipment decontamination will follow SOP E-1 listed on **Worksheet #21** and included in the Final Master SOPs (CH2M, 2010). Disposable equipment and personal protective equipment (PPE) that comes in contact with environmental media at the site will be decontaminated in accordance with SOP E-1 and disposed of with normal trash.

Investigation Derived Waste Management

Other than PPE (discussed under "Equipment Decontamination" above), no solid investigation-derived waste (IDW) will be generated. The only liquid IDW anticipated is relatively small amounts of decontamination fluids. If practical, the liquid IDW will be allowed to evaporate; otherwise, it will be containerized, characterized, and disposed of in general accordance with the Master Waste Management Plan (CH2M, 2010a).

Shipments

All analytical samples will be sent by Federal Express which has on-island staff. All samples will be shipped in accordance with the SOP H-5 listed on **Worksheet #21** and included in the Final Master SOPs (CH2M, 2010).

Quality Control

All quality control samples are listed on **Worksheet #20**. In reference to the field tasks, all fieldwork will be overseen by an FTL who is responsible for the quality control of the sampling and making sure the proper SOPs are followed for each task.

Sample Analysis

The laboratory will maintain, test, inspect, and calibrate analytical instruments (**Worksheets #24** and **#25**). The laboratory will analyze sediment samples for various groups of parameters as shown on **Worksheets # 15** and **#18**.

Data Management

The project data manager is responsible for data tracking and storage. In addition a third party data validator will receive all analytical data from the laboratory and the data will be validated prior to its use by the Navy. All validated analytical data will be loaded into the Navy Installation Restoration Information System (NIRIS) database. For more data management information, refer to **Worksheets #29** and **#34-36**.

Procedures for Recording and Correcting Data

Field data will be recorded in field logbooks.

Project Assessment/Audit: **Worksheets #31** and **#32**.

Data Validation: **Worksheets #35** and **#36**.

Data Usability Assessment: **Worksheet #37**.

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SAP Worksheet #15-1—Reference Limits and Evaluation Table

Matrix: SD
Analytical Group: EXPLO

Analyte[1]	CAS #	RSLs Residential Soil Adj[2] (ug/kg)	Sediment ESVs[2] (ug/kg)	Project QL Goal[3] (ug/kg)	Laboratory Limits[5] (ug/kg)			LCS and MS/MSD Recovery Limits and RPD[4](%)		
					LOQ	LOD	DL	LCL	UCL	RPD
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	390,000	115,000	57,500	500	200	80	74	124	20
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	6,100	891,000	3,050	500	200	80	67	129	
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	220,000	7,000	3,500	500	200	79	80	116	
1,3-Dinitrobenzene (1,3-DNB)	99-65-0	630	--	315	450	200	63	73	119	
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	16,000	72	36	500	200	91	68	135	
Nitrobenzene (NB)	98-95-3	5,100	21	10.5	500	200	75	67	129	
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	3,600	20,000	1,800	500	200	83	71	120	
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	15,000	--	7,500	500	200	75	64	127	
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	15,000	--	7,500	500	200	75	71	123	
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	1,700	--	850	500	200	83	75	121	
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	360	549	180	500	200	83	79	117	
2-Nitrotoluene (2-NT)	88-72-2	3,200	--	1,600	500	200	66	70	124	
3-Nitrotoluene (3-NT)	99-08-1	630	--	315	500	200	71	67	129	
4-Nitrotoluene (4-NT)	99-99-0	25,000	--	12,500	500	200	80	71	124	
Nitroglycerin (NG)	55-63-0	630	--	315	500	200	85	73	124	
Pentaerythritol tetranitrate (PETN)	78-11-5	13,000	--	6,500	2500	1000	579	72	128	
Perchlorate[6]	14797-73-0	5,500	--	2,750	6	4	2	84	121	15
Picric Acid	88-89-1	--	53,400	26,700	200	120	60	**30**	**130**	20

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

[1] Full 8330B-list (excluding 3,5-dinitroaniline [3,5-DNA] due to a lack of toxicity data) plus Picric Acid and Perchlorate.

[2] Refer to **Worksheet #11** for specific identification of PALs by matrix. RSLs values are current as of June 2015.

[3] The PQL Goal is 1/2 the lesser of the applicable screening levels.

[4] DoD QSM v5.0 is the basis for laboratory control sample (LCS) and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

[5] For SW-846 6850, results for non-aqueous samples are reported on a dry-weight basis. For SW-846 8330B and 8321, results for non-aqueous samples are reported on an as received basis (for the dried fraction).

[6] Perchlorate reporting limits reflect the 10g extraction.

Ammonium picrate can be calculated from picric acid using the following equation: [ammonium picrate (ug/kg)] = [picric acid (ug/kg)] * (246.13/229.10).

SAP Worksheet #15-2—Reference Limits and Evaluation Table

Matrix: SD
Analytical Group: METAL

Analyte[1, 6, 7]	CAS #	RSLs Residential Soil Adjusted[2] (mg/kg)	Sediment ESVs[2] (mg/kg)	Project QL Goal[3] (mg/kg)	Laboratory Limits[4] (mg/Kg)			LCS and MS/MSD Recovery Limits and RPD[5](%)		
					LOQ	LOD	DL	LCL	UCL	RPD
Aluminum	7429-90-5	7,700	18,000	3,850	50	4	1.98	74	119	20
Antimony	7440-36-0	3.1	2	1	0.2	0.2	0.1	72	124	
Arsenic	7440-38-2	0.68	8.2	0.34	0.5	0.3	0.08	82	118	
Barium	7440-39-3	1,500	48	24	2	0.4	0.07	83	113	
Beryllium	7440-41-7	16	--	8	0.5	0.2	0.04	83	113	
Cadmium	7440-43-9	7.1	1.2	0.6	0.1	0.08	0.03	84	116	
Calcium	7440-70-2	--	--	20	100	20	12	81	116	
Chromium	7440-47-3	0.3	81	0.15	0.5	0.2	0.07	83	119	
Chromium (hexavalent)	18540-29-9	0.3	--	0.15	0.6	0.4	0.3	**80**	**120**	
Cobalt	7440-48-4	2.3	10	1.15	0.1	0.08	0.02	84	115	
Copper	7440-50-8	310	34	17	5	0.4	0.21	81	117	
Iron	7439-89-6	5,500	220,000	2,750	80	4	3.5	81	118	
Lead	7439-92-1	400	46.7	23.35	0.9	0.8	0.25	81	112	
Magnesium	7439-95-4	--	--	4	30	4	3.5	78	115	
Manganese	7439-96-5	180	260	90	4.5	0.4	0.13	84	114	
Nickel	7440-02-0	150	20.9	10.45	4	0.4	0.11	83	113	
Potassium	7440-09-7	--	--	50	300	50	40	81	116	
Selenium	7782-49-2	39	1	0.5	0.5	0.1	0.1	80	119	
Silver	7440-22-4	39	1	0.5	0.1	0.05	0.02	83	118	
Sodium	7440-23-5	--	--	50	500	50	45	83	118	
Thallium	7440-28-0	0.078	--	0.039	0.1	0.05	0.02	83	118	

SAP Worksheet #15-2—Reference Limits and Evaluation Table (continued)

Matrix: SD
Analytical Group: METAL

Analyte[1, 6]	CAS #	RSLs Residential Soil Adjusted[2] (mg/kg)	Sediment ESVs[2] (mg/kg)	Project QL Goal[3] (mg/kg)	Laboratory Limits[4] (mg/Kg)			LCS and MS/MSD Recovery Limits and RPD[5](%)		
					LOQ	LOD	DL	LCL	UCL	RPD
Vanadium	7440-62-2	39	57	19.5	2	0.4	0.1	82	114	20
Zinc	7440-66-6	2,300	150	75	8	4	1.15	82	113	

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

[1]TAL from ILM05; merged-list; no mercury, no cyanide

[2] Refer to **Worksheet #11** for specific identification of PALs by matrix. RSLs values are current as of June 2015.

[3] The PQL Goal is 1/2 the lesser of the applicable screening levels.

[4] Results for non-aqueous samples are reported on a dry-weight basis.

[5] DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

[6] Al, Ba, Be, Ca, Cu, Fe, Pb, Mg, Mn, Ni, K, Na, V, and Zn are reported from ICP-AES. Sb, As, Cd, Cr, Co, Se, Ag, and Tl are reported from ICP-MS.

[7] There are no PALs for nutrients (Na, Ca, Mg, K) but these are part of the TAL.

SAP Worksheet #15-3—Reference Limits and Evaluation Table

Matrix: SD
Analytical Group: WCHEM

Analyte	CAS #[1]	Units	Project Indicator Limit[2]	Project QL Goal[2]	Laboratory Limits			LCS and MS/MSD Recovery Limits and RPD[3] (%)		
					LOQ	LOD	DL	LCL	UCL	RPD
pH	PH	pH units	--	--	NA	NA	NA	NA	NA	NA
Redox (MV) (ORP)	REDOX	MV	--	--	NA	NA	NA	NA	NA	NA
Total Organic Carbon (TOC)	TOC	MG/KG	--	--	200	150	100	**80**	**120**	**20**

Notes:

[1] Some CAS numbers are contractor-specific.

[2] There are not project indicator limits for these WCHEM data. pH data are used to help interpret metals data for ecological receptors. TOC data may be used to evaluate bioavailability of chemicals . ORP and pH data are used to help interpret hexavalent chromium results.

[3] Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

SAP Worksheet #15-4—Reference Limits and Evaluation Table

Matrix: SD
Analytical Group: GRAINSIZE

Analyte[1]	CAS #[2]	Units[3]
GS03 Sieve 3" (75 mm)	SIEVE75.0	PCT_P
GS05 Sieve 2" (50 mm)	SIEVE50.0	PCT_P
GS06 Sieve 1.5" (37.5 mm)	SIEVE37.5	PCT_P
GS07 Sieve 1" (25.0 mm)	SIEVE25.0	PCT_P
GS08 Sieve 0.75" (19.0 mm)	SIEVE19.0	PCT_P
GS10 Sieve 0.375" (9.5 mm)	SIEVE9.5	PCT_P
Sieve No. 004 (4.75 mm)	SIEVE4.75	PCT_P
Sieve No. 010 (2.00 mm)	SIEVE2.0	PCT_P
Sieve No. 020 (850 um)	SIEVE850	PCT_P
Sieve No. 040 (425 um)	SIEVE425	PCT_P
Sieve No. 060 (250 um)	SIEVE250	PCT_P
Sieve No. 080 (180 um)	SIEVE180	PCT_P
Sieve No. 100 (150 um)	SIEVE150	PCT_P
Sieve No. 200 (75 um)	SIEVE75	PCT_P
Gravel (%)	GRAVEL	PCT
Sand (%)	14808-60-7	PCT
Coarse Sand (%)	COARSESAND	PCT
Medium Sand (%)	MEDIUMSAND	PCT
Fine Sand (%)	FINESAND	PCT
Fines (%)	FINES	PCT

Notes:

[1] A similar sieve set is OK.

[2] Some CAS numbers are contractor-specific.

[3] PCT_P is percent passing. PCT is percent.

SAP Worksheet #15-5—Reference Limits and Evaluation Table

Matrix: SD
Analytical Group: AVS/SEM

Analyte	CAS #[1]	Project Indicator Limit[2] (umol/g)	Project QL Goal[2] (umol/g)	Laboratory Limits (umol/g)			LCS and MS/MSD Recovery Limits and RPD[3](%)		
				LOQ	LOD	DL	LCL	UCL	RPD
Acid Volatile Sulfide	ACIDSO2	--	--	0.016	0.006	0.004	60 (56 for MS)	115 (142 for MS)	45
Cadmium	7440-43-9	--	--	0.0002	0.0002	0.00007	80 (75 for MS)	120 (125 for MS)	20
Copper	7440-50-8	--	--	0.002	0.0009	0.0005			
Lead	7439-92-1	--	--	0.001	0.001	0.0005			
Mercury	7439-97-6	--	--	0.00004	0.00002	0.000008			
Nickel	7440-02-0	--	--	0.001	0.0007	0.0003			
Silver	7440-22-4	--	--	0.001	0.0006	0.0003			
Zinc	7440-66-6	--	--	0.003	0.0006	0.0003			

Notes:

[1] Some CAS numbers are contractor-specific.

[2] For AVS/SEM there are no PALs/PILs but the ratio of SEM to AVS is used to determine availability.

[3] Laboratory in-house limits are the basis for LCS and MS/MSD because DoD QSM v5.0 does not specify.

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

The UXO 16 sediment sampling will be implemented in accordance with the schedule provided in the Draft Final Site Management Plan FY16 (CH2M, 2015b), amended as necessary with concurrence among the stakeholder agencies.

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SAP Worksheet #17—Sampling Design and Rationale

The sampling design and rationale reflects the analytical protocol jointly developed and concurred upon in the scoping session by the Vieques Technical Subcommittee in July 2015 (see **Worksheet #9**). Sediment sampling activities will focus on areas with the highest potential for contamination, comprising locations where DMM/MPPEH were previously identified, higher densities of MD, depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present. The 0-6 inch sampling depth represents the sediment exposure depth for human and ecological receptors, and is consistent with associated risk assessment protocols.

In total, 21 sediment samples will be collected from the site (**Figure 7**) and 16 sediment samples will be collected from a background area (**Figure 8**). The munitions investigation sufficiently delineated the nature and extent of munitions at the site and the seafloor bottom along each transect. It is appropriate to place sample locations along transects based on findings of previous investigations and of known seafloor conditions to avoid impacting potential habitats. The locations and rationale for spatial coverage are appropriate along former transects to determine if MC occur spatially at the site. The rationale for each sample is as follows:

- **DMM/MPPEH** – SD07, SD11, and SD12 at the former locations of the photoflash cartridges, SD17 at the former location of the photoflash cartridge base section, SD18 at the former location of the 20mm projectile, and SD19 at the former location of the 40mm flare base section. The sample locations represent areas where munitions constituents may have been released from breaches in or corrosion of all of the MEC items found at the site and have the best chance of containing measurable explosives concentrations from potential point sources (Craig et al., 2011). Samples will be collected as close as possible to the original coordinates of recovered items. However, it should be noted that where samples will be collected at the locations of items found during the SI/ESI, the samples will be collected as close to the former locations of those items as is practical due to the constraints inherent with recording (and re-acquiring) coordinates of objects on the sea floor using GPS units on the sea surface. When the items were found, their positions were recorded using GPS at the ocean surface. These coordinates will be used to re-acquire the positions at the ocean surface and then transferred to the ocean floor (e.g., using weighted lines, coordinates entered into the ROV, etc.) where the samples will be collected. While there is a margin of error of up to several feet based on the accuracy of the GPS and the ability to transfer the coordinates to the ocean floor, this is the best way to re-acquire the item locations and since the objective of the RI is to establish sediment chemical characteristics that represent UXO 16 (offshore of SWMU 4) as a whole, because multiple samples will be collected across this area, this level of accuracy is sufficient to meet the objective.
- **High densities of MD** – SD04, SD05, SD06, SD08, SD09, SD10, SD-21 at the former locations of higher densities of MD. The sample locations represent areas where munitions constituents may have been released from breaches in or corrosion of items and have the best chance of containing measurable explosives concentrations from potential point sources (Craig et al., 2011).
- **Depositional areas from ephemeral stream–** SD04 through SD10, SD17, and SD18 occur at or in the vicinity of the sand fan from the ephemeral stream where contaminated sediments may have accumulated. The likelihood for munitions constituent (MC) detection is unknown, however all these depositional area samples are biased toward locations where munitions debris (MD), discarded military munitions (DMM), and material potentially presenting an explosive hazard (MPPEH) were identified during the 2012 Site Investigation and 2015 ESI. This is a conservative sampling approach, focusing on the locations where contamination would be found, if present.
- **Spatial coverage** - SD01 through SD03, SD13 through SD16, and SD-20 to evaluate spatial extent. SD-15 will also evaluate the potential for contaminant migration from the former Laguna Boca Quebrada outlet to the ocean.

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

All site sediment samples will be analyzed for explosives, inorganics, pH, TOC, ORP, AVS/SEM (site samples only), and grain size.

In addition, background samples will be collected from an inshore zone southeast of the site where coastal physical characteristics are similar to the site, but outside of potential site-related influences (**Figure 8**). This area is located outside of the OB/OD explosives safety arc, upstream with respect to the ocean current, and has similar characteristics of the UXO 16 site with a number of ephemeral streams and located adjacent to Mt. Pirata. Background stations will be determined in the field, selected to represent as best as possible each general sediment type sampled at the site. It is estimated that two sediment types will be encountered, including unconsolidated sediment (e.g., sand) and submerged vegetation (e.g., seagrass), with 8 samples collected per sediment type for a total of 16 samples. A biologist familiar with Caribbean marine ecosystems and directly involved with sediment sampling at the site will make the final, field determination of representative background sampling stations.

The background samples will be used for comparison with site data to help distinguish inorganic constituent concentrations attributable to site-related releases from those attributable to other sources. All background sediment samples will be analyzed for inorganics, pH, TOC, ORP, and grain size.

SAP Worksheet #18—Location-Specific Sampling Methods/SOP Requirements Table

Station ID[1]	Sample ID[1,2]	Matrix	Depth	Analytical Group[3]	Number of Samples	Sampling SOP Reference
Sediment Samples						
VW-UXO16-SDSW01	VW-UXO16-SD01-000H VW-UXO16-SD01P-000H	SD	0 - 6 inches	EXPLO, METAL, WCHEM, AVS/SEM, GRAINSIZE	2 (FD)	See **Worksheet #21**
VW-UXO16-SDSW02	VW-UXO16-SD02-000H				1	
VW-UXO16-SDSW03	VW-UXO16-SD03-000H				1	
VW-UXO16-SDSW04	VW-UXO16-SD04-000H VW-UXO16-SD04-000H-MS VW-UXO16-SD04-000H-SD				3 (MS/MSD)	
VW-UXO16-SDSW05	VW-UXO16-SD05-000H				1	
VW-UXO16-SDSW06	VW-UXO16-SD06-000H				1	
VW-UXO16-SDSW07	VW-UXO16-SD07-000H				1	
VW-UXO16-SDSW08	VW-UXO16-SD08-000H				1	
VW-UXO16-SDSW09	VW-UXO16-SD09-000H				1	
VW-UXO16-SDSW10	VW-UXO16-SD10-000H VW-UXO16-SD10P-000H				2 (FD)	
VW-UXO16-SDSW11	VW-UXO16-SD11-000H				1	
VW-UXO16-SDSW12	VW-UXO16-SD12-000H				1	
VW-UXO16-SDSW13	VW-UXO16-SD13-000H				1	
VW-UXO16-SDSW14	VW-UXO16-SD14-000H				1	
VW-UXO16-SDSW15	VW-UXO16-SD15-000H				1	
VW-UXO16-SDSW16	VW-UXO16-SD16-000H				1	
VW-UXO16-SDSW17	VW-UXO16-SD17-000H				1	
VW-UXO16-SDSW18	VW-UXO16-SD18-000H				1	
VW-UXO16-SDSW19	VW-UXO16-SD19-000H				1	
VW-UXO16-SDSW20	VW-UXO16-SD20-000H VW-UXO16-SD20P-000H				2 (FD)	
VW-UXO16-SDSW21	VW-UXO16-SD21-000H VW-UXO16-SD21-000H-MS VW-UXO16-SD21-000H-SD				3 (MS/MSD)	
VW-UXO16-QC	VW-UXO16-EBMMDDYY-SD	EB	N/A	EXPLO, METAL	3	

SAP Worksheet #18—Location-Specific Sampling Methods/SOP Requirements Table (continued)

Station ID[1]	Sample ID[1,2]	Matrix	Depth	Analytical Group[3]	Number of Samples	Sampling SOP Reference
Background Sediment Samples						
VW-UXO16-SDSW22	VW-UXO16-SD22-MMYY VW-UXO16-SD22P-MMYY	SD	0 - 6 inches	METAL, WCHEM, GRAINSIZE	2 (FD)	See **Worksheet #21**
VW-UXO16-SDSW23	VW-UXO16-SD23-MMYY				1	
VW-UXO16-SDSW24	VW-UXO16-SD24-MMYY				1	
VW-UXO16-SDSW25	VW-UXO16-SD25-MMYY				1	
VW-UXO16-SDSW26	VW-UXO16-SD26-MMYY				1	
VW-UXO16-SDSW27	VW-UXO16-SD27-MMYY				1	
VW-UXO16-SDSW28	VW-UXO16-SD28-MMYY VW-UXO16-SD28-MMYY-MS VW-UXO16-SD28-MMYY-SD				3 (MS/MSD)	
VW-UXO16-SDSW29	VW-UXO16-SD29-MMYY				1	
VW-UXO16-SDSW30	VW-UXO16-SD30-MMYY				1	
VW-UXO16-SDSW31	VW-UXO16-SD31-MMYY				1	
VW-UXO16-SDSW32	VW-UXO16-SD32-MMYY VW-UXO16-SD32P-MMYY				2 (FD)	
VW-UXO16-SDSW33	VW-UXO16-SD33-MMYY				1	
VW-UXO16-SDSW34	VW-UXO16-SD34-MMYY				1	
VW-UXO16-SDSW35	VW-UXO16-SD35-MMYY				1	
VW-UXO16-SDSW36	VW-UXO16-SD36-MMYY				1	
VW-UXO16-SDSW37	VW-UXO16-SD37-MMYY				1	
VW-UXO16-QC	VW-UXO16-EBMMDDYY-SD	EB	N/A	METAL	2	

[1]MMYY = Two digit month and year of sampling date.

[2]Station IDs and sample IDs may be updated to add OU information if assigned prior to sampling.

[3]FDs, MS/MSDs, and EBs require analysis for EXPLO, and METALs, as appropriate.

SAP Worksheet #19—Field Sampling Requirement Table

Matrix	Analytical Group[1]	Analytical and Preparation Method / SOP Reference[5]	Containers	Sample Volume[2]	Preservation Requirements	Maximum Holding Time
SD	EXPLO	SW-846 8330B / HPL8330, MSE018	1 x 8 oz amber glass wide-mouth jar with Teflon lined screw cap	20 g[3]	≤ 6°C but not frozen	14 days / 40 days
		SW8330B, SW-846 8321A / MSE018, HPL8321				
		SW-846 6850 / HPL6850		10 g[4]	Headspace in jar; ≤ 6°C but not frozen	28 days
	METAL	SW-846 3050B, 6010C, 6020A / PRE3050B, ANA6010, ANA6020	1 x 8 oz amber glass wide-mouth jar with Teflon lined screw cap	1 g	≤ 6°C but not frozen	180 days
		SW-846 3060A, SW-846 7199/ ANA3060A, ANA218.6-7199		2.5 g		30 days / 7 days
	WCHEM (pH)	SW-846 9045D / ANA9045		20 g		ASAP
	WCHEM (TOC)	Walkley Black / ANAWALKLEY		0.5 g		28 days
	WCHEM (ORP)	ASTM D1498 / ASTM D1498	1 x 4 oz glass jar	10 g		30 days
	GRAINSIZE	ASTM D422 / BR-GT-006	16 oz glass jar	500 g	N/A	N/A
	AVS/SEM	EPA 821_R-91-100 / GEN-AVS, MET-7470A, MET-ICP	1 x 8 oz glass jar with Teflon lined screw cap (zero head space above sediment)	Do not composite; Fill jar completely	≤ 6°C but not frozen	14 days / 7 days for AVS, 180 days for SEM, 28 days for SEM Hg

Notes:

[1] Refer to **Worksheet #18** for details regarding analytical groups to be tested for each media.

[2] Fill to capacity (except for SW-846 6850). These are minimum required for preparation and/or analysis.

[3] 8330B Explosives and Picric Acid are analyzed from the same extract.

[4] APPL will extract 10g of soil for perchlorate rather than the typical 1g. This is intended to provide a more-representative extraction.

[5] Laboratory SOPs are not provided as part of SAPs because they are proprietary and confidential.

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SAP Worksheet #20—Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/ MSD Pairs	No. of Equipment Blanks	Total No. of Samples to Lab[1]
SD	EXPLO	21	3	2	3	29
	METAL	21	3	2	3	29
	WCHEM (pH)	21	--	--	--	21
	WCHEM (TOC)	21	--	--	--	21
	WCHEM (ORP)	21	--	--	--	21
	AVS/SEM	21	--	--	--	21
	GRAINSIZE	21	--	--	--	21
Background SD	METAL	16	2	1	2	22
	WCHEM (pH)	16	--	--	--	16
	WCHEM (TOC)	16	--	--	--	16
	WCHEM (ORP)	16	--	--	--	16
	GRAINSIZE	16	--	--	--	16

Notes:

[1]The number of QA/QC samples to be collected is dependent upon the number of parent samples and the number of days of the sampling event.

- Field duplicates are collected at a frequency of 1 per 10 field samples per matrix.
- MS/MSD pairs are collected at a frequency of 1 per 20 samples per matrix.
- Equipment Blanks for deconned equipment are collected once per day of sampling, per type of equipment.
- Equipment Blanks for disposable equipment are collected once per lot.

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SAP Worksheet #21—Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP E-1	Decontamination of Personnel and Equipment	CH2M HILL	Decontamination equipment	N	
SOP H-1	Preparing Field Logbooks	CH2M HILL	Logbook	N	
SOP H-4	Chain-of-custody	CH2M HILL	SOP, tape, custody seals, electronic chain-of-custody forms	N	
SOP H-5	Packaging and Shipping Procedures for Samples Not Considered Dangerous Goods	CH2M HILL	SOP	N	
SOP H-6	Equipment Blank Preparation	CH2M HILL	Sample containers	N	
SOP G-2	Sediment Sampling	CH2M HILL	Sediment Sampling equipment	Y	Modified to include collection of sediment by SCUBA diver and/or remotely-operated vehicle (ROV) with sampler

Notes:

SOPs listed in this Worksheet are included in the Master Standard Operating Procedures, Protocols, and Plans document (CH2M, 2010).

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Resp. Person	SOP Reference
Ponar dredge	n/a		Visual inspection. Check release mechanisms to ensure they are working properly.	Daily, before use	n/a	Replace any damaged/ non-working parts. Do not use this instrument if it is unable to work properly.	FTL	SOP G-2
Deep Trekker ROV with Grabber Arm	n/a	Charge all batteries nightly thoroughly rinse Deep Trekker and grabber arm with fresh water.	Visual inspection. Perform functionality test.	Daily, before use		Check battery charge. Make sure all moving parts are free from debris. Do not use this instrument if it is unable to function properly.	FTL	SOP G-2
Nalgene jars	n/a	Visual inspection.	Ensure jars are undamaged, and lids properly threaded. Inspect Lexan tubes for splits, and proper fit of end caps.	Daily, before use		Do not use damaged lids jars, and/or tubes.	FTL	SOP G-2

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SAP Worksheet #23—Analytical SOP References Table

Lab SOP Number	Title, Revision Date[1], and/or Number	Date Last Revisited if not Revised[1]	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis[2]	Variance to QSM	Modified for Project Work? (Y/N)
ANA6010	Inductively Coupled Plasma Atomic Emission Spectroscopy by EPA Method 6010; 10/2014; Rev. 8		Definitive	SD / METAL	ICP-AES	APPL	None	N
ANA6020	Inductively Coupled Plasma-Mass Spectrometry by EPA Method 6020; 10/2014; Rev. 5		Definitive	SD / METAL	ICP-MS	APPL	None	N
ANA218.6-7199	Hexavalent Chromium Analysis EPA Method 7199/218.6; 06/2015; Rev. 5		Definitive	SD / METAL	IC	APPL	None	N
ANAWALKLEY	Total Organic Carbon (TOC) in Soil (Walkley-Black, Modified); 06/2015; Rev. 1		Screening	SD / WCHEM	N/A (titration)	APPL	None	N
HPL6850	Analysis of Perchlorate in Environmental Samples by EPA 6850; 08/2015; Rev. 3		Definitive	SD / EXPLO	HPLC	APPL	None	Y[3]
HPL8321	Method 8321 LC-Mass Spectrometer Analysis of Carbamate / Urea and Nitroaromatic / Nitrosamine Compounds; 01/2015; Rev. 4		Definitive	SD / EXPLO (Picric Acid only)	HPLC	APPL	None	N
HPL8330	Explosive Compounds: Diode Array Detector by High Pressure Liquid Chromatography; 01/2015; Rev. 6		Definitive	SD / EXPLO	HPLC	APPL	None	N
PRE3050B	Acid Digestion of Sediments, Sludges, and Soils by EPA Method 3050B; 06/2015; Rev. 3		Definitive	SD / METAL	N/A (digestion)	APPL	None	N
ANA3060A	Alkaline Digestion for Hexavalent Chromium (Method 3060A); 06/2015; Rev. 1		Definitive	SD / METAL (Hexavalent Chromium only)	N/A (digestion)	APPL	None	N
ANA9045	pH in Soil and Waste (EPA SW846 Method 9045C&D); 06/2015; Rev. 3		Screening	SD / WCHEM	pH Probe	APPL	None	N
ASTM D1498	ALS-Kelso employs ASTM D1498 for analysis of ORP in soil. Due to copyright restrictions, this method is not available for distribution.		Screening	SD / WCHEM	ORP Probe	ALS - Kelso	None	N
SHR001	Receiving Samples; 07/01/2015; Rev. 3		N/A (Receiving)	SD / EXPLO, METAL, WCHEM, GRAINSIZE, AVS/SEM	N/A (Receiving)	APPL	None	N
SHR003	Subcontracting Samples to Other Laboratories; 07/17/2015; Rev. 16		N/A (Receiving)	SD / EXPLO, METAL, WCHEM, GRAINSIZE, AVS/SEM	N/A (Receiving)	APPL	None	N
SHR012	Sample Disposal and Waste Collection, Storage and Disposal; 01/28/2015; Rev. 16		N/A (Disposal)	SD / EXPLO, METAL, WCHEM, GRAINSIZE, AVS/SEM	N/A (Disposal)	APPL	None	N
MET-ICP	Determination of Metals and Trace elements by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP) by Method 6010C; 1/1/2015; Rev. 25		Screening	SD / AVS/SEM	ICP-AES	ALS - Kelso	None	N
MET-7470A	Mercury in Liquid Waste by EPA 7470A; 1/31/2014; Rev. 16		Screening	SD / AVS/SEM	CVAA	ALS - Kelso	None	N
GEN-AVS	Acid Volatile Sulfides; 4/30/2013; Rev. 7		Screening	SD / AVS/SEM	Spectrophotometer	ALS - Kelso	None	N
SMO-SCOC	Sample Tracking and Internal Chain-of-custody; 4/1/2015; Rev. 15		N/A (Receiving)	SD / WCHEM, AVS/SEM	N/A (Receiving)	ALS - Kelso	None	N
SMO-DISP	Sample Disposal; 5/1/2015; Rev. 12		N/A (Disposal)	SD / WCHEM, AVS/SEM	N/A (Disposal)	ALS - Kelso	None	N
SMO-GEN	Sample Receiving; 9/11/2015; Rev. 32		N/A (Receiving)	SD / WCHEM, AVS/SEM	N/A (Receiving)	ALS - Kelso	None	N

SAP Worksheet #23—Analytical SOP References Table (continued)

Lab SOP Number	Title, Revision Date[1], and/or Number	Date Last Revisited if not Revised[1]	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis[2]	Variance to QSM	Modified for Project Work? (Y/N)
MSE018	EPA Method 8330 Mechanical Orbital Shaker Extraction for Solid Explosive Samples; 07/2015; Rev. 1		Definitive	SD / EXPLO	N/A (extraction)	APPL	None	N
BR-GT-006	Particle Size Analysis (ASTM D 2217 and D422-63); 02/20/2014; Rev. 7		Screening	SD / GRAINSIZE	Sieve set	Test America - Burling ton	None	N
BR-EH-001	Tracking and Collection of Hazardous Waste; 05/13/2014; Rev. 16		N/A (Disposal)	SD / GRAINSIZE	N/A (Disposal)	Test America - Burling ton	None	N
BR-SM-001	Sample Management; 02/19/2014; Rev. 12.1		N/A (Receiving)	SD / GRAINSIZE	N/A (Receiving)	Test America - Burling ton	None	N
BR-SM-003	Sample Storage & Temperature Monitoring of Refrigerated and Frozen Storage Units; 01/31/2014; Rev. 6		N/A (Receiving)	SD / GRAINSIZE	N/A (Receiving)	Test America - Burling ton	None	N

Notes:
1. This worksheet was prepared in September 2015. It is intended to be a snapshot as it pertains to dates for SOP revision/revisitation and DoD Environmental Laboratory Accreditation Program (ELAP) accreditation.
2. The laboratories are DoD ELAP accredited for analysis methods they are to perform which will generate definitive data. Laboratories will remain certified prior to sampling and throughout analysis. Refer to **Attachment A**:
   APPL's DoD ELAP accreditation through Perry Johnson Laboratory Accreditation, Inc. (PJLA) is granted through November 27, 2015.
   ALS-Kelso's DoD ELAP accreditation through PJLA is granted through March 13, 2016.
   Test America-Burlington's DoD ELAP accreditation through L-A-B is granted through February 25, 2017.
3. Due to regulator request, APPL will extract 10g of soil for perchlorate rather than the typical 1g. This is intended to provide a more-representative extraction.

