FINAL

Contaminated Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan Solid Waste Management Unit 6 (SWMU 6)

Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico
Contract Task Order 113

June 2014

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

Navy CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by

CH2MHILL

Virginia Beach, Virginia

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Executive Summary

This Sampling and Analysis Plan (SAP) is prepared to support the field sampling activities at Solid Waste Management Unit (SWMU) 6, located at the former Naval Ammunition Support Detachment (NASD) located in the western portion of Vieques, Puerto Rico (**Figure 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) U.S. Environmental Protection Agency (USEPA) *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (USEPA, 2002), and 2) USEPA, *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) (Intergovernmental Data Quality Task Force, 2005).

This SAP was prepared under the United States Navy (Navy) Comprehensive Long-Term Environmental Action (CLEAN) Contract N62470-08-D-1000, Contract Task Order 113, for submittal to the Naval Facilities Engineering Command (NAVFAC) Atlantic Division, USEPA Region 2, the Commonwealth of Puerto Rico Environmental Quality Board (PREQB), and the United States Fish and Wildlife Service (USFWS). The Navy, USEPA, PREQB, and USFWS work jointly as the Vieques Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Environmental Restoration Program (ERP) Technical Subcommittee.

SWMU 6, the Former Mangrove Disposal Site, was used for the disposal of general solid waste during the 1960s and 1970s from Navy operations within the former NASD. A removal action conducted in 2009 to remove the waste debris and impacted soil resulted in the environmental setting changing from a predominantly terrestrial habitat to a shallow, open water lagoon, which also resulted in a change to the exposure pathways to human and ecological receptors. Based on potentially unacceptable risks determined using post-removal confirmatory sediment and biota data, a Feasibility Study (FS) was completed to evaluate remedial alternatives to address the sediment chemicals of concern (COCs) identified by the risk assessments: aroclor-1254 (a polychlorinated biphenyl [PCB]), lead, and zinc (CH2M HILL, 2013).

The investigation covered by this SAP will include characterization of sediment to determine the horizontal and vertical extent of the COCs above preliminary remediation goals (PRGs) and to refine the remediation area and volume. Based on discussion held at the May 2013 ERP Technical Subcommittee meeting, the PCB-related COC will be total PCBs (i.e., sum of aroclors) rather than just aroclor-1254. This information will be used to revise the alternatives, as applicable, contained in the FS (via an addendum).

Sediment core samples will be collected in a grid-based sampling approach at an estimated 32 sample locations. At each sample location, sediment cores will be collected to a depth of approximately 6.5 feet (ft) to delineate the horizontal and vertical extent of COCs above PRGs; 6-inch-interval subsurface sediment samples will be collected within each 2-ft interval (0 to 6 inches, 24 to 30 inches, 48 to 54 inches, and 72 to 78 inches below ground surface [bgs]). Sediment samples will be collected from the pre-determined depths unless evidence of an organic layer, "rust colored" sediment, or a silt/clay layer within a sand interval is encountered, in which case the sample will be collected from the unique layer. All samples will be analyzed for total PCBs (i.e., aroclors), lead, and zinc.

The sediment data will be compiled to develop area and volume estimates of COCs (total PCBs, lead, and zinc) above PRGs. This information will be used to revise Alternative 3 (Excavation, Dewatering, and Off-Site Disposal of Contaminated Sediment), and other alternatives, as warranted, which will be presented in an FS Addendum.

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., spatial characterization, area and volume estimates, and remedial alternatives evaluation). The laboratory information cited in this SAP is for Empirical Laboratories, which will provide analytical services for this investigation.

NOTE: THIS SUMMARY IS PRESENTED IN ENGLISH AND SPANISH FOR THE CONVENIENCE OF THE READER. EVERY EFFORT HAS BEEN MADE FOR THE TRANSLATIONS TO BE AS ACCURATE AS REASONABLY POSSIBLE. HOWEVER, READERS SHOULD BE AWARE THAT THE ENGLISH VERSION OF THE TEXT IS THE OFFICIAL VERSION.

NOTA: ESTE RESUMEN SE PRESENTA EN INGLÉS Y EN ESPAÑOL PARA LA CONVENIENCIA DEL LECTOR. SE HAN HECHO TODOS LOS ESFUERZOS PARA QUE LA TRADUCCIÓN SEA PRECISA EN LO MÁS RAZONABLEMENTE POSIBLE. SIN EMBARGO, LOS LECTORES DEBEN ESTAR AL TANTO QUE EL TEXTO EN INGLÉS ES LA VERSIÓN OFICIAL.

TABLE ES-1

SWMU 6 Contaminant Sediment Refinement Sampling and Analysis Plan Summary Table

Former Naval Ammunition Support Detachment

Vieques, Puerto Rico

Pertinent Historical Information	Contaminant Sediment Refinement SAP Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
SWMU 6, the Former Mangrove Disposal Site, was used for the disposal of general solid waste during the 1960s and 1970s from Navy operations within the former NASD. A removal action conducted in 2009 to remove the waste debris and impacted soil resulted in the environmental setting changing from a predominantly terrestrial habitat to a shallow, open water lagoon, which also resulted in a change to the exposure pathways to human and ecological receptors. Based on potentially unacceptable risks determined using post-removal confirmatory sediment and biota data, a Feasibility Study (FS) was completed to evaluate remedial alternatives to address the sediment chemicals of concern (COCs) identified by the risk assessments: aroclor-1254 (a polychlorinated biphenyl [PCB]), lead, and zinc.	The investigation objective is to determine the horizontal and vertical extent of COC (total PCBs [sum of arodors], lead, and zinc) concentrations in sediment above the Preliminary Remediation Goals (PRGs) to help refine the remediation area and volume assumed in the FS.	Sediment samples will be collected and the sediment data will be compiled to develop area and volume estimates of COCs (total PCBs, lead, and zinc) above PRGs.	Collecting sediment core samples in a grid-based (20-ft by 20-ft) sampling approach. Sediment core samples will be collected from an estimated 32 sample locations to an approximate depth of 6.5 ft. The sediment locations are designed to encompass the main part of the SWMU 6 lagoon, surrounding the areas where elevated levels of COCs were detected in post-removal confirmatory sediment samples. Six-inch-interval subsurface sediment samples will be collected for analysis within each 2-ft interval (0-6 inches, 24-30 inches, 48-54 inches, and 72-78 inches or from an interval that has evidence of an organic layer "rust colored" sediment, or a silt/clay layer within a sand interval if observed in each of the 2-foot intervals) from each location.	PCBs and lead and zinc.	Compiling and analyzing the sediment data collected to develop area and volumes estimates of the excavation area (i.e., area and volumes of sediment where PRGs are exceeded). The sediment results and area and volume estimates will be presented to the Environmental Restoration Program (ERP) Technical Subcommittee in a technical memorandum. The ERP Technical Subcommittee will determine if the new data support an alternative other than FS Alternative 3. If Alternative 3 is still preferred, it will be refined with the new area and volume information, as well as additional considerations likely necessary (e.g., multiple excavation events to achieve PRGs), and presented in an FS Addendum.

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Resumen Ejecutivo

Este Plan de Muestreo y Análisis (SAP, por sus siglas en inglés) se preparó para apoyar las actividades de campo para el muestreo en la Unidad de Manejo de Desperdicios Sólidos 6 (SWMU) 6, localizada en el Antiguo Destacamento de Apoyo de Municiones Navales (NASD, por sus siglas en inglés) en la porción oeste de Vieques, Puerto Rico (Figura 1). Este SAP incluye 37 hojas de trabajo que detallan varios aspectos del proceso investigativo y sirven como guías para las actividades de campo y la revisión de los datos. Este SAP fue desarrollado de acuerdo a dos documentos guías: 1) *Agencia de Protección Ambiental (USEPA, por sus siglas en inglés), Guía para Planes de Proyectos de Garantía de Calidad (“USEPA Guidance for Quality Assurance Project Plans”, USEPA QA/G-5, QAMS* (USEPA, 2002)), y 2) *USEPA, Política Federal Uniforme para Planes de Proyectos de Garantía de Calidad* (*“USEPA Uniform Federal Policy for Quality Assurance Project Plans”* (UFP-QAPP) (Grupo Especial Intergubernamental para la Calidad de los Datos, 2005).

Este SAP fue preparado bajo el Contrato N62470-08-D-1000, Orden de Trabajo 113 del Contrato para Acción Exhaustiva a Largo Plazo (CLEAN, por sus siglas en inglés) de la Marina de los Estados Unidos (Marina). El SAP será sometido al Comando de Ingeniería de Instalaciones Navales del Atlántico (NAVFAC, por sus siglas en inglés), la USEPA Región 2, la Junta de Calidad Ambiental del Estado Libre Asociado de Puerto Rico (JCA), y el Servicio de Pesca y Vida Silvestre de los Estados Unidos (USFWS, por sus siglas en inglés). La Marina, la USEPA, la JCA y el USFWS trabajan conjuntamente y forman el Subcomité Técnico del Programa de Restauración Ambiental de Vieques bajo la Ley de Responsabilidad, Compensación y Recuperación Ambiental (CERCLA, por sus siglas en inglés).

SWMU 6, el Antiguo Sitio de Disposición en el Manglar, fue utilizado para la disposición de desperdicios sólidos generales de las operaciones de la Marina en la Antigua NASD durante los años 1960s y 1970s. Una acción de remoción llevada a cabo en el 2009 para remover la basura y el suelo afectado resultó en un cambio en el entorno ambiental de un ambiente predominantemente terrestre a una laguna llana y abierta al mar, lo cual también resultó en un cambio en las rutas de exposición a los receptores humanos y ecológicos. Basado en posibles riesgos inaceptables determinados usando datos confirmatorios de sedimento y biota post-remoción, se completó un Estudio de Viabilidad (FS, por sus siglas en inglés) para evaluar alternativas de remediación para los químicos de preocupación en los sedimentos (COC, por sus siglas en inglés) que fueron identificados en las evaluaciones de riesgo: aroclor-1254 (un bifenil policlorado [PCB, por sus siglas en inglés]), plomo y zinc (CH2M HILL, 2013).

La investigación cubierta por este SAP incluirá la caracterización de los sedimentos para determinar la extensión vertical y horizontal de los COCs por encima de las metas de remediación preliminares (PRGs, por sus siglas en inglés) y para refinar el área y volumen de la remediación. Basado en una discusión ocurrida en la reunión de mayo de 2013 del Subcomité Técnico del Programa de Restauración Ambiental, los COCs relacionados con PCBs serán PCB totales (suma de los aroclor) en vez de solamente aroclor-1254. Esta información será usada para revisar las alternativas, según aplique, contenidas en el FS (por medio de un apéndice).

Muestras de núcleo de sedimento serán obtenidas con un método de muestreo basado en cuadrantes con un estimado de 32 sitios de muestreo. En cada sitio de muestreo, núcleos de sedimento serán obtenidos a una profundidad aproximada de 6.5 pies (ft) para delinear la extensión horizontal y vertical de los COCs por encima de los PRGs; muestras de sedimento serán obtenidas a intervalos de 6 pulgadas de subsuelo, por cada intervalo de 2 pies (0 a 6 pulgadas, 24 a 30 pulgadas, 48 a 54 pulgadas, y 72 a 78 pulgada) bajo la superficie del terreno. Las muestras de sedimento serán obtenidas a las profundidades pre-determinadas a menos que se encuentre evidencia de una capa orgánica, sedimento de color rojizo, o una capa de limo/arcilla dentro de un intervalo de arena, en tal caso la muestra se obtendrá de la capa especial o única. Todas las muestras serán analizadas para PCBs totales (aroclor), plomo y zinc.

Los datos de sedimento serán compilados para desarrollar estimados del área y volumen de los COCs (PCBs totales, plomo y zinc) por encima de los PRGs. Esta información se utilizará para revisar la Alternativa 3 (Excavación, Deshidratación y Disposición del Sedimento Contaminado Fuera del Sitio), y otras alternativas, si aplica, las cuales se presentarán como un Apéndice al FS.