SAP Worksheet #24—Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC (for 8330B EXPLO)	Initial Calibration (ICAL) for all analytes (including surrogates)	At instrument setup and after ICV or CCV failure, prior to sample analysis.	ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤15%; Option 2: linear least squares regression for each analyte: r^2 ≥0.99; Option 3: non-linear least squares regression (quadratic) for each analyte: r^2 ≥ 0.99.	Correct problem, then repeat ICAL.	Analyst	HPL8330
	Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analyte(s) and surrogates within ± 20% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	Continuing Calibration Verification (CCV)	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within ± 20% of the true value.	Recalibrate and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
HPLC-MS (for Picric Acid)	ICAL	At instrument set-up and after ICV or CCV failure, prior to sample analysis.	ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤ 20%; Option 2: linear least squares regression for each analyte: r^2 ≥ 0.99; Option 3: non-linear least squares regression (quadratic) for each analyte: r^2 ≥ 0.99.	Correct problem then repeat ICAL.	Analyst	HPL8321
	Retention Time window position establishment	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.		
	Retention Time (RT) window width	At method set-up and after major maintenance (e.g., column change).	RT width is ± 3 times standard deviation for each analyte RT from the 72-hour study.	NA.		
	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within established RT windows. All reported analytes within ± 15% of true value.	Correct problem, rerun ICV. If that fails, repeat ICAL.		
	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within established RT windows. All reported analytes and surrogates within ± 15% of true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC-MS (for Perchlorate)	Interference ThresholdStudy	At initial setup and when major changes occur in the method's operating procedures (e.g., addition of cleanup procedures, column changes, mobile phase changes).	Measure the threshold of common suppressors (chloride, sulfate, carbonate, bicarbonate) that can be present in the system without affecting the quantitation of perchlorate. The threshold is the concentration of the common suppressors where perchlorate recovery falls outside an 80-120% window.	NA	Analyst	HPL6850
	Mass Calibration	Instrument must have a valid mass calibration prior to any sample analysis. The mass calibration is updated on an as needed basis (e.g., QC failures, ion masses show large deviations from known masses, major instrument maintenance is performed, or the instrument is moved).	Mass calibration range must bracket the ion masses of interest. The most recent mass calibration must be used for an analytical run, and the same mass calibration must be used for all data files in an analytical run. Mass calibration must be verified by acquiring a full scan continuum mass spectrum of a perchlorate stock standard.	If the mass calibration fails, recalibrate. If it still fails, consult manufacturer instructions on corrective maintenance.		
	Tune Check	Prior to ICAL and after any mass calibration or maintenance is performed.	Tuning standards must span the mass range of the analytes of interest and meet acceptance criteria outlined in the laboratory SOP.	Retune instrument and verify. If the tune check will not meet acceptance criteria, an instrument mass calibration must be performed and the tuning redone.		
	Initial Calibration (ICAL)	At instrument setup or after ICV or CCV failure, prior to sample analysis.	ICAL must meet one of the two options below: Option 1: RSD for each analyte ≤ 15%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.995$.	Correct problem, then repeat ICAL.		
	Initial Calibration Verification (ICV)	Once after each ICAL.	Perchlorate concentration must be within ± 15% of its true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	Continuing Calibration Verification (CCV)	On days an ICAL is performed, after every 10 field samples and at the end of the analytical sequence. On days an ICAL is not performed, at the beginning of the sequence, after every 10 field samples and at the end of the analytical sequence.	Perchlorate concentration must be within ± 15% of its true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Laboratory Reagent Blank (LRB)	Prior to calibration and at the end of the analytical sequence.	No perchlorate detected > ½ LOQ.	Reanalyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-AES (for METAL)	Linear Dynamic Range (LDR) or high-level check standard	At initial set up and checked every 6 months with a high standard at the upper limit of the range.	Within ± 10% of true value	Dilute samples within the calibration range, or re-establish/ verify the LDR.	Analyst	ANA6010
	Initial Calibration (ICAL) for all analytes	Daily ICAL prior to sample analysis.	If more than one calibration standard is used, $r^2 \geq 0.99$.	Correct problem, then repeat ICAL.		
	Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within ± 10% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	Continuing Calibration Verification (CCV)	After every 10 field samples, and at the end of the analysis sequence.	All reported analytes within ± 10% of the true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Low-level Calibration Check Standard (Low-level ICV)	Daily.	All reported analytes within ± 20% of true value.	Correct problem and repeat ICAL.		
	Initial and Continuing Calibration Blank (ICB/CCB)	Before beginning a sample run, after every 10 field samples, and at end of the analysis sequence.	No analytes detected >LOD.	Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed.		
	Interference Check Solutions (ICS) (also called Spectral Interference Checks)	After ICAL and prior to sample analysis.	ICS-A: Absolute value of concentration for all nonspiked project analytes <LOD (unless they are a verified trace impurity from one of the spiked analytes); ICS-AB: Within ± 20% of true value.	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-MS (for METAL)	Linear DynamicRange (LDR) orHigh-levelCheck Standard	At initial set-up andchecked every 6 months with a high standard atthe upper limit of therange.	Within ±10% of true value.	Dilute samples withinthe calibration range, or re-establish/ verify the LDR.	Analyst	ANA6020
	Tuning	Prior to ICAL.	Mass calibration ≤ 0.1 amu from the true value; Resolution < 0.9 amu full width at 10% peak height.	Retune instrument and verify.		
	Initial Calibration (ICAL) for All Analytes	Daily ICAL prior to sample analysis.	If more than one calibration standard is used, r2 ≥ 0.99.	Correct problem, then repeat ICAL.		
	Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes, within ± 10% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence.	All reported analytes within ± 10% of the true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Low-level Calibration Check Standard (Low Level ICV)	Daily.	All reported analytes within ± 20% of the true value.	Correct problem and repeat ICAL.		
	Initial and Continuing Calibration Blank (ICB/CCB)	Before beginning a sample run, after every 10 field samples, and at end of the analysis sequence.	No analytes detected >LOD.	Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed.		
	Interference Check Solutions (ICS) (also called Spectral Interference Checks)	After ICAL and prior to sample analysis.	ICS-A: Absolute value of concentration for all non- spiked project analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes); ICS-AB: Within ± 20% of true value.	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
IC (for Hexavalent Chromium)	ICAL (minimum three standards and a calibration blank)	Daily ICAL prior to sample analysis	$r^2 \geq 0.99$	Correct problem, then repeat ICAL.	Analyst	ANA218.6-7199
	ICV	Immediately following ICAL	Value of second source within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat calibration.		
	CCV	Before and after every 10 field samples and at the end of the run.	Value of CCV within ± 10% of true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze 2 additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV		
	CCB	Before and after every 10 field samples and at the end of the run.	No analytes detected > LOD	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		
pH meter	Minimum 3-point calibration	Daily or prior to analyzing samples	±0.05 unit.	Terminate analysis, recalibrate, and verify before sample analysis.	Analyst	ANA9045
	CCV	One CCV every 10 samples	±0.05 unit.	Terminate analysis, recalibrate, and verify before sample analysis.		
ORP Probe	Electrode zero	Daily	±0.5mV	Correct the problem and repeat the electrode zero.	Analyst	ASTM D1498
	Check to Standard Redox Solution	Daily	Within ±30mV of expected value. A second reading (from fresh solution) within ±10mv of first reading	Correct the problem and repeat the check.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-AES (SEM Metals)	ICAL	Each analytical sequence - High Standard and a Blank	ICV Standard, MRL Standard, & Calibration Blank to meet criteria	Recalibrate	Lab Section Supervisor	MET-ICP
	ICV	Once after each ICAL, prior to beginning a sample run	Analytes must agree within 10% of the expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.		
	CCV	Every 10 samples and at the end of the analytical sequence	Analytes must agree within 10% of the expected value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.		
	High-level check standard	Daily	Analytes must agree within 10% of the expected value	Correct problem, reanalyze		
	MRL standard	Beginning and end of daily run	70-130%	Correct problem, reanalyze		
	Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOQ	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed except samples <LOQ.		
	Interference check solutions (ICS)	At beginning and end of the daily sequence	ICS-A: Absolute value of concentration for all non-spiked analytes < LOQ (<2XLOQ for elements with LOQ<10mg/L) ICS-AB: Within 20% of true value	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze affected samples.		
CVAA (SEM Mercury)	ICAL	Each analytical sequence (5 standards)	Correlation coefficient of calibration curve ≥0.995	Correct problem, repeat ICAL	Lab Section Supervisor	MET-7470A
	ICV	Once after each ICAL, prior to beginning a sample run	Analytes must agree within 10% of the expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.		
	CCV	Every 10 samples and at the end of the analytical sequence	Analyte must agree within 20% of the expected value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.		
	Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOQ	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		
Spectrophotometer (AVS)	ICAL	As needed	The correlation coefficient must be ≥ 0.995	Correct problem then repeat ICAL	Lab Section Supervisor	GEN-AVS
	ICV	After each initial calibration	± 10% of the expected value	Correct problem and rerun ICV. If that fails, correct problem and repeat ICAL.		
	CCV	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	± 10% of the expected value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.		

Notes:
DoD QSM v5.0 is the basis for EXPLO (including picric acid and perchlorate) and METAL by 6010/6020. Laboratory SOPs and analytical methods are the basis for hexavalent chromium, pH, ORP and AVS/SEM.

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

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
HPLC	Change guard cartridge, inlet filter and PTFE frit	EXPLO	Review pressure profile	As needed, based on pressure profile	Part was replaced	Replace them and check often	Analyst / Supervisor	HPL8330
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Analyte separation and calibration curve meets 20% RSD	Replace column, if needed		
	Replace mobile phase daily		Visually inspect for sufficient level of solvent	Daily	Solvent was replaced	Prepare fresh mobile phase solution		
HPLC-MS	Change guard cartridge, inlet filter and PTFE frit	Picric Acid	Review pressure profile	As needed, based on pressure profile	Passing ICAL and CCV	Replace them and check often	Analyst / Supervisor	HPL8321
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Passing ICAL and CCV	Replace with another analytical column		
	Replace mobile phase daily		Check the stability of the base line	Daily	Minimum noise in the base line	Prepare fresh mobile phase solution		
	Monitor for subtle changes in chromatography and detector quality.		Warning flags indicating a decrease in data quality include: a decreased detector response, elevated baseline or calibration inconsistencies	Daily	N/A	Tune MS		
	tune MS		Manufacturer comes on-site to re-tune annually.	Annual	Calibrations meet method acceptance criteria.	A service call should be placed with the manufacturer		
HPLC	Change guard cartridge, inlet filter and Ftpp frit	Perchlorate	Review pressure profile.	As needed based on pressure profile	Part was replaced	Replace them and check often	Analyst / Supervisor	HPL6850
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Analyte separation and calibration curve meets 20% RSD	Replace column, if needed		
	Replace mobile phase daily		N/A	Daily	Minimum noise in the base line	Prepare fresh mobile phase solution		
ICP-AES	Check instrument connections, gas flow, pressure.	Conduct leak test.	Visually inspect for wear or damage and indicator from computer controls.	Daily and annual maintenance from manufacturer	Intensity of spectrum is within manufacture's recommendation	Call for maintenance service.	Analyst / Supervisor	ANA6010
	Clean the torch in Aqua Regia solution and align the torch.	Conduct leak test and adjust alignment.	Inspect for leaks and align the torch and ensure that it is in the center.	Each week (minimum every 2 weeks)	Torch is centered and no leaks	Replace or call for maintenance service.		
	Clean the chamber and nebulizer.	METAL	Visually inspect for foreign objects.	Each week	Make sure chamber and nebulizer are clean	Replace or call for maintenance service.		
	Clean the lens and optimize the detector sensitivity.		Clean up the dust from the lens.	Every 6 months	In accordance with manufacturer's recommendation or lab SOP	Install new lens.		

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

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP-MS	Check windings	METAL	Visually inspect for wear or damage	8 hours of operation	Part was replaced	Replace windings	Analyst / Supervisor	ANA6020
	Clean nebulizer		Visually inspect for wear or damage	Daily prior to operation	Part was replaced	Flush with DI water		
	Clean spray chamber		Visually inspect for dirt or deterioration	As necessary	Part was replaced	Rinse with DI water		
	Clean Torch		Visually inspect for dirt or deterioration	Monthly	Part was replaced	Clean with a 10% HNO3 solution and soak any parts with buildup overnight in a 5% HNO3 solution. Rinse with DI water and air dry.		
Dionex IC	Inject DI rinse at the end of every run; rinse the piston seals	Hexavalent Chromium	Check for and isolate leaks	Daily	None	Clean up and repair any leaks.	Analyst / Supervisor	ANA218.6-7199
	Locate and replace any pinched or damaged airlines		When chromatography indicates a flow problem.	As necessary	None	Repair any airlines.		
	Replace primary and rinse seals in pump heads		When chromatography indicates a flow problem.	As necessary	None	Repair any seals or rinse pump heads.		
pH meter	Check LCD display and pH probe	3 point calibration using known standards	Visually inspect for wear or damage and indicator from computer controls.	Daily and annual maintenance from manufacturer	± 0.05 units	Return to manufacturer for recalibration or call for maintenance service.	Analyst / Supervisor	ANA9045
ICP-AES (SEM Metals)	Clean plasma torch; clean filters; clean spray and nebulizer chambers; replace pump tubing	SEM Metals	Torch, filters, nebulizer chamber, pump, pump tubing	Perform as needed.	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service.	Analyst / Supervisor	MET-200.7/6010B
CVAA (SEM Mercury)	Clean or replace dehydrator tubing and sample mixing coil tubing; replace sample probe; replace pump tubing; clean optical cell.	SEM Mercury	Tubing, sample probe, optical cell	Perform as needed.		Repeat maintenance activity or remove from service.	Analyst / Supervisor	MET-7470A/245.1
Spectrophotometer (AVS)	Inspect lamp alignment. Adjust zero. Replace lamp as needed.	AVS	Check wavelengths against NIST traceable standards	Every 6 months	Within 3% of certified transmittance density values or 2nm for holmium oxide	Repeat maintenance activity or remove from service.	Analyst / Supervisor	GEN-AVS

SAP Worksheet #26—Sample Handling System

(UFP-QAPP Manual Appendix A)

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization):	Field Team Leader (TBD)/CH2M HILL
Sample Packaging (Personnel/Organization):	Sample Processor or Field Team Member (TBD)/CH2M HILL
Coordination of Shipment (Personnel/Organization):	Sample Processor or Field Team Member (TBD)/CH2M HILL
Type of Shipment/Carrier:	Overnight/Federal Express
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Receipt Personnel/APPL. Sample Receipt Personnel/ALS-Kelso. Sample Receipt Personnel/Test America-Burlington. Note that all samples will be shipped to APPL who will forward ORP and AVS/SEM fractions to ALS-Kelso and GRAINSIZE fractions to Test America-Burlington.
Sample Custody and Storage (Personnel/Organization):	Sample Receipt Personnel/APPL. Sample Receipt Personnel/ALS-Kelso. Sample Receipt Personnel/Test America-Burlington.
Sample Preparation (Personnel/Organization):	Digestion Personnel/APPL. Extraction Personnel/ALS-Kelso. Extraction Personnel/Test America-Burlington.
Sample Determinative Analysis (Personnel/Organization):	Analyst/APPL. Analyst/ALS-Kelso. Analyst/Test America-Burlington.
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	90 Days
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	Extracts may be disposed of 90 days after extraction. Digestates may be disposed of 90 days after digestion.
Biological Sample Storage (No. of days from sample collection):	90 days
SAMPLE DISPOSAL	
Personnel/Organization:	Environmental Health and Safety Officer/APPL. Environmental Health and Safety Officer/ALS-Kelso. Environmental Health and Safety Officer/Test America-Burlington.
Number of Days from Analysis:	Samples may be disposed of 90 days after report mail date.

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SAP Worksheet #27—Sample Custody Requirements

(UFP-QAPP Manual Section 3.3.3)

Sample Labeling

Sample labels will include, at a minimum, client name, site, sample identification (ID), date/time collected, analysis group or method, preservative, and sampler's initials. Labels will be taped to the jar to ensure that they do not separate. Note that tape may not be necessary if it adds to the weight of pre-tared vials. Note that tape may not be necessary if it interferes with the robotics of an autosampler. In the event that tape is not necessary, waterproof labels and ink will be used.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory)

Samples will be collected by field team members under the supervision of the field team leader. As samples are collected, they will be placed into containers and labeled, as outlined above. Samples will be cushioned with packaging material and placed into coolers containing enough ice to keep the samples below 4°C until they are received by the laboratory. The chain-of-custody will also be placed into the cooler. Coolers will be shipped to the laboratory via Federal Express, with the airbill number indicated on the chain-of-custody (to relinquish custody). Upon delivery, the laboratory will log in each cooler and report the status of the samples.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal)

Please refer to BR-0300, SMO-GEN (1) and SMO-GEN (2) for details on sample receipt. Please refer to BR-0300 and SMO-SCOC for details on sample management and chain-of-custody. Please refer to BR-0303, SMO-SDIS, and SMO-SPLDIS for details on laboratory waste disposal.

Sample Identification Procedures

Upon opening the cooler, the receiving clerk signs the chain-of-custody and then takes the temperature using the temperature blank (if absent, then a sample container or infrared thermometer is used). The sample containers in the cooler are unpacked and checked against the client's chain-of-custody and any discrepancies or breakage is noted on the chain-of-custody. Next, if any water samples require preservative, the clerk will check the pH values to see if they are in the acceptable pH range. The clerk will deliver the chain-of-custody (and any other paperwork; e.g. temperature or pH QA notice) to the project manager for Laboratory Information Management System (LIMS) entry and client contact (if needed).

The field logbook will identify the sample ID with the location, depth, date/time collected, and the parameters requested. The laboratory will assign each field sample a laboratory sample ID based on information in the chain-of-custody. The laboratory will send sample login forms to the project data manager to check sample IDs and parameters are correct.

Chain-of-Custody Procedures

Chains of custody will include, at a minimum, laboratory contact information, client contact information, sample information, and relinquished by/received by information. Sample information will include sample ID, date/time collected, number and type of containers, preservative information, analysis method, and comments. The chain-of-custody will also have the sampler's name and signature. The chain-of-custody will link location of the sample from the field logbook to the laboratory receipt of the sample. The laboratory will use the sample information to populate the LIMS database for each sample.

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SAP Worksheet #28-1—Laboratory QC Samples Table

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 8330B / HPL8330

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Soil drying procedure	Each sample, LCS, and Method Blank.	Laboratory must have a procedure to determine when the sample is dry to constant mass. Record date, time, and ambient temperature on a daily basis while drying samples.	NA	Analyst/Supervisor	NA	Same as Method/SOP QC Acceptance Limits
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prep and reanalyze method blank and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	
Laboratory Control Sample (LCS)	One per preparatory batch.	See **Worksheet #15**	Correct problem. If required, re-prep and reanalyze the LCS and all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		Accuracy	
Matrix Spike (MS)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Precision	
Surrogate Spike	All field and QC samples.	1,2-Dinitrobenzene: 78-119%	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary. Apply Q-flag to all associated analytes if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Confirmation of positive results (second column)	All positive results must be confirmed.	Calibration and QC criteria are the same for the confirmation analysis as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	Report from both columns. Apply J-flag if RPD > 40%. Discuss in the case narrative.		Accuracy, Precision	

SAP Worksheet #28-1—Laboratory QC Samples Table (continued)

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 8330B / HPL8330

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-2—Laboratory QC Samples Table

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 8321A / HPL8321

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prep and reanalyze MB and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst/Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch.	See **Worksheet #15**	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for the failed reported analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix Spike (MS)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Surrogate Spike	All field and QC samples.	1,2-Dinitrobenzene: 50-150% (laboratory limits as QSM v5.0 does not specify)	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary. Apply Q-flag to all associated analytes if acceptance criteria are not met and explain in the case narrative.		Accuracy	

SAP Worksheet #28-2—Laboratory QC Samples Table (continued)

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 8321A / HPL8321

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-3—Laboratory QC Samples Table

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 6850 / HPL6850

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Isotope Ratio $^{35}Cl/^{37}Cl$	Every sample, batch QC sample, and standard.	Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantitated. Must fall within 2.3 to 3.8.	If criteria are not met, the sample must be rerun. If the sample was not pretreated, the sample must be re- extracted using cleanup procedures. If, after cleanup, the ratio still fails, use alternative techniques to confirm presence of perchlorate, e.g.., a post spike sample or dilution to reduce any interference. If reanalysis after cleanup fails to meet acceptance criteria, data must be qualified with a Q-flag and explained in the case narrative.	Analyst/ Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Internal Standard (IS)	Addition of 18O-labeled perchlorate to every sample, batch QC sample, standard, instrument blank, and method blank.	Measured 18O IS area within ± 50% of the value from the average of the IS area counts of the ICAL. RRT of the perchlorate ion must be 1.0 ± 2% (0.98 – 1.02).	Rerun the sample at increasing dilutions until the ± 50% acceptance criteria are met. If criteria cannot be met with dilution, the interference is suspected and the sample must be re-prepped using additional pretreatment steps. If reanalysis after pretreatment steps fails to meet acceptance criteria, data must be qualified with a Q-flag and explained in the case narrative.		Accuracy	
Interference Check Sample (ICS)	One ICS is prepared with every batch of 20 samples and must undergo the same preparation and pretreatment steps as the samples in the batch. It verifies the method performance at the matrix conductivity threshold (MCT). At least one ICS must be analyzed daily. The ICS shall be prepared at the LOQ.	Perchlorate concentration must be within ± 20% of its true value.	Correct problem. Reanalyze all samples and QC samples in the batch. If poor recovery from the cleanup filters is suspected, a different lot of filters must be used to re-extract all samples in the batch. If column degradation is suspected, a new column must be calibrated before the samples can be reanalyzed. Flagging criteria are not appropriate.		Accuracy, Bias	
Laboratory Reagent Blank (LRB)	Prior to calibration and at the end of the analytical sequence.	No perchlorate detected > ½ LOQ.	Reanalyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated batch. Problem must be corrected. Results may not be reported without a valid reagent blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed. Additional LRBs may be needed to ensure that there was no carryover from over range samples.		Contamination	
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. Re-prep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	

SAP Worksheet #28-3—Laboratory QC Samples Table (continued)

Matrix: SD
Analytical Group: EXPLO
Analytical Method/SOP Reference: SW-846 6850 / HPL6850

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per preparatory batch.	See **Worksheet #15**	Correct problem. Re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst/ Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix Spike (MS)	One per preparatory batch per matrix.	See **Worksheet #15**	Examine the project specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy	
Matrix Spike Duplicate (MSD) or Laboratory Duplicate (LD)	One per preparatory batch per matrix.	See **Worksheet #15**	Examine the project specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy, Precision	
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-4—Laboratory QC Samples Table

Matrix: SD
Analytical Group: METAL
Analytical Method/SOP Reference: SW-846 6010C / ANA6010

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst/Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch.	See **Worksheet #15**	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.		Accuracy	
Matrix Spike (MS)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Dilution Test	One per preparatory batch if MS or MSD fails. Only applicable for samples with concentrations > 50 x LOQ (prior to dilution). Use along with MS/MSD and PDS data to confirm matrix effects.	Five-fold dilution must agree within ± 10% of the original measurement.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Post-Digestion Spike (PDS) Addition (ICP only)	Perform if MS/MSD fails. One per preparatory batch (using the same sample as used for the MS/MSD if possible). Criteria applies for samples with concentrations <50 X LOQ prior to dilution.	Recovery within 80-120%.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Method of Standard Additions (MSA)	When dilution test or post digestion spike fails and if required by project.	NA	NA		Accuracy, Precision	
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes: The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-5—Laboratory QC Samples Table

Matrix: SD
Analytical Group: METAL
Analytical Method/SOP Reference: SW-846 6020A / ANA6020

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Internal Standards (IS)	Every field sample, standard and QC sample.	IS intensity in the samples within 30-120% of intensity of the IS in the ICAL blank.	If recoveries are acceptable for QC samples, but not field samples, the field samples may be considered to suffer from a matrix effect. Reanalyze sample at 5- fold dilutions until criteria is met. For failed QC samples, correct problem, and rerun all associated failed field samples.	Analyst/Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	
Laboratory Control Sample (LCS)	One per preparatory batch.	See **Worksheet #15**	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix Spike (MS)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Precision	
Dilution Test	One per preparatory batch if MS or MSD fails. Only applicable for samples with concentrations > 50 X LOQ (prior to dilution). Use along with MS/MSD or PDS data to confirm matrix effects.	Five-fold dilution must agree within ± 10% of the original measurement.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Post Digestion Spike (PDS) Addition	One per preparatory batch if MS or MSD fails (using the same sample as used for the MS/MSD if possible). Criteria apply for samples with concentrations < 50 X LOQ prior to dilution.	Recovery within 80-120%.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply J- flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Method of Standard Additions (MSA)	When dilution or post digestion spike fails and if the required by project.	NA	NA		Accuracy, Precision	

SAP Worksheet #28-5—Laboratory QC Samples Table (continued)

Matrix: SD
Analytical Group: METAL
Analytical Method/SOP Reference: SW-846 6020A / ANA6020

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-6—Laboratory QC Samples Table

Matrix: SD
Analytical Group: METAL
Analytical Method/SOP Reference: SW-846 7199 / ANA218.6-7199

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method blank	One per preparatory batch of up to 20 samples.	No analytes detected >1/2 LOQ and >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise effect sample results for common laboratory contaminants no analytes >LOQ.	Correct problem, then re-prep and reanalyze the MB and all samples in the associated batch for failed analytes, except when sample results are below the LOD if sufficient material is available.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch of up to 20 samples.	See **Worksheet #15**	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated batch for failed analytes, if sufficient material is available. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	See **Worksheet #15**	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate	One per preparatory batch	See **Worksheet #15**			Accuracy, Precision	
Pre-digestion matrix spikes (solid matrix samples only, Method 3060)	One soluble and insoluble pre-digestion MS analyzed per preparatory batch prior to analysis	Spike recovery within 75–125%	Correct problem and re-homogenize, re-digest, and reanalyze samples. If that fails, evaluate against LCS results.		Accuracy, Precision	
Post-digestion matrix spike (solid matrix samples only)	One per preparatory batch.	Spike recovery between 85–115%.	Examine project-specific data quality objectives (DQOs). Contact the client as to additional measures to be taken. If requested, correct problem and re-homogenize, re-digest, and reanalyze samples.		Accuracy, Precision	
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per **Worksheet #36**.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see above)	Assess decontamination procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See above.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of laboratory SOPs and analytical methods.

SAP Worksheet #28-7—Laboratory QC Samples Table

Matrix: SD
Analytical Group: WCHEM (pH)
Analytical Method/SOP Reference: SW-846 9045D / ANA9045

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Laboratory Replicate	One per every 10 samples.	%D ≤ 3% (between sample and laboratory replicate)	Correct problem and reanalyze sample and duplicate.	Analyst / Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of laboratory SOPs and analytical methods.

SAP Worksheet #28-8—Laboratory QC Samples Table

Matrix: SD
Analytical Group: WCHEM (TOC)
Analytical Method/SOP Reference: Walkley Black / ANAWALKLEY

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements.	Correct problem, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
LCS	One LCS per analytical/preparation batch	See **Worksheet #15**	Correct problem, re-analyze or re-extract the LCS and all associated batch samples in accordance with DoD QSM requirements.		Accuracy	
MS/MSD	One MS/MSD pair per analytical/preparation batch of 20 samples or less (if deemed necessary by the laboratory)	See **Worksheet #15**	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-qualifier if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of laboratory SOPs and analytical methods.

SAP Worksheet #28-9—Laboratory QC Samples Table

Matrix: SD
Analytical Group: WCHEM (ORP)
Analytical Method/SOP Reference: ASTM D1498

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Laboratory Replicate	One per batch of 20 or fewer samples	≤ 30% RPD	Repeat until QC acceptance limits are met. Narrate as "difficult sample matrix" if the system is slow to stabilize and thus will not yield a meaningful result.	Analyst / Supervisor	Precision	Same as Method/SOP QC Acceptance Limits
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of laboratory SOPs and analytical methods.

SAP Worksheet #28-10—Laboratory QC Samples Table

Matrix: SD
Analytical Group: GRAINSIZE
Analytical Method/SOP Reference: ASTM D422 / BR-GT-006

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
QA/QC Samples are not required for GRAINSIZE analysis.						

SAP Worksheet #28-11—Laboratory QC Samples Table

Matrix: SD
Analytical Group: AVSSEM
Analytical Method/SOP Reference: EPA 821_R-91-100 / GEN-AVS, MET-7470A, MET-ICP

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per batch or 5%, whichever is greater. This blank carries through AVS extraction and SEM digestion and analysis.	Target analytes must be ≤ LOQ	Correct the problem; if required, re-prep and reanalyze the method blank and all samples processed with the contaminated blank	Analyst/Supervisor	Contamination/ Bias	Same as Method/SOP QC Acceptance Limits.
Digestion Blank	One is performed for each batch of 20 samples. This blank does not undergo AVS extraction. It only undergoes SEM digestion and analysis.	Target analytes must be ≤ LOQ	Correct the problem; if required, re-prep and reanalyze the method blank and all samples processed with the contaminated blank		Contamination/ Bias	
LCS	One per batch or 5%, whichever is greater. The LCS is spiked after AVS extraction and before SEM digestion.	See **Worksheet #15**.	Re-prepare and analyze all associated samples.		Accuracy/Bias	
Laboratory Replicate (for AVS extraction)	One per batch or 5%, whichever is greater.	RPD ≤30%	Note outlier in case narrative		Precision	
Serial Dilution	One is performed for each preparation batch with sample concentration(s) > 50x LOQ.	The five-fold dilution result must agree within ± 10% of the original sample result.	Qualify the results.		Precision / Accuracy	
Post Digestion Spike	One is performed when serial dilution fails or analyte concentration(s) in all samples < 50x LOD.	The result must agree within ± 25% of expected result.	Run all associate sample in the preparatory batch by method of standard additions or qualify results.		Precision / Accuracy	
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause a significant data quality issue. Qualify as per **Worksheet #36**.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

Notes:
The specifications in this table meet the requirements of laboratory SOPs and analytical methods.

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SAP Worksheet #29—Project Documents and Records Table

Document	Where Maintained[2]
Field Notebooks	Electronic portable document format (.pdf) copies in the project file. Hard copy (bound Field Notebook) in the project file. Archived at project closeout.*
Chain-of-custody Records	Electronic .pdf copies in the project file. Hard copy in the project file. Archived at project closeout.
Air Bills	Hard copy in the project file. Archived at project closeout.
Corrective Action Forms	Electronic .pdf copies in the project file. Hard copy in the project file. Archived at project closeout.
Various field measurements	Recorded in Field Notebook.
Pertinent telephone conversations	Recorded in Field Notebook.
Sample Receipt, Custody, and Tracking Records	Electronic .pdf copies in the project file. Hard copy in the full data package.
Sample Prep Logs	Hard copy in the full data package[1]. Archived at project closeout.
Run Logs	Hard copy in the full data package[1]. Archived at project closeout.
Reported Field Sample Results	Electronic .pdf copies in the project file. Hard copy in the full data package[1]. Archived at project closeout.
Reported Results for Standards, QC Checks, and QC Samples	Hard copy in the full data package[1]. Archived at project closeout.
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hard copy in the full data package[1]. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Clean-up Records	Hard copy in the full data package[1].
Raw Data	Hard copy in the full data package[1]. Archived at project closeout.
Field Sampling Audit Checklists	Hard copy in the project file. Archived at project closeout.
Fixed Laboratory Audit Checklists	If completed, hard copy in the project file. Archived at project closeout.
Data Validation Reports	Electronic .pdf copies in the project file. Hard copy stored with the data package. Archived at project closeout. Data validation reports will be included as an appendix to the FS Addendum.
Electronic Data Deliverable (EDD)	The EDD will be prepared by the laboratory and submitted to CH2M HILL and transferred to the NIRIS during data management process.
Remedial Investigation (RI) Report	Electronic .pdf copies in the project file and in the Administrative Record. Hard copy in the project file. Archived at project closeout

*The contractor manages the project files until the project is closed. The length of time for maintaining project files is both file- and contract-specific. Once the project is closed, the files are archived and/or returned to the Navy in accordance with contract terms. After completion of the project, project documents required to be maintained will be stored at the Federal Records Center (FRC) in Suitland, MD:

Washington National Records Center
4205 Suitland Road
Suitland, Maryland 20746-8001

[1] CH2M HILL requires a “Level 4” package. When manual integration is required, the supporting information (i.e. chromatograms before and after manual integration as well as narration) is included in the data package.

[2] Hardcopy project documents, including laboratory data and validation narratives, are stored in the CH2M office while the project is in progress. After project closeout, documents are archived at the federal records center

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SAP Worksheet #30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization[1]	Backup Laboratory / Organization
SD	EXPLO	See **Worksheet #18**	SW-846 8330B / MSE018 , HPL8330	Standard 28 calendar-day TAT	APPL, Inc. 908 North Temperance Avenue Clovis, CA 559 275-2175 POC: Cynthia Clark	TBD
	EXPLO (Picric Acid)		SW-846 8321A / MSE018, HPL8321			
	EXPLO (Perchlorate)		SW-846 6850 / HPL6850			
	METAL		SW-846 6010C, 6020A / PRE3050B, ANA6010, ANA6020			
	METAL (Hexavalent Chromium)		SW-846 7199 / ANA3060A, ANA218.6-7199			
	WCHEM (pH)		SW-846 9045D / ANA9045D			
	WCHEM (TOC)		Walkley Black / ANAWALKLEY			
	WCHEM (ORP)		ASTM D1498		ALS - Kelso 1317 South 13th Avenue Kelso, WA 98626 360-577-7222 POC: Howard Holmes	
	GRAINSIZE		ASTM D422 / BR-GT-006		Test America - Burlington 30 Community Drive, Suite 11 South Burlington, VT 05403 802-660-1990 POC: Don Dawicki	
	AVS/SEM		EPA 821_R-91-100 / GEN-AVS, MET-7470A, MET-ICP		ALS-Kelso	

Notes:

[1] All samples will be shipped from the field to APPL. APPL will ship ORP and AVS/SEM fractions to ALS-Kelso and GRAINSIZE fractions to Test America.

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SAP Worksheet #31—Potential Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Ensuring Implementation of CA (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Field Performance Audit	Maximum of one during sampling activities	Internal	CH2M HILL	On-island staff CH2M HILL	Field Team Leader CH2M HILL	Bill Hannah, Project Manager CH2M HILL	Renee Hunt, Environmental Investigation Lead CH2M HILL
Safe Work Observation	One per week during field activities	Internal	CH2M HILL	Field Team Leader CH2M HILL	Project Field Team CH2M HILL	Carl Woods, H&S Officer CH2M HILL	Renee Hunt, Environmental Investigation Lead CH2M HILL

Notes:
CA corrective action

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SAP Worksheet #32—Assessment Findings and Corrective Action Responses Table

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
Corrective Actions	Corrective Action Form	Field Team PM Activity Manager	Within 1 day of corrective action	Verbal and CA Form	FTL CH2M HILL	Within one day of receipt of CA Form
Field Performance Audit	Field Performance Audit Checklist	Field Team PM Activity Manager	Within 1 day of audit	Verbal and CA Form	FTL CH2M HILL	Within one day of receipt of CA Form
Safe Work Observation (SWO)	Safe Work Observation Form	FTL Field Team PM	Immediately (person involved or observed person). Following day (field team). Within 1 week if worthy of elevation (H&S officer)	On SWO Form	FTL and individual being observed, and the PM and if elevated to the H&S officer.	Corrected in the field immediately, and within 1 week if elevated.

SAP Worksheet #32-1—Corrective Action Form

Person initiating corrective action (CA): _____ Date _____

Description of problem and when identified: _____

_____

_____

Cause of problem, if known or suspected: _____

_____

_____

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

_____

_____

_____

_____

_____

_____

CA implemented by: _____ Date: _____

CA initially approved by: _____ Date: _____

Follow-up date: _____

Final CA approved by: _____ Date: _____

Information copies to: Brett Doerr/Vieques Activity Manager

SAP Worksheet #32-2—Field Performance Audit Checklist

Project Responsibilities

Project No.: _____ **Date:** _____

Project Location: _____ **Signature:** _____

Team Members

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

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

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

Sample Collection

Yes _____ No _____ 1) Is there a written list of sampling locations and descriptions?
Comments _____

Yes _____ No _____ 2) Are samples collected as stated in the Master SOPs?
Comments _____

Yes _____ No _____ 3) Are samples collected in the type of containers specified in the work plan?
Comments _____

Yes _____ No _____ 4) Are samples preserved as specified in the work plan?
Comments _____

Yes _____ No _____ 5) Are the number, frequency, and type of samples collected as Specified the work plan?
Comments _____

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

Yes _____ No _____ 6) Are QA checks performed as specified in the work plan?
Comments _____

Yes _____ No _____ 7) Are photographs taken and documented?
Comments _____

Document Control

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

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

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

Yes _____ No _____ 4) Are the samples identified with sample tags?
Comments _____

Yes _____ No _____ 5) Are blank and duplicate samples properly identified?
Comments _____

Yes _____ No _____ 6) Are samples listed on a chain-of-custody record?
Comments _____

Yes _____ No _____ 7) Is chain-of-custody documented and maintained?
Comments _____

SAP Worksheet #32-3—Safe Work Observation Form

Project:		Observer:	Date:
Position/Title of worker observed:		**Background Information/comments:**	
Task/Observation Observed:			

Identify and reinforce safe work practices/behaviors

Identify and improve on at-risk practices/acts

Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards

Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)

Positive, corrective, cooperative, collaborative feedback/recommendations

Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current and accurate Pre-Task Planning/ Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			Positive Observations/Safe Work Practices:
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			Questionable Activity/Unsafe Condition Observed:
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			Observer's CAs/Comments:
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			Observed Worker's CAs/Comments:
Other…			

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SAP Worksheet #33—Quality Assurance Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (title and organizational affiliation)	Report Recipient(s) (title and organizational affiliation)
Field Audit Report	Maximum of one during sampling activities	Submitted with report in which data are analyzed and presented.	Project Manager: Bill Hannah/CH2M HILL	Regional Health, Safety and Environment and Quality Manager: Carl Woods/CH2M HILL
Data Validation Reports	Once, after analysis by laboratory, for all laboratory analytical data except %solids and %lipids.	Submitted by the data Validator within 14 calendar-days of notification to begin).	Project Manager: Laura Maschoff	Project Chemist: Michael Zamboni/CH2M HILL Project Manager: Bill Hannah/CH2M HILL
Data Usability Assessments (Data Quality Evaluation)	Once as an appendix to the report in which the data are analyzed and presented.	Along with the project report	Project Chemist: Michael Zamboni/CH2M HILL	Vieques RPM: Daniel Rodriquez/EPA and Vieques RPM: Gloria Toro/PREQB

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SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data Review Input	Description[1]	Responsible for Verification	Step I / IIa / IIb[2]	Internal / External
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	FTL/CH2M HILL (TBD)	Step I	Internal
Chains of Custody and Shipping Forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody will be initialed by the reviewer, a copy of the chain-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment. Chains of custody will also be reviewed for adherence to the SAP by the project chemist.	FTL/CH2M HILL (TBD) Michael Zamboni/CH2M HILL Project Chemist (PC)	Step I	Internal / External
Sample Condition Upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the Project Chemist in the form of laboratory logins.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Documentation of Laboratory Method Deviations	Laboratory Method Deviations will be discussed and approved by the project chemist. Documentation will be incorporated into the case narrative which becomes part of the final hardcopy data package.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check). The laboratory generates an electronic data deliverable. Upon receipt, the project chemist spot-checks this for accuracy. For data which require Level IV analytical data validation, the data validator updates (adds-to) the EDD with a final result, a final flag, a reason code, and validation status (“validated”). For data which do not require Level IV analytical data validation, the project chemist updates (adds-to) the EDD with a final result (typically the same as the lab result), a final flag (typically the same as the lab flag), a reason code (if any changes are necessary), and validation status (“preload check”). The project chemist checks the validator’s changes against the validation narrative. The data are loaded into a contractor-owned database and then checked for accuracy by the project chemist. The data are then migrated to NIRIS, the final database.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process. This is verification that they were generated and applicable to the data packages.	Data Validator/TBD	Step I	External
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	APPL QAO ALS - Kelso QAO Test America - Burlington QAO	Step I	Internal
Laboratory Data	The data will be verified for completeness by the Project Chemist. In order to ensure completeness, EDDs will be compared to the SAP and Sampler's Table. This is verification that all samples are included in the laboratory data and correct analyte lists are included.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and CA forms will be reviewed internally to ensure that all appropriate CAs have been taken and that CA reports are attached. If CAs have not been taken, the site manager will be notified to ensure action is taken.	Bill Hannah/CH2M HILL (PM) Michael Zamboni/CH2M HILL (PC)	Step I	Internal
Corrective Action Reports	CA reports will be reviewed by the project chemist or PM and placed into the project file for archival at project closeout.	Bill Hannah/CH2M HILL (PM) Michael Zamboni/CH2M HILL (PC)	Step I	External

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description1	Responsible for Verification	Step I / IIa / IIb2	Internal / External
Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods by comparing the EDDs to the SAP. If methods other than those specified in the SAP were used, the reason will be determined and documented.	Michael Zamboni/CH2M HILL (PC)	Step IIa	External
Target Compound List and Target Analyte List	Ensure the laboratory reported all analytes from each analysis group as per **Worksheet #15**. If the target compound list is not correct, then it must be corrected prior to sending the data for validation. Once the checks are complete, the project manager is notified via email.	Michael Zamboni/CH2M HILL (PC)	Step IIa	External
Reporting Limits	Ensure the laboratory met the project-designated quantitation limits as per **Worksheet #15**. If quantitation limits were not met, the reason will be determined and documented.	Michael Zamboni/CH2M HILL (PC)	Step IIb	External
Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed.	Data Validator/TBD	Step IIa	External
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered by the data validator during the data validation process.	Data Validator/TBD	Step IIa / IIb	External
Raw Data	10 percent review of raw data to confirm laboratory calculations.	Data Validator/TBD	Step IIa	External
Onsite Screening	All non-analytical field data will be reviewed against QAPP requirements for completeness and accuracy based on the field calibration records.	FTL/CH2M HILL (TBD)	Step IIb	Internal
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Data Validator/TBD	Step IIa	External
Documentation of Field QC Sample Results	Establish that all required QAPP QC samples were run and met limits.	Michael Zamboni/CH2M HILL (PC) Data Validator/TBD	Step IIb	External
Validation Reports	Data validation narratives will include, at a minimum, a discussion of all QC parameters evaluated, acceptance criteria, QC exceedances, associated samples, and a summary of qualifiers applied.	Data Validator/TBD	Step IIa / IIb	External
Third-Party Data Validation (METAL)[3]	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. QA/QC criteria for field QC samples are presented in **Worksheet #28**, QA/QC criteria for calibrations are presented in **Worksheet #24**, and QA/QC criteria for laboratory QC samples are presented in **Worksheet #28**. Reference limits, laboratory-specific limits, and accuracy/precision limits are presented in **Worksheet #15**. Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in "ICP-MS Data Validation" (SOP HW-2b; Rev. 15; December 2012) for SW-846 6020A and "ICP-AES Data Validation" (SOP HW-2a; Rev. 15; December 2012) for SW-846 6010C. Note that, because there are no EPA Region II SOPs for data validation of 6010, 6020, and 7199 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Guidance and qualifiers from "National Functional Guidelines for Inorganic Superfund Data Review (OSWER 9355.0-131; EPA-540-R-013-001; August, 2014) may also be applicable.	Data Validator/TBD	Step IIa and IIb	External

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description1	Responsible for Verification	Step I / IIa / IIb2	Internal / External
Third-Party Data Validation (EXPLO)[3]	For SW-846 8330B and 8321A: "Nitroaromatics and Nitroamines by HPLC" (SOP HW-16 Rev. 2.1; December 2010). Note that this validation SOP is specific to 8330A; therefore A/P limits from this UFP-SAP will take precedence over validation SOP limits. For SW-846 6850: Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. QA/QC criteria for field QC samples are presented in **Worksheet #28**, QA/QC criteria for calibrations are presented in **Worksheet #24**, and QA/QC criteria for laboratory QC samples are presented in **Worksheet #28**. Reference limits, laboratory-specific limits, and accuracy/precision limits are presented in **Worksheet #15**. Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in "ICP-MS Data Validation" (SOP HW-2b; Rev. 15; December 2012). Note that, because there are no EPA Region II SOPs for data validation of 6850 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Guidance and qualifiers from "National Functional Guidelines for Inorganic Superfund Data Review (OSWER 9355.0-131; EPA-540-R-013-001; August, 2014) may also be applicable.	Data Validator/TBD	Step IIa and IIb	External
Data Validation (WCHEM, GRAINSIZE, AVS/SEM)	Level IV analytical data validation is not required for screening data. However, they are still subject to the verification and validation procedures described above.	Michael Zamboni/CH2M Hill (PC)	Step I, IIa and IIb	External

Notes:

1. Should the CH2M HILL project chemist find discrepancies during the verification or validation procedures above, an email documenting the issue will be circulated to the internal project team, and a Corrections to File Memo will be prepared identifying the issues and the corrective action needed. This memo will be sent to the laboratory, or applicable party, and maintained in the project file.
2. IIa = compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005.]
   IIb = comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005]
3. Level IV third-party data validation will be performed on 100% of definitive analyses. Of the 100% validated, 10% of results will be recalculated from the raw data in order to verify calculations.

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SAP Worksheet #37—Usability Assessment

Data usability evaluation comprises critical assessment of the data with respect to the project objective. Given that the primary objective of this effort is to determine the nature and extent of potential munitions constituents contamination as a result of former OB/OD operations at SWMU 4, the comprehensive dataset will be reviewed to determine if it is adequate for making the project-specific determinations.

Some specific examples of data availability and usability protocol are:

- For data which are subject to third-party data validation, the third-party data validator is the only party who applies qualifiers to the data. Minor QC exceedances will result in “estimated” data, represented by J, NJ, and UJ qualifiers. Major QC exceedances will result in “rejected” data, represented by R-qualifiers. These are typical qualifiers familiar to EPA Region 2. The effect on availability and usability of rejected results will be evaluated.
- The use of “estimated” data will be discussed in the report. “Estimated” data are generally considered usable for all purposes. For results reported between the DL and LOQ the laboratory will apply J-flags. Although there is some added uncertainty in the concentration of estimated results, estimated data are generally considered usable for all purposes at their reported concentration. When the screening level is between the LOD and LOQ there is added uncertainty when the result is also between the LOD and LOQ (there is not added uncertainty when the result is detected at greater than the LOQ or is nondetect) but detections are still compared directly to screening levels. The added uncertainty is discussed in the data quality evaluation and risk assessments included in the RI Report.
- When detected results and screening levels are both less than the LOQ, results are still used at their reported concentration, which may be greater than or less than the screening level. The resulting uncertainty is acceptable because the planned data set is sufficiently large. In addition, the DQE will make an evaluation of the usability of the resulting dataset and will consider the quantity of estimated data versus unqualified data.
- While all non-rejected data are available for use to the project team, non-detect (and attributable to blank contamination) results may not be useful if the LOD is greater than the associated project action limit. In these cases, the project team will determine whether or not the laboratory would have reported the contaminant if detected at or above the PAL (i.e., evaluation of the PAL versus the DL).
- 10 percent of hardcopy analytical data will be checked against the electronic data to identify systematic reporting discrepancies. The basis for verifying 10 percent is traditional and has been shown to be sufficient for this purpose. The check will be performed manually. The check will verify results and laboratory qualifiers. This process is intended to identify discrepancies between the hardcopy and electronic data. If any discrepancies are identified during the ten percent verification, the laboratory will be contacted, the discrepancies will be communicated, and the laboratory will resolve the discrepancies. Separate from this check, 100 percent of data validation changes (qualifiers, etc.) are verified between the data validation reports, Form 1s, and electronic deliverable.
- If significant deviation is evident between parent samples and their field or laboratory duplicate, the cause will be investigated. The possibility of a switched sample will be considered. Field duplicates are expected to exhibit greater deviation than laboratory duplicates. Field duplicate and laboratory duplicate reproducibility is outlined in **Worksheet #28**.

SAP Worksheet #37—Usability Assessment (continued)

- Significant biases may be evident based on LCS, MS/MSD, and spiked surrogate exceedances. The third-party data validator will consider QC exceedances and biases when applying qualifiers to data. The project team will consider the direction of bias when determining the usability of qualified data compared to PALs. Low biases are expected to occur more frequently than high biases. In the case of rejected non-detect data, low biases may represent the inability of the laboratory to detect contaminants that may or may not be present at the site. The project team will act conservatively and understand that it is not known whether or not these compounds are present below, at, or above the PAL. High biases indicate that a result may be lower than it is reported. When high-biased data are greater than a PAL, the project team will examine the proximity of the result to the PAL to determine whether additional data are needed or if the result should simply be interpreted as a PAL exceedance.
- After completion of the data validation, the distribution of applied data validation qualifiers will be examined to determine if there are patterns that negatively affect the usability of data. This information will be compiled into a DQE, which will be presented as an appendix to the project report.
- Data usability is not decided upon by any one individual or entity. The project team, as a whole, will decide upon the usability of the data.
- Deviations from the SAP sampling and analytical protocols will be reviewed to ascertain whether or not they are significant enough to negatively affect the usability of data.
- Precision is assessed via percent difference or relative percent difference. Percent difference is typically used when one value is considered theoretically correct and relative percent difference is typically used when both values are experimental. Percent difference is calculated by taking the absolute value of the difference divided by the theoretical value. This is also expressed as

  $((|X_1 - X_2|) / X_1) * 100$

  where X_1 is the theoretical value and X_2 is the experimental value. If it is necessary to imply the direction of a bias, such as for percent drift, the absolute value need not be considered. Relative percent difference is calculated by taking the absolute value of the difference divided by the mean. This is also expressed as

  $((|X_1 - X_2|) / ((X_1 + X_2)/2)) * 100$

  where X_1 and X_2 are both measured values. Percent difference and relative percent difference often have upper control limits for precision.
- Accuracy is assessed via percent recovery. This is calculated by taking the measured value divided by the theoretical value. This is also expressed as

  $(X_2 / X_1) * 100$

  where X_1 is the theoretical value and X_2 is the experimental value, both positive numbers because they are 'amounts' or concentrations. Percent recovery can be negative, such as for MS and MSD recovery, if X_2 is calculated by subtracting a parent concentration from an experimental recovery. Percent recovery often has upper and lower control limits for accuracy.
- Completeness is calculated by taking the number of available results divided by the total number of results. This is also expressed as

  $(X_2 / X_1) * 100$

  where X_2 is the number of distinct results deemed "available for use" (not rejected) and X_1 is the total number of distinct results (not excluded). Completeness is calculated for the entire data set, for each matrix, and for each combination of matrix and analysis group. If patterns of rejection are evident in the data set, completeness may also be calculated for select combinations of matrix, analysis group, and analyte or other combinations as applicable for the data quality evaluation. Completeness has a lower control limit (completeness goal) and cannot exceed 100 percent.

SAP Worksheet #37—Usability Assessment (continued)

- Representativeness is qualitative and is assessed by verifying that the samples were collected and analyzed following approved SOPs.
- Comparability is also qualitative and is assessed by examining the other Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) considerations, including common matrices in the investigation, and using common analysis methods (i.e. SW-846 series) and common analytical techniques (i.e. 'HPLC' and 'ICP-MS').
- Sensitivity and its effect on usability is examined in great detail in the DQE report, but the procedure for doing so depends on the recommendations, which depend on the actual investigation results.
- Detailed descriptions of precision, accuracy, representativeness, completeness, comparability, and sensitivity will be included in the DQE with sufficient information to support the data usability conclusions.
- The information discussed in Worksheet #37 will be included in the DQE along with sufficient information to support the data usability conclusions.

Notes:

1. Completeness is defined as the percentage of measurements that are judged to be available compared to the total number of measurements made. The objective of the overall completeness goal for this project is set at 95 percent available data. This goal is inclusive of both field and laboratory analytical data.
2. Discussions of precision, accuracy, representativeness, completeness, and comparability will be included in the data quality review to describe the impact of data quality on project data quality objectives and data usability.

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Figures

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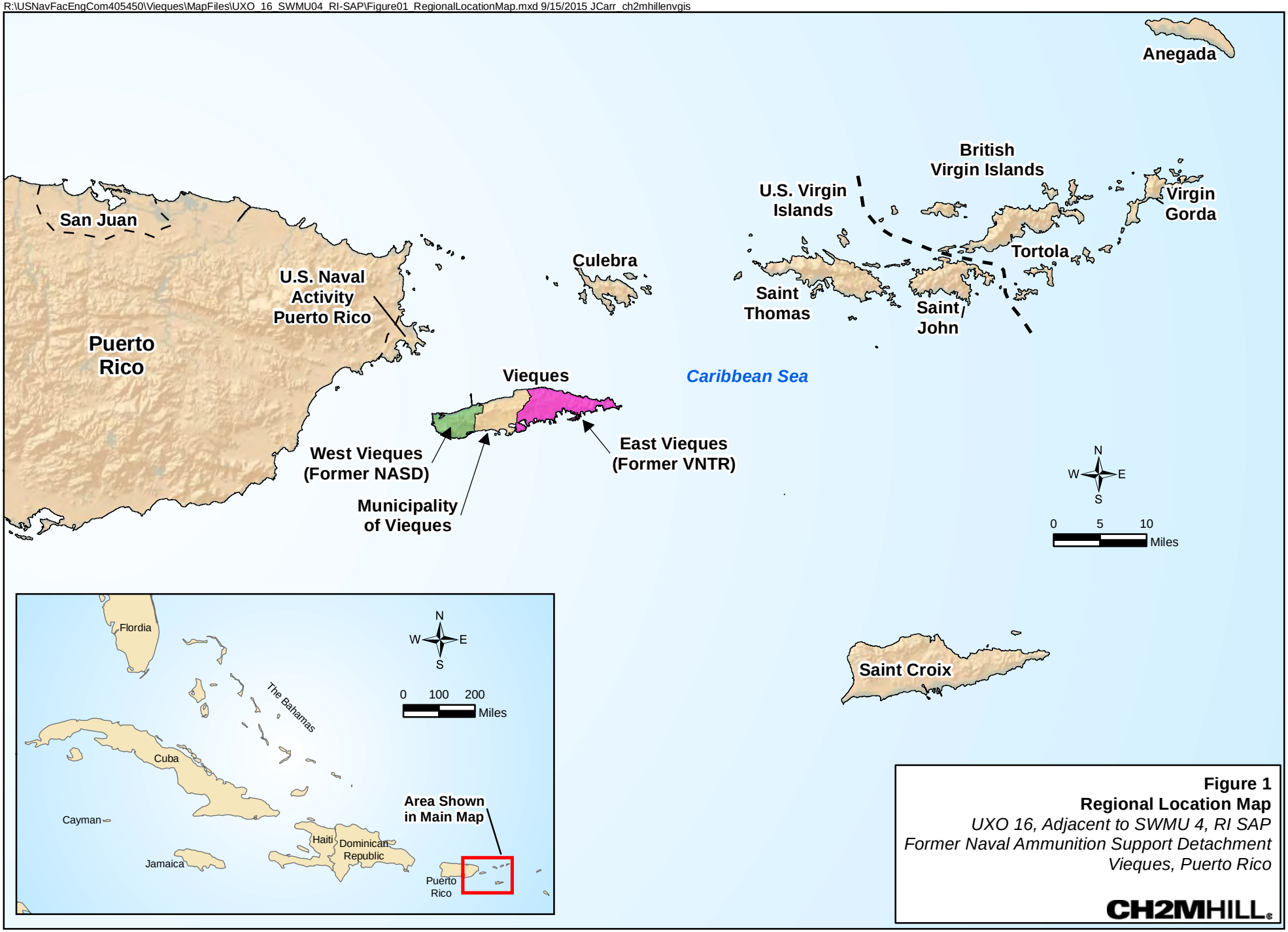

Figure 1
Regional Location Map
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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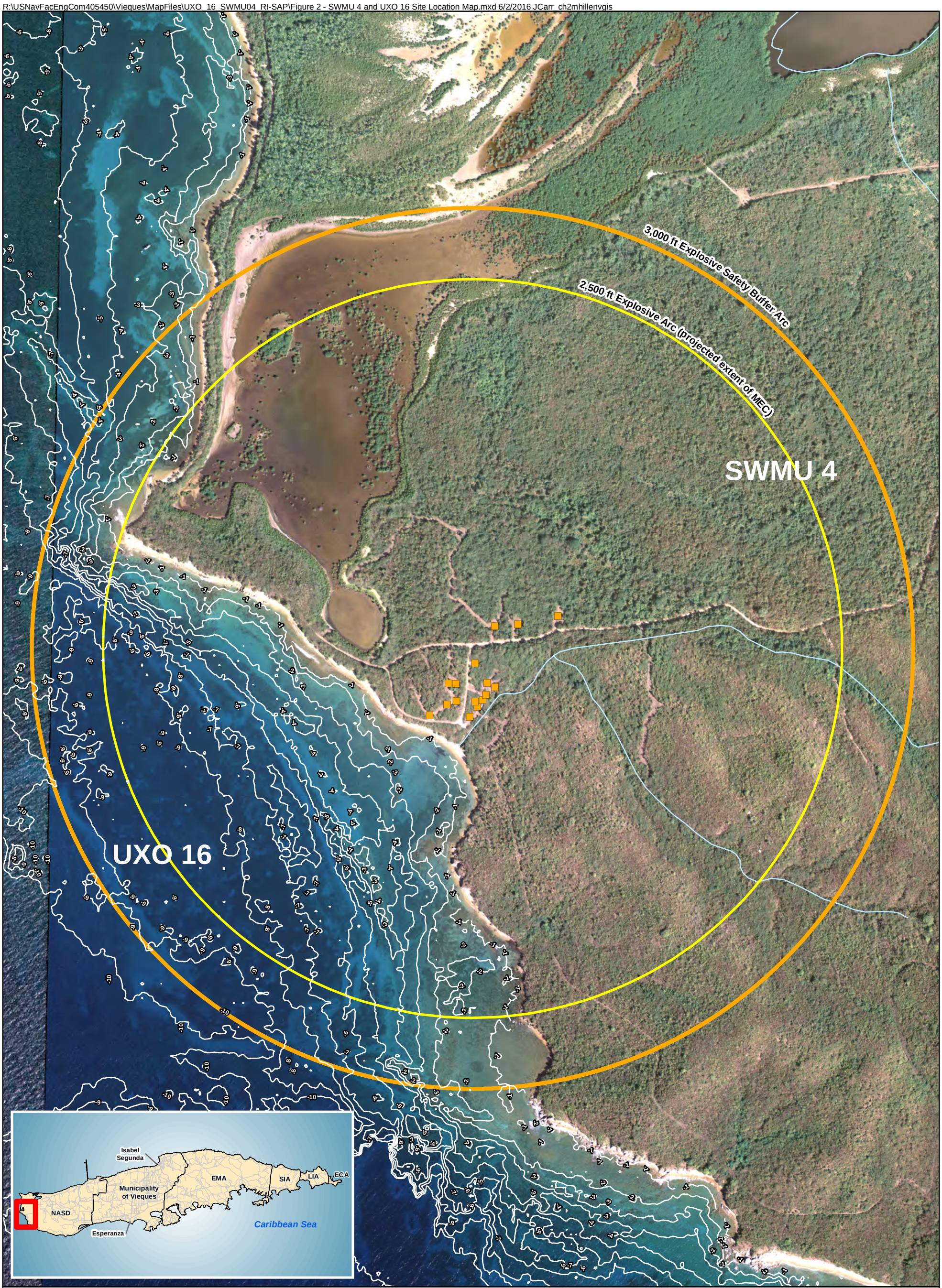

Legend

- OB/OD Pits
- Bathymetry Contour (meters)
- Ephemeral Stream

N
W E
S

0 500 1,000
Feet

Figure 2
SWMU 4 and UXO 16 Site Location Map
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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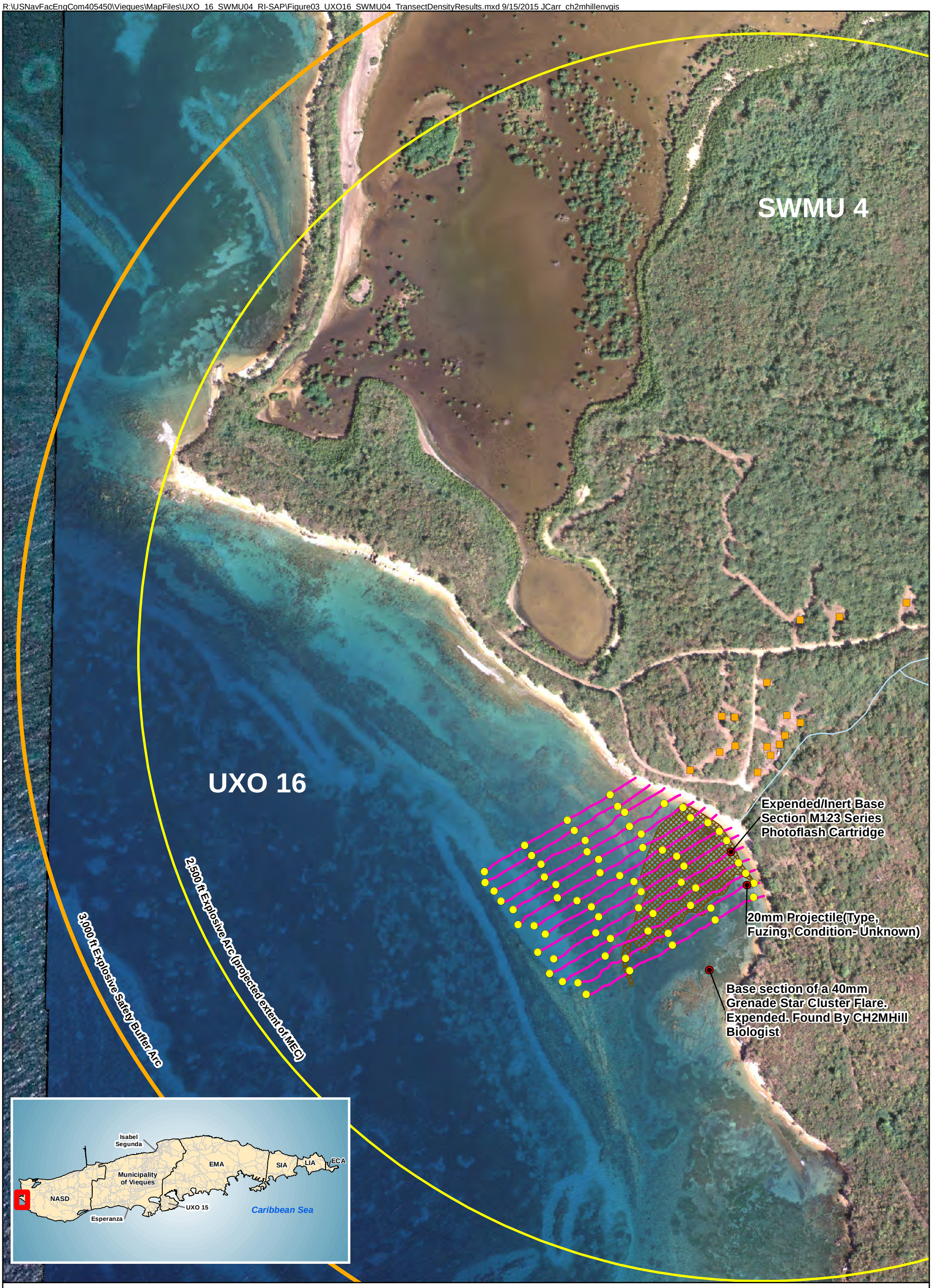

Legend

- Interval Point (200ft Intervals)
- MPPEH Location
- OB/OD Pits
- Underwater Transects from July, 2012 Site Inspection
- Ephemeral Stream
- Delta from Ephemeral Stream

N W E S

0 250 500 Feet

Figure 3
UXO 16 Area Adjacent to SWMU 4 Initial SI Results
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Note:
- Spacing for Transects is Approximately 50 ft.

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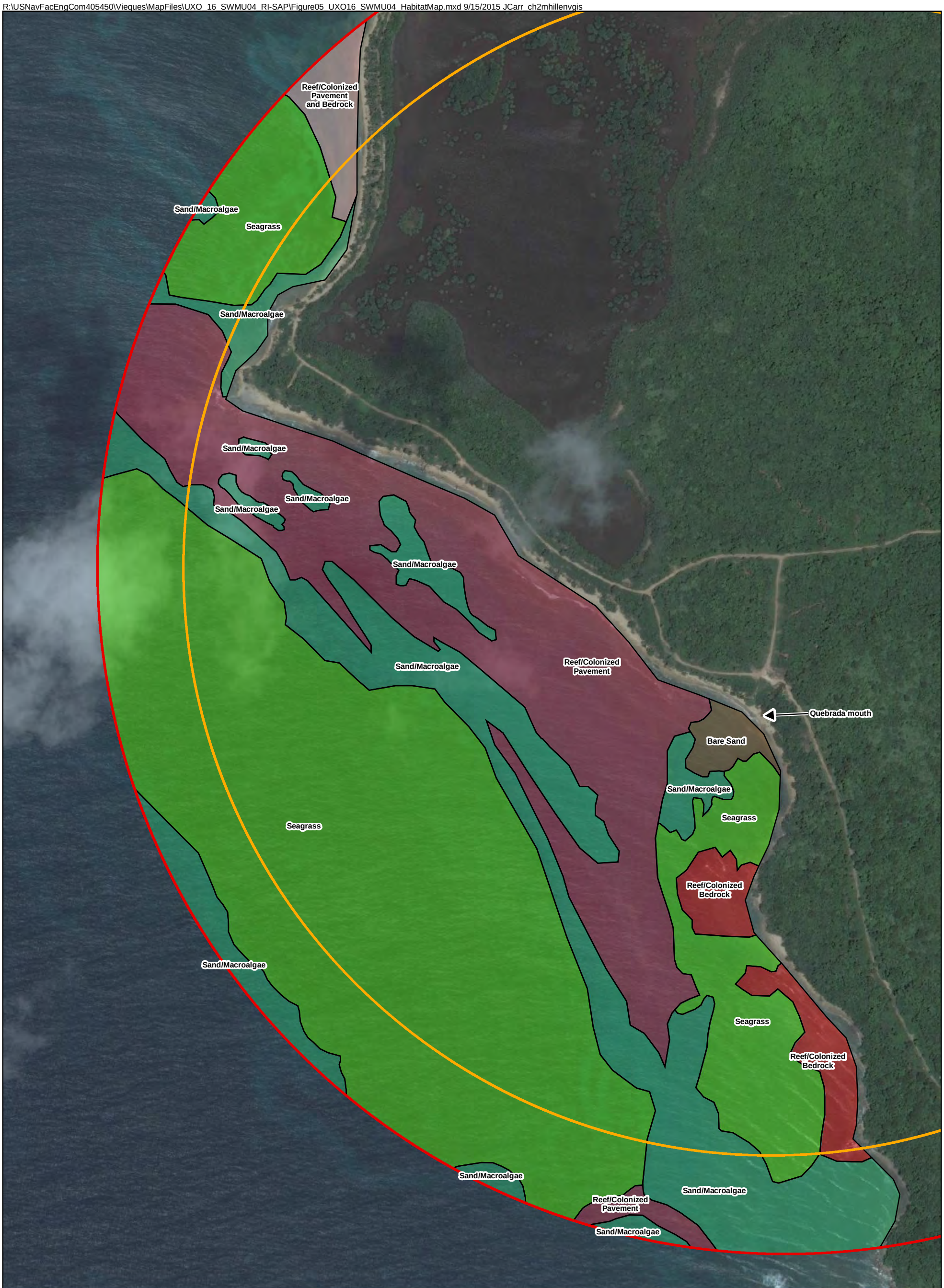

Legend
- Projected Extent of MEC
- SWMU 4 Site Boundary

Underwater Habitats
- Bare Sand
- Reef/Colonized Bedrock
- Reef/Colonized Pavement
- Reef/Colonized Pavement and Bedrock
- Sand/Macroalgae
- Seagrass

Figure 4
UXO 16 Adjacent to SWMU 4 Habitat Map
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

N
W E
S

0 200 400
Feet

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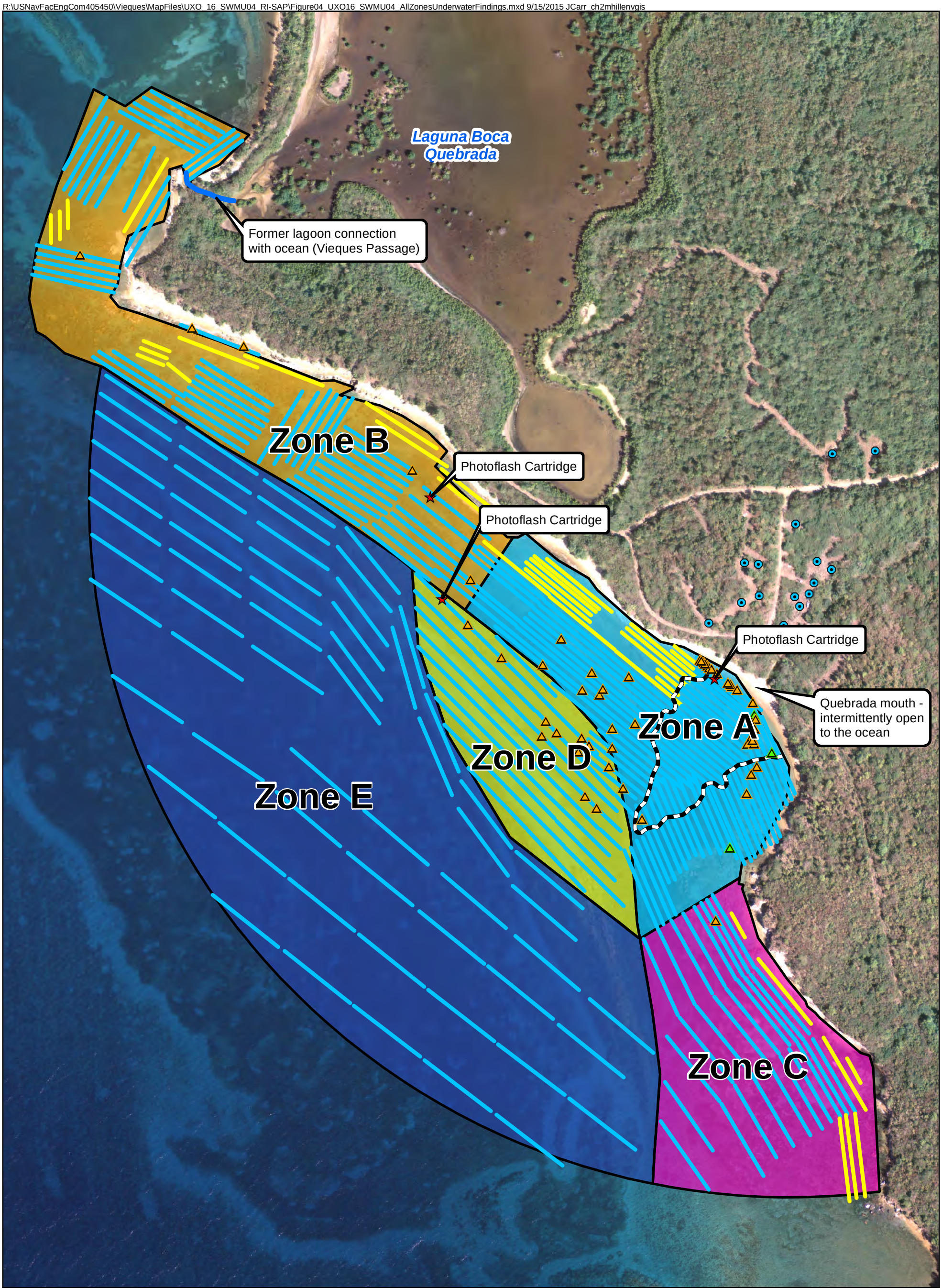

Legend

- OBOD Pits
- DMM
- MD
- MPPEH (2012 Site Investigation)
- General boundary of sand fan associated with quebrada
- Transect not surveyed. Area of shallow reef, sensitive coral species, jagged rock, and/or strong surf making conditions unsuitable for diving or boating.
- Completed survey transect