Este SAP va a ayudar a asegurar que los datos ambientales obtenidos o compilados son científicamente válidos y confiables, de calidad conocida y documentada, y útiles para el uso destinado (por ejemplo, caracterización espacial, estimados de área y volumen, y evaluación de alternativas de remediación). La información de laboratorio citada en este SAP es de Empirical Laboratories, quienes proveerán servicios analíticos para esta investigación.

TABLA ES-1

Tabla de Resumen del Plan de Muestreo y Análisis de Refinamiento de la Contaminación de Sedimento en SWMU 6

Antiguo Destacamento de Apoyo de Municiones Navales

Vieques, Puerto Rico

Información Histórica Pertinente	Objetivos del SAP Relacionados con el Refinamiento de la Contaminación del Sedimento	Enfoque de la Investigación	Tareas de Investigación	Análisis de Muestras	Proceso de Evaluación de los Datos
SWMU 6, el Antiguo Sitio de Disposición del Manglar, fue utilizado para la disposición de desperdicios sólidos generales de las operaciones de la Marina en la Antigua NASD. Una acción de remoción llevada a cabo en el 2009 para remover la basura y el suelo afectado resultó en un cambio en el entorno ambiental de un ambiente predominantemente terrestre a una laguna llana y abierta al mar, lo cual también resultó en un cambio en las rutas de exposición a los receptores humanos y ecológicos. Basado en posibles riesgos inaceptables determinados usando datos confirmatorios de sedimento y biota post-remoción, se completó un Estudio de Viabilidad (FS, por sus siglas en inglés) para evaluar alternativas de remediación sobre los químicos de preocupación en los sedimentos (COC, por sus siglas en inglés) que fueron identificados en las evaluaciones de riesgo: arodor-1254 (un bifenil policlorado [PCB, por sus siglas en inglés]), plomo y zinc.	El objetivo de esta investigación es determinar la extensión vertical y horizontal de las concentraciones de los COC en el sedimento (PCBs totales [suma de los aroclor], plomo y zinc) por encima de las metas de remediación preliminares (PRGs, por sus siglas en inglés) para refinar el área y volumen de la remediación asumidos en el FS.	Muestras de sedimento serán obtenidas y los datos de los sedimentos serán compilados para desarrollar estimados de área y volumen de los COCs (PCBs totales, plomo, y zinc) sobre los PRGs.	Colección de muestras de núcleo de sedimentos con método de cuadrantes (20 pies por 20 pies). Las muestras de núcleo de sedimento se obtendrán en un estimado de 32 sitios de muestreo a una profundidad aproximada de 6.5 pies. Los sitios de sedimentos están diseñados para incluir la mayor parte de la laguna de SWMU 6, alrededor de las áreas donde los niveles elevados de COCs fueron detectados en el muestreo confirmatorio de sedimentos post-remoción. Muestras de sedimento de 6 pulgadas de subsuelo serán obtenidas para análisis entre cada intervalo de 2 pies (0-6 pulgadas, 24-30 pulgadas, 48-54 pulgadas, y 72-78 pulgadas) o de un intervalo que tenga evidencia de una capa orgánica, sedimento color rojizo, o capa de limo/arcilla dentro de un intervalo de arena si se observa dentro de algún intervalo de 2 pies) en cada sitio.	PCBs, plomo y zinc.	Compilar y analizar la data de sedimento obtenida para desarrollar estimados de área y volumen del área de excavación (. áreas y volúmenes de sedimento donde los PRGs se excedan). Los resultados del sedimento y los estimados de área y volumen serán presentados al Subcomité Técnico del Programa de Restauración Ambiental en un memorando técnico. El Subcomité Técnico del Programa de Restauración Ambiental determinará si los datos nuevos apoyan una alternativa diferente a la Alternativa 3 del FS. Si la Alternativa 3 continúa siendo la preferida, ésta será refinada con la nueva información de área y volumen, al igual que con consideraciones adicionales posiblemente necesarias (por ejemplo, múltiples eventos de excavación para alcanzar los PRGs), y presentados en un Apéndice al FS.

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Contents

Tables

Figures

Attachments

Acronyms and Abbreviations

AHA	Activity Hazard Analysis
CA	Corrective Action
CAS	Chemical Abstracts Service
CCV	Continuing Calibration
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
COC	Contaminant of Concern
CSM	Conceptual Site Model
DoD	Department of Defense
DOI	Department of Interior
DL	Detection Limit
DQE	Data Quality Evaluation
DQI	Data Quality Indicator
DQO	Data Quality Objective
EBS	Environmental Baseline Survey
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency, United States
EQB	Environmental Quality Board
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
FD	Field Duplicate
FS	Feasibility Study
ft	foot or feet
FTL	Field Team Leader
FRC	Federal Records Center
GC/ECD	Gas Chromatography/Electron Capture Detector
H&S	Health and Safety
HASP	Health and Safety Plan
HHRA	human health risk assessment
ICAL	initial calibration
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectrometry
ICS	Interference Check Solutions
ICV	Initial Calibration Verification
IDW	investigation-derived waste
IR	Installation Restoration
LCL	Lower Control Limit
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management Systems
LOD	Limit of Detection
LOQ	Limit of Quantitation
MEC	Munitions and explosives of concern
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram

MOV	Municipality of Vieques
MPC	Measurement Performance Criteria
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSOPPP	Master Standard Operating Procedures, Protocols, and Plans
N/A	not applicable
NASD	Naval Ammunition Support Detachment
Navy	U.S. Department of Navy
NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NS	Not spiked
PAL	Project Action Limit
PCBs	Polychlorinated Biphenyls
.pdf	electronic portable document format
PDS	Post Digestion Spike
PM	Project Manager
POC	point of contact
PQOs	Project Quality Objectives
PREQB	Puerto Rico Environmental Quality Board
PRGs	Preliminary Remediation Goals
PTSP	Pre Task Safety Plan
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
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SD	Sediment
SI	Site Inspection
SMP	Site Management Plan
SOP	Standard Operating Procedure
SSC	Site Safety Coordinator
STAC	Safety Task Analysis Card
SW	Surface Water
SWMU	Solid Waste Management Plan
SWO	safe work observation
TAT	turnaround time
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure

TOC	total organic carbon
UCL	Upper Control Limit
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VOC	Volatile Organic Compounds

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Final
Contaminated Sediment Delineation
to Support Feasibility Study Alternative Evaluation
Sampling and Analysis Plan
SWMU 6

Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico
Contract Task Order – 113
June 2014

Prepared for:

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Naval Facilities Engineering Command
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Contract Task Order – 113

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Wilmarie Rivera
PREQB – Remedial Project Manager

Susan Silander
USFWS – Remedial Project Manager

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SAP Worksheet #2—Sampling and Analysis Plan Identifying Information

Site Name/Number: Solid Waste Management Unit 6 (SWMU 6) at the former Naval Ammunition Support Detachment (NASD), Vieques, Puerto Rico.

Operable Unit: OU-8, as designated in the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database.

Contractor Name: CH2M HILL

Contract Number: N62470-08-D-1000

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)* (USEPA, 2005) and United States Environmental Protection Agency (USEPA) *Guidance for Quality Assurance Project Plans, EPA QA/G-5*, Quality Assurance Management Section (QAMS) (USEPA, 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 - Manhattan, New York	May 8, 2013
Sediment COC Delineation SAP Scoping Session - Conference Call	June 6, 2013

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
Final Work Plan, Removal Actions, SWMU 6, SWMU 7, AOC J, and AOC R	December 2007
Final Master Standard Operating Procedures, Protocols, and Plans	April 2010
Final Post-Removal Supplemental Confirmatory Sampling and Analysis Plan	December 2010
Final Post-Removal Supplemental Confirmatory Sampling and Analysis Plan Addendum	January 2012

6. Organizational partners (stakeholders) and connection with lead organization:
   - **USEPA 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
   - **United States Fish and Wildlife Service (USFWS)** - Land owner of all 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)** – Technical resource to USEPA.
7. Lead organization (see Worksheet #7 for detailed list of data users):
   - U. S. Department of 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.

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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
John Martin	Potential Field Team Leader/Site Safety Coordinator	CH2M HILL	352-384-7122	John.Martin@ch2m.com			A
John Swenfurth	Project Manager	CH2M HILL	813-874-0777	john.swenfurth@ch2m.com	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
Bill Hannah	Environmental Investigation Lead	CH2M HILL	757-671-6277	Bill.hannah@ch2m.com	A		A
Brett Doerr	Contractor Activity Manager/Navy contractor primary POC	CH2M HILL	757-671-6219	brett.doerr@ch2m.com	A		A
Sonya Gordon	Analytical Laboratory/ Project Manager	Empirical Laboratories, LLC	615-345-1115	sgordon@empirlabs.com			HC
Laura Maschoff	Project Manager	DataQual Environmental Services, LLC	314-330-1327	dataqual@charter.net			CD
John Martin or To be determined (TBD)	Field Team Leader (FTL)/Site Safety Coordinator (SSC)	CH2M HILL	352-384-7122 or TBD	John.Martin@ch2m.com or TBD	A		A
Julio Vazquez	Vieques RPM/ Regulatory agency POC	USEPA	212-637-4323	vazquez.julio@epa.gov	A		A
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (c)	rodriguez.daniel@epa.gov	A		A
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SAP Worksheet #3—Distribution List (continued)

Name of SAP Recipients	Title/Project Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	D	DF	F
Diana Cutt	Geology/Hydrogeology Lead/ Technical input and draft document review	USEPA	212-637-4311	cutt.diana@epa.gov	A		A
Mindy Pensak	Ecological Risk Assessment (ERA) Lead/Technical input and draft document review	USEPA	732-321-6705	pensak.mindy@epa.gov	A		A
Bradley Martin	Technical Support Consultant for USEPA/USEPA contractor primary POC	TechLaw	312-345-8960	bmartin@techlawinc.com	A		A
Laura Velez-Velez	President/No project-specific role	PREQB	787-767-8056	lauravelez@jca.gobierno.pr	CL		CL
Wilmarie Rivera	Vieques RPM/ Regulatory agency POC	PREQB	787-767-8181 (x6141) (w) 787-365-8573 (c)	wilmarierivera@jca.gobierno.pr	A		A
Katarina Rutkowski	Technical Support Consultant for Environmental Quality Board (EQB)/ EQB contractor primary POC	TRC	860-298-6202	krutkowski@trcsolutions.com	A		A
Elizabeth Denly	Technical Support Consultant for EQB/ EQB contractor Project Manager (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
Marelisa Rivera	Deputy Field Supervisor/No project-specific role	USFWS	787-851-7297 (ext. 206) (w) 787-510-5207 (c)	marelisa_rivera@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
Colleen McNamara	N/A	RAB	787-380-2545	lacolina@hughes.com		A	
Stacie D. Notine	N/A	RAB	N/A	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	

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

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			
John Swenfurth	CH2M HILL/Contractor PM/Logistics and Administration	813-874-0777 (x57762) 813-390-4734 (c)			
Bill Hannah	CH2M HILL/Technical Consultant	757-671-6277			
Mark Orman	CH2M HILL/Contractor Health and Safety Lead/ Health and Safety Officer	414-847-0597 414-712-4138 (c)			
John Martin or To be determined (TBD)	Field Team Leader (FTL)/Site Safety Coordinator (SSC)	352-384-7122 or TBD			
Mike Zamboni	CH2M HILL/Project Chemist	703-376-5301			
Sonya Gordon	Empirical Laboratories, LLC/Project Manager	615-345-1115			
Laura Maschoff	DataQual Environmental Services, LLC/Project Manager	314-330-1327			
Bhavana Reddy	Critigen Project/Data Manager	703-608-1488			

Note: CH2MHILL will maintain the signed signature page with the project files.