- Zone A
- Zone B
- Zone C
- Zone D
- Zone E

0 165 330 660 Feet

N W E S

Figure 5
All Zones Underwater Findings
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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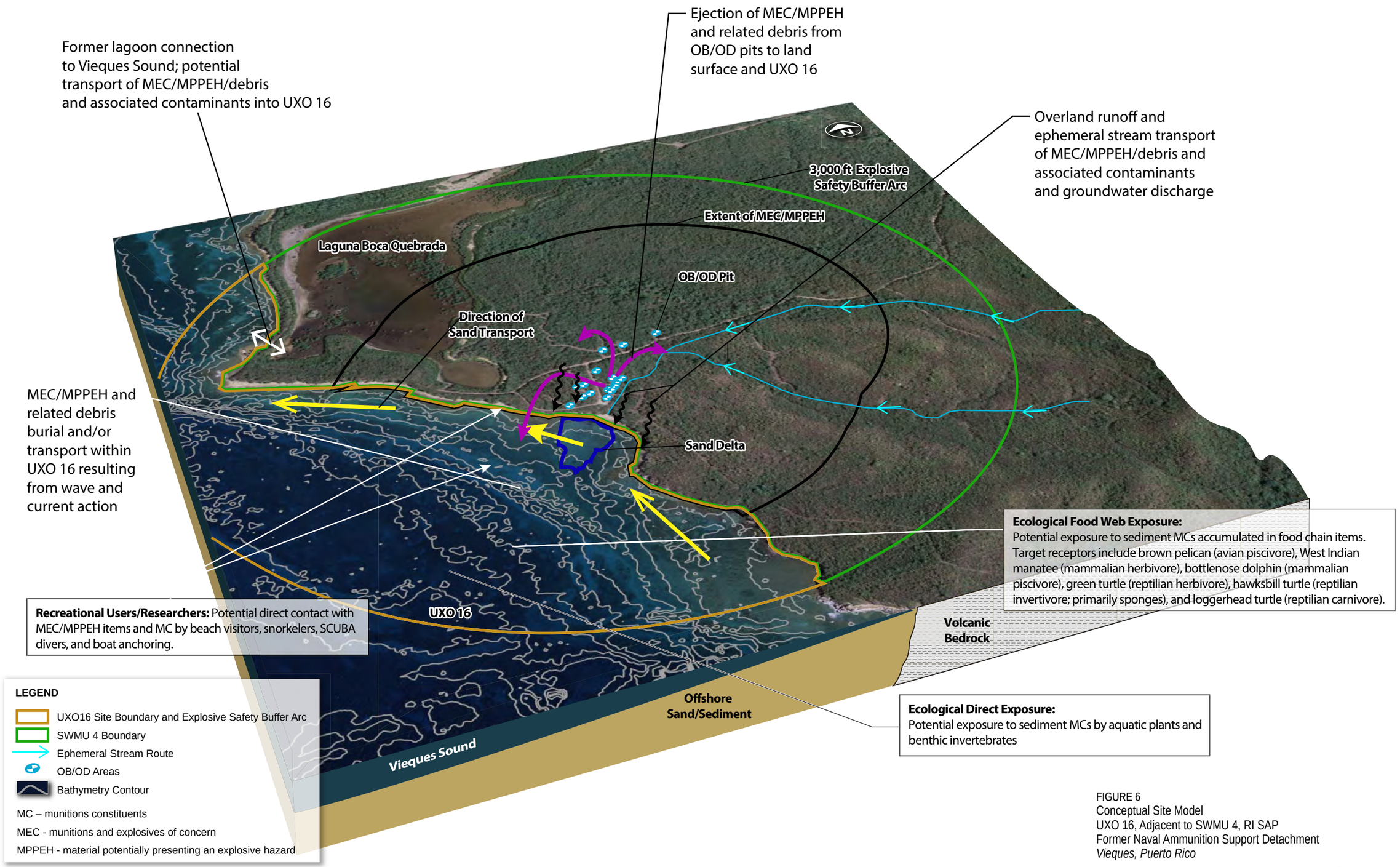

FIGURE 6
Conceptual Site Model
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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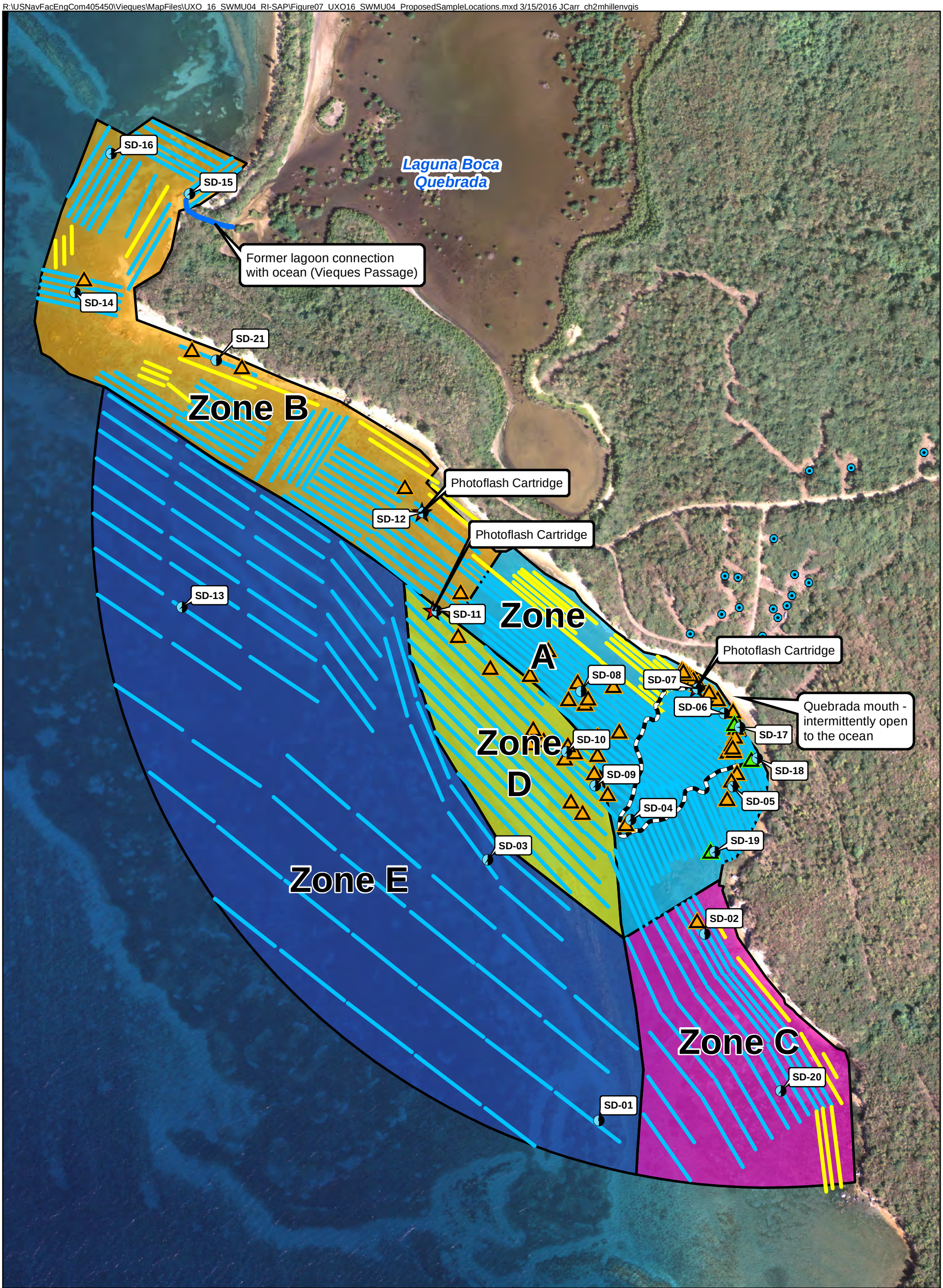

Proposed Sediment Locations
OBOD Pits
MPPEH (2012 Site Investigation)
DMM
MD
General boundary of sand fan associated with quebrada
Transect not surveyed. Area of shallow reef, sensitive coral species, jagged rock, and/or strong surf making conditions unsuitable for diving or boating.
Completed survey transect

Zone A
Zone B
Zone C
Zone D
Zone E

N
W E
S

0 165 330 660 Feet

Figure 7
Proposed Sample Locations
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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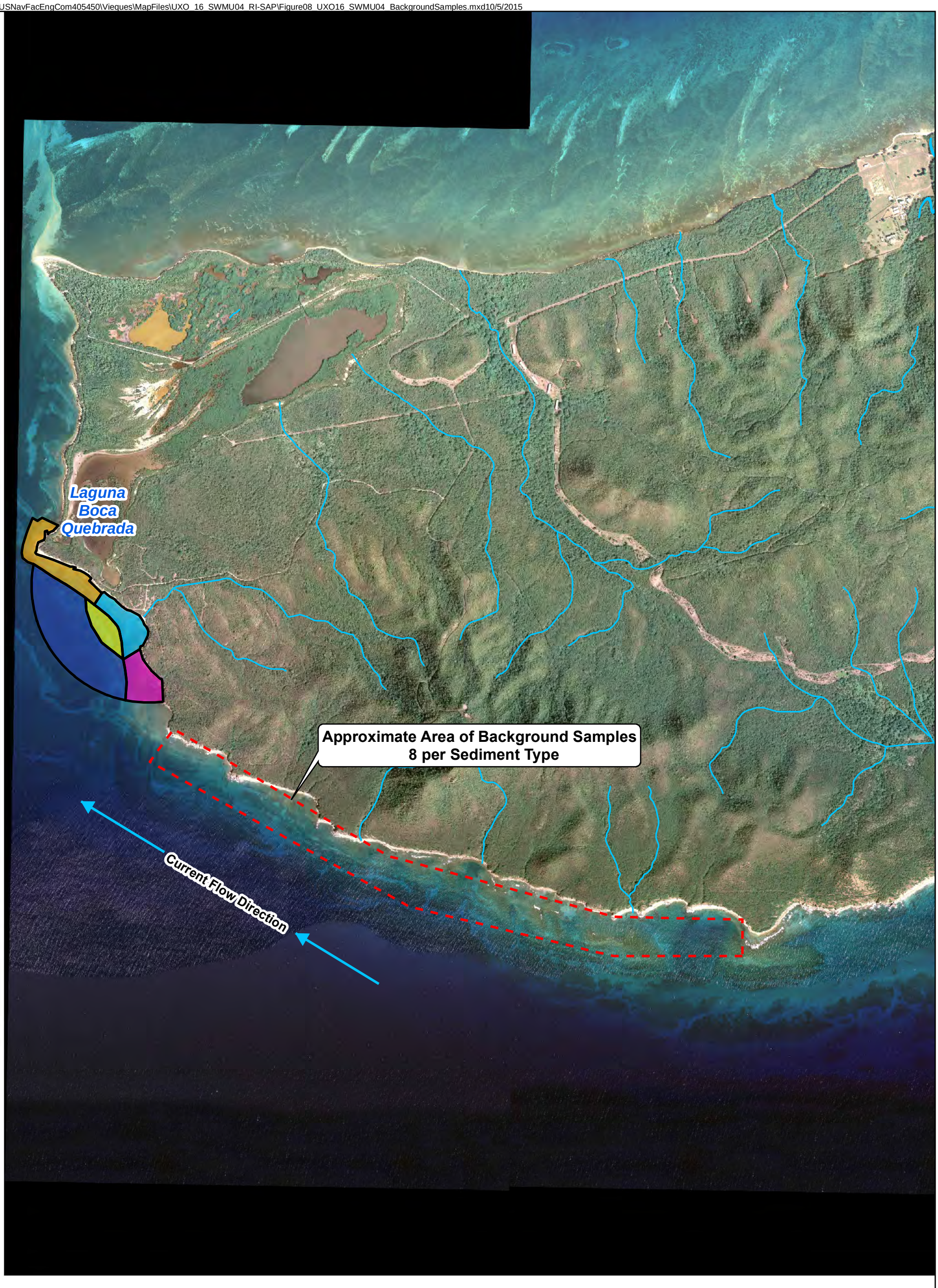

Ephemeral Stream
Zone A
Zone B
Zone C
Zone D
Zone E

N
W E
S

0 1,000 2,000 4,000
Feet

Figure 8
Background Samples
UXO 16, Adjacent to SWMU 4, RI SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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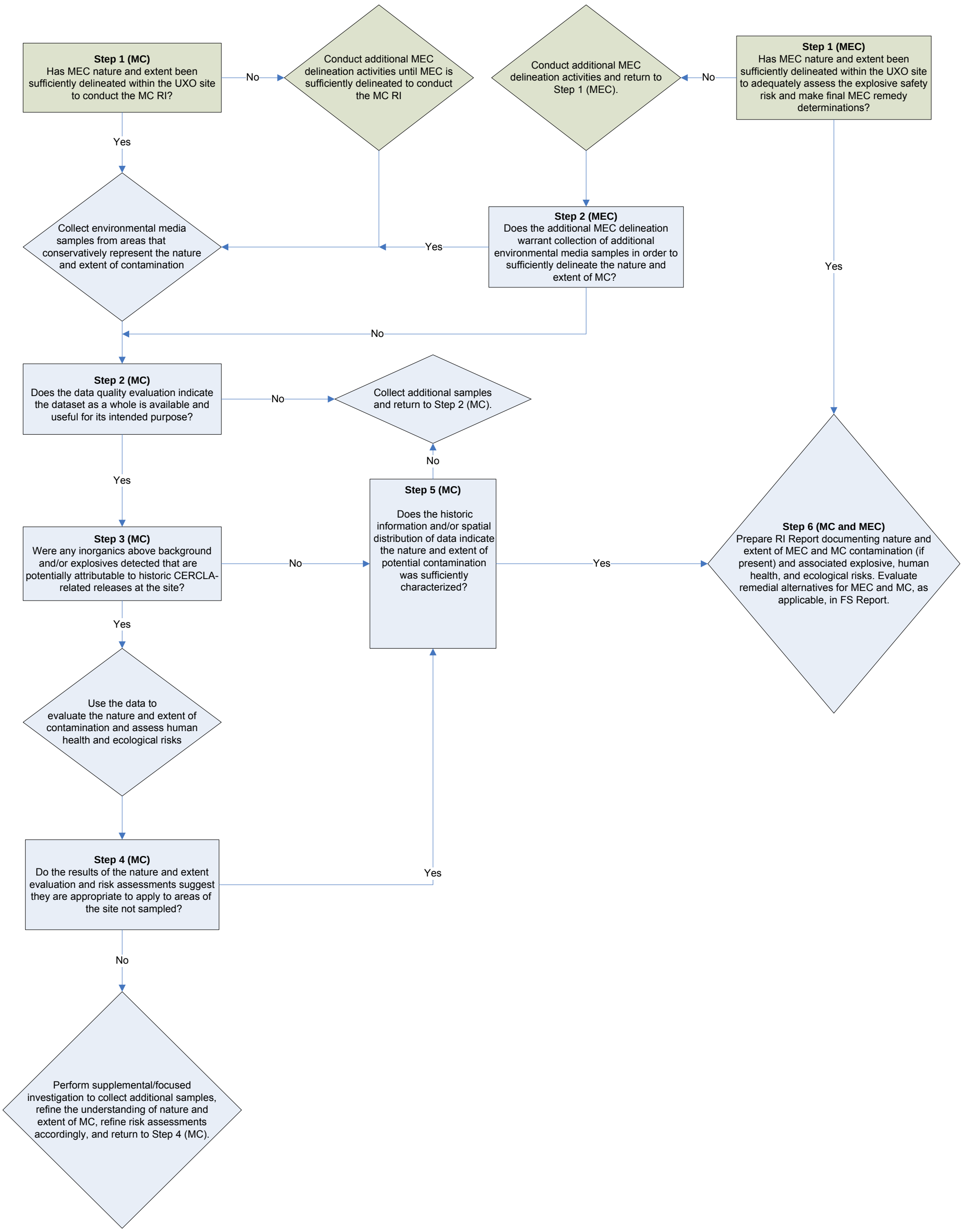

Notes:
The decision makers associated with this decision tree are the Navy, EPA, PREQB, and USFWS.

FIGURE 9
MEC and MC Remedial Investigation Decision Process
UXO 16 Adjacent to SWMU 4 Remedial Investigation
Sampling and Analysis Plan
Former Naval Ammunition Support Detachment

Attachment A
DoD ELAP Letters

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 4.2 10/26/2010 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:

Environmental Testing

(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
July 19, 2011	March 13, 2014	March 13, 2016

Accreditation No.:	*Certificate No.:*
65188	L14-51

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 1631E	CVAFS	Mercury (Low level)
Aqueous	EPA 1664A	Gravimetry	Hexane Extractable Material (HEM)
Aqueous	EPA 1664A	Gravimetry	Total Petroleum Hydrocarbons (TPH)
Aqueous	EPA 180.1	Nephelometer	Turbidity
Aqueous	EPA 2340B	Calculation by 6010	Hardness as $CaCO_3$)
Aqueous	EPA 245.1	CVAA	Mercury
Aqueous	EPA 300.0	IC	Bromide
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate + Nitrite as N
Aqueous	EPA 300.0	IC	Nitrate as N
Aqueous	EPA 300.0	IC	Nitrite as N
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 353.2	Automated Colorimetry	Nitrate + Nitrite as N
Aqueous	EPA 7196A	Colorimetry	Chromium VI
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8260C SIM	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1,2-Trichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dibromoethane (EDB)
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,3 Butadine
Aqueous	EPA 8260C SIM	GC-MS	1,4-Dichlorobenzene
Aqueous	EPA 8260C SIM	GC-MS	Bromodichloromethane
Aqueous	EPA 8260C SIM	GC-MS	Carbon Tetrachloride
Aqueous	EPA 8260C SIM	GC-MS	Chlorodibromomethane
Aqueous	EPA 8260C SIM	GC-MS	Chloroform
Aqueous	EPA 8260C SIM	GC-MS	Chloromethane
Aqueous	EPA 8260C SIM	GC-MS	cis-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous	EPA 8260C SIM	GC-MS	Tetrachloroethene
Aqueous	EPA 8260C SIM	GC-MS	trans-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Trichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Vinyl chloride
Aqueous	EPA 9020B	Microcoulometric-titration detector	Total Organic Halides (TOX)

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Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 9040C	pH Meter	pH
Aqueous	EPA 9060A	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SM 2130B	Nephelometer	Turbidity
Aqueous	SM 4500 CN- G	Colorimetry	Cyanide, Amenable
Aqueous	SM 4500 P-E	Colorimetry	ortho-phosphorous
Aqueous	SM 4500 S2 D	Distillation Unit	Sulfide
Aqueous	SM2320B	Titrimetry	Total Alkalinity (as $CaCO_3$)
Aqueous	SM2510B	Conductivity Meter	Specific Conductance
Aqueous	SM2540B	Balance	Solids, Total
Aqueous	SM2540C	Balance	Solids, Total Dissolved
Aqueous	SM2540D	Balance	Solids, Total Suspended
Aqueous	SM4500CN E	Colorimetry	Total Cyanide
Aqueous	SM4500CN-G	Colorimetry	Cyanide, Amenable
Aqueous	SM4500NH3 G	Colorimetry	Ammonia
Aqueous	SM5220C	Titrimetry	Chemical Oxygen Demand (COD)
Aqueous	SM5310C	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n butanoic acid (PFBA)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n octanesulfonate (PFOS)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n octanoic acid (PFOA)
Aqueous/Drinking Water	EPA 200.9	GFAA	Antimony
Aqueous/Drinking Water	EPA 200.9	GFAA	Selenium
Aqueous/Drinking Water	EPA 200.9	GFAA	Thallium
Aqueous/Drinking Water	EPA 200.9	GFAA	Arsenic
Aqueous/Drinking Water	EPA 200.9	GFAA	Lead
Aqueous/Solid	ASTM D 1426-93B	ISE	Nitrogen, Total Kjeldahl (TKN)
Aqueous/Solid	EPA 1630	CVAFS	Methyl Mercury
Aqueous/Solid	EPA 1020A	Closed Cup Flashpoint	Ignitability
Aqueous/Solid	EPA 314.0	IC	Perchlorate
Aqueous/Solid	EPA 350.1	Colorimetry	Ammonia
Aqueous/Solid	EPA 365.3	Colorimetry	Total Phosphorus
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Aluminum

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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Antimony
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Arsenic
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Barium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Beryllium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Boron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cadmium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Calcium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Chromium, total
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cobalt
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Copper
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Iron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Lead
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Magnesium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Manganese
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Molybdenum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Nickel
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Potassium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Selenium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Silver
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Sodium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Strontium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Thallium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Tin
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Titanium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Vanadium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Zinc
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Aluminum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Antimony
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Arsenic
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Barium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Beryllium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Boron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cadmium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Chromium, total

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ISO/IEC 17025:2005 and DoD-ELAP

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cobalt
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Copper
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Iron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Lead
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Manganese
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Molybdenum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Nickel
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Selenium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Silver
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Strontium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Thallium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Tin
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Titanium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Vanadium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Zinc
Aqueous/Solid	EPA 7010	GFAA	Antimony
Aqueous/Solid	EPA 7010	GFAA	Arsenic
Aqueous/Solid	EPA 7010	GFAA	Chromium, total
Aqueous/Solid	EPA 7010	GFAA	Lead
Aqueous/Solid	EPA 7010	GFAA	Selenium
Aqueous/Solid	EPA 7010	GFAA	Thallium
Aqueous/Solid	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Aqueous/Solid	EPA 8015C/AK103-RRO	GC-FID	Residual Range Organics (RRO)
Aqueous/Solid	EPA 8015C; AK101-GRO; NWTPH-Gx	GC-FID	Gasoline Range Organics (GRO)
Aqueous/Solid	EPA 8015C; AK102-DRO; NWTPH-Dx	GC-FID	Diesel Range Organics (DRO)
Aqueous/Solid	EPA 8021B	GC-FID	Benzene
Aqueous/Solid	EPA 8021B	GC-FID	Ethyl Benzene
Aqueous/Solid	EPA 8021B	GC-FID	Toluene
Aqueous/Solid	EPA 8021B	GC-FID	Xylene, total
Aqueous/Solid	EPA 8081A, B	GC-ECD	Aldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Alpha-BHC

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDD (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDE (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDT (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	delta-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	Dieldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan I
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan II
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin aldehyde
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin ketone
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-Chlordane
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Methoxychlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Toxaphene (total)
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDD
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDE
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDT
Aqueous/Solid	EPA 8081B	GC-ECD	Chlorpyrifos
Aqueous/Solid	EPA 8081B	GC-ECD	cis-Nonachlor
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobenzene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobutadiene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachloroethane
Aqueous/Solid	EPA 8081B	GC-ECD	Isodrin
Aqueous/Solid	EPA 8081B	GC-ECD	Mirex
Aqueous/Solid	EPA 8081B	GC-ECD	Oxychlordane
Aqueous/Solid	EPA 8081B	GC-ECD	trans-Nonachlor
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5,5,6-Nonachlorobiphenyl (PCB 206)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5,6-Octachlorobiphenyl (PCB 195)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5-Heptachlorobiphenyl (PCB 170)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4-Hexachlorobiphenyl (PCB 128)

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ISO/IEC 17025:2005 and DoD-ELAP

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Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5,5-Heptachlorobiphenyl (PCB180)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5,6-Heptachlorobiphenyl (PCB 183)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5-Hexachlorobiphenyl (PCB 138)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,6,6-Heptachlorobiphenyl (PCB 184)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5,5,6-Heptachlorobiphenyl (PCB 187)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5-Pentachlorobiphenyl (PCB87)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5-Pentachlorobiphenyl (PCB90)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,5-Tetrachlorobiphenyl (PCB44)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,4,4,5,5-Hexachlorobiphenyl (PCB153)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,4,5,5-Pentachlorobiphenyl (PCB 101)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,5,5-Tetrachlorbiphenyl (PCB 53)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,5-Trichlorobiphenyl (PCB18)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5,5-Heptachlorobiphenyl (PCB 189)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5-Hexachlorobiphenyl (PCB 157)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,6-Hexachlorobiphenyl (PCB 158)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4-Pentachlorobiphenyl (PCB 105)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5,5 Hexachlorobiphenyl (PCB 167)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5,6-Hexachlorobiphenyl (PCB 168)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 123)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4-Tetrachlorobiphenyl (PCB60)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4-Tetrachlorobiphenyl (PCB66)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,4,4-Trichlorobiphenyl (PCB 28)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,4-Dichlorobiphenyl (PCB8)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4,5,5-Hexachlorobiphenyl (PCB 169)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4,5-Pentachlorobiphenyl (PCB 126)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4-Tetrachlorobiphenyl (PCB 77)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,4,4,5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1016
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1221
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1232

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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1242
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1248
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1254
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1260
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1262
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1268
Aqueous/Solid	EPA 8082, A	GC-ECD	Decachlorobiphenyl (PC B209)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-TP (Silvex)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-D
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-DB
Aqueous/Solid	EPA 8151A	GC-ECD	Dalapon
Aqueous/Solid	EPA 8151A	GC-ECD	Dicamba
Aqueous/Solid	EPA 8151A	GC-ECD	Dichloroprop
Aqueous/Solid	EPA 8151A	GC-ECD	Dinoseb
Aqueous/Solid	EPA 8151A	GC-ECD	MCPA
Aqueous/Solid	EPA 8151A	GC-ECD	MCPP
Aqueous/Solid	EPA 8260B, C	GC-MS	1-phenylpropane
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	DIPE
Aqueous/Solid	EPA 8260B, C	GC-MS	ETBE
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethyl Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 11
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 113
Aqueous/Solid	EPA 8260B, C	GC-MS	MTBE
Aqueous/Solid	EPA 8260B, C	GC-MS	TAME
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-Butyl alcohol
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	Xylene, total
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2-Trichloroethane

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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethane
Aqueous/Solid	EPA 8260B,C	GC-MS	1,1-Dichloroethene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,1-Dichloropropene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,3-Trichloropropane
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dibromoethane (EDB)
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	2,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Butanone (MEK)
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chloroethylvinylether
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Hexanone
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Isopropyltoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetone
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrolein
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrylonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromochloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromodichloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromoform
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromomethane

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon disulfide
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon Tetrachloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorodibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroform
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Dibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichlorodifluoromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous/Solid	EPA 8260B, C	GC-MS	Di-isopropylether (DIPE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8260B, C	GC-MS	Isopropylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Methyl-tert-butylether (MTBE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Naphthalene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Propylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	sec-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Styrene
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-amylmethylether (TAME)
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Tetrachloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichlorofluoromethane (Freon 11)
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl acetate
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl chloride
Aqueous/solid	EPA 8260B, C	GC-MS	Xylenes, total

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dimethylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chloronaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	3,3-Dichlorobenzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	3-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Aniline
Aqueous/Solid	EPA 8270C, D	GC-MS	Anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Azinphos-methyl (Guthion)

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ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso
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Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzoic acid
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzyl alcohol
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroisopropyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-ethylhexy)phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Butyl benzyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Carbazole
Aqueous/Solid	EPA 8270C, D	GC-MS	Chlorpyrifos
Aqueous/Solid	EPA 8270C, D	GC-MS	Chrysene
Aqueous/Solid	EPA 8270C, D	GC-MS	Demeton O & S
Aqueous/Solid	EPA 8270C, D	GC-MS	Diazinon
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzofuran
Aqueous/Solid	EPA 8270C, D	GC-MS	Dichlorvos
Aqueous/Solid	EPA 8270C, D	GC-MS	Diethyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	dimethoate
Aqueous/Solid	EPA 8270C, D	GC-MS	Dimethylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	di-n-butylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Di-n-octylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Disulfoton
Aqueous/Solid	EPA 8270C, D	GC-MS	Ethoprop
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluorene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorocyclopentadiene

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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachloroethane
Aqueous/Solid	EPA 8270C, D	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Isophorone
Aqueous/Solid	EPA 8270C, D	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	Nitrobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodiethylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodimethylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solid	EPA 8270C, ~~D~~	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	o-Toluidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Parathion, ethyl
Aqueous/Solid	EPA 8270C, D	GC-MS	Parathion, methyl
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phorate
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyridine
Aqueous/Solid	EPA 8270C, D	GC-MS	Ronnel
Aqueous/Solid	EPA 8270C, D	GC-MS	Stirophos
Aqueous/Solid	EPA 8270C, D	GC-MS	Sulfotepp
Aqueous/Solid	EPA 8270C, D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solid	EPA 8270C,D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solid	EPA 8270SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270SIM	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270SIM	GC-MS	Anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(k)fluoranthene

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ALS Environmental-Kelso
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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270SIM	GC-MS	Chrysene
Aqueous/Solid	EPA 8270SIM	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Fluorene
Aqueous/Solid	EPA 8270SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270SIM	GC-MS	p-Dioxane
Aqueous/Solid	EPA 8270SIM	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Pyrene
Aqueous/Solid	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	1,3-Dinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Amino-4,6-dinitrtoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	3,5-Dinitroaniline
Aqueous/Solid	EPA 8330B	HPLC	3-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Aqueous/Solid	EPA 8330B	HPLC	Nitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Nitroglycerin
Aqueous/Solid	EPA 8330B	HPLC	Pentachloronitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Aqueous/Solid	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solid	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solid	EPA 9012B,	Colorimetry	Total Cyanide
Aqueous/Solid	EPA 9030B	Distillation Unit	Sulfide
Aqueous/Solid	EPA 9056A	IC	Bromide
Aqueous/Solid	EPA 9056A	IC	Chloride
Aqueous/Solid	EPA 9056A	IC	Fluoride

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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 9056A	IC	Sulfate
Aqueous/Solid	EPA 9065	Spectrophotometer	Total Phenolics
Aqueous/Solid	LCP-NITG	HPLC/UV	Nitroguanidine
Aqueous/Solid	SM4500 NH3 G	Colorimetry	Ammonia
Aqueous/Solid	SOC-OTTO	GC-ECD	Otto Fuel
Aqueous/Solid	SOC-Butyl	GC-FPD	Di-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	n-Butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tetra-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tri-n-butyltin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Aldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Alpha-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	beta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDD (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDE (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDT (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	delta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Dieldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan I
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan II
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan sulfate
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin aldehyde
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin ketone
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	gamma-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor Epoxide (beta)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Methoxychlor
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromo-3-chloropropane (DBCP)
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,1,1,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,1-Trichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,2,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethene

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichloropropane
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,2-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,3,5-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,4-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	2,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	2-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Isopropyltoluene
Drinking Water	EPA 524.2	GC-MS	Benzene
Drinking Water	EPA 524.2	GC-MS	Bromobenzene
Drinking Water	EPA 524.2	GC-MS	Bromochloromethane
Drinking Water	EPA 524.2	GC-MS	Bromodichloromethane
Drinking Water	EPA 524.2	GC-MS	Bromoform
Drinking Water	EPA 524.2	GC-MS	Bromomethane
Drinking Water	EPA 524.2	GC-MS	Carbon Tetrachloride
Drinking Water	EPA 524.2	GC-MS	Chlorobenzene
Drinking Water	EPA 524.2	GC-MS	Chlorodibromomethane
Drinking Water	EPA 524.2	GC-MS	Chloroethane
Drinking Water	EPA 524.2	GC-MS	Chloroform
Drinking Water	EPA 524.2	GC-MS	Chloromethane
Drinking Water	EPA 524.2	GC-MS	cis-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	cis-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Dibromomethane
Drinking Water	EPA 524.2	GC-MS	Dichlorodifluoromethane
Drinking Water	EPA 524.2	GC-MS	Dichloromethane (Methylene Chloride)

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	Ethylbenzene
Drinking Water	EPA 524.2	GC-MS	Hexachlorobutadiene
Drinking Water	EPA 524.2	GC-MS	Isopropylbenzene
Drinking Water	EPA 524.2	GC-MS	m+p-Xylene
Drinking Water	EPA 524.2	GC-MS	Naphthalene
Drinking Water	EPA 524.2	GC-MS	n-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	n-Propylbenzene
Drinking Water	EPA 524.2	GC-MS	o-Xylene
Drinking Water	EPA 524.2	GC-MS	sec-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	Styrene
Drinking Water	EPA 524.2	GC-MS	tert-butylbenzene
Drinking Water	EPA 524.2	GC-MS	Tetrachloroethene
Drinking Water	EPA 524.2	GC-MS	Toluene
Drinking Water	EPA 524.2	GC-MS	trans-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	trans-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Trichloroethene
Drinking Water	EPA 524.2	GC-MS	Trichlorofluoromethane (Freon 11)
Drinking Water	EPA 524.2	GC-MS	Vinyl chloride
Drinking Water	EPA 524.2	GC-MS	Xylenes, total
Solid	ASTMD4129-92M, Lloyd Kahn	TOC Meter	Total Organic Carbons (TOC)
Solid	EPA 160.3M	Gravimetry	Solids, Total
Solid	EPA 7471A, B	CVAA	Mercury
Solid	EPA 9045D	pH Meter	pH
Solid	EPA 9056A	IC	Nitrate as N
Solid	EPA 9056A	IC	Nitrite as N
Solid	EPA 9071B	Gravimetry	Hexane Extractable Material (HEM)
Solid	GEN-AVS	Colorimetry	Acid Volatile Sulfides
Solid	GEN-NCEL	Colorimetry	Nitrocellulose
Solid	LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline

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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Solid	LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Solid	LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Solid	LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Solid	LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Solid	LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Solid	LCP-Nitro	HPLC/MS/MS	Picramic Acid
Solid	LCP-Nitro	HPLC/MS/MS	Picric Acid
Solid	PSEP	Gravimetry	Particle Size

Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 1640	Reductive Metals Precipitation	Prep Method
Aqueous	EPA 3010A	Acid Digestion	Metals Digestion
Aqueous	EPA 3020A	Acid Digestion	Metals Digestion
Aqueous	EPA 3520C	Continuous Liquid-Liquid Extraction	Extractable Prep
Aqueous	EPA 3535A	Solid Phase Extraction	Prep Method
Aqueous	EPA 5030B	Purge and Trap for Volatiles	Volatile Prep
Aqueous	SOP-MET-DIG	Acid Digestion	Metals Digestion
Aqueous/Solids	EPA 1311	TCLP Extraction	Physical Extraction
Aqueous/Solids	EPA 3620C	Florisil clean up	Extractable Cleanup
Aqueous/Solids	EPA 3630C	Silica gel clean up	Extractable Prep
Aqueous/Solids	EPA 3640A	Gel-Permeation Clean-up	Extractable Cleanup
Aqueous/Solids	EPA 3660	Sulfur Clean-up	Extractable Prep
Aqueous/Solids	EPA 3665A	Acid clean up	Extractable Cleanup
Aqueous/Solids	ASTM D3590-89	Digestion	TKN
Solid	EPA 3050B	Acid Digestion	Metals Digestion
Solid	EPA 3060	Alkaline Digestion for Cr(VI)	Alkaline Digestion for Cr(VI) only
Solid	EPA 3541	Automated Soxhlet Extraction	Extractable Prep
Solid	EPA 3550B	Ultrasonic Extraction	Extractable Prep
Solid	EPA 5035A	Purge and Trap for Volatiles	Voc Organics
Solid	EPA 5050	Bomb Digestion	Prep Method
Solids	EPA 9013	Midi-Distillation	Cyanides

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

AGRICULTURE & PRIORITY POLLUTANTS LABORATORIES, INC. (APPL, INC.)
908 N. Temperance Ave.
Clovis, CA 93611
Contact: Diane Anderson Phone: 559-275-2175

ENVIRONMENTAL

Valid To: June 30, 2017 Certificate Number: 4064.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2009 TNI Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

High Resolution Gas Chromatography/Mass Spectormetry, ICP-OES, ICP-Mass Spectrometry, Atomic Absorption Spectrometry, Gas Chromatography/ECD/FID, Liquid Chromatography- Mass Spectometry, High Performance Liquid Chromatography, Ion Chromatography, Titrimetry

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
PCB Congeners				
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,4,4'-Trichlorobiphenyl (PCB 28)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3'-Dichlorobiphenyl (PCB 6)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,5'-Tetrachlorobiphenyl (PCB 44)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',5-Trichlorobiphenyl (PCB 18)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
Decachlorobiphenyl (PCB 209)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 129 + 138 + 163	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 153 + 168	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 156 + 157	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 180 + 193	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 20 + 28	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 90 + 101 + 113	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCBs, total	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
Metals				
Aluminum	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Antimony	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Arsenic	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Barium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Beryllium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Boron	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Cadmium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Calcium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Chromium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Cobalt	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Copper	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Iron	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Lead	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Magnesium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Manganese	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Molybdenum	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Nickel	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Potassium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Selenium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Silver	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Sodium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Strontium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Thallium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Tin	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Titanium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Total Phosphorus	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Vanadium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Zinc	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Aluminum	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Antimony	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Arsenic	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Barium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Beryllium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Boron	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Cadmium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Calcium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Chromium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Cobalt	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Copper	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Iron	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Lead	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Magnesium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Manganese	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Molybdenum	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Nickel	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Potassium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Selenium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Silver	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Sodium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Strontium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Thallium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Tin	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Titanium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Vanadium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Zinc	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Mercury	EPA 245.1	EPA 245.1/7470A	EPA 7471A/7471B	EPA 7471A/7471B
Pesticides/Herbicides/PCBs/TPH/ Fumigants				
1,2,3-Trichloropropane	----------	EPA 8011	----------	----------
1,2-Dibromo-3-chloropropane (DBCP)	----------	EPA 8011	----------	----------
1,2-Dibromomethane (EDB, Ethylene dibromide)	----------	EPA 8011	----------	----------
DRO (Diesel Range Organics), C10-C28	----------	EPA 8015B/8015C/ 8015D	EPA 8015B/8015C/ 8015D	EPA 8015B/8015C/ 8015D
RRO (Residual Range Organics), C25-C36	----------	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D
DRO (Diesel Range Organics), C10-C25	----------	AK102	AK102	AK102
RRO (Residual Range Organics), C25-C36	----------	AK103	AK103	AK103
GRO (Gasoline Range Organics), C6-C10	----------	EPA 8015B/8015C/ 8015D	EPA 8015B/8015C/ 8015D	EPA 8015B/8015C/ 8015D

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
GRO (Gasoline Range Organics), C6-C10	----------	AK101	AK101	AK101
GRO (Gasoline Range Organics), C6-C10	----------	EPA 8260B/8260C	EPA 8260B/8260C 8260B/8260C	EPA 8260B/8260C
GRO (Gasoline Range Organics), C6-C10	----------	AK101-MS	AK101-MS	AK101-MS
Methane	----------	RSK-175	RSK-175	RSK-175
Ethane	----------	RSK-175	RSK-175	RSK-175
Ethene	----------	RSK-175	RSK-175	RSK-175
4,4'-DDD	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
4,4'-DDE	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
4,4'-DDT	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
a-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
a-Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Aldrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
b-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
d-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Dieldrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan I	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan II	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan sulfate	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin aldehyde	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin ketone	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
g-BHC (Lindane)	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
g-Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Heptachlor	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Heptachlor epoxide	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Hexachlorobenzene	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Methoxychlor	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Toxaphene	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,4,4'-Trichlorobiphenyl (PCB 28)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1016/1242	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1016 (PCB-1016)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1221 (PCB-1221)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1232 (PCB-1232)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1242 (PCB-1242)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1248 (PCB-1248)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1254 (PCB-1254)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1260)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1262)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1268)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 129 + 138 + 163	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 153 + 168	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 156 + 157	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 180 + 193	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 20 + 28	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 90 + 101 + 113	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCBs, total	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,4,5-T	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4,5-TP	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-D (2,4-Dichlorophenoxyacetic acid)	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-DB	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dalapon	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dicamba	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dichlorprop	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dinoseb	----------	EPA 8151A	EPA 8151A	EPA 8151A
Pentachlorophenol	----------	EPA 8151A	EPA 8151A	EPA 8151A
Silvex (2,4,5-TP)	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPA	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPP	----------	EPA 8151A	EPA 8151A	EPA 8151A
Pugeable Organics (volatiles-VOC)				
1,1,1,2-Tetrachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,1-Trichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2,2-Tetrachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2-Trichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2-Trichlorotrifluoroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,3-Trichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,3-Trichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
1,2,4-Trichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,4-Trimethylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dibromo-3-chloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dibromoethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3,5-Trimethylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,4-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2,2-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Butanone (Methyl ethyl ketone)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Chloroethyl vinyl ether	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Chlorotoluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Hexanone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
4-Chlorotoluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
4-methyl-2-pentanone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acetone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acetonitrile	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acrolein	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acrylonitrile	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromochloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromodichloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromoform	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Carbon disulphide	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Carbon tetrachloride	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chloroform	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
cis-1,2-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
cis-1,3-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Cyclohexane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dibromochloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dibromomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dichlorodifluoromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Ethyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Ethyl tert-butyl ether (ETBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Hexachlorobutadiene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Hexachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Iodomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Isopropyl ether (DIPE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Isopropylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
m+p-Xylene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylacetate	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylcyclohexane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methyl tert-butyl ether (MTBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylene chloride (Dichloromethane)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Naphthalene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
n-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
n-Propylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
o-Xylene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
p-isopropyl toluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
sec-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Styrene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Amyl methyl ether (TAME)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl alcohol (t-Butanol)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl ethyl ether (ETBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Tetrachloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Toluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Total Xylenes	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
trans-1,2-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
trans-1,3-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Trichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Trichlorofluoromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Vinyl Acetate	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Vinyl chloride	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Extractable Organics (semivolatiles-SVOC)				
1,1'-Biphenyl	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2,4,5-Tetrachlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2,4-Trichlorbenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,3-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,4-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,4-Dioxane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,3,4,6-Tetrachlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4,5-Trichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4,6-Trichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dimethylphenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dinitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dinitrotoluene (2,4-DNT)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,6-Dichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,6-Dinitrotoluene (2,6-DNT)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Chloronaphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
2-Chlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methyl-4,6-Dinitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methylnaphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methylphenol (o-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Nitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3, 4-Methylphenol (m+p-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3,3'-Dichlorobenzidine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Bromophenyl phenyl ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chloro-3-methylphenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chloroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chlorophenyl phenylether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Methylphenol (p-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Nitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acenaphthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acenaphthylene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acetophenone	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Aniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Atrazine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzaldehyde	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzidine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(a)anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(a)pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(b)fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(g,h,i)perylene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(k)fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzoic acid	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzyl alcohol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzyl butyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Biphenyl	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Chloroethoxy) methane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Chloroethyl) ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Chloroisopropyl) ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Ethylhexyl) phthalate (DEHP)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Butyl benzyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Caprolactam	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Carbazole	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Chrysene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dibenz(a,h) anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dibenzofuran	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Diethyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dimethyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Di-n-butyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Di-n-octyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Fluorene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorobutadiene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorocyclopentadiene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachloroehane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Indeno(1,2,3-cd) pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Isophorone	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Naphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Nitrobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodimethylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodi-n-propylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodiphenylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pentachlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Phenanthrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Phenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pyridine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1-Methylnaphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
2-Methylnaphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Acenaphthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Acenaphthylene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(a)anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(a)pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(b)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(b+k)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(g,h,I)perylene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(k)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Chrysene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Dibenzo(a,h)anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Fluorene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Indeno(1,2,3-cd) pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Naphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM /8270D SIM	EPA 8270C SIM/8270D SIM
Phenanthrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Dioxins/Furans				
1,2,3,4,6,7,8,9-OCDD	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8,9-OCDF	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8-Hpcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8-Hpcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8,9-Hpcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,6,7,8-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,6,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8,9-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8,9-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8-Pecdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8-Pecdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,4,6,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,4,7,8-Pecdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,7,8-TCDD	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,7,8-TCDF	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hpcdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hpcdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hxcdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hxcdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
PCDD + PCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
PCDD, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
PCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Pecdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Pecdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
TCDD, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
TCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Carbamates/Energetics				
Aldicarb	----------	EPA 8321A	EPA 8321A	EPA 8321A
Ammonium Picrate	----------	EPA 8321A	EPA 8321A	EPA 8321A
Barban	----------	EPA 8321A	EPA 8321A	EPA 8321A
Baygon (Propoxur)	----------	EPA 8321A	EPA 8321A	EPA 8321A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Bromacil	----------	EPA 8321A	EPA 8321A	EPA 8321A
Carbaryl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Carbofuran	----------	EPA 8321A	EPA 8321A	EPA 8321A
Chloroxuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Diuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Linuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Methiocarb	----------	EPA 8321A	EPA 8321A	EPA 8321A
Methomyl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Oxamyl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Picric Acid	----------	EPA 8321A	EPA 8321A	EPA 8321A
Propham	----------	EPA 8321A	EPA 8321A	EPA 8321A
Siduron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Perchlorate	----------	EPA 6850	EPA 6851	EPA 6851
1,3,5-Trinitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
1,3-Dinitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,4,6-Trinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,4-Dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,6-Dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2-Amino-4,6-dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
3-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
4-Amino-2,6-dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
4-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Nitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Nitroglycerin	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Pentaerythritoltetranitrate (PETN)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Inorganics				
Ignitability	----------	----------	EPA 1030	EPA 1030
pH / Corrosivity	----------	EPA 9040C	----------	----------
pH / Corrosivity	----------	----------	EPA 9045C/D	EPA 9045C/D
Chromium VI	EPA 218.6/ 218.7	EPA 218.6/218.7	----------	----------
Chromium VI	----------	EPA 7199	EPA 7199	EPA 7199
Chromium VI	----------	EPA 7196A	EPA 7196A	EPA 7196A
Bromide	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Chloride	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Fluoride	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrate as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrite + Nitrate as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrite as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Orthophosphate as P	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Phosphate and Orthophosphate - as P	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Sulfate	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Bromide	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Chloride	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Fluoride	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrate as N (NO3- as N)	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrite + Nitrate as N	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrite as N	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Sulfate	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Phosphate and Orthophosphate - as P	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Phosphate / Orthophosphate / Total Phosphorus	SM 4500 PE	SM 4500 PE	SM 4500 PE	SM 4500 PE
Cyanide, total and Amenable	----------	EPA 9010C & 9014	EPA 9010C & 9015	EPA 9010C & 9015
Cyanide, total and Amenable	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G
Ammonia as N	EPA 350.1	EPA 350.1	EPA 350.1	EPA 350.1
Total Kheldahl Nitrogen	EPA 351.2	EPA 351.2	EPA 351.2	EPA 351.2
Nitrate as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Nitriate + Nitrate as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Nitrite as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Bicarbonate	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Carbonate	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Hydroxide	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Total Alkalinity (CaCO3)	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Specific conductance, Conductivity (25C)	SM 2510B	SM 2510B	SM 2510B	SM 2510B
Total Dissolved Solids (TDS)	EPA 160.1	EPA 160.1	EPA 160.1	EPA 160.1
Total Dissolved Solids (TDS)	----------	SM 2540C	SM 2540C	SM 2540C
Non-Filterable Residue (TSS)	----------	SM 2540D	SM 2540D	SM 2540D
Ferrous Iron	SM 3500-Fe Bc	SM 3500-Fe Bc	SM 3500-Fe Bc	SM 3500-Fe Bc
Sulphide	SM 4500-S_2F	SM 4500-S_2F	SM 4500-S_2F	SM 4500-S_2F
Oil & Grease	SM 5520B	SM 5520B	SM 5520B	SM 5520B
TPH (Gravimetric)	SM 5520BF	SM 5520BF	SM 5520BF	SM 5520BF
n-Hexane Extractable Material (O&G)	----------	EPA 1664A	EPA 1664A	EPA 1664A
TPH (SGT-HEM)	----------	EPA 1664A	EPA 1664A	EPA 1664A
Total Organic Carbon (TOC)	----------	----------	WALKLEY-BLACK	WALKLEY-BLACK
Sample Preparation				
TCLP Extraction	----------	----------	EPA 1311	EPA 1311
SPLP Extraction	----------	----------	EPA 1312	EPA 1312
Acid digestion for metals analysis	----------	EPA 3010A	EPA 3010A	----------
Microwave assisted acid digestion for metals analysis	----------	EPA 3015A	EPA 3015A	----------
Acid digestion for metals analysis	----------	----------	EPA 3050B	EPA 3050B
Microwave assisted acid digestion for metals	----------	----------	EPA 3051A	EPA 3051A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
analysis				
Alkaline digestion for hexavalent chromium	----------	----------	EPA 3060A	EPA 3060A
Separatory funnel extraction	----------	EPA 3510C	EPA 3510C	----------
Liquid-Liquid extraction	----------	EPA 3520C	EPA 3520C	----------
Soxhlet extraction	----------	----------	EPA 3540C	EPA 3540C
SPE extraction for explosives	----------	EPA 3535A	EPA 3535A	----------
Ultrasonic extraction	----------	----------	EPA 3550B	EPA 3550B
Silica gel cleanup	----------	EPA 3630C	EPA 3630C	EPA 3630C
Sulfuric acid cleanup	----------	EPA 3660B	EPA 3660B	EPA 3660B
Sulfuric acid - Permanganate cleanup	----------	EPA 3665A	EPA 3665A	EPA 3665A
Purge and trap	----------	EPA 5030B/5030C	EPA 5030B/5030C	EPA 5030B/5030C
Closed-system purge and trap extraction	----------	EPA 5035/5035A	EPA 5035/5035A	EPA 5035/5035A
Mercury digestion	EPA 245.1	EPA 7470A	EPA 7470A	EPA 7470A
Mercury digestion	----------	EPA 7471A/7470B	EPA 7471A/7470B	EPA 7471A/7470B
Herbicide extraction	----------	EPA 8151A	EPA 8151A	EPA 8151A
Incremental sampling	----------	----------	EPA 8330B, Appendix A	EPA 8330B, Appendix A
Waste Extraction test (WET) (STLC)	----------	----------	CCR Chapter 11, Article 5, Appendix II	CCR Chapter 11, Article 5, Appendix II

Accredited Laboratory

A2LA has accredited

AGRICULTURE & PRIORITY POLLUTANTS LABORATORIES, INC. (APPL, INC.)

Clovis, CA

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality System Manual for Environmental Laboratories (QSM), accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978
DISTRICT OF COLUMBIA
A2LA

Presented this 3rd day of March 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 4064.01
Valid to June 30, 2017

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

LABORATORY ACCREDITATION BUREAU

Certificate # L2336

Scope of Accreditation For TestAmerica Burlington

30 Community Drive, Suite 11
South Burlington, VT 05403
Sara S. Goff
802-923-1027

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM v4.2) based on the National Environmental Laboratory Accreditation Conference Chapter 5 Quality Systems Standard (NELAC Voted Revision June 5, 2003), accreditation is granted to TestAmerica Burlington to perform the following tests:

Accreditation granted through: **February 25, 2017**

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/FID	EPA RSK-175	Methane
GC/FID	EPA RSK-175	Ethane
GC/FID	EPA RSK-175	Ethene
GC/TCD	EPA RSK-175	Carbon Dioxide
HPLC	EPA 6850	Perchlorate
HPLC	EPA 8330B	1,3,5-Trinitrobenzene
HPLC	EPA 8330B	1,3-Dinitrobenzene
HPLC	EPA 8330B	2,4,6-Trinitrophenol
HPLC	EPA 8330B	2,4,6-Trinitrotoluene
HPLC	EPA 8330B	2,4-diamino-6-nitrotoluene
HPLC	EPA 8330B	2,4-Dinitrotoluene
HPLC	EPA 8330B	2,6-diamino-4-nitrotoluene
HPLC	EPA 8330B	2,6-Dinitrotoluene
HPLC	EPA 8330B	2-Amino-4,6-dinitrotoluene
HPLC	EPA 8330B	4-Amino-2,6-dinitrotoluene
HPLC	EPA 8330B	HMX
HPLC	EPA 8330B	m-Nitrotoluene
HPLC	EPA 8330B	Nitrobenzene
HPLC	EPA 8330B	Nitroglycerin
HPLC	EPA 8330B	o-Nitrotoluene
HPLC	EPA 8330B	PETN

Non-Potable Water

Technology	Method	Analyte
HPLC	EPA 8330B	p-Nitrotoluene
HPLC	EPA 8330B	RDX
HPLC	EPA 8330B	Tetryl
GC/MS	EPA 8260B	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,1-Trichloroethane
GC/MS	EPA 8260B	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,2-Trichloroethane
GC/MS	EPA 8260B	1,1-Dichloroethane
GC/MS	EPA 8260B	1,1-Dichloroethene
GC/MS	EPA 8260B	1,1-Dichloropropene
GC/MS	EPA 8260B	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B	1,2,3-Trichloropropane
GC/MS	EPA 8260B	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B	1,2-Dibromoethane
GC/MS	EPA 8260B	1,2-Dichlorobenzene
GC/MS	EPA 8260B	1,2-Dichloroethane
GC/MS	EPA 8260B	1,2-Dichloroethene, Total
GC/MS	EPA 8260B	1,2-Dichloropropane
GC/MS	EPA 8260B	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B	1,3-Dichlorobenzene
GC/MS	EPA 8260B	1,3-Dichloropropane
GC/MS	EPA 8260B	1,4-Dichlorobenzene
GC/MS	EPA 8260B	1,4-Dioxane
GC/MS	EPA 8260B	2,2-Dichloropropane
GC/MS	EPA 8260B	2-Butanone
GC/MS	EPA 8260B	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B	2-Chlorotoluene
GC/MS	EPA 8260B	2-Hexanone
GC/MS	EPA 8260B	4-Chlorotoluene
GC/MS	EPA 8260B	4-Isopropyltoluene
GC/MS	EPA 8260B	4-Methyl-2-pentanone
GC/MS	EPA 8260B	Acetone
GC/MS	EPA 8260B	Benzene
GC/MS	EPA 8260B	Bromochloromethane
GC/MS	EPA 8260B	Bromodichloromethane
GC/MS	EPA 8260B	Bromoform
GC/MS	EPA 8260B	Bromomethane
GC/MS	EPA 8260B	Carbon disulfide
GC/MS	EPA 8260B	Carbon tetrachloride

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8260B	Chlorobenzene
GC/MS	EPA 8260B	Chloroethane
GC/MS	EPA 8260B	Chloroform
GC/MS	EPA 8260B	Chloromethane
GC/MS	EPA 8260B	cis-1,2-Dichloroethene
GC/MS	EPA 8260B	cis-1,3-Dichloropropene
GC/MS	EPA 8260B	Cyclohexane
GC/MS	EPA 8260B	Dibromochloromethane
GC/MS	EPA 8260B	Dibromomethane
GC/MS	EPA 8260B	Dichlorodifluoromethane
GC/MS	EPA 8260B	Ethylbenzene
GC/MS	EPA 8260B	Freon TF
GC/MS	EPA 8260B	Hexachlorobutadiene
GC/MS	EPA 8260B	Isobutyl alcohol
GC/MS	EPA 8260B	Isopropylbenzene
GC/MS	EPA 8260B	m&p-Xylene
GC/MS	EPA 8260B	Methyl acetate
GC/MS	EPA 8260B	Methyl iodide
GC/MS	EPA 8260B	Methyl t-butyl ether
GC/MS	EPA 8260B	Methylcyclohexane
GC/MS	EPA 8260B	Methylene Chloride
GC/MS	EPA 8260B	Naphthalene
GC/MS	EPA 8260B	n-Butylbenzene
GC/MS	EPA 8260B	n-Propylbenzene
GC/MS	EPA 8260B	o-Xylene
GC/MS	EPA 8260B	sec-Butylbenzene
GC/MS	EPA 8260B	Styrene
GC/MS	EPA 8260B	tert-Butylbenzene
GC/MS	EPA 8260B	Tetrachloroethene
GC/MS	EPA 8260B	Tetrahydrofuran
GC/MS	EPA 8260B	Toluene
GC/MS	EPA 8260B	trans-1,2-Dichloroethene
GC/MS	EPA 8260B	trans-1,3-Dichloropropene
GC/MS	EPA 8260B	Trichloroethene
GC/MS	EPA 8260B	Trichlorofluoromethane
GC/MS	EPA 8260B	Vinyl acetate
GC/MS	EPA 8260B	Vinyl chloride
GC/MS	EPA 8260B	Xylenes, Total
ICP-AES	EPA 6010C	Aluminum
ICP-AES	EPA 6010C	Antimony
ICP-AES	EPA 6010C	Boron

Non-Potable Water

Technology	Method	Analyte
ICP-AES	EPA 6010C	Beryllium
ICP-AES	EPA 6010C	Cadmium
ICP-AES	EPA 6010C	Calcium
ICP-AES	EPA 6010C	Cobalt
ICP-AES	EPA 6010C	Copper
ICP-AES	EPA 6010C	Iron
ICP-AES	EPA 6010C	Lead
ICP-AES	EPA 6010C	Magnesium
ICP-AES	EPA 6010C	Manganese
ICP-AES	EPA 6010C	Nickel
ICP-AES	EPA 6010C	Molybdenum
ICP-AES	EPA 6010C	Potassium
ICP-AES	EPA 6010C	Selenium
ICP-AES	EPA 6010C	Silver
ICP-AES	EPA 6010C	Sodium
ICP-AES	EPA 6010C	Thallium
ICP-AES	EPA 6010C	Vanadium
ICP-AES	EPA 6010C	Zinc
Combustion	EPA 9060A	Total Organic Carbon
Preparation	**Method**	**Type**
Digestate	EPA 3010A	Acid Digestion
Solvent	EPA 5030B	Purge and Trap

Solid and Chemical Materials

Technology	Method	Analyte
HPLC	EPA 6850	Perchlorate
HPLC	EPA 8330B	1,3,5-Trinitrobenzene
HPLC	EPA 8330B	1,3-Dinitrobenzene
HPLC	EPA 8330B	2,4,6-Trinitrophenol
HPLC	EPA 8330B	2,4,6-Trinitrotoluene
HPLC	EPA 8330B	2,4-diamino-6-nitrotoluene
HPLC	EPA 8330B	2,4-Dinitrotoluene
HPLC	EPA 8330B	2,6-diamino-4-nitrotoluene
HPLC	EPA 8330B	2,6-Dinitrotoluene
HPLC	EPA 8330B	2-Amino-4,6-dinitrotoluene
HPLC	EPA 8330B	4-Amino-2,6-dinitrotoluene
HPLC	EPA 8330B	HMX
HPLC	EPA 8330B	m-Nitrotoluene
HPLC	EPA 8330B	Nitrobenzene

Solid and Chemical Materials

Technology	Method	Analyte
HPLC	EPA 8330B	Nitroglycerin
HPLC	EPA 8330B	o-Nitrotoluene
HPLC	EPA 8330B	PETN
HPLC	EPA 8330B	p-Nitrotoluene
HPLC	EPA 8330B	RDX
HPLC	EPA 8330B	Tetryl
GC/MS	EPA 8260B	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,1-Trichloroethane
GC/MS	EPA 8260B	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,2-Trichloroethane
GC/MS	EPA 8260B	1,1-Dichloroethane
GC/MS	EPA 8260B	1,1-Dichloroethene
GC/MS	EPA 8260B	1,1-Dichloropropene
GC/MS	EPA 8260B	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B	1,2,3-Trichloropropane
GC/MS	EPA 8260B	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B	1,2-Dibromoethane
GC/MS	EPA 8260B	1,2-Dichlorobenzene
GC/MS	EPA 8260B	1,2-Dichloroethane
GC/MS	EPA 8260B	1,2-Dichloroethene, Total
GC/MS	EPA 8260B	1,2-Dichloropropane
GC/MS	EPA 8260B	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B	1,3-Dichlorobenzene
GC/MS	EPA 8260B	1,3-Dichloropropane
GC/MS	EPA 8260B	1,4-Dichlorobenzene
GC/MS	EPA 8260B	1,4-Dioxane
GC/MS	EPA 8260B	2,2-Dichloropropane
GC/MS	EPA 8260B	2-Butanone
GC/MS	EPA 8260B	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B	2-Chlorotoluene
GC/MS	EPA 8260B	2-Hexanone
GC/MS	EPA 8260B	4-Chlorotoluene
GC/MS	EPA 8260B	4-Isopropyltoluene
GC/MS	EPA 8260B	4-Methyl-2-pentanone
GC/MS	EPA 8260B	Acetone
GC/MS	EPA 8260B	Benzene
GC/MS	EPA 8260B	Bromochloromethane
GC/MS	EPA 8260B	Bromodichloromethane
GC/MS	EPA 8260B	Bromoform

Solid and Chemical Materials

Technology	Method	Analyte
GC/MS	EPA 8260B	Bromomethane
GC/MS	EPA 8260B	Carbon disulfide
GC/MS	EPA 8260B	Carbon tetrachloride
GC/MS	EPA 8260B	Chlorobenzene
GC/MS	EPA 8260B	Chloroethane
GC/MS	EPA 8260B	Chloroform
GC/MS	EPA 8260B	Chloromethane
GC/MS	EPA 8260B	cis-1,2-Dichloroethene
GC/MS	EPA 8260B	cis-1,3-Dichloropropene
GC/MS	EPA 8260B	Cyclohexane
GC/MS	EPA 8260B	Dibromochloromethane
GC/MS	EPA 8260B	Dibromomethane
GC/MS	EPA 8260B	Dichlorodifluoromethane
GC/MS	EPA 8260B	Ethylbenzene
GC/MS	EPA 8260B	Freon TF
GC/MS	EPA 8260B	Hexachlorobutadiene
GC/MS	EPA 8260B	Isobutyl alcohol
GC/MS	EPA 8260B	Isopropylbenzene
GC/MS	EPA 8260B	m&p-Xylene
GC/MS	EPA 8260B	Methyl acetate
GC/MS	EPA 8260B	Methyl iodide
GC/MS	EPA 8260B	Methyl t-butyl ether
GC/MS	EPA 8260B	Methylcyclohexane
GC/MS	EPA 8260B	Methylene Chloride
GC/MS	EPA 8260B	Naphthalene
GC/MS	EPA 8260B	n-Butylbenzene
GC/MS	EPA 8260B	n-Propylbenzene
GC/MS	EPA 8260B	o-Xylene
GC/MS	EPA 8260B	sec-Butylbenzene
GC/MS	EPA 8260B	Styrene
GC/MS	EPA 8260B	tert-Butylbenzene
GC/MS	EPA 8260B	Tetrachloroethene
GC/MS	EPA 8260B	Tetrahydrofuran
GC/MS	EPA 8260B	Toluene
GC/MS	EPA 8260B	trans-1,2-Dichloroethene
GC/MS	EPA 8260B	trans-1,3-Dichloropropene
GC/MS	EPA 8260B	Trichloroethene
GC/MS	EPA 8260B	Trichlorofluoromethane
GC/MS	EPA 8260B	Vinyl acetate
GC/MS	EPA 8260B	Vinyl chloride
GC/MS	EPA 8260B	Xylenes, Total

Solid and Chemical Materials

Technology	Method	Analyte
ICP-AES	EPA 6010C	Aluminum
ICP-AES	EPA 6010C	Antimony
ICP-AES	EPA 6010C	Boron
ICP-AES	EPA 6010C	Beryllium
ICP-AES	EPA 6010C	Cadmium
ICP-AES	EPA 6010C	Calcium
ICP-AES	EPA 6010C	Cobalt
ICP-AES	EPA 6010C	Copper
ICP-AES	EPA 6010C	Iron
ICP-AES	EPA 6010C	Lead
ICP-AES	EPA 6010C	Magnesium
ICP-AES	EPA 6010C	Manganese
ICP-AES	EPA 6010C	Nickel
ICP-AES	EPA 6010C	Molybdenum
ICP-AES	EPA 6010C	Potassium
ICP-AES	EPA 6010C	Selenium
ICP-AES	EPA 6010C	Silver
ICP-AES	EPA 6010C	Sodium
ICP-AES	EPA 6010C	Thallium
ICP-AES	EPA 6010C	Vanadium
ICP-AES	EPA 6010C	Zinc
Preparation	**Method**	**Type**
Digestate	EPA 3050B	Acid Digestion
Solvent	EPA 5035 /5035A	Purge and Trap

Air and Emissions

Technology	Method	Analyte
GC/MS	TO-15	1,1,1-Trichloroethane
GC/MS	TO-15	1,1,2,2-Tetrachloroethane
GC/MS	TO-15	1,1,2-Trichloroethane
GC/MS	TO-15	1,1-Dichloroethane
GC/MS	TO-15	1,1-Dichloroethene
GC/MS	TO-15	1,2,4-Trichlorobenzene
GC/MS	TO-15	1,2,4-Trimethylbenzene
GC/MS	TO-15	1,2-Dibromoethane
GC/MS	TO-15	1,2-Dichlorobenzene
GC/MS	TO-15	1,2-Dichloroethane
GC/MS	TO-15	1,2-Dichloroethene, Total
GC/MS	TO-15	1,2-Dichlorotetrafluoroethane

Air and Emissions

Technology	Method	Analyte
GC/MS	TO-15	1,3,5-Trimethylbenzene
GC/MS	TO-15	1,3-Butadiene
GC/MS	TO-15	1,3-Dichlorobenzene
GC/MS	TO-15	1,4-Dichlorobenzene
GC/MS	TO-15	1,4-Dioxane
GC/MS	TO-15	2,2,4-Trimethylpentane
GC/MS	TO-15	2-Chlorotoluene
GC/MS	TO-15	3-Chloropropene
GC/MS	TO-15	4-Ethyltoluene
GC/MS	TO-15	4-Isopropyltoluene
GC/MS	TO-15	Acetone
GC/MS	TO-15	Benzene
GC/MS	TO-15	Benzyl chloride
GC/MS	TO-15	Bromodichloromethane
GC/MS	TO-15	Bromoethene(Vinyl Bromide)
GC/MS	TO-15	Bromoform
GC/MS	TO-15	Bromomethane
GC/MS	TO-15	Carbon disulfide
GC/MS	TO-15	Carbon tetrachloride
GC/MS	TO-15	Chlorobenzene
GC/MS	TO-15	Chloroethane
GC/MS	TO-15	Chloroform
GC/MS	TO-15	Chloromethane
GC/MS	TO-15	cis-1,2-Dichloroethene
GC/MS	TO-15	cis-1,3-Dichloropropene
GC/MS	TO-15	Cumene
GC/MS	TO-15	Cyclohexane
GC/MS	TO-15	Dibromochloromethane
GC/MS	TO-15	Dichlorodifluoromethane
GC/MS	TO-15	Ethylbenzene
GC/MS	TO-15	Freon 22
GC/MS	TO-15	Freon TF
GC/MS	TO-15	Hexachlorobutadiene
GC/MS	TO-15	Isopropyl alcohol
GC/MS	TO-15	m,p-Xylene
GC/MS	TO-15	Methyl Butyl Ketone (2-Hexanone)
GC/MS	TO-15	Methyl Ethyl Ketone
GC/MS	TO-15	Methyl isobutyl ketone
GC/MS	TO-15	Methyl methacrylate
GC/MS	TO-15	Methyl tert-butyl ether
GC/MS	TO-15	Methylene Chloride

Air and Emissions

Technology	Method	Analyte
GC/MS	TO-15	Naphthalene
GC/MS	TO-15	n-Butane
GC/MS	TO-15	n-Butylbenzene
GC/MS	TO-15	n-Heptane
GC/MS	TO-15	n-Hexane
GC/MS	TO-15	n-Propylbenzene
GC/MS	TO-15	o-Xylene-
GC/MS	TO-15	sec-Butylbenzene
GC/MS	TO-15	Styrene
GC/MS	TO-15	tert-Butyl alcohol
GC/MS	TO-15	tert-Butylbenzene
GC/MS	TO-15	Tetrachloroethene
GC/MS	TO-15	Tetrahydrofuran
GC/MS	TO-15	Toluene
GC/MS	TO-15	trans-1,2-Dichloroethene
GC/MS	TO-15	trans-1,3-Dichloropropene
GC/MS	TO-15	Trichloroethene
GC/MS	TO-15	Trichlorofluoromethane
GC/MS	TO-15	Vinyl chloride
GC/MS	TO-15	Xylene, Total

Notes:

1) This laboratory offers commercial testing service.

Approved by: _____ Date: February 25, 2014

R. Douglas Leonard
Chief Technical Officer

Reissued: 2/25/14

Attachment B
Standard Operating Procedures

STANDARD OPERATING PROCEDURE E-1

Decontamination of Personnel and Equipment

I. Purpose and Scope

This standard operating procedure (SOP) provides standardized procedures for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments. Any project required deviations from SOPs, will be provided in site specific sampling and analysis plans (SAPs).

II. Equipment and Materials

1. Potable water from a municipal water supplier.
2. ASTM Type II reagent water with analysis certification.
3. Soap solution, such as 2.5% (W/W) Liquinox, or Alconox.
4. 10% solvent such as methanol, isopropyl, hexane or other approved solvent (DO NOT USE ACETONE). Pesticide-grade solvents will only be used if directed by project-specific SAPs.
5. Large plastic pails or tubs, scrub brushes, squirt bottles for soap and solvent solutions, plastic bags and sheets.
6. Department of transportation approved 55-gallon drum for disposal of waste (if required)Personal protective equipment (PPE).

III. Procedures and Guidelines

A. Personnel Decontamination

This is a guide, and may be modified if the contamination is less or more than what is required here.

- Only if there is gross contamination present that cannot be removed using the procedures below should the PPE be disposed of with investigation derived waste (IDW).
- Wash boots in soap solution and rinse with water. If disposable latex booties are worn over boots in the work area, rinse with soap solution, remove, and discard with normal trash.
- Wash outer gloves in soap solution, rinse, remove, and discard with normal trash.
- Remove disposable coveralls ("Tyveks"), wash any obvious dirt or contamination off with soap solution, rinse, and discard with normal trash.

- Remove respirator (if worn).
- Remove inner gloves and discard with normal trash.
- Sanitize respirator if worn in accordance with manufacturer's instructions.
- At the end of the work day, shower entire body, including hair, either at the work site or at home.

B. Sampling Pump Decontamination

- Don disposable gloves.
- Spread plastic on the ground to keep hoses from touching the ground.
- Turn off pump after sampling. Remove pump from well and place pump in decontamination container.
- Pre-rinse the pump in potable water to remove bulk soil or contamination.
- Disassemble pump, as practical, and scrub pump with soap solution. If disassembly of pump not practical, run solution through pump for 1 minute.
- Scrub in tap water, then reassemble and run pump in tap water for one minute.
- Disassemble and spray pump with 70-100% solvent solution. (DO NOT USE ACETONE). If disassembly of pump not practical, run 10 percent solution through pump for 1 minute.
- Allow to air dry.
- Spray with ASTM type II reagent water with analysis certification.
- Reassemble and wrap pump in aluminum foil or clean plastic sheeting and place into decontamination tube.
- Collect all rinsate and dispose of according to the Master Waste Management Plan.
- Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment can be decontaminated (using the above procedure) and disposed of with normal trash or can be disposed of according to the Master Waste Management Plan.

C. Other Sampling Equipment Decontamination

- Don latex-free gloves.
- Pre-rinse and scrub equipment with potable water.
- Wash all equipment surfaces that contacted the potentially contaminated soil/water with soap solution.
- Rinse with potable water.
- Rinse with distilled water and 10% solvent solution.

- Air dry.
- Rinse with ASTM type II reagent water with analysis certification.
- Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling.
- Collect all rinsate and dispose of according to the Master Waste Management Plan.
- Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment can decontaminated (using the above procedure) and disposed of with normal trash or can be disposed of according to the Master Waste Management Plan.