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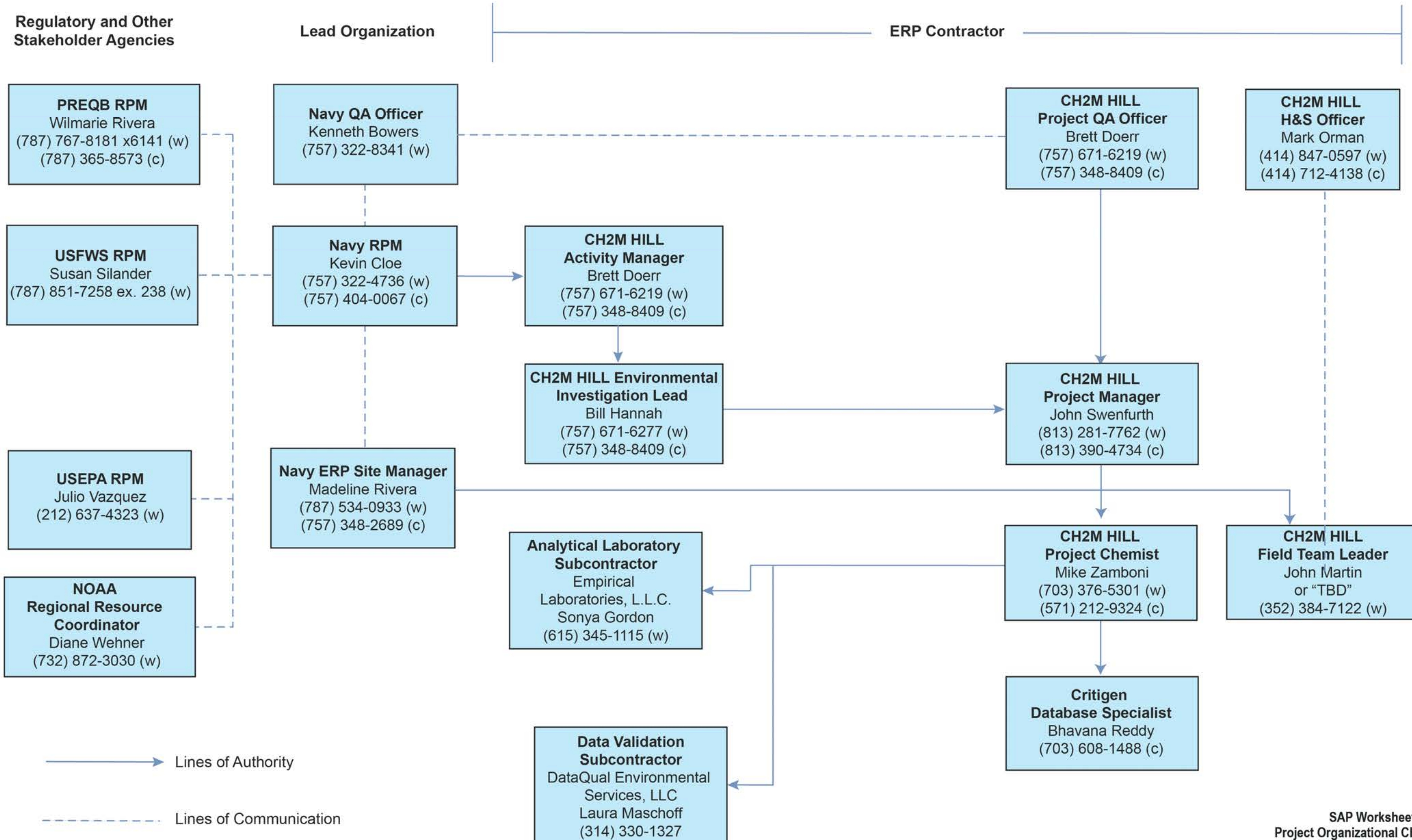
SAP Worksheet #5—Project Organizational Chart



SAP Worksheet #5
Project Organizational Chart
SWMU 6 Contaminant Sediment Refinement SAP
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

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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 USEPA (e.g., receipt of SAP for review; submission of USEPA comments)	USEPA RPM	Julio Vazquez	212-637-4323	Primary POC for USEPA (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 comments)	PREQB RPM	Wilmarie Rivera	787-767-8181 (x6141)	Primary POC for PREQB (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 (ext. 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 USFWS (e.g., receipt of SAP for review; submission of USFWS comments)	USFWS Manager	Marelisa Rivera	787-851-7297 (ext. 206) (w)	Secondary POC for USFWS (via e-mail, telephone, hardcopy, or in-person, as warranted).
Navy Quality Assurance (QA)/Quality Control (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.
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 Environmental Investigation Lead and Senior Technical Consultant	Bill Hannah	757-671-6277	Direct communication with Activity Manger on technical issues related to the field work and report preparation along with update presentations to the Technical Subcommittee.
Project administration and logistics	CH2M HILL PM	John Swenfurth	813-874-0777 (x57762) 813-390-4734 (c)	Direct communication (via e-mail, telephone, hardcopy, or in-person, as warranted) to/from Navy contractor project staff to ensure appropriate project implementation.
Health and safety expectations and procedures	CH2M HILL Health and Safety Officer	Mark Orman	414-847-0597 414-712-4138 (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.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Implementation of sampling activities; SAP changes in the field	CH2M HILL FTL	John Martin or TBD	352-384-7122 (w) 352-359-5717 (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.
Field corrective actions	CH2M HILL FTL	John Martin or TBD	352-384-7122 (w) 352-359-5717 (c)	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.
Daily Field Progress Reports	CH2M HILL FTL	John Martin or TBD	352-384-7122 (w) 352-359-5717 (c)	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 in the field	CH2M HILL SSC	John Martin or TBD	352-384-7122 (w) 352-359-5717 (c)	Daily safety tailgates; daily observations; real-time discussions of observations and changes to be implemented with field staff.
Stop Work Order	CH2M HILL field team, SSC, FTL, or AM	John Martin or TBD	352-384-7122 (w) 352-359-5717 (c)	Any field member can immediately stop work if an unsafe condition which is immediately threatening to human health is observed. The field staff, FTL, or SSC, 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 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 Quality Assurance Officer (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 EIS.	Critigen 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	Laboratory Quality Assurance Manager Empirical	Sonya Gordon	615-345-1115	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	Environmental restoration program (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 point of contact (POC); assists in data evaluation and interpretation; reviews report
John Swenfurth	PM	CH2M HILL	Project administration; coordinates staffing; monitors project performance; directs and oversees project staff
Bill Hannah	Environmental 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
Mark Orman	Health and Safety 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
John Martin or TBD	FTL and SSC	CH2M HILL	Supervises sampling and coordinates all field activities; ensures onsite compliance with work plan; oversees and ensures safety of onsite personnel
Bhavana Reddy	Database Manager	Critigen	Uploads validated data to environmental database
Sonya Gordon	Analytical Laboratory Project Manager	Empirical Laboratories	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

There are no special personnel training requirements for this project.

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SAP Worksheet #9a—Project Scoping Session Participants Sheet

Project Name: Navy Clean - Vieques			**Site Name:** SWMU 6		
Projected Date(s) of Sampling: June 2014			**Site Location:** SWMU 6 Lagoon – Former NASD		
Project Manager: John Swenfurth					
Date of Session: May 8, 2013					
Scoping Session Purpose: Concur on path forward at SWMU 6					
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
Julio Vazquez	West Vieques RPM	USEPA	212-637-4323	Vazquez.Julio@epa.gov	Primary USEPA POC
Diane Wehner	Regional Resource Coordinator	NOAA	240-338-3411	Diane.wehner@noaa.gov	Technical input related to sediment
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 Rodriguez	East Vieques RPM	USEPA	787-741-5201 or 787-671-9879 (c)	Rodriguez.daniel@epamail.gov	No project-specific role
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 x226	Felix_lopez@fws.gov	Technical input
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 x6141	wilmarierivera@jca.gobierno.pr	Primary PREQB POC
Katarina Rutkowski	Technical Support Contractor Human Health Risk Assessment Lead	TRC	860-298-6202	krutkowski@trcsolutions.com	Technical input and review of human health risk aspects on behalf of PREQB. Primary TRC POC.
Brett Doerr	Activity Manager	CH2M HILL	757-671-6219	Brett.doerr@CH2M.com	Scope development and technical review. Primary CH2M HILL POC.
Bill Hannah	Hydrogeologist	CH2M HILL	757-671-6230	Bill.Hannah@ch2m.com	Technical input and support
Angela Carpenter	Technical Support EPA special projects branch	USEPA	212-637-4435	Carpenter.angela@epa.gov	No project specific role
Mindy Pensak	Ecological Risk Assessment Lead	USEPA	732-321-6705	Pensak.mindy@epa.gov	Technical input and draft document review
Jim Pastorick	Technical support contractor to EQB	UXO Pro	703-548-5300	jim@uxopro.com	No project-specific role
Susan Silander	Caribbean Islands Refuges Supervisor	USFWS	787-851-7258 (x38)	Susan.silander@fsw.gov	No project-specific role
Mike Barandiaran	Refuge Manager	USFWS	787-741-2138	Mike_barandiaran@fws.gov	No project specific role

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

Key Discussion Points

The Subcommittee reviewed the SWMU 6 Feasibility Study and discussed which potential remedial alternative is appropriate for the site. USEPA recommended Alternative 3 (Excavation, Dewatering, and Off-site Disposal of Contaminated Sediment) as the remedial action for the site, since the site is small, will result in the reduction of toxicity and mobility, and the action will result in unrestricted use. The potential remedies were presented to EPA's Regional Administrator and her position was Alternative 3. Angela Carpenter added that the Administrator's sense that this cost was insignificant and the site can be no further action (NFA) with unrestricted use following the remedy. Angela added that they discussed this with PREQB, and PREQB concurred with EPA's preferred alternative.

Dan Waddill responded that the Navy would like to conduct a scoping session for additional sampling to define the remedial excavation area. The team discussed that the sampling results to define the remedial excavation area would be presented in a Technical Memorandum. Dan asked if the clean-up goal for this site could be revised from the conservative value of 0.2 mg/kg (for aroclor-1254) to a comparable value commonly used at other sites around the country (including Region 2), which are typically 1 mg/kg total PCBs (i.e., sum of aroclors). Angela responded that USEPA will consider this.

SAP Worksheet #9b—Project Scoping Session Participants Sheet

Project Name: Navy Clean - Vieques	**Site Name:** SWMU 6
Projected Date(s) of Sampling: June 2014	**Site Location:** SWMU 6 Lagoon – Former NASD
Project Manager: John Swenfurth	
Date of Session: June 6, 2013	
Scoping Session Purpose: Sediment COC Delineation SAP Scoping Session	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Diane Wehner	Regional Resource Coordinator	NOAA	240-338-3411	Diane.wehner@noaa.gov	Technical input related to sediment
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	No project specific role
Daniel Rodriguez	East Vieques RPM	USEPA	787-741-5201 or 787-671-9879 (c)	Rodriguez.daniel@epamail.gov	No project-specific role
Julio Vazquez	West Vieques RPM	USEPA	212-637-4323	Vazquez.Julio@epa.gov	Primary USEPA POC
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 ext. 226	Felix_lopez@fws.gov	Technical input
Susan Silander	Vieques RPM	USFWS	787-851-7258 x238	Susan_silander@fws.gov	Primary USFWS POC/No project-specific role
Mike Barandiaran	FWS Refuge Manager	USFWS	787-741-2138	M_Barandiaran@fws.gov	No project specific role
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 ext. 6141	wilmarierivera@jca.gobierno.pr	Primary PREQB POC
Katarina Rutkowski	Technical Support Contractor Human Health Risk Assessment Lead	TRC	860-298-6202	krutkowski@trcsolutions.com	Technical input and review of human health risk aspects on behalf of EQB. Primary TRC POC.
John Martin	Ecological Risk Assessor Lead/ Potential Field Team Leader	CH2M HILL	352-384-7122	John.martin@chwm.com	Ecological Risk Assessment
Brett Doerr	Activity Manager	CH2M HILL	757-671-6219	Brett.doerr@CH2M.com	Scope development and technical review. Primary CH2M HILL POC.
Bill Hannah	Hydrogeologist	CH2M HILL	757-671-6230	Bill.Hannah@ch2m.com	Technical input and support
Mindy Pensak	Ecological Risk Assessor Lead	USEPA	732-321-6705	Pensak.mindy@epa.gov	Technical input and draft document review
Barrie Selcoe	Human Health Risk Assessment Lead	CH2M HILL	281-246-4322	Barrie.Selcoe@ch2m.com	Human Health Risk Assessment
Angela Carpenter	Technical Support EPA special projects branch	USEPA	212-637-4435	Carpenter.angela@epa.gov	No project specific role
Michael Sivak	Human Health Risk Assessment (HHRA) Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and draft document review

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

Comments/Decisions

Brett Doerr/CH2M HILL presented the proposed sampling approach to refine the potential remedial excavation area and volume of sediment; the seed file presented to the Subcommittee is provided below. Note that the seed file approach was modified based on ERP Technical Subcommittee discussion, which is presented below the bulleted seed file.

Site History

SWMU 6, the Former Mangrove Disposal Site, is located in a mangrove swamp between two tidally-influenced lagoons of the Laguna Kiani complex (Laguna Kiani and Laguna El Pobre), along Highway 200 on the former Naval Ammunition Support Detachment (NASD). The site was used for the disposal of general solid waste during the 1960s and 1970s from Navy operations within the former NASD.

A removal action was conducted in 2009 to remove the waste debris and impacted soil, followed by post-removal confirmatory sampling of sediment/soil in the excavation area. The excavation depth ranged from 1 to 2 feet in most areas. Excavation activities resulted in the environmental setting changing from a predominantly terrestrial habitat to a shallow, open water lagoon that is hydraulically connected to, and tidally influenced by, the adjacent Laguna Kiani complex.

Because the site was significantly altered during removal activities, and resulting environmental conditions and exposure pathways to human and ecological receptors changed, supplemental confirmatory sampling of surface water, sediment, and soil was conducted in February 2011 to generate an appropriate dataset for the post-removal risk assessments.

The post-removal HHRA identified PCBs as the only human health COCs, based on human consumption of edible size fish/blue crab. The PCB concentrations posing unacceptable risk were based on PCB uptake from sediment and subsequent bioaccumulation in the fish and crab.

The post-removal ERA identified cadmium, copper, lead, and zinc as the only ecological COCs, based on direct exposure to these metals in sediment by lower trophic level receptors.

Based on the post-removal HHRA results, fish/blue crab sampling was conducted in January and February 2012 for a focused list of parameters to provide tissue data for refining the post-removal HHRA.

Based on the refined post-removal HHRA and the post-removal ERA, the FS was completed to evaluate remedial alternatives to address COCs in sediment. Sediment PRGs were developed for Aroclor-1254 (0.2 mg/kg), lead (218 mg/kg), and zinc (410 mg/kg); maximum cadmium and copper values at the site were below the PRGs so are not included as part of the remedial action.

Contaminated Sediment Delineation Objective

Determine the horizontal and vertical extent of remedial action COC (Aroclor-1254, lead, and zinc) concentrations in sediment above the PRGs to refine the remediation area and volume assumed in the FS.

Framework for Sediment Sampling

Sediment core samples to be collected in a grid-based (20-ft by 20-ft) sampling approach around a transect through sample locations SD03 and SD09 (the two post-removal sediment samples where one or more COC exceeded the PRGs) for a total of 32 sample locations.

At each sample location, sediment cores will be collected to a depth of approximately 6.5 ft to delineate the vertical extent of remediation required; 6-inch-interval subsurface sediment samples will be collected for potential analysis within each 2-ft interval (0 to 6 inches, 24 to 30 inches, 48 to 54 inches, and 72 to 78 inches).

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

For each set of four samples from each core, the samples will be analyzed for Aroclor-1254, lead, and zinc beginning with the shallowest sample and proceeding to the next deeper sample until all concentrations are at or below the PRGs. Once a particular sample's COC concentrations are at or below the PRGs, no deeper sample within the core will be analyzed.

Data Use

The sediment data will be compiled to develop an area and volume estimates of the sediment excavation area (i.e., area and volume of sediment where PRGs are exceeded).

The sediment results and area and volume estimates will be presented to the Vieques Technical Subcommittee in a technical memorandum.

Based on the technical memorandum, the Vieques Technical Subcommittee will determine if the new data support an alternative other than FS Alternative 3 (excavation).

If Alternative 3 is still preferred, it will be refined with the new area and volume information, as well as additional considerations likely necessary (e.g., multiple excavation events to achieve PRGs), and presented in an FS Addendum.

Angela Carpenter/USEPA asked how the vertical extent of removal would be defined between two sample depth intervals. Brett responded that if a surface sediment sample was above the PRG and the 2 ft sample was below, the excavation would extend to a depth immediately above 2 ft. Katarina Rutkowski/TRC was concerned if debris was still present on the surface and if contaminants had migrated vertically; she added that the sampling approach would miss subsurface contamination because a deeper subsurface sample would not be collected if the surface sediment did not have an exceedance. Brett discussed the previous debris removal conducted by Shaw. Katarina asked if the subsurface depth interval selection could be based on fine-grained layers or organic layers rather than a prescriptive approach, since the COCs tend to adsorb to organic layers. Dan Waddill/NAVFAC asked about the 0-6 inch layer related to organics, and how PREQB would like the organic layers to be detected. The team discussed organic content of the sediment collected previously and most of the sediment was sand (65%) with clay (35%) in the upper 6-inches. Dan commented that the Navy wants to do what is right to define the excavation of the remedy. Julio asked if post-removal samples would be collected; the team discussed that they would be collected. The team determined that all sediment samples at the various depths would be analyzed.

Katarina requested that total Aroclors be reported because specific Aroclors can weather or convert to a different Aroclor type. Dan asked how we would calculate total PCBs and stated that the PRG was only for Aroclor-1254. Katarina responded that a total PCB PRG would be calculated. Katarina added that PREQB may comment on this on the SAP. Dan responded that the Navy can provide further justification on why only Aroclor-1254 is appropriate. Michael Sivak/EPA added that only Aroclor-1254 was previously detected, but agreed that a clean-up goal could be established for all PCBs with a value of 1 ppm, consistent with other Region 2 sites. Dan responded that Navy is interested in this route and analysis of all PCBs with the 1 ppm clean-up goal. John Martin/CH2M HILL asked how non-detects would be calculated for total Aroclors; Angela responded that EPA would have to evaluate this further; Michael added in some cases half of the detection limit is used but in some cases it has to be assumed that the Aroclor is just not present. Katarina asked if Region 2 requires congener analysis for clean-up goals as this is PREQB's recommendation but will defer to USEPA; Michael responded that with the concentrations we see at this site, USEPA recommends only analyzing for specific aroclors.

Note that although various discussions of PCB analysis occurred during the two scoping sessions, based on the 1 ppm total PCBs (as sum of aroclors) commonly used for PCB remedial actions within Region 2 and across the country, total PCB analysis (as sum of aroclors) will be conducted as part of this SAP and 1 mg/kg will be used as the corresponding PRG.

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SAP Worksheet #10—Conceptual Site Model

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

Site Background

SWMU 6, the Former Mangrove Disposal Site, is located in a mangrove swamp between two tidally influenced lagoons of the Laguna Kiani complex, along Highway 200 on the former NASD (**Figures 1 and 2**). The site was used for the disposal of general solid waste during the 1960s and 1970s from Navy operations within the former NASD. Waste discarded at the site comprised empty containers of lubricants, oil, solvents, and paints; broken glass; and rubble. No munitions and explosives of concern (MEC) were identified at the site; however, munitions-related items such as inert concrete-filled practice bombs, empty bomb dispensers, and empty shell casings were identified. Items identified at the site were deteriorated from natural corrosion in the saltwater environment.

The Navy ceased facility-wide operations on the former NASD on April 30, 2001, when the land was transferred to the Department of the Interior (DOI), the Municipality of Vieques (MOV), and Conservation Trust. SWMU 6 is located on DOI property that has been designated as a wildlife refuge. **Figure 2** is an aerial photograph of SWMU 6 that shows the dense vegetation in the mangrove area prior to the removal activities. Highway 200, located adjacent to the site, is an access road to the public beaches located further to the west.

Investigation History

On March 15, 2005, Vieques was placed on the National Priorities List (NPL) that required all subsequent environmental restoration activities for Navy Installation Restoration (IR) sites (including SWMU 6) to be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) procedures.

Historical environmental investigations conducted at SWMU 6 to characterize potential contamination associated with the waste materials included an Initial Assessment Study and Environmental Baseline Survey (EBS) (Program Management Company, 2000), and an Expanded Preliminary Assessment/Site Inspection (CH2M HILL, 2000). More recently, an Engineering Evaluation/Cost Analysis (EE/CA) (CH2M HILL, 2005), a Remedial Investigation (RI) (CH2M HILL, 2007), a Removal Action Work Plan (Shaw, 2007), pre-removal waste characterization human health and ecological risk assessments (CH2M HILL, 2008a; 2008b), a Removal Action (Shaw, 2010), post-removal confirmatory sampling (CH2M HILL, 2010a), post-removal human health and ecological risk assessments (CH2M HILL, 2011a; 2011b), tissue sampling for refinement of the post- removal human health risk assessment (CH2M HILL, 2012), and a Feasibility Study (FS) (CH2M HILL, 2013) were completed for the site.

A removal action was conducted at the site in 2009 to remove the waste debris and a significant quantity of impacted soil, followed by confirmation sampling and site restoration activities. The extent of debris removal was based on visual observation; the extent of soil excavation area was defined by pre-removal waste characterization human health and ecological risk assessments (CH2M HILL, 2008a; 2008b), which were summarized in the technical memorandum entitled *Determination of the Disposition of Excavated Soils at SWMU 6* (CH2M HILL, 2008c).

Due to the removal action, the environmental setting was altered from an intertidal forested wetland habitat to a shallow, open water marine habitat that is hydraulically connected to and tidally influenced with the adjacent Laguna Kiani complex. The site now supports a relatively small community of marine fish and invertebrates, along with foraging wildlife such as wading birds.

Because the site was significantly altered during removal activities, and resulting environmental conditions and exposure pathways to human and ecological receptors changed, supplemental confirmatory sampling of surface water, sediment, and soil was conducted in February 2011 (CH2M HILL, 2010a) to generate an appropriate dataset for the post-removal risk assessments.

SAP Worksheet #10—Conceptual Site Model (continued)

The post-removal ecological risk assessment (CH2M HILL, 2011b) identified cadmium, copper, lead, and zinc as the only ecological COCs, based on direct exposure to these metals in sediment by lower trophic level receptors. The post-removal human health risk assessment (CH2M HILL, 2011a) identified polychlorinated biphenyls (PCBs) as the only human health COC, based on human consumption of edible-size fish/blue crab. The PCB concentrations posing unacceptable risk were based on PCB uptake from sediment and subsequent bioaccumulation in the fish and crab. In January and February 2012, fish/blue crab sampling was conducted for a focused list of parameters to provide tissue data for refining the post-removal human health risk assessment (CH2M HILL, 2012).

Based on the refined post-removal human health risk assessment and the post-removal ecological risk assessment, the FS was completed to evaluate remedial alternatives to address COCs in sediment (CH2M HILL, 2013). Sediment PRGs were developed for Aroclor-1254 (0.2 mg/kg), lead (218 mg/kg), and zinc (410 mg/kg); maximum cadmium and copper values at the site were below the PRGs, so remedial action associated with these constituents is not warranted; therefore, they are not included in this contaminant sediment refinement sampling. No unacceptable risks were identified for potential/hypothetical human or ecological receptors exposed to soil, groundwater, or surface water.

Conceptual Site Model

Figure 3 presents a generalized conceptual site model of SWMU 6. Pertinent elements of the CSM are discussed below.