D. Sample Container Exterior Decontamination

- The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection.
- Wipe container with a paper towel dampened with soap solution. Repeat the above steps using potable water.
- Dispose of all used paper towels according to the Master Waste Management Plan.

E. Water Level Meter

Water level meters will be decontaminated before being used in the first well, and after measuring each well as follows:

1. Wipe tape, first with a towel dampened with 10 percent solvent solution, then with a towel dampened with DI water.
2. Spray off probe, first with 10 percent solvent solution, then with ASTM type II reagent water with analysis certification.

IV. Key Checks and Items

- Clean with solutions of soap, solvent, and ASTM type II reagent water with analysis certification.
- Do not use acetone for decontamination.
- Minimize generation of IDW to the maximum extent possible by decontaminating to the extent practical and disposing with normal trash.

STANDARD OPERATING PROCEDURE G-2

Sediment Sampling

I. Purpose

These standardized procedures describe the collection and handling of sediment samples during field operations.

II. Scope

Sediments occur in freshwater and marine environments such as streams/rivers, ponds/lakes, canals, ditches, wetlands, lagoons, estuaries, and ocean. The sediment sampling procedures generally describe the equipment and techniques needed to collect representative sediment samples. Always collect surface water quality samples prior to collecting sediment samples if sampling locations are located with or near each other.

The sampling team will document the site conditions (e.g., surrounding land use, surface water characteristics, obvious nearby sources of contamination) and sediment characteristics (e.g., color, texture, odor, sediment depth sampled) through a brief description in the logbook, sediment log sheet, and/or representative site photos. It is also important to document that the media being sampled is in fact sediment (and not soil), meaning that overlying water was present at the time of sampling, or that there is obvious evidence of frequent and recent inundation (e.g., sampling exposed sediment at low tide). Any project required deviations from the standard operating procedures (SOPs) will be provided in the site-specific sampling and analysis plan (SAP).

III. Equipment and Materials

- Sample collection device (hand corer, scoop, dredge, grab sampler, or other suitable device).
- Rope to lower sediment grab or dredge.
- Measuring tape to measure water depth.
- Sediment log sheets.
- Underwater Camera (to document sample characteristics and site conditions).
- Hip waders.
- Materials for classifying soils, particularly the percentage of fines.
- Sample jars, including jars for grain size, total organic carbon, and pH, as appropriate.
- Boat or canoe with U.S. Coast Guard-approved safety equipment.

- Deep Trekker ROV with grabber arm
- Diver equipment in accordance with the Dive Plan

IV. Procedures and Guidelines

Sediment samples can be collected using one of three different types of equipment: (1) scoops, (2) corers and (3) dredges/grab samplers. Soil sampling equipment is generally not applicable to sediments because of the low cohesion of the medium, but may be used if appropriate. When selecting the appropriate sampling equipment, consider sampling location (edge or middle of lagoon), depth of water and sediment, sediment grain size (fineness), water velocity, and analytes of interest.

Direct collection with the appropriate sample container may be appropriate in very low water, where sediment is exposed, or when collecting by divers. Use dredges for hard or rocky substrates (can also be used for fine sediment). They are heavy enough to use in high velocity streams. Use coring devices in quiescent waters, unless water depth precludes effective sample collection. Always note the depth of sediment actually collected; environmental and mechanical factors may prevent collection to targeted depth (e.g., 0-6 inches).

A. Scoops or Similar Equipment

- Scooping is generally most useful in shallow waters, and where water flow is minimal so as not to disturbed the scooped sample as it is brought up through the water column. Additionally, scooping can be done by divers if transferring the sediment directly into a jar at depth. Collect samples by facing the direction of minimal flow and approach the location from the downcurrent direction. Take precautions not to disturb the bottom prior to scooping. Scoop and transfer the sample to the appropriate sample container(s) or to a decontaminated bowl if homogenization is required. If homogenization is required at a location requiring divers, transfer to an appropriate watertight container, bring to surface, and homogenize and transfer to sample container(s) as above. Scooping can also be conducted in marine environments with the Deep Trekker grabber arm.

B. Corers

Coring devices can be easily fabricated from many materials. Some corers are simple "push tubes," whereas other more sophisticated models may be finned, gravity driven devices. A core may be useful for preserving the historical layering of sediments.

The corer is an acceptable choice for sampling fine sediments. Corer diameter, grain size, and sample consistency will determine if the sample will remain in the corer upon withdrawal. Sample washout can be a problem, and ways to reduce or prevent it are as follows:

- Fit the leading edge of the corer with a nosepiece or core catcher that physically keeps the sample from slipping back out of the corer. The core catcher material must also be compatible with the analytes of interest.

- A second option is fit the top or back end with a check valve which creates negative pressure as it is being pulled from the substrate, and prevents surface water from washing out the top portion of the sample.
- Rotate the corer, if needed, as it is pushed into the sediment but do not rock the coring device back and forth. Rotation improves penetration and prevents compaction of the sample.
- Upon withdrawal from the water surface, place a cap on the bottom to prevent the sample from sliding out.
- Corers can also be fitted with liners if a complete core is desired.
- As the core is extruded, carefully remove the sample with a decontaminated, non-reactive utensil and transfer into the appropriate sample container(s) or a bowl if homogenization is required or if a specific depth fraction is required to be sampled.
- If coring by divers, excavate around driven core tube if possible/reasonable, and place baggie/cap under bottom of tube while removing core tube to prevent sample from sliding out.

C. Dredges or Grab Samplers

The three main types of devices used in freshwater (and can be used in salt water) are the Peterson, Ponar, and Ekman. The Peterson and Ponar dredges are suitable for hard or rocky substrates, deep water bodies, and streams with fast currents. The Peterson and Ponar are virtually the same, except that the Ponar has been adapted with a top screen and side plates to prevent sample loss upon ascent. Use the following method to collect a sediment sample:

- Open the jaws and place the cross bar into the proper notch.
- Lower the dredge to the bottom, making sure it settles flat.
- When tension is removed from the line, the cross bar will drop, enabling the dredge to close as the line is pulled upward during retrieval.
- Pull the sampler to the surface. Check to make sure the jaws are fully closed and that no sample was lost while lifting the dredge.
- Carefully open the jaws, remove the sample with a decontaminated, non-reactive utensil and transfer the sample into the appropriate sample container(s) or bowl for homogenization.

The Ekman is designed for sampling soft substrates (e.g., sand, silt, or mud) in areas with little current and is used as follows:

- Open the spring-loaded jaws and attach the chains to the pegs at the top of the sampler.
- Lower the dredge to the bottom, making sure it settles flat.
- Holding the line taut, send down the messenger to close the jaws of the dredge.
- Pull the sampler to the surface. Check to make sure the jaws are fully closed and that no sample was lost while lifting the dredge.

- Carefully open the jaws, remove the sample with a clean, non-reactive utensil and transfer the sample into the appropriate sample container(s) or bowl for homogenization.

D. General Sampling Procedures

1. Field personnel will start downstream and work upstream to prevent disturbance of or influence on unsampled areas. In surface water bodies that are tidally influenced, sampling should be performed at low tide and under low flow conditions to minimize the dilution of possible contaminants; however, sampling at other tide stages may be warranted to provide data representative of other, actual conditions. Sediment sampling activities should not occur immediately after periods of heavy rainfall.
2. As needed, make a sketch of the sample area that shows important nearby river features and permanent structures that can be used to locate the sample points on a map. Use a GPS to gather station coordinates, if needed. Also characterize depth and width of waterway, rate of flow, type, consistency, and odor of sediment, and point and depth of sample removal (along shore, mid-channel, etc.).
3. Transfer sample into appropriate sample jars with a stainless steel utensil. Be especially careful to avoid the loss of the very fine clay/silt particles when collecting the sample. Minimize the amount of overlying water that is collected with the sample matrix. Decant the excess water off of the sample slowly and carefully to maximize retention of the very fine particles. The sampler's fingers should never touch the sediment since skin or gloves may introduce organic interference into the sample. Classify the soil type of the sample using the Unified Soil Classification System, noting particularly the percentage of silt and clay.
4. Samples for volatile organics (and, if applicable, acid volatile sulfides/simultaneously extracted metals [AVS/SEM]) should immediately be placed in jars prior to homogenization of sediment. Rocks and other debris should be removed with utensils before placement in jars. If sediment is stiff enough to sample with EnCore® or Terra Core® samplers for VOC analysis, follow the instructions contained in the EnCore® or Terra Core® SOPs, as applicable.
5. For channel sampling, be on the alert for submerged hazards (rocks, tree roots, broken bottles, sharps, snakes, drop-offs, loose silt and muck) which can make wading dangerous.
6. Follow the site safety plan designed for the specific nature of the site's sampling activities and locations.
7. Decontaminate all sampling implements and protective clothing according to prescribed procedures.

V. Attachments

Sediment Log Form.

VI. Key Checks and Items

- When working in flowing streams, start downstream and work upstream. When working in marine currents, start down current, and work up, collecting sample from up current of the sampler.
- As necessary and practical, log exact locations using permanent features, and gather GPS coordinates.
- Beware of hidden hazards in the water column.
- When sediment sampling at a location for the first time, bring several types of sampling equipment in case one does not work.

CH2MHILL

PROJECT NUMBER	SAMPLE NUMBER SHEET 1 OF 1

SEDIMENT LOG

PROJECT : LOCATION : DATE:

WEATHER:

METHOD AND EQUIPMENT USED :

LOGGER :

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SEDIMENT DESCRIPTION COLOR, ODOR, MOISTURE CONTENT PARTICLE SIZE CHARACTERIZATION	COMMENTS UNUSUAL CHARACTERISTICS
0.5						
1.0						
1.5						
2.0						
2.5						

Sampler Signature: _____ Date: _____

STANDARD OPERATING PROCEDURE H-1

Preparing Field Log Books

I. Purpose and Scope

This SOP will provide standardized procedures and basic requirements for entering field data into log books during field activities. Log books are legal documents. They must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy.

II. Equipment and Materials

- Log book
- Indelible pen

III. Procedures and Guidelines

Properly completed field log books are a requirement of the work performed under the Navy CLEAN contract.

A. Procedures for Completing Field Log Books

1. Field notes are to be kept in bound, hard-covered logbooks, as well as task-specific logs. The pages are to be water-resistant and notes will be taken only with a water-proof, non-erasable permanent ink pen.
2. The inside cover of the log book generally should include:
    - Company name and address.
    - Log-holders name if log book was assigned specifically to that person.
    - Activity or location.
    - Project name.
    - Project manager's (PM's) name.
    - Phone numbers of the company, supervisors, emergency response, etc.
3. Daily entries will be made chronologically. Each page of the log book will have the date of the work and the note takers initials.
4. Information will be recorded directly into the field log during the work activity. Entries into the log should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on memory. Entries must be legible and complete.

5. Every line should be used to prevent later additions of text, or be marked through with a line, initialed and dated. Unused pages will be marked through with a line, the author's initials, date, and the note "Intentionally Left Blank."
6. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the person performing the correction. If possible, all corrections should be made by the individual keeping the log.
7. Only information relevant to the subject project will be added to the log book.
8. The final page of each day's notes will include the note-takers signature and date.
9. Copies of the field notes generally should be sent to the PM or designee in a timely manner (generally by the end of each week of work being performed).

B. Information generally to be Included in Field Logs

1. Use the left side border to record times and the remainder of the page to record information.
2. General project information will be recorded at the beginning of each field project; the project title, project number, staff, scope of the day's work and weather conditions (note changes).
3. Subcontractor Information: Record name of company, names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List start and stop times, and quantities of billable line items accomplished.
4. Technical and Project Information: Describe the details of the work being performed. The project SAP will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the PM prior to beginning the field work.
5. Any conditions that might adversely affect the work or data obtained.
6. Time: Keep a running time log explaining field activities as they occur throughout the day.
7. Tail Gate Safety Talks: Record topics discussed.
8. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE). Also record other required health and safety procedures as specified in the project specific health and safety plan.
9. Instrument Calibration: Record calibration information for each piece of health and safety/field equipment if not recorded elsewhere.
10. Personnel: Record when personnel and visitors enter and leave the site.
11. Communications: Record all communications that impact performance of the project.
12. Deviations from the SAP: Record deviations from the SAP; document the reasons and communications authorizing deviations.

13. Heath and Safety Incidents: Record all health and safety incidents in detail, immediately reporting them to the field team leader (FTL) and PM.

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

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

    - Description of the general sampling area – site name, buildings and streets in the area, etc.
    - Station/Location identifier.
    - Description of the sample location – estimate location in comparison to two fixed points – If location not already identified on a map or figure, draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
    - Sample matrix and type.
    - Sample identifier, date and time.
    - Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples.
    - Number and type of sample containers collected.
    - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity).
    - Parameters to be analyzed for, if appropriate.
    - Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.
    - If the PM specifies, some of the above can be entered in GBC or spiral bound field sampling books printed specifically for the sampling task instead of in the hard cover log book.

C. Suggested Format for Recording Field Data

1. Use tables to record sampling information and field data from multiple samples. Keep data organized for easier review.

2. Sketch sampling locations, construction sites, and other pertinent information.

3. Sketch well construction diagrams or use well-completion logs.

STANDARD OPERATING PROCEDURE H-4

Chain-of-Custody

I. Purpose

This SOP provides standardized procedures for completing chain of custody (COC) forms. Any project required deviations from standard operating procedures (SOPs) will be provided in site specific sampling and analysis plans (SAPs).

II. Scope

This procedure describes the steps necessary for transferring samples through the use of a COC. A COC is required for the tracking and recording of samples collected during program activities. Use of the COC creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over regional- or site-specific requirements.

III. Definitions

Chain-of-Custody Record - A COC is a printed form that accompanies a sample or group of samples as custody is transferred from one custodian to another custodian. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes the custodian. A sample is under one's custody if:

- It is in one's actual possession.
- It is in one's view, after being in one's physical possession.
- It was in one's physical possession and is secured to prevent tampering.

Sample - A sample is physical evidence which is representative of conditions at the point and time that it was collected.

IV. Procedures

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is valid. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom, as well as providing security for the evidence as it is moved and/or passed from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain-of-possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

A. Sample Identification

The method of identification of a sample depends on the type of measurement or analysis performed. When *in situ* measurements are made, the data are recorded directly in bound logbooks or other field data records with identifying information.

Information which may be recorded in the field logbook, when in-situ measurements or samples for laboratory analysis are collected, includes:

- Field Sampler(s),
- Contract Task Order (CTO) Number,
- Project Sample Number,
- Sample location or sampling station number,
- Date and time of sample collection and/or measurement,
- Field observations,
- Equipment used to collect samples and measurements, and
- Calibration data for equipment used

Measurements and observations shall be recorded using waterproof ink.

1. Sample Label

Samples removed and transported from the sample location to a laboratory or other location for analysis will be collected into laboratory provided containers and labeled. Sample labels will include:

- Project - CTO Number.
- Sample Identification - The SAP/SSP I.D. provided for the sample.
- Date - Day, month, and year of sample collection.
- Time - A four-digit number in the 24-hour format at time of collection.
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type of preservation.
- Analysis – Type of analysis to be performed (e.g., VOC).

- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

B. Chain-of-Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under COC procedures until it is in the custody of the analytical laboratory and has been stored or disposed of.

1. Field Custody Procedures

- Care must be taken to ensure that the sample information on the label matches the COC exactly.
- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.
- Sample labels shall be completed for each sample, using waterproof ink.

2. Transfer of Custody and Shipment

Samples are accompanied by a COC. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the COC. This documents sample custody transfer from the sampler to the analyst in the laboratory. The COC is shipped as described below:

- Place the original (top, signed copy) of the COC in a plastic zipper-type bag or other appropriate sample-shipping package. Retain the copy with field records.
- Sign and date two custody seals, 1-inch by 3-inch white paper labels with black lettering and an adhesive backing. The custody seals are part of the COC process and are used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seals across the shipping container opening on diagonally opposite corners, so that one would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

Any corrections are made by drawing a line through, initialing and dating the change, then entering the correct information. Erasures are not permitted.

As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment then signs and dates the COC, completing the sample transfer process. It is then the laboratory's responsibility to maintain custody records throughout sample preparation and analysis.

V. Quality Assurance Records

Once samples have been packaged and shipped, the COC copy and airbill receipt become part of the QA record.

VI. Attachments

Chain of Custody Form.

VII. References

USEPA. *User's Guide to the Contract Laboratory Program*. Office of Emergency and Remedial Response, Washington, D.C. (EPA/540/P-91/002), January 1991.

Vieques ERP

CH2M HILL

Chain of Custody Form

Project Site		AOC E			Number of Containers	Analysis Requested												Project No.	
Project Manager		Brett Doerr																	
Contact Tel No.		757-283-9246 (Adrienne Jones)																Lab Batch/SDG ID	
Contact Address		4350 W. Cypress Street, Suite 600, Tampa, FL 33607																	
Lab Name																		Lab Tel No./Fax No.	
Lab Contact																			
Lab Address																			
Item	Sample ID	Station ID	Matrix	Date & Time Collected		MET_SO/CN	PCB_SO	PEST_SO	SVOC_SO	TL_SO	TOC_SO	TPH_SO_DRO/ORO	TPH_SO_GRO	VOC_SO	GRAIN_SIZE	TPH_W_GRO	VOC_W	Comments	
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
Sampled By:				Date/Time:		Custody Seal: Y / N Relinquished By:												Date/Time:	
Shipped Via: UPS FedEx Hand Other (Please specify):																			
Samples Temperature and Condition Upon Receipt (for lab's use):																			
Received By:			Date/Time:			Custody Seal: Y / N Relinquished By:												Date/Time:	
Received By:			Date/Time:			Custody Seal: Y / N Relinquished By:												Date/Time:	
Remarks:																			

Updated May 2007

STANDARD OPERATING PROCEDURE H-5

Packaging and Shipping Procedures for Samples Not Considered Dangerous Goods

I. Purpose and Scope

The purpose of this guideline is to describe the packaging and shipping of samples of various media to a laboratory for analysis. This standardized procedure only covers samples of sufficiently low concentration as to not be considered dangerous goods for purposes of shipping.

II. Scope

The guideline only discusses the packaging and shipping of samples that are anticipated to have sufficiently low concentrations of chemical constituents as to not be considered dangerous goods when being shipped. Whether or not samples should be classified as low-concentration or otherwise will depend upon the site history, observation of the samples in the field, odor, and photoionization-detector readings.

If the site is known to have produced high-concentration samples in the past or the sampler suspects that high concentrations of contaminants might be present in the samples, then the sampler should conservatively assume that the samples cannot be classified as low-concentration. Samples that are anticipated to have medium to high concentrations of constituents should be packaged and shipped following procedures for dangerous-goods shipping specified by the intended shipper (e.g., Federal Express).

III. Equipment and Materials

- Coolers
- Clear tape
- Duct tape
- "This Side Up" labels
- "Fragile" labels
- Ziplock bags or bubble wrap
- Ice
- Chain-of-Custody form (completed)
- Custody seals

IV. Procedures and Guidelines

A. Sample Packing

1. Prepare coolers for shipment:
   - Tape drains shut from the inside of the cooler.
   - Affix "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of each cooler, if available.
   - Place mailing label with laboratory address on top of coolers.
   - As necessary (helpful for large bottle ware), fill bottom of coolers with about 3 inches of bubble wrap.
2. Arrange decontaminated sample containers in groups by sample number. Consolidate volatile organic compound (VOC) samples into one cooler to minimize the need for trip blanks.
3. Affix appropriate adhesive sample labels to each container. Protect with clear label protection tape.
4. Seal each set of sample bottles within a separate water proof zipper-type plastic bag and bubble wrap, if available. Make every attempt to ensure the samples are water proof. Double bag Encore VOC samples and soil samples. Sample label should be visible through the bag.
5. Place two large plastic bag liners, one inside the other, openings up. Arrange sample containers in liners so bags do not touch each other. Temp blank should go on the bottom of the cooler, in an area where it can be completely surrounded by ice.
6. If ice is required to preserve the samples, use at least two full bags and place on and around the containers.
7. Fill remaining spaces with bubble wrap or ice as required and add the laboratory provided trip blank.
8. Close the inside liner first by twisting the opening to the bag liner closed, allowing as much air to escape as possible. Zip-tie the bag closed and tie the end into a knot. Do the same to the second liner being sure to remove as much air as possible.
9. Complete and sign COC (or obtain signature) and indicate the time and date it was relinquished to Federal Express or the courier. Place into a zip-type bag and tape it to the inside of the lid of the cooler.
10. Close lid and latch.
11. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.
12. Tape cooler shut on both ends, making several complete revolutions with tape. Do not cover custody seals.

13. Relinquish to Federal Express or to a courier arranged with the laboratory. Scan airbill receipt and COCs to the sample documentation coordinator (or mail if scanner not available) along with the other documentation.

B. Medium- and High-Concentration Samples

Medium- and high-concentration samples are packaged using the same techniques used to package low-concentration samples, with several additional restrictions. The sample handler must refer to instructions associated with the shipping of dangerous goods for the necessary procedures for shipping by Federal Express or other overnight carrier.

V. Attachments

None.

VI. Key Checks and Items

- Be sure laboratory address is correct on the mailing label.
- Pack sample bottles carefully, with adequate bubble wrap or other packaging and without allowing bottles to touch.
- Be sure there is adequate ice.
- Include COC.
- Affix custody seals.

STANDARD OPERATING PROCEDURE H-6

Equipment Blank Preparation

I. Purpose and Scope

This document provides standardized procedures for collecting equipment blanks used to determine whether decontamination procedures are adequate during sampling. Any project required deviations from standard operating procedures (SOPs) will be provided in site specific sampling and analysis plans (SAPs). The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

II. Equipment and Materials

- ASTM Type II reagent water with analysis certification (blank water).
- Sample bottles with preservatives according to the SAP.
- Gloves.

III. Procedures and Guidelines

A. Decon all sampling equipment according to "Decontamination of Personnel and Equipment" SOP.

B. For volatile organic compound (VOC) analysis from the surfaces of equipment other than pumps, pour blank water over one piece of equipment and into three 40-ml vials as per VOC water sampling procedure.

C. For non-VOC analyses, one aliquot is to be used for equipment. Pour blank water into the sampling bowl and other equipment so surfaces which previously contacted the sample are now in contact with the blank water. Pour blank fluid from pan into the appropriate sample bottles.

D. For pumps, run an extra gallon of blank water through the pump while collecting the pump outflow into appropriate containers. If a pump with disposable tubing is used, put new tubing onto the pump to collect the equipment blank.

E. Document and ship samples in accordance with the procedures for other samples.

IV. Attachments

None.

V. Key Checks and Items

- Wear gloves.
- Do not use any disposable or non-decontaminated equipment to prepare blank.
- Use ASTM-Type II reagent water with analysis certification.

Attachment C
Standard Operating Procedures for Protection of Federally Listed Species and Sensitive Habitat

Standard Operating Procedures for Protection of Federally Listed Species and Sensitive Habitat

Former Naval Ammunition Support Detachment and
Former Vieques Naval Training Range
Vieques, Puerto Rico

These Standard Operating Procedures (SOPs) apply to the underwater sample collection offshore of the former Naval Ammunition Support Detachment (NASD) and the former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. These SOPs are required to be implemented in conjunction with the Sampling and Analysis Plan for the project. These SOPs are required to be posted onboard all work vessels.

Vessel Operations

- All project related watercrafts should travel at no wake speed within shallow waters (10 feet or less) and/or when 150 feet from the coastline.
- All vessels will preferentially follow deep water routes whenever possible.
- Vessel operators will use nautical charts, onboard depth sounders, and other sensors, as applicable, to avoid contacting the seafloor and underwater obstacles, including coral colonies.
- Vessels will be anchored preferentially on sandy bottom whenever possible. If anchoring on sandy bottom is not possible, vessels may be anchored on vegetated bottom that consists of seagrass and/or algae (seaweed). Vessels will not be anchored on hardbottom that contains hard and/or soft coral, regardless of the percentage of coral cover present. The type of bottom present will be confirmed by divers, onboard using a glass-bottom bucket, or by other appropriate means, prior to anchoring.
- If the vessel is anchored on vegetated bottom (seagrass/algae), the anchor will be removed from the seafloor in a manner that minimizes disturbance to the vegetation, for example, by attaching a secondary anchor line to the rear of any plow-type anchor (danforth, union, bruce) and pulling the anchor free from the seafloor before lifting to the surface.

Protection of Sea Turtles and Marine Mammals

- All work personnel will be familiar with the identification of federally listed sea turtle and marine mammal species that have the potential to occur in the work areas; Endangered Species Act (ESA) policy and associated civil/criminal penalties for violations; and the procedures to be followed to prevent impacts to sea turtles and marine mammals during work activities.
- The following federally listed sea turtle species have the potential to occur in the work areas:
  - Loggerhead sea turtle (*Caretta caretta*)
  - Green sea turtle (*Chelonia mydas*)
  - Leatherback sea turtle (*Dermochelys coriacea*)
  - Hawksbill sea turtle (*Eretmochelys imbricata*)
- The following federally listed marine mammal species have the potential to occur in the work areas:
  - West Indian manatee (*Trichechus manatus*)
  - Humpback whale (*Megaptera novaeangliae*)
  - Sperm whale (*Physeter macrocephalus*)
  - Sei whale (*Balaenoptera borealis*)

  - Blue whale (*Balaenoptera musculus*)
  - Finback whale (*Balaenoptera physalus*)

- All sightings of the above federally listed sea turtle and marine mammal species will be documented in a log to be provided to the Navy, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and Puerto Rico Department of Natural and Environmental Resources (DNER) at the end of the project. The following information shall be collected and recorded:
  - Sighted species
  - Date and time of sighting
  - GPS coordinates of sighting location
  - One or more photographs if possible
  - Any action taken to minimize potential impacts to species (see below)
- All personnel onboard work vessels are responsible for observing for the presence of sea turtles and marine mammals. The work areas will be routinely monitored for the presence of sea turtles and marine mammals.
- If a whale is sighted, maintain a distance of 100 yards or greater between the whale and the vessel whenever possible.
- If a sea turtle or manatee is sighted, maintain a distance of 50 yards or greater between the animal and the vessel whenever possible.
- If a whale is sighted while a vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the whale has left the area.
- Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of whales are sighted near an underway vessel, when safety permits. A single whale at the surface may indicate the presence of submerged animals in the vicinity. The vessel should attempt to route around the animals, maintaining a minimum distance of 100 yards whenever possible.
- Sea turtles and marine mammals may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel, reduce speed and shift the engine to neutral. Do not engage the engines until the animal is clear of the area.
- Any collision with and/or injury to a sea turtle or marine mammal will be reported to NMFS and DNER. Work personnel should report sightings of any injured or dead sea turtle or marine mammal immediately to NMFS, regardless of whether the injury/death is caused by the work personnel.
  - Report sea turtles to the NMFS Southeast Regional Office: (727) 824-5312 and to the DNER Ranger Corps 787-724-5700 or 787-771-1124.
  - Report marine mammals to the Southeast U.S. Stranding Hotline: (877) 433-8299 and the DNER Marine Mammal Rescue Program (787) 645-5593 or (787) 538-4684. Any incidents involving manatees must be reported immediately to the DNER Manatee Stranding Coordinator at 787 645-5593, the USFWS Caribbean Field Office at 787 851-7297 ext. 220, and to the Vieques National Wildlife Refuge at (787) 741-2138.
- If the injury or death of a sea turtle or marine mammal is caused by a vessel collision or other work activity, the responsible parties will remain available to assist the respective response personnel as needed.

Protection of Coral and Benthic Habitats

- All work personnel will be familiar with the identification of federally listed coral species, hardbottom habitat, and vegetated bottom habitat that have the potential to occur in the work areas; ESA policy and

associated civil/criminal penalties for violations; and the procedures to be followed to prevent impacts to listed coral species, hardbottom habitat, and vegetated bottom habitat during work activities.

- The following federally Threatened coral species have the potential to occur in the work areas:
  - Staghorn coral (*Acropora cervicornis*)
  - Elkhorn coral (*Acropora palmata*)
  - Pillar coral (*Dendrogyra cylindrus*)
  - Lobed star coral (*Orbicella annularis*)
  - Mountainous star coral (*Orbicella faveolata*)
  - Boulder star coral (*Orbicella franksi*)
  - Rough cactus coral (*Mycetophyllia ferox*)

  The seven threatened coral species are protected by the ESA; currently elkhorn and staghorn corals have "take" prohibitions established, while the remaining five species may have "take" prohibitions in the future. If during the underwater investigation any ESA-listed corals are inadvertently impacted, whatever activity causing the impact will be stopped. Information will be gathered including the following:
  - Time, date, and coordinates of the impact
  - Name and type of vessel involved, and vessel speed
  - A description of the incident
  - Water depth
  - Environmental conditions (such as visibility, waves, wind speed and direction)
  - The coral species impacted and description of the damage

  This information will be reported to the NOAA Office of Law Enforcement at (800) 853-1964, NMFS in Boquerón at (787) 851-3700, and DNER at (787) 645-5593.

- As standard practice, impacts to any hard or soft coral species should be avoided.
- The potential for vessels to impact seagrass or coral is very low as the above impact avoidance measures identified for vessel operations will be strictly followed. In the event that seagrass or coral is inadvertently impacted by vessel operations, the restoration measures identified below will be implemented. Any impacts to seagrass or coral will be reported to NMFS.
- Any seagrass that is inadvertently impacted during the project will be inspected by scientific divers who will determine the type of restoration measures, if necessary, that should be implemented. All seagrass restoration will occur in the area impacted and will be conducted by scientific divers who have experience in seagrass restoration techniques. Any void created on the seafloor by an inadvertent impact will be backfilled with adjacent sediment so the grade of the impacted area is flush with the surrounding grade. The methods used to restore seagrass will be specific to the condition of the impacted seagrass and the seagrass species involved. Turtle grass (*Thalassia testudinum*) has deeper rhizomes/roots than shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and paddle grass (*Halophila decipiens*). Divers will attempt to maintain the integrity of the root/rhizome structure of any seagrass that is uprooted or otherwise impacted; the techniques used will depend on the impact condition and species involved. Use of biodegradable stakes to secure replanted seagrass will be evaluated in the field with respect to its suitability based on field conditions
- Any hard or soft corals that are inadvertently impacted during the project will be inspected by scientific divers who will determine the type of restoration measures, if necessary, that should be implemented. All coral restoration will be conducted by scientific divers who have experience in coral restoration techniques. The overall potential for impacts to coral, especially federally listed coral species, is very low. Restoration measures would primarily involve reattaching any coral that is inadvertently broken. The affected coral would be relocated to a suitable nearby location and reattached onto suitable

substrate via cement or marine epoxy using established NOAA methodology. General guidance on coral reattachment is provided in the following two videos: http://www.youtube.com/watch?v=_XaUttAUHv4 (NOAA, 2009) and http://www.youtube.com/watch?v=qRlfOu7fERw (NOAA, 2011).

- If an underwater item that may have historic or archaeological value is encountered, the item will not be disturbed in any way. The item will be photographed, GPS coordinates of the location will be collected, and the Navy will be notified. The Navy will coordinate the collected information with the Puerto Rico State Historic Preservation Office in compliance with the National Historic Preservation Act.

Attachment D
Responses to Regulatory Comments

Responses to EPA Comments on the
DRAFT UXO 16 ADJACENT TO SOLID WASTE MANAGEMENT UNIT 4
REMEDIAL INVESTIGATION SAMPLING ANALYSIS PLAN
DATED NOVEMBER 2015

GENERAL COMMENTS

1. The UXO 16 RI/SAP indicates that 16 sediment samples will be collected from background areas outside of the site boundary for background comparison of inorganic constituents. However, little information justifying the selection of the proposed background areas, specific sample collection locations and number of samples is provided. For example, while it is indicated in Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, that the areas "outside of the influence of the OB/OD [open burn/open detonation] activities (i.e., southeast of the OB/OD explosives safety buffer arc and upstream with respect to ocean current, as shown in Figure 8)," it is unclear whether these areas may have been impacted by other site activities. Expanded detail is presented in Worksheet #17, Sampling Design and Rationale, regarding the characteristics of the zone from which samples will be collected (i.e., similar to the study area, presumed to contain two types of sediment), though clarification of how this area was determined to be "outside of potential site-related influences" is not provided. It is also unclear how the number of samples (16) was selected (e.g., to support a statistical evaluation). In addition, it is noted that the UXO 16 RI/SAP makes reference to historical background evaluations; however, the results of these evaluations are not presented. Revise the UXO RI/SAP to provide more detailed information regarding the selection of the proposed background areas, specific sample collection locations and number of samples, and to provide the results of historical investigations and/or background evaluations, if applicable.

Navy Response: The Navy feels that the information in the SAP, with reference to the Expanded Site Inspection Report, provides significant justification for the location of the background samples. There is detailed discussion related to the potential impacts of SWMU 4 activities to the offshore environment and references documents (such as the SWMU 4 RI Report) that summarize the former site activities, conceptual site model, and nature and extent of contamination at SWMU 4. The number of background samples is consistent with prior Vieques background investigations and in accordance with EPA's Unified Guidance that recommends that a minimum of at least 8 to 10 independent background observations be collected before running most statistical tests. Including all of this information is cumbersome and not included to help streamline the document and focus on UXO 16.

In regards to the comment that the site may have been impacted by other site activities and how the area was determined to be "outside of potential site-related influences," note that Worksheet 10 states: "Although contaminant release to UXO 16 could also be associated with overland runoff and groundwater discharge from SWMU 4, the soil, groundwater, surface water, and sediment data collected during the SWMU 4 RI indicate this release mechanism is insignificant." In addition, Worksheets #10 and #11 also states that the offshore current flow direction is from the proposed background area to UXO 16 off of SWMU 4. Also note that the highest mountain on Vieques (Mt. Pirata) occurs between SWMU 4 and the proposed background area. If the comment is related to other potential sites that could impact the background samples, the Vieques FY16 Site Management Plan describes the western munitions sites within the Former NASD in detail; note that the next closest site is the anchorage area within UXO 16, which is located miles away from SWMU 4.

For clarity for reviewers not familiar with the site or previous Vieques investigations, the following modifications have been made.

- Worksheet #17, fourth paragraph, the following is added as a second sentence: "This area is located outside of the OB/OD explosives safety arc, upstream with respect to the ocean current, and has similar characteristics of the UXO 16 site with a number of ephemeral streams and located adjacent to Mt. Pirata."

Please also see the response to Specific Comment #6 below regarding the number of background samples.

Evaluation of the Response to General Comment (GC) 1 and Specific Comment (SC) 6: The responses partially address the comments. The original GC 1 requests clarification of several items associated with sampling. All items with the exception of concerns associated with background are adequately addressed. The key remaining concern is associated with the justification for the proposed number of background samples. This issue overlaps with those expressed in SC 6. The overall issue was also discussed in detail during the Vieques Technical Subcommittee Meeting of April 12 - 14, 2016. In order to address concerns related to the adequacy of the proposed dataset, the Navy proposed to present these concerns to their statisticians. To be included in this evaluation is the use of a power analysis to provide justification for the path forward. The resolution of this issue is therefore considered as pending.

Navy Response to Evaluation Comment: A power analysis to determine the appropriate number of background samples is not necessary and has the potential to yield misleading results. Power calculations that are sometimes used in environmental studies are generally based upon two-sample comparisons (e.g. two-sample t tests, Wilcoxon Rank Sum comparisons, etc.). On the other hand, the method utilized to select the number of background samples for the UXO 16 RI is consistent with EPA guidance and is the same process used for past background studies on Vieques, which were approved by the stakeholder parties. This process utilizes background comparisons based on comparison of individual site observations to calculated background threshold values (e.g. upper tolerance limits), which represents a different statistical comparison that is unlikely to benefit from power analysis.