Physical Characteristics

As a result of the removal action conducted in 2009, the site is currently a shallow, tidally influenced saltwater lagoon that is hydraulically connected to the Kiani Lagoon complex through a small, partially blocked opening at the northern portion of the site. Areas around the perimeter of the site are periodically inundated with water due to tidal fluctuations. Sediment and soil consist of silty sand with organic material and well-graded sand with crushed shells. The site now supports a relatively small community of marine fish and invertebrates, along with foraging wildlife such as wading birds.

Potential Contaminant Sources and Transport Pathways

Historically, the debris was the potential contaminant source at the site. Although the debris and a significant quantity of associated soils (nearly 1,500 tons) were removed from the site in 2009, residual sediment contamination has been identified that could pose potentially unacceptable risks to human and/or ecological receptors. Although a potential, the partially blocked connection with the larger, surrounding lagoon complex make contaminant transport (suspended sediment) via tidal exchanges unlikely.

Receptors

Although the CSM (**Figure 3**) identifies multiple potential human and ecological receptors, human consumers of edible-size fish and blue crab from the lagoon are the only human receptors of concern at the site due to the potential presence of elevated PCBs in lagoon sediments. The post-removal ERA identified lower trophic level receptors as the ecological receptors of concern at the site because lead and zinc were identified as ecological COCs in sediment during the post-removal ERA.

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

General Problems to Address

The ERP Technical Subcommittee met in May and June 2013 to jointly scope the rationale, sampling approach, and analysis for the SWMU 6 investigation. The investigation objective is to determine the horizontal and vertical extent of COC (total PCBs [sum of aroclors], lead, and zinc) concentrations in sediment above the PRGs to help refine the remediation area and volume assumed in the FS.

Environmental Questions to be Answered

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

1. **What are the horizontal and vertical extents of COCs (total PCBs [sum of aroclors], lead, and zinc) in sediment above the PRGs?**

   This question will be answered by collecting sediment core samples in a grid-based (20-ft by 20-ft) sampling approach. Sediment core samples will be collected from an estimated 32 sample locations, as shown in Figure 4, to an approximate depth of 6.5 ft. The sediment locations are designed to encompass the main part of the SWMU 6 lagoon, surrounding the areas where elevated levels of COCs were detected in post-removal confirmatory sediment samples. Six-inch-interval subsurface sediment samples will be collected for analysis within each 2-ft interval (0-6 inches, 24-30 inches, 48-54 inches, and 72-78 inches) from each location. Sediment samples will be collected from these pre-determined depths unless evidence of an organic layer, "rust colored" sediment, or a silt/clay layer within a sand interval is encountered, in which case the sample will be collected from the unique layer.

   The sediment samples will be submitted to the laboratory for a standard (28-day) turn-around time (TAT) analysis of lead and zinc by EPA Method SW-846 6010C and total PCBs by EPA Method SW-846 8082A. Standard turnaround is sufficient for this investigation. The horizontal and vertical extents will be defined as where lead, zinc, and or total PCBs are above the PRGs: total PCBs (1 mg/kg), lead (218 mg/kg), and zinc (410 mg/kg).

2. **Based on the results of the sediment delineation sampling, is FS Alternative 3 (excavation) still preferred?**

   This question will be answered by compiling and analyzing the sediment data collected to develop area and volumes estimates of the excavation area (i.e., area and volumes of sediment where PRGs are exceeded). The sediment results and area and volume estimates will be presented to the ERP Technical Subcommittee in a technical memorandum. The ERP Technical Subcommittee will determine if the new data support an alternative other than FS Alternative 3 (excavation). If Alternative 3 is still preferred, it will be refined with the new area and volume information, as well as additional considerations likely necessary (e.g., multiple excavation events to achieve PRGs), and presented in an FS Addendum.

   <u>Who will use the data and what will the data be used for?</u>

   The Navy, USEPA, EQB, USFWS, and NOAA will use the data collected to determine whether FS Alternative 3 or an alternative other than FS Alternative 3 is supported.

   <u>What are the Project Action Limits (PALs)?</u>

   The PALs are listed, by constituent group, in Worksheet #15. The PALs are the sediment PRGs that were developed in the FS for lead (218 mg/kg) and zinc (410 mg/kg) and the action level for PCBs (1 mg/kg) based on the Toxic Substances Control Act and the CERCLA.

   In addition to listing the particular analytes, PALs, and limits of detection (LODs), Worksheet #15 identifies where LODs are greater than PALs; the LODs for the analytes being sampled during this investigation are all less than their respective PALs.

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

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 (Empirical Laboratories in Nashville, Tennessee).

Based on existing sediment and biota tissue sampling data, as well as discussions among the ERP Technical Subcommittee members during scoping sessions, the COCs are PCBs (sum of aroclors), lead, and zinc as shown in Worksheet #15.

Worksheets #10, #15, and #18 define the specific target analytes for SWMU 6.

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. 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, USEPA Region 2, and Navy guidance and the data will be validated per Region 2 guidelines, methodology, and laboratory 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 DoD Quality Systems Manual (QSM), as applicable, and laboratory in-house limits where QSM does not apply.

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 USEPA. 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 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 will be collected with the various media 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 1 per 10 field samples. 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 per matrix. 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 are collected at a frequency of 1 per day per medium sampled 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 SWMU 6 as no samples will be analyzed for volatile organic compounds (VOCs).

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

In order to support the environmental decisions, each result must be available and usable for the project team. All data sets will undergo a Data Quality Evaluation (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.

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

Worksheet #18 contains the number of sediment samples per analyte for SWMU 6. Worksheets #15 contain the particular analytes, PALs, and LODs. Worksheet #17 provides the rationale for the particular sampling at the site.

An estimated 128 sediment samples will be collected at the site as discussed in Worksheet #17.

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

Samples will be collected during one field mobilization planned to occur in June 2014.

Data will be collected and generated in accordance with the procedures outlined in the UFP-SAP.

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

CH2M HILL field staff will collect the samples.

Laboratory analysis will be performed by Empirical Laboratories in Nashville, Tennessee.

The data will be reported in a technical memorandum presented to the Vieques Technical Subcommittee and, ultimately, may be used to modify the FS Alternative 3 and/or other alternatives, as appropriate.

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

The general objectives of the decision analysis process are:

To determine the vertical and horizontal extent of COC (PCBs, lead, and zinc) concentrations in sediment above the PRGs.

To develop area and volume estimates for the potential removal of sediment containing COCs exceeding PRGs.

To determine whether FS Alternative 3 (excavation) is still the preferred remedy.

The associated PQO statements are:

If the concentrations of COCs at the boundaries of sampling (both horizontally and vertically) are approximately at or below the PRGs, no additional sediment sampling will be necessary in order to make area and volume estimates of contaminated soil requiring remediation. Note that it is not necessary for all COC concentrations at the boundaries of sampling to be below PRGs in order to make the necessary area and volume estimates suitable for remedial alternatives evaluation. For any boundary (horizontal or vertical) COC concentration above its PRG, professional judgment will be used to determine if the concentration is close enough to the PRG to use in area and volume estimates in the FS: (i.e., less than approximately 50% above the PRG).

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

If the concentrations of COC(s) at the boundaries of sampling (both horizontally and vertically) are above the PRG(s) and not close enough to the PRG(s) to use in area and volume estimates suitable for an FS, additional sediment samples will be collected in the appropriate direction (horizontally and/or vertically) until the condition outlined in the above PQO statement is achieved. If additional samples are collected, they will approximate the grid spacing and depth profiling protocols presented in this SAP; a SAP addendum will not be necessary.

If FS Alternative 3 (excavation) is still the preferred remedy based on the refined area and volume estimates and discussion among the ERP Technical Subcommittee representatives, FS Alternative 3 will be revised based on the refined area and volume information, as well as additional considerations likely necessary (e.g., multiple excavation events to achieve PRGs), which will be presented in an FS Addendum. Otherwise, another FS alternative will be identified as the preferred alternative and, if warranted, the alternative will be modified in an FS Addendum.

Note that in the event COC concentrations below PRGs are detected in shallower sample(s) and above PRG(s) in deeper sample(s) for any given sediment sampling station, estimates of remediation area and volume may be affected. However, how they will be affected will depend on actual spatial results obtained. Any affect on the site's conceptual model of exposure and remediation area and volume will be discussed in the FS Addendum Report, which will be provided for regulatory review.

SAP Worksheet #12—Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2)

In accordance with regulator request on past SAPs, all field QC sample information is 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
13 sediment (or surface soil in areas where open water was not present) supplementary confirmation samples. 10 co-located background surface water and sediment samples were also collected from nearby lagoons.	CH2M HILL, Post-Removal Confirmatory Sampling, February 2011	Soil post-removal confirmation samples	Sediment sample results were used as a guide for the 20x20 grid pattern of sediment samples planned for this SAP.	Historical data will not be used to estimate the remedial action area; newly collected sediment sample will supersede historical data.
8 tissue samples. An additional 8 background tissue samples were also collected.	CH2M HILL, Tissue Sampling for Refinement of the Post-Removal Human Health Risk Assessment, January/February 2012	Biota tissue samples	Will not be used as part of the refinement investigation.	Not applicable

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SAP Worksheet #14—Summary of Project Tasks

The technical approach for the proposed field activities at SWMU 6 is detailed below. Protocols and standard operating procedures (SOPs) are included in the current version of The Master Standard Operating Procedures, Protocols, and Plans (MSOPPP) (CH2M HILL, 2010b).

Mobilization

Prior to mobilization, NAVFAC, USEPA, PREQB, and USFWS 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:

- Driller with macrocore capabilities or equivalent
- Investigation-derived waste (IDW) handler
- 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 field meetings to discuss the work items and worker responsibilities, and to familiarize workers with the HSP.

Sediment Sampling and Analysis

Sediment core samples will be collected using a grid-based (20-ft by 20-ft) sampling approach, for an estimated total of 32 sample locations (**Figure 4**). The samples will be distributed relatively uniformly across the lagoon so that the estimate (from the FS) of the remediation volume and area can be refined. The sediment sampling locations will be established at or near high tide by placing temporary stakes near the corners of the inundated area and then placing additional stakes at approximately 20-foot spacings to approximate the grid pattern shown in Figure 4. Once all stakes are set, the coordinates for each will be collected using a global positioning system (GPS) unit. Sediment samples will be collected from inundated locations. Sediment cores will be collected to a depth of approximately 6.5 ft and 6-inch-interval subsurface sediment samples will be collected for analysis within each 2-ft interval (0-6 inches, 24-30 inches, 48-54 inches, and 72-78 inches). Sediment samples will be collected from the pre-determined depths unless evidence of an organic layer, "rust colored" sediment, or a silt/clay layer within a sand interval is encountered, in which case the sample will be collected from the unique layer.

Sediment samples will be collected using a macrocore sampler or similar (e.g., slide hammer, direct-push, etc.), in general accordance with the SOPs listed on Worksheet # 21. All samples will be analyzed for total PCBs, lead, and zinc.

Equipment Decontamination

Non-disposable equipment decontamination will follow SOP E-1 listed on Worksheet #21 and included in the Final Master SOPs (CH2M HILL, 2010b). 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.

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

Investigation Derived Waste Management

Other than PPE (discussed under "Equipment Decontamination" above), no solid investigation-derived waste (IDW) will be generated; any excess sediment will be returned to the lagoon. The only liquid IDW anticipated is decontamination fluids, which are anticipated to be only several gallons. 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 of the Master Protocols (CH2M HILL, 2010b).

Shipments

All analytical samples will be sent by Fed Ex 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 HILL, 2010b).

Quality Control

All quality control samples are listed on Worksheet #20. In reference to the field tasks, all field work will be overseen by a field team leader 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 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.