A power analysis for a two-sample t test requires assumed values for: (1) the Type I error rate (false rejection rate of the comparison's null hypothesis), (2) Type II error (false acceptance rate of the comparison's null hypothesis), (3) concentration variability (usually included as the estimated sample standard deviation), and (4) minimum detectable difference (MDD; the smallest difference the statistical test can resolve). Regulation-based statistical comparisons typically use a Type I error of 0.05. The choice of the other three assumed values is difficult and/or very subjective, which will result in vastly different recommended sample sizes. For example, the concentration variability is not known, so it must be assumed, which alone can result in a wide range of sample sizes. Similarly, the selection of an MDD is subjective and can also result in a wide range of sample sizes. For instance, if a Type II error of 0.20 (where 1 – 0.20 = 80% power), a standard deviation/MDD ratio of 1 results in a recommended sample size of 14 samples, but ratios of 2, 3, and 4 result in recommended sample sizes of 51, 112, and 199 for a two sample t-test. Ratio differences of that magnitude can easily occur between different constituents from the same site, and likely more so between different sites, even if variability estimates are strong and MDD values receive strong consensus.

Therefore, it is recommended that the process utilized for selecting the number of background samples and the subsequent background evaluation conducted remain consistent with EPA guidance and the process used for past Vieques background studies.

2. The UXO 16 RI/SAP uses the term "overland transport" to describe the methodology by which some munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) may have arrived at their current locations in the area of concern. However, it is unclear as to what exactly is intended by the term "overland transport." Revise the first use of this term in the Executive Summary to explain the components of "overland transport."

Navy Response: Overland transport is the conveyance of materials (e.g., soil, debris) along the ground surface under the influence of such forces as surface runoff. This information has been added to the text.

3. UXO 16 RI/SAP Attachment C, Standard Operating Procedures, includes standard operating procedure (SOP) C-1, Calibration and Measurement with Field Instruments; however, SOP C-1 is not referenced in the applicable Worksheets (e.g., Worksheet #21, Project Sampling SOP References Table, and Worksheet #22, Field Equipment Calibration, Maintenance, Testing, and Inspection Table). Revise the UXO 16 SAP to reference all SOPs provided in Appendix C. Alternatively, remove SOP C-1 from the UXO 16 RI/SAP if it is not applicable to the current investigation.

Navy Response: SOP C-1 has been removed as it is not applicable to this RI.

4. The UXO 16 RI/SAP does not provide the laboratory SOPs for the proposed sample preparation and analytical methods. Without this information, the adequacy of the laboratory methods cannot be evaluated. For example, it is unclear if the proposed methods for metals analysis will provide representative subsamples, or if grinding of dried sediments for explosives analysis will be performed. Revise the UXO 16 RI/SAP to include all relevant laboratory-specific SOPs.

Navy Response: With respect to providing laboratory SOPs associated with SAPs, the procedure followed for this SAP submittal is the same as the procedure followed for all past Vieques SAP submittals. Laboratory SOPs are never provided as part of SAPs because they are proprietary and confidential (this information has been added to the SAP); they can be provided upon request, but will not be included in the document itself for this reason. Further, the laboratory-specific information necessary to determine the adequacy of laboratory methods is already included in the SAP. Notably, Worksheet #23 lists the analytical SOPs, which show the vast majority of analytical methodology SOPs (13 of 16 SOPs) are based on EPA methods and the other 3 analytical methodology SOPs are based on well-established procedures (i.e., Walkley-Black, ASTM); all 16 analytical methodologies are readily available to the reviewer. Worksheets #24 and #28 provide additional laboratory-specific information regarding quality control related to the sample analysis. Nevertheless, lab SOPs are provided to the regulatory agencies as part of the response to this comment.

5. The data management, reduction and reporting discussion is insufficiently detailed. For example, it is unclear where hardcopy project documents will be stored and where the project database will be maintained. It is also unclear how long these documents and the database will be stored before archival/disposal. Lastly, it is unclear how analytical data will be entered into the database, if the entry will be reviewed, and how data qualifiers will be added to the final reports. Revise the UXO 16 RI/SAP to provide greater detail regarding the data management, reduction and reporting tasks as per Section 3.5, Data Management Tasks, of the *Uniform Federal Policy Quality Assurance Project Plan Manual*, dated March 2005 (UFP QAPP Manual).

Navy Response: The level of detail in the UXO 16 RI SAP is consistent with previous Vieques SAPs. For example, in the SAP entitled *Final Expanded Site Inspection Sampling and Analysis Plan, UXO 15, Former Vieques Naval Training Range, Vieques, Puerto Rico*, Worksheets #14 and 29, which is where the information on data management and reduction/reporting is provided, contain the same information as the information provided in the UXO 16 RI SAP with the exception of how the data will be reported. Therefore, Worksheet #29 has been updated to include a line for the RI Report that will be produced for this RI.

Evaluation of the Response to GC 5: The response does not address the comment. The UXO 16 RI/SAP should be revised to provide greater detail regarding the data management, reduction and reporting tasks as per Section 3.5, Data Management Tasks, of the *Uniform Federal Policy for Quality Assurance Project Plans Manual*, dated March 2005 (UFP QAPP Manual). The UXO 16 RI/SAP should discuss where hardcopy project documents will be stored and where the project database will be maintained, and how long these

documents and the database will be stored and maintained before archive/disposal. In addition, the UXO 16 RI/SAP should discuss how analytical data will be entered into the database, if the entry will be reviewed, and how data qualifiers will be added to the final reports. Revise the UXO 16 RI/SAP to include this information as per Section 3.5 of the UFP QAPP Manual.

Navy Response to Evaluation Comment: The level of detail in the UXO 16 RI SAP is consistent with previous Vieques SAPs. Data management, reduction, and reporting is discussed in Worksheets #14, #29, and #34-36. Hardcopy project documents, including laboratory data and validation narratives, are stored in the CH2M office while the project is in progress. After project closeout, documents are archived at the federal records center (refer to Worksheet #29). Most of this information is already in Worksheet #29, but this additional detail has been added to Worksheet #29. For database entry, the following has been added to Worksheet #34-36 (new data review input "Electronic Data Deliverables" under the existing entry): "The laboratory generates an electronic data deliverable. Upon receipt, the project chemist spot-checks this for accuracy. For data which require Level IV analytical data validation, the data validator updates (adds-to) the EDD with a final result, a final flag, a reason code, and validation status ("validated"). For data which do not require Level IV analytical data validation, the project chemist updates (adds-to) the EDD with a final result (typically the same as the lab result), a final flag (typically the same as the lab flag), a reason code (if any changes are necessary), and validation status ("preload check"). The project chemist checks the validator's changes against the validation narrative. The data are loaded into a contractor-owned database and then checked for accuracy by the project chemist. The data are then migrated to NIRIS, the final database." As report tables are pulled from the database, validation qualifiers are already incorporated.

6. The UXO 16 RI/SAP does not discuss manual integrations for chromatographic analyses. Revise the UXO 16 RI/SAP to ensure that if manual integration is required, the supporting information (i.e., chromatograms before and after manual integration as well as a brief explanation for the manual integration) will be included in the data package deliverables and evaluated during data validation.

Navy Response: The following sentence has been added to the end of Footnote #1 at the bottom of Worksheet #29: "When manual integration is required, the supporting information (i.e. chromatograms before and after manual integration as well as narration) is included in the data package." Data validation of such is already discussed in Worksheet #36.

7. The Sediment Sampling Methods described in Worksheet #14 discuss the use of global positioning system (GPS) units for identifying sample locations; however, the GPS is not listed in Worksheets #21 or #22, nor is an SOP for GPS provided. Additionally, the accuracy of the GPS is not discussed. Revise the applicable worksheets to include the GPS units that will be used for the planned sampling activities, and discuss the accuracy requirements of the GPS units and how they will be ensured when establishing sample locations.

Navy Response: The following clarification will be included in Worksheet #14: "Sampling locations will be initially located by boat and using a hand-held Trimble (or similar) Global Positioning System (GPS) unit with sub-meter accuracy. A weighted line with float will be lowered to mark the targeted location. An underwater inspection by munitions divers will be conducted by sweeping the location with a metal detector to verify that it is safe to collect intrusive sediment samples. If required for safety, the marker will be move to the nearest cleared location. After final inspection, the marker line will be adjusted to position the float directly over the sample location, and a final GPS coordinate will be taken. However, it should be noted that where samples will be collected at the locations of items found during the SI/ESI, the samples will be collected as close to the former locations of those items as is practical due to the constraints inherent with recording (and re-acquiring) coordinates of objects on the sea floor using GPS units on the sea surface. When the items were found, their positions were recorded using GPS at the ocean surface. These coordinates will be used to re-acquire the positions at the ocean surface and then transferred to the ocean floor (e.g., using weighted lines, coordinates entered into the ROV, etc.) where the samples will be collected. While there is a

margin of error of up to several feet based on the accuracy of the GPS and the ability to transfer the coordinates to the ocean floor, this is the best way to re-acquire the item locations and since the objective of the RI is to establish sediment chemical characteristics that represent UXO 16 (offshore of SWMU 4) as a whole, because multiple samples will be collected across this area, this level of accuracy is sufficient to meet the objective."

Evaluation of the Response to GC 7: The response does not address the comment. Worksheet #14 discusses the use of global positioning system (GPS) units for identifying sample locations; therefore, the GPS should be listed in Worksheets #21 or #22, and a standard operating procedure (SOP) for GPS should be provided. Revise Worksheets #21 and #22 to include the GPS units that will be used for the planned sampling activities, and provide an SOP for the GPS unit.

Navy Response to Evaluation Comment: As noted in the initial response, a hand-held Trimble (or similar) Global Positioning System (GPS) unit with sub-meter accuracy will be utilized. The information provided in the revised text in Worksheet #14 is the process that will be used, so a separate SOP is not necessary. In addition, the unit will be operated in accordance with the unit's operation manual, a copy of which can be provided to the reviewer once the unit is acquired.

8. The UXO 16 RI/SAP does not provide the laboratory-specific quality control (QC) acceptance limits for many analytes. Instead, the UXO 16 RI/SAP references Department of Defense Quality Systems Manual, version 5.0, dated July 2013 (DoD QSM) limits. While it may be acceptable to use the DoD QSM acceptance limits, the UXO 16 RI/SAP should provide laboratory-specific values to ensure the DoD QSM values can be met. Revise the UXO 16 RI/SAP to provide this information.

Navy Response: The limits provided (some are from DoD QSM and some are in-house; the basis is provided) are those which will be used during the analysis. For example, if these limits are exceeded, then there is some kind of action (narrate, corrective action, etc.). In-house laboratory limits do not apply when there are DoD QSM limits.

Evaluation of the Response to GC 8: The response does not address the comment. The response states that in-house laboratory limits do not apply when there are Department of Defense Quality Systems Manual (DoD QSM) limits. While use of the DoD QSM values as measurement performance criteria (MPC) may be acceptable, Section 3.4.2 of the UFP QAPP Manual indicates that choosing a laboratory that can meet the project specific quality control (QC) acceptance limits is critical. Further, Worksheet #28 of the UFP QAPP Manual includes both MPC and laboratory/method-specific QC limits. Therefore, laboratory-specific QC limits should also be included in the UXO 16 RI/SAP to ensure that the current laboratory-specific limits can meet the project specified MPC. Revise the UXO 16 RI/SAP to provide the current laboratory statistically derived QC limits for all proposed analyses.

Navy Response to Evaluation Comment: The laboratory is evaluated using the DoD QSM limits, which are statistically generated across multiple laboratories. The laboratory is evaluated, using these limits, during their DoD ELAP audit. These are the limits which will be used during analysis and not in-house limits. For example, if there is an exceedance of a DoD QSM limit, the laboratory will take corrective action as appropriate and it may be necessary for the data validator to qualify. Therefore, in-house laboratory limits are not relevant and will not be included in the SAP.

9. The UXO 16 RI/SAP data concerning the distribution of munitions related materials differs somewhat from the distribution observed on the terrestrial portion of SWMU 4. Review this information and provide a discussion of the reasons for the differing distribution in the terrestrial versus the water related data.

Navy Response: This information is already provided in the Expanded Site Inspection Report (specifically, see Section 2.2), which is why the ESI Report is referenced in Worksheet #10 of the SAP.

10. The proposed sampling design for this effort is acceptable; however, for the Sites on the East side of the island where the navy will have to characterize sediments adjacent to UXO items still present in the marine environment, a more targeted sampling design to characterize munition constituents will likely be warrant.

Navy Response: Comment noted.

SPECIFIC COMMENTS

1. **Acronyms and Abbreviations, Page x:** The acronym "MPPEH" is incorrectly defined. The correct definition is: "material potentially presenting an explosive hazard." Revise the text to correct this definition. Also, the acronym "MC" is defined as "munitions constituents," whereas the definition presented in the Acronyms and Abbreviations section of the Expanded Site Inspection Report, Draft UXO 16 Adjacent to Solid Waste Management Unit 4 Expanded Site Inspection, reads "munitions constituent." This latter definition is the correct definition provided in DoD 6055.09-M-V8 (Department of Defense Ammunition and Explosives Safety Standards, Volume 8, Glossary). Correct the definition as noted.

   Navy Response: The "s" from materials and constituents has been removed.

2. **Worksheet # 10 (Conceptual Site Model), Expanded Site Inspection, page 24:** Although it is noted that Zones C and D had relatively low exposure potential, it appears that a greater amount of munition debris (MD) items were identified in Zone D compared to Zone B (Figure 5 All Zones Underwater Findings). Provide additional clarification as per the information presented in the Expanded Site Inspection Report Section 3.1.1 Zone Coverage, page 3-1.

   Navy Response: Zone descriptions were modified to include additional human exposure information, as provided in the Expanded Site Inspection Report. Updated text is as follows:

   - Zone A has the highest exposure potential because of ready beach access and shallow sandy areas potentially supportive of wading; approximately 25% zone coverage with generally 30-ft transect spacing.
   - Zone B has a moderate exposure potential because of lower beach accessibility and rocky, coral bottom, which would limit wading; approximately 15% zone coverage with generally 50-ft transect spacing.
   - Zone C has relatively low exposure potential because the beach is not readily accessible due to the long distance from the road and being bounded by high cliffs. Recreational snorkeling/diving could occur, but wading would be difficult due to the abundance of jagged rock and coral. Approximately 10% zone coverage with generally 80-ft transect spacing.
   - Zone D has relatively low exposure potential because it occurs greater than 400 feet offshore and is beyond the depth of where water depth is typically greater than 12 feet; therefore, snorkeling/diving from a boat may occur, swimming/snorkeling from shore would not be likely, and wading would not occur. Approximately 10% zone coverage with generally 80-ft transect spacing.
   - Zone E has very low exposure potential because it extends from approximately 300 to 2,000 feet offshore, with depths approximately 15 to 30 feet. Snorkeling /diving from a boat may occur, swimming/snorkeling from shore would not be likely, and wading would not occur. This zone occurs outside of the depth of closure; approximately 5% zone coverage with generally 130-ft transect spacing.

3. **Worksheet #10 (Conceptual Site Model), Potential receptors and exposure pathways, Page 26:** The UXO 16 RI/SAP mentions that the wildlife receptors of concern identified for potential consideration through food web exposure in a future Ecological Risk Assessment (ERA) include birds (e.g., brown pelican), mammals (e.g., West-Indian manatee and bottlenose dolphin), and reptiles (e.g., hawksbill turtle and loggerhead turtle). However, the Master ERA Protocol (p. 7) specifically states "Upper trophic-level receptor species quantitatively evaluated in the ERA will be limited to birds and mammals, the taxonomic groups with the most available information regarding exposure and toxicological effects". In addition, the Master ERA Protocol (p. 7) does not include the West-Indian manatee or bottlenose dolphin as target aquatic mammal wildlife receptors for use in wildlife exposure modeling. Amend the text of the UXO 16 RI/SAP to address these critical discrepancies and note that the master ERA protocol will be updated to include aquatic mammals.

   Navy Response: As noted in first paragraph of the Final ERA Protocol, Revision 1, which was provided to the agencies on October 5, 2015, the protocol does not apply to off-shore aquatic habitats (open ocean). UXO 16 supports open ocean species such as manatee and dolphins. For open ocean species not included in the ERA Protocol, associated exposure and toxicological information will be provided in the ERA that will be included in the UXO 16 (adjacent to SWMU 4) RI Report, which will be provided for agency review. The RI SAP contains sufficient information regarding the species that will be considered in the UXO 16 RI ERA. The Master ERA Protocol will be revised to account for open ocean receptors, but this update will done concurrently with implementation of the RI, not prior to implementation, as doing so would unnecessarily delay the field work.

4. **Worksheet #10 (Conceptual Site Model):** Duplicate text appears on pages 23 and 24. The first paragraph under the heading UXO 16 and SWMU 4 beginning "SI field activities were conducted from July 9 to July 15, 2012…" on page 23 also appears on page 24 under the heading Site inspection. Revise the UXO 16 RI/SAP to remove the duplicate text.

   Navy Response: Revised as requested

5. **Worksheet # 11 (Project Quality Objectives/Systematic Planning Project Statements), page 27:** Under item 1, the first paragraph, it should be noted whether any of the DMM or MPPEH are intact. Further, during the ESI, 3 MPPEH were identified and removed. Please indicate whether the three proposed sediment samples in the vicinity of MPPEH are from the same3 MPPEH locations, as discussed in Worksheet # 17 – Sampling Design and Rationale, first bullet.

   Navy Response: In Worksheet #11, Item 1, the first sentence has been updated as follows:
   "This question will be answered by collecting a minimum of 21 sediment samples for analysis of MC (explosives and inorganics) at the general locations where MEC/MPPEH were identified and removed (<u>3 DMM identified during the ESI that were generally intact but corroded, and 3 MPPEH fragments identified during the SI</u>), in areas where higher densities of munitions-related items were identified and removed, in depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present, as shown in Figure 7."

6. **Worksheet #11 (Project Quality Objectives/Systematic Planning Project Statements), Page 27:** Under item 1, the text states that 16 background sediment samples will be collected from marine in-shore areas outside of the influence of the OB/OD activities. It is currently unknown if the 16 proposed background samples are enough to properly characterize the inherent variability in the background inorganics concentrations. A statistical power analysis needs to be applied to evaluate the analytical results and help determine if the background sediment dataset will be robust enough to support defensible risk management decision making. Generating a background dataset acceptable to all parties concerned is a

key component of the proposed sampling program because (see last sentence in the bottom bullet on p. 31 of the UXO 16 RI/SAP) "[…], if the only chemicals exceeding RSLs [Regional Screening Levels] or ecological screening values are inorganic constituents within background levels, a Human Health Risk Assessment (HHRA) and ERA will not be necessary." This statement is not in agreement with item 2 which indicates that a human health risk assessment and an ecological risk assessment will be conducted. Further, the statement that an ERA will not be necessary does not take into account the need to conduct food chain modeling in the event that contaminants of bioaccumulative concern are identified. Comparison of inorganic concentrations to background inorganic values is conducted as part of the Step 3a ecological risk assessment, and not during the Screening Level Ecological Risk Assessment. Therefore this statement should be amended. Specifically it should be clear that this statement refers to a "release assessment" rather than a "risk assessment." Hence, important risk management decisions are likely to hinge on the statistical power of the background sediment dataset. Amend the text to fully address this issue.

Navy Response: The number of background samples is consistent with prior Vieques background investigations and EPA's Unified Guidance recommendation that a minimum of at least 8 to 10 independent background observations be collected before running most statistical tests, and the Vieques Technical Subcommittee concurrence on this approach for previous background data. The collection of a total of 16 background sediment samples, which may be divided into two data sets representing different sediment types, is appropriate.

It has been previously concurred upon by the Navy and regulatory agencies that HHRAs and ERAs are not necessary if the only chemicals exceeding human health or ecological screening values are inorganic constituents attributable to background. Please see the excerpts from the Final Meeting Minutes – Vieques Technical Subcommittee Conference Call – April 19, 2005 and associated background data use decision flowcharts (attached).

Item 2 of Worksheet #11 has been revised to read: "Once the nature and extent of contamination have been . . . in a human health risk assessment (HHRA) and ecological risk assessment (ERA) performed, if necessary, in accordance with . . . . Master ERA Protocol, including Addendum 1 (CH2M HILL, 2015a), modified to include the ecological receptors identified in the CSM (Worksheet #10). If the only constituents exceeding human health or ecological risk-based screening values are inorganics and their concentrations are attributable to background, risk assessments will not be necessary."

7. **Worksheet #11 (Project Quality Objectives/Systematic Planning Process Statements), Page 27:** Worksheet #11 indicates that the sampling program was developed, in part, to "provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination;" however, it is unclear what spatial coverage requirements (e.g., minimum number of samples per area) have been established and how the proposed sampling approach satisfies these requirements. It is noted that similar references to spatial coverage are included throughout the UXO 16 RI/SAP. Revise the UXO 16 RI/SAP to include specific spatial coverage objectives and to demonstrate how these objectives will be achieved.

Navy Response: There is no requirement for a minimum number of samples per acre. The approach to characterizing the site is consistent with the approach that has been used throughout many RIs conducted at Vieques whereby sampling targets particular areas of interest (e.g., areas most likely contaminated, potentially higher receptor use or exposure), but includes samples elsewhere to ensure information across the site is obtained, such that the nature and extent for the site as a whole can be conservatively determined. In Worksheet #11, Environmental Question #1, the first sentence has been modified as follows:

"This question will be answered by collecting a minimum of 21 sediment samples for analysis of MC (explosives and inorganics) at the general locations where MEC/MPPEH were identified and removed (3 DMM identified during the ESI that were generally intact but corroded, and 3 MPPEH fragments identified during the SI), in areas where higher densities of munitions-related items were identified and removed, in

depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present, as shown in Figure 7."

8. **Worksheet #11 (Project Quality Objectives/Systematic Planning Process Statements), Page 27:** Worksheet #11 states that "The nature and extent of contamination and the results of the HHRA and ERA will be used, in conjunction with risk management considerations (e.g., land uses, control mechanisms, remedy feasibility), to determine (1) if remedy/removal actions are warranted, or (2) if no further action other than land use controls (due to the potential presence of MEC) is warranted." It is noted that the risk management considerations included above may constitute a remedy and therefore require selection by means of the CERCLA process. As noted in Step 6 (MC and MEC)—RI Report and Feasibility Study (FS) Report Preparation, evaluation of remedial alternatives is performed in a Feasibility Study. Revise the quoted statement to clarify that the full CERCLA process will be observed.

   Navy Response: The following has been appended to the end of the referenced sentence: "as part of the normal CERCLA process."

9. **Worksheet #11 (Project Quality Objectives/Systematic Planning Process Statements), Page 29:** Worksheet #11 states, "Matrix spike/matrix spike duplicates (MS/MSDs) are collected at a frequency of 2 pair per 20 field samples (i.e., 10 percent)" however; this statement conflicts with Worksheet #20 (Field Quality Control Sample Summary Table) which states that MS/MSD samples are 1 per 20 samples per matrix. Revise the UXO 16 RI/SAP to clearly address the sampling protocol for MS/MSD samples per a given number of analytical samples taken.

   Navy Response: The statement in Worksheet #11 has been updated to "Matrix spike/matrix spike duplicates (MS/MSDs) are collected at a frequency of 1 pair per 20 field samples (i.e., 5 percent)" for consistency with Worksheet #20 et al.

10. **Worksheet #11 (Project Quality Objectives/Systematic Planning Process Statements), Page 30:** Worksheet #11 states in Step 2 (MEC)—Determination of Additional MC Data Needs based on Additional MEC Delineation, that "This step is not applicable since the Step 1 (MEC) PQOs [project quality objectives] were met by the ESI (i.e., the answer to the Step 1 (MEC) question in Figure 9 is "Yes." However, it is noted that, the Draft UXO 16 Adjacent to Solid Waste Management Unit 4 Expanded Site Inspection, Section 3.1.1, Zone Coverage, indicates that only a limited portion of the areas covered by the investigation were evaluated; this focused effort was based on exposure potential and likely occurrence of MEC/other MPPEH (varying from 5 to 25 percent coverage). Also, Section 3.1.2, Location of Transects, of Attachment A indicates that some transects were spaced closer together nearshore to more conservatively assess areas presumably closer to MEC/MPPEH sources. As a result, it is unclear if MEC has been adequately characterized. Revise the UXO 16 RI/SAP to include a more detailed discussion of the adequacy of characterization of MEC that demonstrates that the MEC PQOs were achieved and no further characterization is necessary.

    Navy Response: The Navy feels the adequacy of MEC characterization has been well described in the ESI Report and RI SAP Worksheets #10 and #11.

    As stated in Section 4 of the ESI, the nature and extent of munitions within UXO 16 offshore of SWMU 4 is consistent with what is expected based on the CSM, and the nature and extent of MEC and MD has been sufficiently delineated to satisfy the objectives of an RI.

    As described in RI SAP Worksheet #11, determination of the nature and extent of MEC has two purposes, first is to make explosive safety hazards and associated remedy determinations for the MEC itself, and second is to provide sufficient information on the distribution of MEC such that MC characterization can be performed.

It is important to note that it is necessary only to delineate the nature and extent of MEC until MEC remedy decisions for the site and conservative MC characterization determinations can be made with confidence. In other words, MEC is sufficiently delineated once the remedial actions necessary to protect human health from potential explosive hazards posed by MEC for the potential or intended land use can be appropriately evaluated and selected, which can be done based on the data collected. Therefore, MEC nature and extent have been sufficiently delineated.

Further, the ESI Report does not indicate that only a limited portion of the area was evaluated as the comment states. In fact, the ESI explains that the investigation was focused based on the CSM and that, in fact, the coverage area of the investigation significantly exceeded coverage of an RI conducted at Culebra.

11. **Worksheet #13, Secondary Data Criteria and Limitations Table, Page 35:** This worksheet indicates that there is no secondary data; however, environmental question #3 listed in Worksheet #11 discusses data collected from the Site Inspection (SI) and Expanded Site Investigation (ESI) while the Executive Summary also discusses the ESI. Revise Worksheet #13 to list all secondary/historical data and provide any limitations on the use of that data.

    Navy Response: The worksheet has been revised as follows:

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
UXO 16 SI	UXO 16 Adjacent to Solid Waste Management Unit 4 Expanded Site Inspection, CH2M, November 2015	USAE, Munitions, 2012	To help identify nature and extend of munitions and related items To help identify sediment sampling locations	none

12. **Worksheet #14 (Summary of Project Tasks), Page 38:** Under the Investigation Derived Waste Management (IDW) subsection, Worksheet #14 indicates that "If practical, the liquid IDW will be allowed to evaporate." While such an approach may be acceptable, it is unclear how associated solids (e.g., the "environmental media" referenced in the preceding Equipment Decontamination subsection) will be addressed. It is also noted that sediment samples will be collected using some form of device (e.g., "push tube," "scoop") and returned to the surface where it will be transferred to laboratory containers. It is unclear how these devices/containers will be utilized (e.g., disposed, decontaminated between sample collection locations and how residual sediment with be handled once or if equipment is decontaminated). Revise the UXO 16 RI/SAP to clarify how solid environmental media IDW, if generated, will be addressed.

    Navy Response: Due to the nature of the sampling approach and the media that will be sampled, little to no solid environmental media IDW is anticipated. Whatever film or minor residue of sediment left on the sampling equipment will be washed off in the ocean prior to decontamination procedures.

13. **Worksheet #15 (Reference Limits and Evaluation Table), Page 41 to 46:** For several analytes listed in Worksheet #15, the project action limits (PALs) are not listed; therefore, it is unclear how these analytes will be evaluated. Revise the worksheet to discuss how analytes without PALs will be evaluated.

    Navy Response: There are no PALs for nutrients (Na, Ca, Mg, K) but these are part of the TAL; this information has been added as a footnote in Worksheet #15-2. For pH, TOC, and ORP, refer to Footnote #2 at the bottom of Worksheet #15-3. For AVS/SEM there are no PALs/PILs but the ratio of SEM to AVS is used to determine availability, which has been added to footnote 2 in Worksheet #15-5.

14. **Worksheets #15-1 and #15-2 (Reference Limits and Evaluation Table), Pages 41 to 42:** The worksheets note when PALs are less than the limits of detection (LODs), but the uncertainty associated with results reported below the limits of quantitation (LOQs) is not discussed. For example, when the screening level is between the LOD and LOQ, the UXO 16 RI/SAP should discuss why results are sufficient to meet project data quality objectives (DQOs). Further, in cases where the screening level is less than the LOQ, but above the LOD, this discussion should also include why the level of uncertainty associated with detected results less than the LOQ (i.e., results that are not quantifiably reliable) was deemed acceptable and allowed project DQOs to be met. Revise the UXO 16 RI/SAP to provide a discussion on uncertainty in cases where the screening level is less than the LOQ.

Navy Response: As described in Worksheet #37, the laboratory applies J-flags to results between the LOD and LOQ to indicate that they are estimated. Although there is some added uncertainty in the concentration of estimated results, estimated data are generally considered usable for all purposes at their reported concentration. When the screening level is between the LOD and LOQ there is added uncertainty when the result is also between the LOD and LOQ (there is not added uncertainty when the result is detected at greater than the LOQ or is nondetect) but detections are still compared directly to screening levels. The added uncertainty is discussed in the data quality evaluation and risk assessments included in the RI Report. This clarification has been added to the second bullet of Worksheet #37.

Evaluation of the Response to SC 14: The response does not address the comment. The response does not address the uncertainty associated with detected results less than the limit of quantitation (LOQ) as requested in the comment, and instead, indicates that uncertainty will be discussed in the data reporting phase of the project. However, this uncertainty should be addressed during the planning phase to ensure all parties are in agreement regarding the uncertainty. Further, detected results below the LOQ are not quantifiably reliable, and simply flagging the results as estimated and using them may not be acceptable. If detected results less than the LOQ will be used, the UXO 16 RI/SAP should discuss the uncertainty associated with these results. In addition, as results less than the LOQ are not quantifiably reliable, the UXO 16 RI/SAP should discuss why the uncertainty associated with detected results less than the LOQ was considered acceptable and allowed for project data quality objectives (DQOs) to be met. For example, if the project action limit (PAL) is below background, the elevated laboratory LOQ would not be an issue assuming it was also below or equal to the background value. A second example for sufficient rationale for determining that DQOs were met in cases where the LOQ is above the PAL would be that the compound is not a site contaminant of concern (COC) and/or had never been recorded as used at the site. A final example which may be acceptable is that the COC is part of a larger group of analytes, is not expected to be found alone, and that other analytes in the group have LOQs less than the PALs. Please note that these are only examples and the UXO 16 RI/SAP should provide specifics for this particular situation. Revise the UXO 16 RI/SAP to discuss the uncertainty associated with detected results less than the LOQ. Also, revise the UXO 16 RI/SAP to discuss why this level of uncertainty was considered acceptable and allowed project DQOs to be met.

Navy Response to Evaluation Comment: Although there is uncertainty associated with detections at concentrations less than the LOQ (especially when the screening level is also less than the LOQ), this uncertainty is acceptable and results are still usable at their reported concentration because the planned data set is sufficiently large to account for some estimated data, which is a common approach in CERCLA and one that has been used for all other Vieques projects to date. Additionally, it is consistent with risk assessment guidance. Further, the DQE will make an evaluation of the usability of the resulting dataset and will consider the quantity of estimated data versus unqualified data.

For clarity, a third bullet was added to Worksheet #37 to state “When detected results and screening levels are both less than the LOQ, results are still used at their reported concentration, which may be greater than or less than the screening level. The resulting uncertainty is acceptable because the planned data set is sufficiently-large. In addition, the DQE will make an evaluation of the usability of the resulting dataset and

will consider the quantity of estimated data versus unqualified data."

15. **Worksheet #15-1 (Reference Limits and Evaluation Table), Page 41:** The lower control limits (LCLs) and upper control limits (UCLs) provided in the table (excluding limits for Perchlorate and Picric Acid) are not consistent with DoD QSM, Appendix C, Laboratory Control Sample (LCS) Control Limits and Requirements. For example, Worksheet #15-1 lists the LCL for Tetryl as 68 and UCL as 135. However, DoD QSM, Appendix C, Table 35, Method 8330 Solid Matrix lists the LCL as 66 and the UCL as 138 for Tetryl. Revise the worksheet to list the correct LCLs and UCLs as provided in the DoD QSM. Alternatively, revise footnote 4 to provide the source of the limits in this worksheet.

    Navy Response: Accuracy limits on Worksheet #15-1 are consistent with DoD QSM Appendix C, Table 37 (Method 8330B Solid Matrix) where applicable.

16. **Worksheet #17 (Sampling Design and Rationale), Page 49:** It is shown that all samples for spatial extent have been located along transect investigated during the ESI with no findings, Zones (B and E). No spatial coverage samples have been proposed for Zone C. Please explain the rational used for the selection of these spatial coverage sediment samples, and why all are located within investigated transects. It may be appropriate to move some to areas that have not been investigated and to add additional sample locations for spatial coverage in Zone C, especially near the southern area of Zone C. Also sediment sample SD-15, is identified as a spatial coverage sample. However, it appears to have a better fit to the Depositional areas from ephemeral stream category or group.

    Navy Response: The comment "no spatial coverage samples have been proposed for Zone C" is incorrect; please see Worksheet #17 and Figure 7 related to sample location SD-02 located in Zone C to evaluate spatial extent. However, an additional sample SD-20 has been added in the southern area of Zone C, "upstream" of the site. The following text has been added as part of the spatial coverage bullet: "SD15 will also evaluate the potential for contaminant migration from the former Laguna Boca Quebrada outlet to the ocean."

    The munitions investigation sufficiently delineated the nature and extent of munitions at the site and the seafloor bottom along each transect. It is appropriate to place sample locations along transects based on findings of previous investigations and of known seafloor conditions to avoid impacting potential habitats. The locations and rationale for spatial coverage are appropriate along former transects to determine if MC occur spatially at the site.

    Evaluation of the Response to Specific Comments (SCs) 12 and 16: The responses address the comments. However, ensure that the information presented in the responses is incorporated into the final UXO 16 RI/SAP.

    Navy Response to Evaluation Comment: The information provided in the responses to Specific Comments 12 and 16 has been added to the SAP.

17. **Figure 7, Proposed Sample Locations**, shows that MD were detected in five locations in Zone B. However, no samples are proposed in the vicinity of two of these detections located toward the central area and along the coast within Zone B. It may be appropriate to add a sediment sample in this area to potentially characterize any impacts from the MD.

    Navy Response: An additional sample, SD-21, has been placed in the vicinity of the two nearshore MD items in Zone B.

18. **Worksheet #19 (Field Sampling Requirement Table), Page 53:** The worksheet does not provide the maximum holding times. Instead, the worksheet lists the analytical and preparation SOPs in the holding time column. Revise the worksheet to provide the maximum holding times for each analytical group.

Navy Response: The missing information was added: 14 days / 40 days for 8330B and picric acid; 28 days for 6850; 180 days for 6010/6020; 30 days / 7 days for hexavalent chromium; ASAP for pH; 28 days for TOC; 30 days for ORP; N/A for grain size; 14 days / 7 days for AVS; 180 days for SEM; and 28 days for SEM mercury.

19. **Worksheet #21 (Project Sampling SOP References Table), Page 57:** This worksheet notes that SOP G-2, Sediment Sampling, will be modified for project work, but it is unclear how this SOP will be altered. Revise this worksheet to discuss how the SOP will be modified for the current investigation.