SAP Worksheet #15-1—Field Sampling Requirements Table

(UFP-QAPP Manual Section 2.8.1)
Matrix: SD
Analytical Group: PCB

Analyte	CAS #6	PRG[1] (µg/kg)	Project QL Goal[2] (µg/kg)	Laboratory Limits[4] (µg/kg)			LCS and MS/MSD Recovery Limits and RPD[3](%)		
				LOQ	LOD	DL	LCL	UCL	RPD
Aroclor-1016	12674-11-2	N/A	111	16.7	8.33	4.17	40	140	30
Aroclor-1221	11104-28-2	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor-1232	11141-16-5	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor-1242	53469-21-9	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor-1248	12672-29-6	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor-1254	11097-69-1	N/A	100	16.7	8.33	4.17	40	140	
Aroclor-1260	11096-82-5	N/A	111	16.7	8.33	4.17	60	130	
Aroclor-1262	37384-23-5	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor-1268	11100-14-4	N/A	111	16.7	8.33	4.17	NS	NS	
Aroclor, total[5]	TOTAROCLOR	1000	N/A	N/A	N/A	N/A	NS	NS	

Notes:

[1] Refer to **Worksheet #11** for specific identification of PALs by matrix.

[2] Project QL goals are equal to the PRG for Total Aroclors (1000µg/kg) divided by the number of compounds (9) which is 111µg/kg for each Aroclor. The PQL goal for Aroclor-1254 is 100µg/kg (one-half of a potential PRG of 200µg/kg for Aroclor-1254).

[3] DoD QSM v.4.2 is the basis for LCS and MS/MSD limits.

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

[5] Total Aroclors is defined as the sum of detected Aroclors (post-validation). For any PCB detected during the SWMU 6 Sediment Contamination Delineation, any non-detect results and results U-qualified due to blank contamination will contribute ½ the LOD to the total PCB concentration. Any PCB not detected during the SWMU 6 Sediment Contamination Delineation will contribute zero to the total PCB concentration. This approach may be reconsidered, with discussion among the Vieques Technical Subcommittee, if LODs are elevated and it is suspected that the associated PCBs are not present.

[6] Some CAS numbers may be contractor-specific.

NS - Not spiked in LCS or MS (Aroclor-1254 is expected); if one of these Aroclors is detected in the initial analysis, the laboratory will re-calibrate the instrument and reanalyze the sample.

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: SD

Analytical Group: METAL

Analyte	CAS #	PRG[1] (mg/kg)	Project QL Goal[2] (mg/kg)	Laboratory Limits[4] (mg/kg)			LCS and MS/MSD Recovery Limits and RPD[3](%)		
				LOQ	LOD	DL	LCL	UCL	RPD
Lead	7439-92-1	218	109	1.0	0.60	0.30	80	120	20
Zinc	7440-66-6	410	205	4.0	2.0	1.0	80	120	

Notes:

[1] Refer to **Worksheet #11** for specific identification of PALs by matrix.

[2] Project QL goals are equal to half of the minimum applicable PAL.

[3] DoD QSM v.4.2 is the basis for LCS and MS/MSD limits.

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

SAP Worksheet #16—Project Schedule/Timeline Table

The SWMU 6 sediment investigation will be implemented in accordance with the schedule provided in the draft FY14 Site Management Plan (CH2M HILL, 2013), 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 are based on meeting the objectives defined in Worksheet #10.

Based on data collected during historical environmental investigations conducted at SWMU 6 to characterize potential contamination associated with the waste materials, total PCBs, lead, and zinc in sediment have been identified as the COCs for SWMU 6. Therefore, these target constituents will be analyzed for during this contaminated sediment refinement sampling. The specific sediment analyses are listed in Worksheet #18.

Sediment core samples will be collected in a grid-based (20-ft by 20-ft) sampling approach around a transect through sample locations SD03 and SD09 (the two post-removal sediment samples where one or more COCs exceeded the PRGs) for a total of 32 sample locations, as shown in **Figure 4**. The distribution and depth profile of the sediment samples were jointly selected by the Navy, USEPA, PREQB, and USFWS to ensure the horizontal and vertical extent of COC concentrations in sediment exceeding the PRGs can be estimated sufficiently for the purposes of refining the remediation area and volume assumed in the SWMU 6 FS Addendum. The sediment locations are designed to encompass the areas where elevated levels of COCs were detected in post-removal confirmatory sediment samples. Due to the relative immobility of PCBs, the sampling depth is anticipated to sufficiently account for potential vertical PCB migration. Four 6-inch-interval subsurface sediment samples (0-6 inches, 24-30 inches, 48-54 inches, and 72-78 inches) will be collected from the sediment core obtained from each sample location. Sediment samples will be collected from the pre-determined depths unless evidence of an organic layer, "rust colored" sediment, or a silt/clay layer within a sand interval is encountered, in which case the sample will be collected from the unique layer.

Each sample will be analyzed for total PCBs, lead, and zinc.

The number and locations of the sampling points were discussed and concurred upon by the ERP Technical Subcommittee during the scoping sessions outlined in Worksheet #9.

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

(UFP-QAPP Manual Section 3.1.1)

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples	Sampling SOP Reference
VWW06-SD024 / VWW06-SD024-000H VWW06-SD024 / VWW06-SD024P-000H	SD	0 - 6 inches	PCB, METAL	2 (FD)	See Worksheet #21
VWW06-SD024 / VWW06-SD024-022H		24 - 30 inches		1	
VWW06-SD024 / VWW06-SD024-044H		48 - 54 inches		1	
VWW06-SD024 / VWW06-SD024-055H		72 - 78 inches		1	
VWW06-SD025 / VWW06-SD025-000H VWW06-SD025 / VWW06-SD025-000H-MS VWW06-SD025 / VWW06-SD025-000H-SD		0 - 6 inches		3 (MS/MSD)	
VWW06-SD025 / VWW06-SD025-022H		24 - 30 inches		1	
VWW06-SD025 / VWW06-SD025-044H		48 - 54 inches		1	
VWW06-SD025 / VWW06-SD025-055H		72 - 78 inches		1	
VWW06-SD026 / VWW06-SD026-000H		0 - 6 inches		1	
VWW06-SD026 / VWW06-SD026-022H VWW06-SD026 / VWW06-SD026P-022H		24 - 30 inches		2 (FD)	
VWW06-SD026 / VWW06-SD026-044H		48 - 54 inches		1	
VWW06-SD026 / VWW06-SD026-055H		72 - 78 inches		1	
VWW06-SD027 / VWW06-SD027-000H		0 - 6 inches		1	
VWW06-SD027 / VWW06-SD027-022H VWW06-SD027 / VWW06-SD027-022H-MS VWW06-SD027 / VWW06-SD027-022H-SD		24 - 30 inches		3 (MS/MSD)	
VWW06-SD027 / VWW06-SD027-044H		48 - 54 inches		1	
VWW06-SD027 / VWW06-SD027-055H		72 - 78 inches		1	
VWW06-SD028 / VWW06-SD028-000H		0 - 6 inches		1	
VWW06-SD028 / VWW06-SD028-022H VWW06-SD028 / VWW06-SD028P-022H		24 - 30 inches		2 (FD)	
VWW06-SD028 / VWW06-SD028-022H		48 - 54 inches		1	
VWW06-SD028 / VWW06-SD028-055H		72 - 78 inches		1	
VWW06-SD029 / VWW06-SD029-000H		0 - 6 inches		1	
VWW06-SD029 / VWW06-SD029-022H		24 - 30 inches		1	
VWW06-SD029 / VWW06-SD029-044H VWW06-SD029 / VWW06-SD029-044H-MS VWW06-SD029 / VWW06-SD029-044H-SD		48 - 54 inches		3 (MS/MSD)	
VWW06-SD029 / VWW06-SD029-055H		72 - 78 inches		1	
VWW06-SD030 / VWW06-SD030-000H		0 - 6 inches		1	
VWW06-SD030 / VWW06-SD030-022H		24 - 30 inches		1	
VWW06-SD030 / VWW06-SD030-044H VWW06-SD030 / VWW06-SD030P-044H		48 - 54 inches		2 (FD)	
VWW06-SD030 / VWW06-SD030-055H		72 - 78 inches		1	

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

(UFP-QAPP Manual Section 3.1.1)

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples	Sampling SOP Reference
VWW06-SD031 / VWW06-SD031-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD031 / VWW06-SD031-022H		24 - 30 inches		1	
VWW06-SD031 / VWW06-SD031-044H		48 - 54 inches		1	
VWW06-SD031 / VWW06-SD031-055H		72 - 78 inches		3 (MS/MSD)	
VWW06-SD031 / VWW06-SD031-055H-MS					
VWW06-SD031 / VWW06-SD031-055H-SD					
VWW06-SD032 / VWW06-SD032-000H		0 - 6 inches		1	
VWW06-SD032 / VWW06-SD032-022H		24 - 30 inches		1	
VWW06-SD032 / VWW06-SD032-044H		48 - 54 inches		2 (FD)	
VWW06-SD032 / VWW06-SD032P-044H					
VWW06-SD032 / VWW06-SD032-055H		72 - 78 inches		1	
VWW06-SD033 / VWW06-SD033-000H		0 - 6 inches		1	
VWW06-SD033 / VWW06-SD033-022H		24 - 30 inches		1	
VWW06-SD033 / VWW06-SD033-044H		48 - 54 inches		1	
VWW06-SD033 / VWW06-SD033-055H		72 - 78 inches		1	
VWW06-SD034 / VWW06-SD034-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD034 / VWW06-SD034-022H		24 - 30 inches		1	
VWW06-SD034 / VWW06-SD034-044H		48 - 54 inches		1	
VWW06-SD034 / VWW06-SD034-055H		72 - 78 inches		1	
VWW06-SD035 / VWW06-SD035-000H		0 - 6 inches		2 (FD)	
VWW06-SD035 / VWW06-SD035P-022H					
VWW06-SD035 / VWW06-SD035-022H		24 - 30 inches		1	
VWW06-SD035 / VWW06-SD035-044H		48 - 54 inches		1	
VWW06-SD035 / VWW06-SD035-055H		72 - 78 inches		1	
VWW06-SD036 / VWW06-SD036-000H		0 - 6 inches		1	
VWW06-SD036 / VWW06-SD036-022H		24 - 30 inches		3 (MS/MSD)	
VWW06-SD036 / VWW06-SD036-022H-MS					
VWW06-SD036 / VWW06-SD036-022H-SD					
VWW06-SD036 / VWW06-SD036-044H		48 - 54 inches		1	
VWW06-SD036 / VWW06-SD036-055H		72 - 78 inches		1	
VWW06-SD037 / VWW06-SD037-000H		0 - 6 inches		1	
VWW06-SD037 / VWW06-SD037-022H		24 - 30 inches		1	
VWW06-SD037 / VWW06-SD037-044H		48 - 54 inches		1	
VWW06-SD037 / VWW06-SD037-055H		72 - 78 inches		2 (FD)	
VWW06-SD037 / VWW06-SD037P-055H					

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

(UFP-QAPP Manual Section 3.1.1)

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples	Sampling SOP Reference
VWW06-SD038 / VWW06-SD038-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD038 / VWW06-SD038-022H		24 - 30 inches		1	
VWW06-SD038 / VWW06-SD038-044H		48 - 54 inches		1	
VWW06-SD038 / VWW06-SD038-055H		72 - 78 inches		1	
VWW06-SD039 / VWW06-SD039-000H		0 - 6 inches		1	
VWW06-SD039 / VWW06-SD039-022H		24 - 30 inches		1	
VWW06-SD039 / VWW06-SD039-044H		48 - 54 inches		1	
VWW06-SD039 / VWW06-SD039-055H		72 - 78 inches		1	
VWW06-SD040 / VWW06-SD040-000H		0 - 6 inches		1	
VWW06-SD040 / VWW06-SD040-022H		24 - 30 inches		1	
VWW06-SD040 / VWW06-SD040-044H		48 - 54 inches		1	
VWW06-SD040 / VWW06-SD040-055H		72 - 78 inches		1	
VWW06-SD041 / VWW06-SD041-000H		0 - 6 inches		1	
VWW06-SD041 / VWW06-SD041-022H		24 - 30 inches		1	
VWW06-SD041 / VWW06-SD041-044H		48 - 54 inches		1	
VWW06-SD041 / VWW06-SD041-055H		72 - 78 inches		1	
VWW06-SD042 / VWW06-SD042-000H		0 - 6 inches		1	
VWW06-SD042 / VWW06-SD042-022H VWW06-SD042 / VWW06-SD042P-022H		24 - 30 inches		2 (FD)	
VWW06-SD042 / VWW06-SD042-044H		48 - 54 inches		1	
VWW06-SD042 / VWW06-SD042-055H		72 - 78 inches		1	
VWW06-SD043 / VWW06-SD043-000H		0 - 6 inches		1	
VWW06-SD043 / VWW06-SD043-022H		24 - 30 inches		1	
VWW06-SD043 / VWW06-SD043-044H		48 - 54 inches		1	
VWW06-SD043 / VWW06-SD043-055H		72 - 78 inches		1	
VWW06-SD044 / VWW06-SD044-000H		0 - 6 inches		1	
VWW06-SD044 / VWW06-SD044-022H VWW06-SD044 / VWW06-SD044-022H-MS VWW06-SD044 / VWW06-SD044-022H-SD		24 - 30 inches		1	
VWW06-SD044 / VWW06-SD044-044H		48 - 54 inches		1	
VWW06-SD044 / VWW06-SD044-055H		72 - 78 inches		1	
VWW06-SD045 / VWW06-SD045-000H		0 - 6 inches		1	
VWW06-SD045 / VWW06-SD045-022H		24 - 30 inches		1	
VWW06-SD045 / VWW06-SD045-044H		48 - 54 inches		1	
VWW06-SD045 / VWW06-SD045-055H		72 - 78 inches		1	

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

(UFP-QAPP Manual Section 3.1.1)

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples	Sampling SOP Reference
VWW06-SD046 / VWW06-SD046-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD046 / VWW06-SD046-022H		24 - 30 inches		1	
VWW06-SD046 / VWW06-SD046-044H		48 - 54 inches		2 (FD)	
VWW06-SD046 / VWW06-SD046P-044H					
VWW06-SD046 / VWW06-SD046-055H		72 - 78 inches		1	
VWW06-SD047 / VWW06-SD047-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD047 / VWW06-SD047-022H		24 - 30 inches		1	
VWW06-SD047 / VWW06-SD047-044H		48 - 54 inches		1	
VWW06-SD047 / VWW06-SD047-055H		72 - 78 inches		1	
VWW06-SD048 / VWW06-SD048-000H		0 - 6 inches		1	
VWW06-SD048 / VWW06-SD048-022H		24 - 30 inches		1	
VWW06-SD048 / VWW06-SD048-044H		48 - 54 inches		2 (FD)	
VWW06-SD048 / VWW06-SD048P-044H					
VWW06-SD048 / VWW06-SD048-055H		72 - 78 inches		1	
VWW06-SD049 / VWW06-SD049-000H		0 - 6 inches		1	
VWW06-SD049 / VWW06-SD049-022H		24 - 30 inches		1	
VWW06-SD049 / VWW06-SD049-044H		48 - 54 inches		1	
VWW06-SD049 / VWW06-SD049-055H		72 - 78 inches		1	
VWW06-SD050 / VWW06-SD050-000H		0 - 6 inches		2 (FD)	
VWW06-SD050 / VWW06-SD050P-022H					
VWW06-SD050 / VWW06-SD050-022H		24 - 30 inches		1	
VWW06-SD050 / VWW06-SD050-044H		48 - 54 inches		1	
VWW06-SD050 / VWW06-SD050-055H		72 - 78 inches		1	
VWW06-SD051 / VWW06-SD051-000H		0 - 6 inches		1	
VWW06-SD051 / VWW06-SD051-022H		24 - 30 inches		1	
VWW06-SD051 / VWW06-SD051-044H		48 - 54 inches		1	
VWW06-SD051 / VWW06-SD051-055H		72 - 78 inches		1	
VWW06-SD052 / VWW06-SD052-000H		0 - 6 inches		3 (MS/MSD)	
VWW06-SD052 / VWW06-SD052-000H-MS					
VWW06-SD052 / VWW06-SD052-000H-SD					
VWW06-SD052 / VWW06-SD052-022H		24 - 30 inches		1	
VWW06-SD052 / VWW06-SD052-044H		48 - 54 inches		1	
VWW06-SD052 / VWW06-SD052-055H		72 - 78 inches		1	
VWW06-SD053 / VWW06-SD053-000H		0 - 6 inches		1	
VWW06-SD053 / VWW06-SD053-022H		24 - 30 inches		1	
VWW06-SD053 / VWW06-SD053-044H		48 - 54 inches		1	
VWW06-SD053 / VWW06-SD053-055H		72 - 78 inches		2 (FD)	
VWW06-SD053 / VWW06-SD053P-055H					

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

(UFP-QAPP Manual Section 3.1.1)

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples	Sampling SOP Reference
VWW06-SD054 / VWW06-SD054-000H	SD	0 - 6 inches	PCB, METAL	1	See Worksheet #21
VWW06-SD054 / VWW06-SD054-022H		24 - 30 inches		1	
VWW06-SD054 / VWW06-SD054-044H		48 - 54 inches		1	
VWW06-SD054 / VWW06-SD054-055H		72 - 78 inches		1	
VWW06-SD055 / VWW06-SD055-000H		0 - 6 inches		1	
VWW06-SD055 / VWW06-SD055-022H VWW06-SD055 / VWW06-SD055P-022H		24 - 30 inches		2 (FD)	
VWW06-SD055 / VWW06-SD055-044H		48 - 54 inches		1	
VWW06-SD055 / VWW06-SD055-055H		72 - 78 inches		1	

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SAP Worksheet #19—Field Sampling Requirement Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group[1]	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume[2]	Preservation Requirements	Maximum Holding Time
SD	PCB	SW-846 3546, 8082A / SOP343, SOP211	4-ounce glass jar	15 g	≤ 6 °C but not frozen	14 days / 40 days
	METAL	SW-846 3050B, 6010C / SOP100, SOP105		1 g		180 days

Notes:

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

[2] Fill to capacity. Minimum amounts are shown.

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SAP Worksheet #20—Field Quality Control Sample Summary Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/ MSD Pairs	No. of Equipment Blanks[1]	No. of Trip Blanks	Total No. of Samples to Lab
SD	PCB	128	13	7	8	-	163
	METAL	128	13	7	8	-	163

Notes:
[1] The number of equipment blanks is based on a frequency and fundamental assumption. For sediment samples, it was assumed that 20 samples can be collected per day and one equipment blank is collected per day when equipment is decontaminated.

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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
SOPs A-2, A-5	(A-2) Soil Sampling, (A-5) Slide Hammer Soil Sampling, April 2010 SOP	CH2M HILL	Sampling vessel, vibratory core barrel and liner	N	
SOP E-1	Decontamination of Personnel and Equipment, April 2010 SOP	CH2M HILL	Decontamination equipment	N	
SOP H-1	Preparing Field Log Books, April 2010 SOP	CH2M HILL	Log book	N	
SOP H-4	Chain-of-Custody, April 2010 SOP	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, April 2010 SOP	CH2M HILL	SOP	N	
SOP H-6	Equipment Blank Preparation, April 2010 SOP	CH2M HILL	Sample containers	N	

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

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

No field equipment requiring calibration, maintenance, testing, and inspection will be used during this sediment sampling event.

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SAP Worksheet #23—Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1)

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis[1]	Variance to QSM	Modified for Project Work?
QS10	Laboratory Sample Receiving, Log in, and Storage; September 17, 2012; Rev. 19		N/A (Receiving)	SD / PCB, METAL	N/A (Receiving)	Empirical	None	N
QS14	Analytical Laboratory Waste Disposal; January 23, 2013; Rev. 08		N/A (Disposal)	SD / PCB, METAL	N/A (Disposal)	Empirical	None	N
SOP100	Metals Digestion/Preparation Methods 3005A/USEPA CLPILM0 4.1 Aqueous, 3010A, 3030C, 3050B, USEPA CLPILM0 4.1 (Soil/Sediment), 200.7, Standard Methods 3030C 21st See Addendum for USEPA CLPILM 05.2 (Aqueous & Soil/Sediment); March 7, 2012; Rev. 23	March 20, 2013	Definitive	SD /METAL	N/A (Digestion)	Empirical	None	N
SOP105	METALS BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY (ICP-AES) TECHNIQUE SW-846 6010B; SW-846 6010C, EPA 200.7, SM 2340 B-2011 for Hardness Calculation; July 1, 2013; Rev. 20		Definitive	SD /METAL	ICP-AES	Empirical	None	N
SOP211	Gas Chromatography/Electron Capture Detector (GC/ECD) Organochlorine Pesticides/Polychlorinated Biphenyls (PCB) by EPA Method 608/608.2 or SW846 Method 8081A/8080 or 8081B/8082A; December 17, 2012; Rev. 26		Definitive	SD / PCB	GC/ECD	Empirical	None	N[2]
SOP302	Pesticide/PCBs Aqueous Matrix Extraction for EPA Method 608/608.2 and SW846 Method 8081/8082 Using SW846 Method 3510C; June 7, 2012; Rev. 20	July 31, 2013	Definitive	Aq / PCB	N/A (Extraction)	Empirical	None	N
SOP173	TOTAL RESIDUE; TOTAL SOLIDS (TS) AND TOTAL VOLATILE SOLIDS (TVS); ALSO KNOWN AS PERCENT SOLIDS By Standard Methods SM 2540 B-2011 (Gravimetric, Dried at 103°C to 105°C); July 1, 2013; Rev. 10		N/A (%Solids Determination)	SD / Various	N/A (%Solids Determination)	Empirical	None	N
SOP307	SULFUR CLEANUP BY EPA METHOD SW-846 3660B; 8/20/12; Rev. 7		N/A (cleanup)	SD / PCB	N/A (Cleanup)	Empirical	None	N
SOP308	ACID CLEANUP; SW-846 METHOD 3665A; 9/7/10; Rev. 6	4/10/13	N/A (cleanup)	SD / PCB	N/A (Cleanup)	Empirical	None	N
SOP343	BNA, PESTICIDE/PCB & TPH NON-AQUEOUS MATRIX (MICROWAVE EXTRACTION) USING SW-846 METHOD 3546; 7/26/13; Rev. 5		Definitive	SD / PCB	N/A (Extraction)	Empirical	None	N

Notes:

[1] All labs are DoD ELAP accredited for analysis methods they are to perform which will generate definitive data: Empirical's DoD accreditation through L.A.B. is granted through November 30, 2015.

[2] Method option: Empirical will include an Aroclor-1254 spike in the LCS and MS/MSD.

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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 CA	SOP Reference[1]
GC/ECD	Initial Calibration (ICAL)	Upon instrument receipt, for major instrument changes, or when CCV does not meet criteria	Min 5 pt ICAL for aroclor 1016/1260 and for 1254; mid-point calibration standard for all other aroclors (Note - quantitation for other aroclors requires complete calibration in the event of a detect) (6 pts for non-linear); %RSD <20%; or Linear regression r^2 >0.990 (r>0.995); or Non-linear regression $r^2 \geq 0.990$ (6 pts for non-linear).	Repeat ICAL if criteria are not met	Analyst/Supervisor	SOP211
	Initial Calibration Verification (ICV)	After ICAL	%D < 20% for all analytes	Evaluate, repeat, if still failing, recalibrate.		
	Continuing Calibration (CCV)	Daily, after every 10 field samples and at end of run	%D < 20%	If analyte exceeds with a positive bias and is non-detect, results will be qualified. Detected analytes and analytes with negative bias will be requested for qualification/narration with client. If client approval is not received, correct problem, then rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		
ICP-AES	Linear dynamic range or high-level check standard	Every 6 months	Within ±10% of true value.	N/A	Analyst/ Supervisor	SOP105
	ICAL - minimum one high standard and a calibration blank for all analytes	Daily ICAL prior to sample analysis.	If more than one calibration standard is used, $r \geq 0.995$ (r^2 > 0.990)	Correct problem, then repeat ICAL. Flagging criteria are not appropriate.		
	ICV	Once after each ICAL, prior to beginning a sample run.	Value of second source for all analytes(s) within ±10% of true value.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL. Flagging criteria are not appropriate.		
	CCV	After every 10 field samples and at the end of the analysis sequence.	Within ± 10% of true value.	If analyte exceeds with a positive bias and is non-detect, no corrective action will be performed. Detected analytes and analytes with negative bias will be requested for qualification/narration with client. If client approval is not received, correct problem, then rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be preformed, data must be qualified and explained in the case narrative.		
	Low-level calibration check standard	Daily, after one-point ICAL.	Within ±20% of true value.	Correct problem, then reanalyze. Flagging criteria are not appropriate.		
	Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed. Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.		
	Interference check solutions (ICS)	At beginning of the analytical run.	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD ICS-AB: Within 20% of true value	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples. If corrective action fails, Q qualify all associated analyte results.		