    Navy Response: Worksheet comments for modified SOP G-2 have been revised as: "Modified to include collection of sediment by SCUBA diver and/or remotely-operated vehicle (ROV) with sampler."

20. **Worksheet #23 (Analytical SOP References Table), Page 61:** This worksheet notes that APPL Laboratory SOP PRE3050B, Acid Digestion of Sediments, Sludges, and Soils by EPA Method 3050B, 06/2015, Rev. 3, will be modified for project work, but it is unclear how this SOP will be altered. Revise this worksheet to discuss how the SOP will be modified for the current investigation.

    Navy Response: Worksheet #23 for PRE3050B was updated to reflect that the SOP will not be modified, as is not required for discrete samples.

21. **Worksheet #27 (Sample Custody Requirements), Page 73:** The project-specific sample identification/numbering scheme has not been included in this worksheet. Revise the UXO 16 RI/SAP to describe how samples will be identified, or reference where this information may be found.

    Navy Response: Worksheet #27 does not pertain to sample identification/numbering. That information is included in Worksheet #18.

22. **Worksheet #34-36 (Data Verification and Validation (Steps I and IIa/IIb) Process Table), Pages 105 to 107:** The worksheet does not indicate what will be included in the data verification/validation reports. Revise the UXO 16 RI/SAP to ensure that data validation and verification reports will present a discussion of all QC parameters evaluated, the acceptance criteria used to evaluate each QC parameter, a list of all QC exceedances as well as the extent of the exceedance, the samples associated with each exceedance, and the qualifiers applied.

    Navy Response: A new row was added to Worksheet #36 just above "Third-Party Data Validation (METAL)[3]." The data review input is "Validation Reports." The description is "Data validation narratives will include, at a minimum, a discussion of all QC parameters evaluated, acceptance criteria, QC exceedances, associated samples, and a summary of qualifiers applied." The "Data Validator/TBD" is responsible for verification. It is Step IIa / IIb and External.

23. **Worksheet #37 (Usability Assessment), Page 109 to 110:** The contents of the data quality evaluation (DQE) report have not been specified. For example, this worksheet indicates biases in the data and unacceptable QC will be assessed, but it is unclear if the DQE will discuss these evaluations. The DQE should include a detailed description of how the items discussed in Worksheet #37 were evaluated along with sufficient information to support the data usability conclusions. Revise Worksheet #37 to indicate that the information discussed in Worksheet #37, along with sufficient information to support the data usability conclusions, will be included in the DQE.

    Navy Response: A final bullet has been added to Worksheet #37 that states "The information discussed in Worksheet #37 will be included in the DQE along with sufficient information to support the data usability conclusions."

24. **Worksheet #37 (Usability Assessment), Page 110:** The calculation of completeness indicates that the amount of available results will be compared to the total number of results. However, completeness should be calculated relative to the total amount of results planned in order to account for results that were not able to be obtained (e.g., sample breakage, inability to collect a sample, etc.). Revise this worksheet to indicate completeness will be calculated based on the number of planned results.

    Navy Response: The completeness calculation will remain as it is since it is appropriate to know the amount of available results relative to the total results and is consistent with past Vieques projects. The amount of results not obtained would be a separate discussion in the report as a work plan deviation (and the potential effects on the ability to meet the project objectives). Please note that samples are typically recollected when there is breakage, holding time expiration, etc. (situations for which recollection would yield usable data).

    Evaluation of the Response to SC 24: The response does not address the comment. Completeness should be calculated by comparing the number of available results to the total number of results planned in order to determine any limitation on data use, which is also consistent with Section 5.2.3.1.6 of the UFP QAPP Manual. Alternatively, field completeness should be reported, which utilizes the number of planned samples in the denominator. Revise this worksheet to indicate completeness will be calculated based on the number of planned results.

    Navy Response to Evaluation Comment: As noted previously, the completeness calculation will remain as is. This is the approach that has been approved and utilized for previous Vieques projects and the process should remain consistent. With respect to work plan deviations in the report, where work plan deviations are discussed, “field completeness” will also be calculated by considering the number of planned samples (samples not collected would be a deviation to the work plan).

25. **Attachment B, Munitions Related Items Photographic Log, Page B-16:** The description of Item ID # 87126 reads “20mm projectile.” No information is provided as to the type of 20mm projectile (e.g., HE, HE-I, Target Practice) is provided. As the photograph appears to present a projectile that is badly corroded and no type identification is provided, it is unclear how the munitions debris group classification was determined. Review the cited photograph and revise the description to indicate the projectile type. If this is unknown, provide an explanation as to how the munitions debris group classification was determined.

    Navy Response: The munitions debris group classification of all items was done by UXO qualified technicians in the field. Specific identifiable features that were not clearly visible were not reported.

    Evaluation of the Response to SC 31: The response addresses the comment. It is noted that the second sentence in the response states “were that were not,” which appears to be a typographical error. The sentence should likely read, "Specific identifiable features that were not clearly visible were not reported.” Ensure that this correction is incorporated into the final UXO 16 RI/SAP.

    Navy Response to Evaluation Comment The corrected sentence has been incorporated into the SAP.

Minor Comment:

1. EPA suggest that Attachment A, UXO 16 Adjacent to Solid Waste Management Unit 4 Expanded Site Inspection, be made a standalone document and not just and attachment to the UXO 16 RI/SAP.

    Navy Response: At the July 2015 Technical Subcommittee meeting, the team concurred in general with the RI approach and to include the ESI Report as an appendix to the RI SAP instead of a standalone document because it will save significant time (i.e., accelerate the CERCLA process in this area). However, since this

approach will have met this objective once all reviews are completed, when the RI SAP is finalized, the ESI Report will be removed and finalized as a separate report.

Responses to PREQB Comments on the
Draft UXO 16 Adjacent to Solid Waste Management Unit 4
Remedial Investigation Sampling and Analysis Plan
Atlantic Fleet Weapons Training Area – Vieques
Former Naval Ammunition Support Detachment Vieques, Puerto Rico

PAGE-SPECIFIC COMMENTS

1. SAP Worksheet #10:

   a. Transport by wave action is discussed and considered insignificant, particularly for water column contamination. Please clarify whether there is any other physical or transport mechanism that might be of concern, particularly for the transport of contaminated sediment or munitions-related items themselves, or for substantial burial of potential contaminants under fresh sediment. These might include longshore currents (related to breaking waves, which is implied by the yellow arrows shown in Figure 6, but not discussed), areas of sediment erosion/deposition, bioturbation, and other mechanisms. Please provide a more thorough discussion of other potential physical and/or transport mechanisms beyond wave activity alone.

      Navy Response: The following has been added to Worksheet #10: "Other physical and/or transport mechanisms potentially affecting sediment or munitions related items include ocean currents and upland erosion. Prevailing current at the site is from the southwest (Figure 6) which could transport and deposit suspended particles. The ephemeral stream associated with SWMU 4 can intermittently deposit sediment in the area during storm events. Movements of sediment can either cover or expose MEC/MPPEH/MD."

2. SAP Worksheet #11:

   a. The assumption in the design of the sampling plan is that MEC/MPPEH have not migrated since their deposition on the seafloor, and thus any related chemical contamination should be found in the immediately adjacent sediments. It seems likely that migration of MEC/MPPEH would have occurred, even if only during very infrequent, extreme events (e.g. hurricanes/tropical storms). Please provide a more complete rationale for this assumption (either in Worksheet #11, or #10).

      Navy Response: It is neither stated nor assumed in the sampling plan that MEC/MPPEH have not migrated since their deposition on the sea floor. The sampling design is, in fact, based on the assumption that munitions and/or contamination may have migrated, which is why many samples target depositional areas and areas where the vast majority of munitions-related items were found (i.e., which represent depositional [either direct or via migration] areas). The CSM presented in the RI SAP specifically discusses munitions transport and the ESI was designed to identify current locations of MEC/MPPEH in the offshore environment (UXO 16), either dropped/deposited into the ocean from OB/OD activities, transported from land via the main ephemeral stream, or transported within the offshore environment due primarily to wave action. Because the ESI verified the CSM and sufficiently delineated the nature and extent of munitions and munitions-related items, the RI sampling approach developed based on the CSM is appropriate.

   b. Page 29: Please revise the frequency of MS/MSDs to 1 pair per 20 field samples, as noted on Worksheet #20.

Navy Response: The statement in Worksheet #11 has been updated to "Matrix spike/matrix spike duplicates (MS/MSDs) are collected at a frequency of 1 pair per 20 field samples (i.e., 5 percent)" for consistency with Worksheet #20 et al.

3. SAP Worksheet #14, Sediment Sampling Methods:

   a. Please elaborate on GPS location procedures, including whether GPS units are being used. Also, please provide the accuracies of the GPS units. Additionally, drift during descent of marker buoys could alter positions even further. In cases where sampling is intended to be in the immediate vicinity of previously identified MEC, it is possible that the sample may only be within 4 to 5 m of the intended location, or farther. Please provide additional detail, either through a location procedure with less error than identified above, or by demonstrating that contamination associated with identified MEC is likely to be found within a radius larger than the potential location error.

      Navy Response: The following clarification has been included in Worksheet #14: "Sampling locations will be initially located by boat and using a hand-held Trimble (or similar) Global Positioning System (GPS) unit with sub-meter accuracy. A weighted line with float will be lowered to mark the targeted location. An underwater inspection by munitions divers will be conducted by sweeping the location with a metal detector to verify that it is safe to collect intrusive sediment samples. If required for safety, the marker will be move to the nearest cleared location. After final inspection, the marker line will be adjusted to position the float directly over the sample location, and a final GPS coordinate will be taken. However, it should be noted that where samples will be collected at the locations of items found during the SI/ESI, the samples will be collected in the general vicinity of the former locations of those items due to the practical constraints associated with recording (and re-acquiring) coordinates of objects on the sea floor using GPS units on the sea surface. However, as the objective of the RI is to establish sediment chemical characteristics that represent UXO 16 (offshore of SWMU 4) as a whole, and that multiple samples will be collected across this area, this level of accuracy is sufficient to meet the objective."

   b. Please clarify the methods that will be used to collect the sediment samples (e.g., core sampling).

      Navy Response: The sediment sample collection methods have been clarified in the 3 bullets on page 38 of Worksheet #14, as follows:

      Sediment sampling methods may include collection with a coring device, scoop/jar, remotely-operated vehicle (ROV) with sampler, and/or ponar dredge. Regardless of which method is used, the sediment will be collected from approximately the top 6 inches of sea floor. Sampling will require the use of boats in this offshore environment. Various environmental factors can influence the actual method employed at each sampling location. Examples include sea conditions, water depth, compactness of sediment, density of algal or seagrass growth on the sediment, presence of large stone or shell material in the sediment, shallow sediment depth, and proximity to protected or sensitive species such as corals. Best professional judgement by field scientists will be used to select the optimal sampling method at each location. Potential sediment sampling methods are as follows:

      - Divers will be deployed to collect sediments where an ROV or ponar dredge is not practical. A sediment coring device such as a "push tube" (i.e., Lexan tube), or a short stainless steel sediment auger with a Lexan tube insert, may be used to collect 0-6 inch (approximate) sediment samples. The samples may be transferred to sampling jars at the location of collection or the ends of the coring device or tube will be covered underwater to retain the sediment for transport to the surface where the sediment will be transferred to laboratory containers. If sediment cannot be adequately collected or retained using a coring technique, such as in areas with very shallow sediment or having loose sediment that cannot be retained in the core, sediment will be collected using a spoon or scoop and placed directly into a sample jar. Sediment samples will then be taken

to the boat and processed as appropriate, including transfer to laboratory containers (if not already placed in laboratory containers at the sampling location) and properly preserved.

- An ROV with an attached sampler capable of collecting sediment samples may be used. The ROV (with live video feed) will be maneuvered in the water to the marked sediment sample location. The sampler will "scoop" the sediment sample, and be returned to the boat for sample retrieval; multiple trips may be required to collect sufficient sample volume. Sediment samples will then be processed as appropriate, including transfer to laboratory containers and properly preserved.
- A Ponar dredge is a "clamshell" type device designed to sample in areas soft enough for the dredge to penetrate approximately 6 inches into the sediment. The Ponar, locked in an open position, will be lowered with a rope to the sediment surface at a marked sampling location. An automatic release then allows the "clamshell" to close and retain sediment as it is retrieved to the boat. Sediment samples will then be processed as appropriate, including transfer to laboratory containers and properly preserved.

4. SAP Worksheet #17:

   a. Page 49: The text states that sediment samples SD-07, SD-11, SD-12 and SD-17 are proposed to be collected at locations where photoflash cartridges were previously recovered. However, only three photocartridges were reported to have been found and their locations are depicted on Figures 6 and 7. The sampling rationale for sediment sample SD-17 is unclear as it does not appear to be located in the vicinity of a photoflash cartridge. Please correct or clarify the rationale for sample SD-17.

      Navy Response: SD-17 is the location of a photoflash cartridge base section. This description has been added to page 49.

   b. Page 49: Background sediment samples will be analyzed for the same parameters as the site sediment samples. It is unclear why AVS/SEM is also being analyzed in the background samples as this parameter indicates the bioavailability of divalent metals in sediment which is generally not a concern with background locations that are unaffected by past releases. Is this parameter necessary for the background samples and, if so, please clarify how the results of this analysis will be used in the comparison of site sediment sampling data and the background sampling data.

      Navy Response: AVS/SEM analysis has been removed from background samples.

   c. Please provide a metric for the proximity of sample locations to the former locations of identified items (e.g., 5 meters, etc.).

      Navy Response: It is not possible to provide an exact metric because it is influenced by sea conditions. The following has been added to the first bullet item in Worksheet #17: "Samples will be collected as close as possible to the original coordinates of recovered items. However, it should be noted that where samples will be collected at the locations of items found during the SI/ESI, the samples will be collected as close to the former locations of those items as is practical due to the constraints inherent with recording (and re-acquiring) coordinates of objects on the sea floor using GPS units on the sea surface. When the items were found, their positions were recorded using GPS at the ocean surface. These coordinates will be used to re-acquire the positions at the ocean surface and then transferred to the ocean floor (e.g., using weighted lines, coordinates entered into the ROV, etc.) where the samples will be collected. While there is a margin of error of up to several feet based on the accuracy of the GPS and the ability to transfer the coordinates to the ocean floor, this is the best way to re-acquire the item locations and since the objective of the RI is to establish sediment chemical characteristics that represent UXO 16 (offshore of SWMU 4) as a whole, because multiple samples will be collected across this area, this level of accuracy is sufficient to meet the objective."

5. Worksheet #17 & Related Data in Worksheet #18: Please clarify whether the 0-6-inch sampling depth is sufficient to recover historical contamination in active depositional areas, which may potentially be capped by recent (and cleaner) sediment. Please provide more complete rationale for chosen sampling depth.

   Navy Response: The 0-6 inch sampling depth represents the sediment exposure depth for human and ecological receptors, and is consistent with associated risk assessment protocols. This information has been added to Worksheet #17.

6. SAP Worksheet #19:

   a. Please correct the last column to include the holding times for each analysis.

      Navy Response: The requested change has been made.

   b. Please correct the SOP for ORP to ASTM D1498, as per Worksheet 323.

      Navy Response: On Worksheet #19, the SOP Reference has been updated from "GEN-CR6" to "ASTM D1498."

7. SAP Worksheet #21: According to this worksheet, SOP G-2, Sediment Sampling, will be modified for this project. Please provide details on the modifications.

   Navy Response: The following sentence will be added into the comments section of Worksheet #21 for modifications of SOP G-2: "Modified to include collection of sediment by SCUBA diver and/or remotely-operated vehicle (ROV) with sampler."

8. SAP Worksheet #26: Sample Receipt: Please revise to note that APPL will forward ORP and AVS/SEM fractions to ALS.

   Navy Response: The statement has been revised to read "Note that all samples will be shipped to APPL who will forward ORP and AVS/SEM fractions to ALS-Kelso and GRAINSIZE fractions to Test America-Burlington."

9. SAP Worksheet #28:

   a. Worksheet # 28-2: Please clarify if the second column confirmation is applicable to this method which utilizes MS.

      Navy Response: The requirement for "Confirmation of positive results (second column)" has been removed from Worksheet #28-2.

   b. Worksheet #28-11: The header of this worksheet indicates it is for grain size analysis. However, it appears to be for ICP-AES analysis. Please clarify and also please provide a worksheet 28 for the AVS/SEM analysis.

      Navy Response: Worksheet #28-11 is for AVS/SEM. The analytical group has been updated to "AVSSEM." The Analytical Method/SOP Reference has been updated to "EPA 821_R-91-100 / GEN-AVS, MET-7470A, MET-ICP."

10. SAP Worksheet #34-36: Third-Party Data Validation (Metals and Explosives): Please update the referenced National Functional Guidelines to the most recent August 2014 version.

Navy Response: The reference, which occurs twice on Worksheet #36, has been updated to "National Functional Guidelines for Inorganic Superfund Data Review (OSWER 9355.0-131; EPA-540-R-013-001; August, 2014."

11. SAP Worksheet #37: Please revise the second sentence of this worksheet as it appears to be left over from another SAP.

    Navy Response: The sentence has been updated to state "Given that the primary objective of this effort is to determine the nature and extent of potential munitions constituents contamination as a result of former OB/OD operations at SWMU 4, the comprehensive dataset . . ."

12. Attachment B: The laboratory certification provided in Appendix F for APPL expired in November 2015. Please provide an updated certificate of accreditation for this laboratory.

    Navy Response: Attachment B has been updated with APPL's DoD ELAP accreditation expiring 6/30/17.

13. Figures: Please provide bathymetry of study area, either on an overview figure or one of the Figures 2 through 5. Contours are shown in the perspective view of Figure 6, but they are difficult to interpret due to the view angle, and lack of labels.

    Navy Response: Bathymetry contours have been added to Figure 2

14. Figure 6 (RI SAP): Please consider addressing the legend for the bathymetric contours by changing the symbol background to blue with white lines, rather than open white box.

    Navy Response: Revised as requested.

Responses PRDNER Comments on:
Draft UXO 16 Adjacent to SWMU 4 Remedial Investigation (RI) Sampling and Analysis Plan (SAP)
Comments Made by PRDNER on February 10, 2016

PDF Pg. #	Doc. Pg. #	SAP Worksheet	Highlighted Document Text/ Summary of Content	DNER Comments	Navy Response
37	22	9	Sediment samples are proposed where DMM and MPPEH items have been found, in areas with higher densities of munitions-related items, in depositional areas, and in areas that provide appropriate spatial coverage to adequately assess the nature and extent of chemical contamination, if present.	Please define / identify the "depositional areas." Does this refer to areas of sediment deposition near the ephemeral stream discharge? If so, given the potential for nearshore sediment transport/mixing, what is the likelihood that MC will be detected in the location(s) where it may have been deposited years (or decades) before? How many samples will be collected in depositional areas and at what spacing/distance from the source(s) of deposition? In other words, the SAP should address how sediment sampling strategies contemplate and anticipate localized sediment transport processes when selecting sampling locations in these depositional areas.	"Depositional areas" and associated sampling locations are defined in Worksheet #17, as follows: • **Depositional areas from ephemeral stream** – SD04 through SD10, SD17, and SD18 occur at or in the vicinity of the sand fan from the ephemeral stream where contaminated sediments may have accumulated. The following has been added to this bullet: "The likelihood for munitions constituents (MC) detection is unknown; however, all these depositional area samples are biased toward locations where munitions debris (MD), discarded military munitions (DMM), and material potentially presenting an explosive hazard (MPPEH) were identified during the 2012 Site Investigation and 2015 ESI. This is a conservative sampling approach, focusing on the locations where contamination would be found, if present. "
38	23	10 (Background Section)	The offshore territorial waters are under the jurisdiction of the Commonwealth of Puerto Rico and extend nine nautical miles from the coast of Vieques.	Please revise the text to read: The Commonwealth of Puerto Rico Department of Natural and Environmental Resources (DNER) has jurisdiction over a 1,000 meter wide belt of all Puerto Rico's coastal lands (and additional distances where needed to protect key coastal natural systems), and the territorial waters, including submerged lands	The sentence was amended to read "PRDNER has jurisdiction over a 1,000 meter wide belt of all Puerto Rico's coastal lands (and additional distances where needed to protect key coastal natural systems), and the territorial waters, including submerged lands beneath them, extending 9 nautical miles offshore."

Responses PRDNER Comments on:
Draft UXO 16 Adjacent to SWMU 4 Remedial Investigation (RI) Sampling and Analysis Plan (SAP)
Comments Made by PRDNER on February 10, 2016

PDF Pg. #	Doc. Pg. #	SAP Worksheet	Highlighted Document Text/ Summary of Content	DNER Comments	Navy Response
				beneath them, extending 9 nautical miles offshore.	
39	24	10 (Investigation History: Site Inspection)	Three MPPEH were identified including a 20-mm projectile, an expended M123 series photoflash cartridge base section, and a 40-mm flare base section, all of which were removed. In addition, 72 metallic anomalies (non MEC/MPPEH) were detected.	Were any of the discovered 72 metallic anomalies MD? Clarify in the document whether any of these 72 items were munitions-related, and, if so, their likely source.	The sentence has been modified as follows: "In addition, 72 metallic anomalies (non MEC/MPPEH) were observed, none of which were identified as MD."
41	26	10 (Physical Characteristics and Transport Mechanisms)	While it is possible that, once released, contaminants associated with munitions could be transported as described above, the very low amount of munitions-related items (relative to the size of the UXO study area) and the significant capacity and movement of ocean water indicate transport of munitions-related contamination would be insignificant. Detections of contamination and potential effects on receptors are anticipated to be localized in the immediate vicinity of the munitions. This has been documented in various studies (Lotufo et. al., 2013, and Rosen and Lotufo, 2010).	How does "significant" movement of ocean water indicate that transport of munitions-related contamination would be "insignificant"? Why wouldn't significant ocean water movement be expected to transport contaminants dissolved in the water column, as well as significant amounts of sediment, and hence potentially significant quantities (proportionally) of any contaminants adsorbed on sediments? This statement does not support the conclusion that munitions-related contamination is insignificant, and should be deleted.	The text has been adjusted to the following: "While it is possible that, once released, contaminants associated with munitions could be transported as described above, the very low amount of munitions-related items (relative to the size of the UXO study area) and the large volume and movement of ocean water across the area indicate that concentrations of transported munitions-related contaminants would likely be low. In addition, detections of contamination and potential effects on receptors are anticipated to be limited to the immediate vicinity of corroded, or breached munitions, as has been documented in various studies (Lotufo et. al., 2013, and Rosen and Lotufo, 2010)."
41	26	10 (Potential Receptors and Exposure Pathways)	Ecological receptors are aquatic plants and benthic invertebrates with direct exposure to the sediment, and birds (e.g., brown pelican), mammals (e.g., West	Please revise the text to include the dermal contact / direct sediment exposure pathway for mammals and reptiles, as there is potential for both sea turtles and manatees to directly contact sediments.	The following text has been added to this paragraph: "Sediment exposure via dermal contact and incidental ingestion may occur for some

Responses PRDNER Comments on:
Draft UXO 16 Adjacent to SWMU 4 Remedial Investigation (RI) Sampling and Analysis Plan (SAP)
Comments Made by PRDNER on February 10, 2016

PDF Pg. #	Doc. Pg. #	SAP Worksheet	Highlighted Document Text/ Summary of Content	DNER Comments	Navy Response
			Indian manatee and bottlenose dolphin), and reptiles (e.g., hawksbill turtle and loggerhead turtle) through food web exposure.		marine mammals and reptiles. These pathways will be evaluated as appropriate but may be limited by the exposure parameter data available in literature."
124	109	37	Given that the primary objective of this effort is to determine the current concentrations of perchlorate in the groundwater at the SWMU 4 site and to see if lagoon biota have been impacted by explosives or metals from site-specific releases such that remedial action is warranted, the comprehensive dataset will be reviewed to determine if it is adequate for making the project-specific determinations.	Please revise the text to ensure that the objective stated in Worksheet 37 is consistent with the objective of this SAP: characterizing potential MC contamination in UXO 16 sediments – not determining current perchlorate concentrations in groundwater at SWMU 4, or impacts to lagoon biota from explosives or metals, as currently stated.	The sentence has been updated to state "Given that the primary objective of this effort is to determine the nature and extent of potential munitions constituents contamination as a result of former OB/OD operations at SWMU 4, the comprehensive dataset . . ."
125	110	37	Comparability is also qualitative and is assessed by examining the other PARCC considerations, including common matrices (such as 'tissue' and 'groundwater') in the investigation, and using common analysis methods (i.e. SW-846 series) and common analytical techniques (i.e. 'HPLC' and 'ICP-MS').	Since PARCC is not included in the defined list of acronyms for the SAP, please define it in the List of Acronyms and in the text – presumably it stands for Precision, Accuracy, Representativeness, Completeness and Comparability. Correct?	The acronym has been spelled out and "(such as 'tissue' and 'groundwater')" has been removed.

Responses to USFWS Comments on the
UXO 16 Adjacent to SWMU 4 Remedial Investigation SAP

On SAP Worksheet # 10 in the Background Section the third paragraph discusses jurisdiction of the Commonwealth of Puerto Rico. The last sentence should be corrected to include jurisdiction over the Maritime-Terrestrial Zone.

Navy Response: The sentence was amended to read "PRDNER has jurisdiction over a 1,000 meter wide belt of all Puerto Rico's coastal lands (and additional distances where needed to protect key coastal natural systems), and the territorial waters, including submerged lands beneath them, extending 9 nautical miles offshore."

SAP Worksheet #37 states that the objective is to determine "the current concentrations of perchlorate in the groundwater at the SWMU 4 site and to see if lagoon biota have been impacted." We assume that this is an error since this does not reflect the stated purpose of the SAP (UXO 16 adjacent to SWMU 4).

Navy Response: The sentence has been updated to state "Given that the primary objective of this effort is to determine the nature and extent of potential munitions constituents contamination as a result of former OB/OD operations at SWMU 4, the comprehensive dataset . . ."

The endangered Antillean manatee *(Trichechus manatus manatus)* is known from the waters of Vieques. As with other in-water work, appropriate operating procedures must be implemented to avoid impacts to the species and its habitat.

Navy Response: The SOP "Standard Operating Procedures for Protection of Federally Listed Species and Sensitive Habitat, UXO 16 Wide Area Assessment" includes procedures for avoiding impact to manatees, and has been appended to the UXO 16 RI (adjacent to SWMU 4) SAP as Attachment D.

Final Meeting Minutes - Vieques Technical Subcommittee Conference Call - April 19, 2005

ATTENDEES:

Wilarie Rivera/PREQB
Katarina Rutkowski/TRC
Michael Sivak/EPA
Andy Crossland/EPA
Danny Rodriguez/EPA
Mindy Pensak/EPA
Sergio Lopez/EPA
Dianne Wehner/NOAA
Jeff Harlow/NAVFAC
John Swenfurth/CH2M HILL
Brett Doerr/CH2M HILL

FROM: G. Brett Doerr/CH2M HILL-VBO

DATE: June 21, 2005

This document summarizes the discussions and resulting concurrences made for various topics regarding East and West Vieques during the Vieques Technical Subcommittee conference call held on April 19, 2005.

EPA Summary of Regulatory Agency Internal Discussions on Various Topics

Andy Crossland/EPA updated the Subcommittee members on recent regulatory agency discussions regarding various topics as follows:

Background Data Use

The figure submitted by CH2M HILL showing the proposed background data use decision matrix has been accepted by the regulatory agencies. It will be included in the Data Summary Report.

Michael Sivak/EPA noted that even if the concentrations of certain site-specific metals that are deemed not to be site-related (e.g., aluminum, etc.) are above background, they can be deemed not to represent a release and may be eliminated via a risk management decision versus a comprehensive risk assessment. This determination will be done on a site-specific basis.

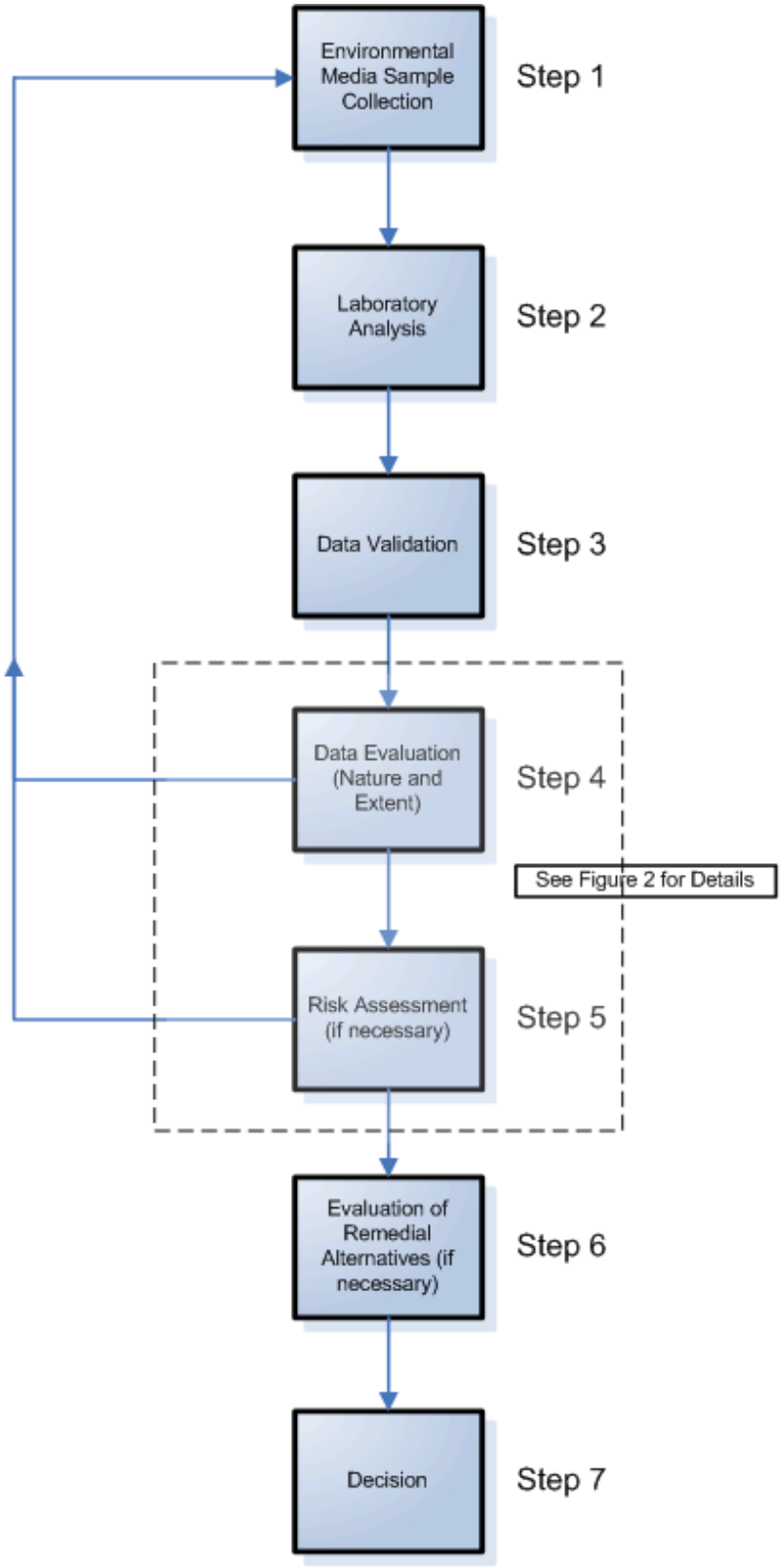

Figure 1
General Schematic of Data Flow Steps

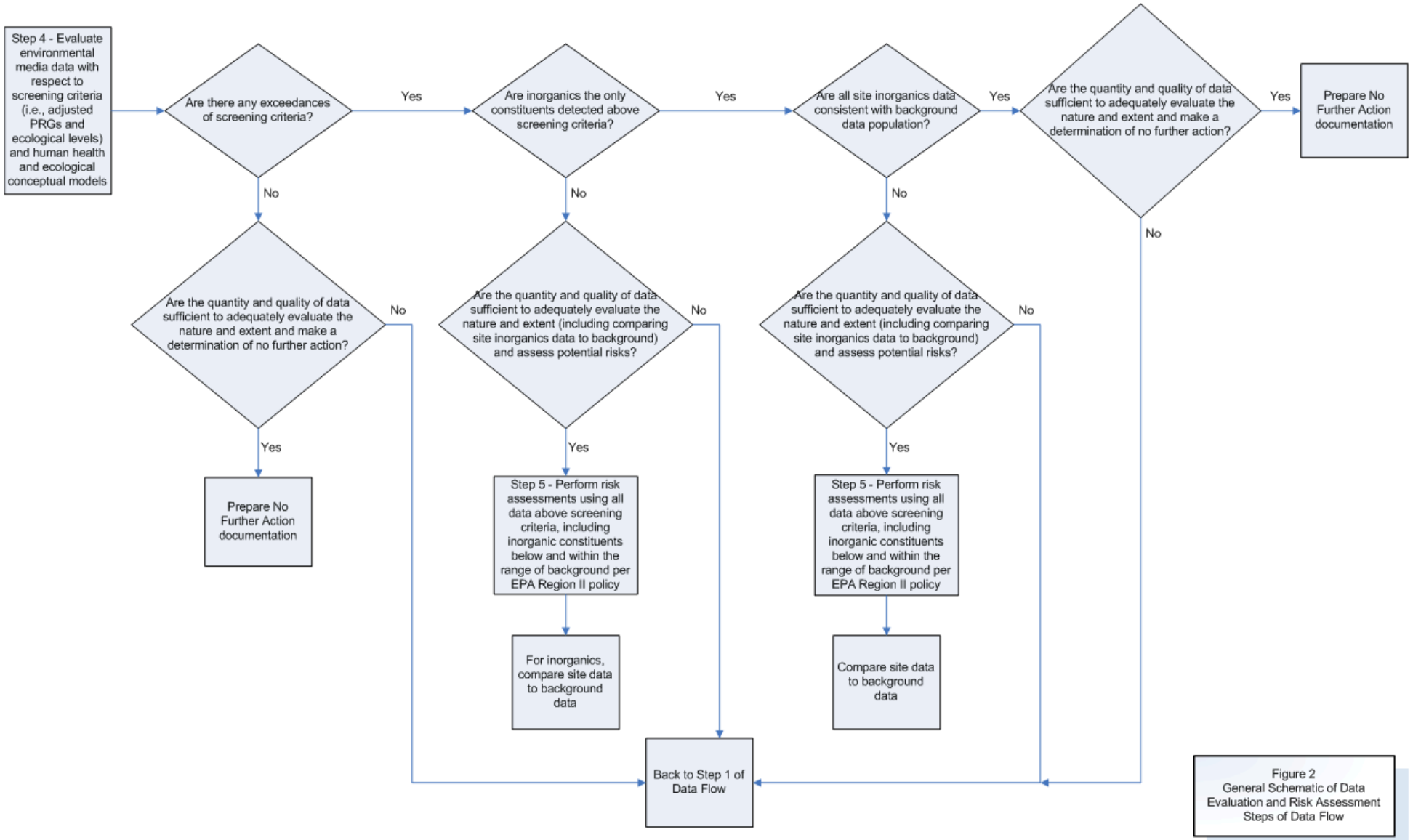

Figure 2
General Schematic of Data Evaluation and Risk Assessment Steps of Data Flow