Notes:
[1] Refer to **Worksheet #23** for a complete reference to relevant analytical SOPs.
[2] The specifications in this table meet the requirements of DoD QSM 4.2.

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

(UFP-QAPP Manual Section 3.2.3)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP-AES	Clean the torch assembly and the spray chamber when they become discolored or when degradation in data quality is observed. Clean the nebulizer, and check the argon supply. Replace the peristaltic pump tubing as needed	TAL Metals	Inspect the torch, nebulizer chamber, pump, and tubing	Maintenance is performed prior to initial calibration or as necessary.	Percent difference ≤ 10%	Recalibrate and/or perform the necessary equipment maintenance. Check the calibration standards. Reanalyze the affected data.	Analyst/ Supervisor	SOP105
GC/ECD	Check pressure and gas supply daily. Bake out column, change septa, liner, seal as needed, cut column as needed.	PCBs	Liner, seal, septum, column	Prior to initial calibration or as necessary	< 20% difference	If % D > +20% and samples are < PQL, narrate. If %D > ± 20% only on one column, narrate. If % D > ±20% for closing CCV, and is likely due to matrix interference, narrate. Otherwise reanalyze all samples back to the last acceptable CCV.	Analyst/ Supervisor	SOP211

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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/FedEx
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Receipt Personnel/Empirical.
Sample Custody and Storage (Personnel/Organization):	Sample Receipt Personnel/Empirical.
Sample Preparation (Personnel/Organization):	Extractions Personnel/Empirical. Digestions Personnel/Empirical
Sample Determinative Analysis (Personnel/Organization):	Analyst/Empirical
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):	N/A
SAMPLE DISPOSAL	
Personnel/Organization:	Environmental Health and Safety Officer/Empirical
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 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 (COC) will also be placed into the cooler. Coolers will be shipped to the laboratory via FedEx, with the airbill number indicated on the COC (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 Laboratory SOP QS10 for details on sample receipt, details on sample management and chain of custody, and QS14 for details on laboratory waste disposal.

Sample Identification Procedures

Upon opening the cooler, the receiving clerk signs the COC 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 COC and any discrepancies or breakage is noted on the COC. 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 COC (and any other paperwork; e.g. temperature or pH QA notice) to the project manager for 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 log-in 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

(UFP-QAPP Manual Section 3.4)
Matrix: SD
Analytical Group: PCB
Analytical Method/SOP Reference: SW-846 8082A / SOP211

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	%RPD < 30%	Assess sampling and laboratory blending procedures and precision. Examine laboratory replicate. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	%RPD < 30%
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as for method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	Same as for method blank (see below)
Matrix Spike/ Matrix Spike Duplicate	Triple volume is provided for one per 20 normal field samples per matrix.	See below.				
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, PC, PM/FTL, Data Validator	Representativeness	≤ 6°C but not frozen
Laboratory QA/QC Samples						
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2LOQ, and >1/10 sample concentration or >1/10 regulatory limit.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results exceed limits, report sample results which are < LOQ or > 10X the blank concentration. Reanalyze blank and samples >LOQ and < 10X the 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.	Analyst/Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15**	If the LCS recoveries are high but the sample results are <LOQ, qualify and narrate. Otherwise, if sample volume available, reprep and reanalyze. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q flag to all samples in the associated preparatory batch.		Accuracy/Bias	
Surrogates	Each field and QC sample	**Analyte / Soil / Water** Decachlorobiphenyl / 60-125 / 40-135 Tetrachloro-m-xylene (Advisory for 8082) / 70-125 / 25-140	If sample volume available, re-analyze affected samples. If matrix effect demonstrated for a representative sample set, discuss with project chemist.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15**	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPD indicate obvious extraction/analysis difficulties. In that case, re-prep MS/MSD.		Accuracy/Bias/Precision	
Confirmation column	All positive results must be confirmed.	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD< 40%.	Apply P-qualifier if RPD>40%. If RPD >100%, report lower number with "M" qualifier.		Precision	

Notes:
The specifications in this table meet the requirements of DoD QSM 4.2.

SAP Worksheet #28-2—Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)
Matrix: SD
Analytical Group: METAL
Analytical Method/SOP Reference: SW-846 6010C / SOP105

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	%RPD < 30%	Assess sampling and laboratory blending procedures and precision. Examine laboratory replicate. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	%RPD < 30%
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as for method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	Same as for method blank (see below)
Matrix Spike/Matrix Spike Duplicate	Triple volume is provided for one per 20 normal field samples per matrix.	See below.				
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, PC, PM/FTL, Data Validator	Representativeness	≤ 6°C but not frozen
Laboratory QA/QC Samples						
Method Blank	One per prep batch of 20 or fewer samples of similar matrix	No analytes detected > 1/2LOQ, and >1/10 sample concentration or >1/10 regulatory limit.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results exceed limits, report sample results which are < LOQ or > 10X the blank concentration. Reanalyze blank and samples >LOQ and < 10X the 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.	Analyst, Laboratory Supervisor	Bias/Contamination	Same as Method / SOP QC Acceptance Limits.
LCS		See **Worksheet #15**	If the LCS recoveries are high but the sample results are <LOQ, qualify and narrate. Otherwise, if sample volume available, reprep and reanalyze. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q flag to all samples in the associated preparatory batch.		Accuracy/Bias	
MS/MSD			Flag results for affected analytes for all associated samples with "N." Perform PDS (for ICP).		Accuracy/Bias/Precision	
Lab replicate	Minimum of 10% of lab samples unless MSD performed	See **Worksheet #15**	Associated data *-qualified, if original result >LOQ		Precision	
Serial Dilution (ICP only)	One per prep batch of 20 or fewer samples of similar matrix	1:5 dilution must agree within ±10% of the original sample result if result is >50X LOQ	Perform PDS		Accuracy/Bias	
Post-digestion spike (PDS) addition (ICP only)	When dilution test fails or analyte concentration in all samples <50X LOD.	Recovery within 80-120%	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.			

Notes:
DoD QSM v. 4.2 is the basis for specifications on this table for laboratory QA/QC samples.

SAP Worksheet #29—Project Documents and Records Table

Document	Where Maintained
Field Notebooks	Electronic portable document format (.pdf) copies in the project file. Hardcopy (bound Field Notebook) in the project file. Archived at project closeout*.
Chain-of-Custody Records	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
Air Bills	Hardcopy in the project file. Archived at project closeout.
Telephone Logs	Hardcopy in the project file. Archived at project closeout.
Corrective Action Forms	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
Various field measurements	Recorded in Field Notebook.
All field equipment calibration information	Recorded in Field Notebook.
Pertinent telephone conversations	Recorded in Field Notebook.
Field equipment maintenance records	Inspected by Field Team Leader. Not maintained.
Sample Receipt, Custody, and Tracking Records	Electronic .pdf copies in the project file. Hardcopy in the full data package.
Equipment Calibration Logs	Hardcopy in the full data package[1]. Archived at project closeout.
Sample Prep Logs	Hardcopy in the full data package[1]. Archived at project closeout.
Run Logs	Hardcopy in the full data package[1]. Archived at project closeout.
Reported Field Sample Results	Electronic .pdf copies in the project file. Hardcopy in the full data package[1]. Archived at project closeout.
Reported Results for Standards, QC Checks, and QC Samples	Hardcopy in the full data package[1]. Archived at project closeout.
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hardcopy in the full data package[1]. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Clean-up Records	Hardcopy in the full data package[1].
Raw Data	Hardcopy in the full data package[1]. Archived at project closeout.
Field Sampling Audit Checklists	Hardcopy in the project file. Archived at project closeout.
Fixed Laboratory Audit Checklists	If completed, hardcopy in the project file. Archived at project closeout.
Data Validation Reports	Electronic .pdf copies in the project file. Hardcopy 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 Naval Installation Restoration Information Solution (NIRIS) during data mgt process.

*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.

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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	Backup Laboratory / Organization
SD	PCB	128	SOP211, SOP302	28 Calendar-day TAT	Empirical Laboratories 621 Mainstream Drive, Suite 270 Nashville, TN 37228 (615) 345-1115 POC: Sonya Gordon	TBD
	METAL	128	SOP100, SOP105			

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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	John Swenfurth, Project Manager CH2M HILL	Bill Hannah, 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	Mark Orman, H&S Officer CH2M HILL	Bill Hannah, 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
Field Performance Audit	Field Performance Audit Checklist	Field Team PM Environmental Manager	Within one 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: Anita Dodson/ Navy CLEAN Program Chemist

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 & 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: John Swenfurth/ CH2M HILL	Regional Health, Safety and Environment and Quality Manager: Mark Orman/CH2M HILL Included in project files.
Data Validation Reports	Once, after analysis by laboratory, for all laboratory analytical data except Grain Size.	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: John Swenfurth/ 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: Julio Vazquez/ USEPA and Vieques RPM Wilmarie Rivera/PREQB

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

(UFP-QAPP Manual Section 5.2.1) (UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Data Review Input	Description	Responsible for Verification/Validation	Step I / IIa / IIb[1]	Internal / External
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	Field Team Leader/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.	Field Team Leader/CH2M HILL (TBD) Project Chemist/CH2M HILL	Step I	Internal / External
Sample Condition Upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project data manager in the form of laboratory logins.	Project Chemist/CH2M HILL	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.	Project Chemist/CH2M HILL	Step I	External
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check).	Project Chemist/CH2M HILL	Step I	External
NIRIS Post-Load Checks	NIRIS Post-load checks will include verifying that all field data (i.e. sites, stations, and samples), analysis methods, and field results have been loaded.	Bhavana Reddy/Critigen Project Data Manager	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.	Laura Maschoff/DataQual (Data Validator)	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.	Marcia McGinnity/Empirical (Laboratory 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. This is verification that all samples were included in the laboratory data and that correct analyte lists were reported.	Project Chemist/CH2M HILL	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.	John Swenfurth/CH2M HILL (Project Manager) Project Chemist/CH2M HILL	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.	John Swenfurth/CH2M HILL (Project Manager) Project Chemist/CH2M HILL	Step I	External
Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods.	Project Chemist/CH2M HILL	Step IIa	External
Target Compounds ListTarget Analyte List	Ensure the laboratory reported all analytes from each analysis group as per Worksheet 15.	Project Chemist/CH2M HILL	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.	Project Chemist/CH2M HILL	Step IIb	External
Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed.	Laura Maschoff/DataQual (Data Validator)	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.	Laura Maschoff/DataQual (Data Validator)	Step IIa / IIb	External

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

(UFP-QAPP Manual Section 5.2.1) (UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Data Review Input	Description	Responsible for Verification/Validation	Step I / IIa / IIb[1]	Internal / External
Raw Data	10 percent review of raw data to confirm laboratory calculations. For a recalculated result, the data validator attempts to re-create the reported numerical value. The laboratory is asked for clarification if a discrepancy is identified which cannot reasonably be attributed to rounding. In general, this is outside 5% difference.	Laura Maschoff/DataQual (Data Validator)	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.	Field Team Leader/CH2M HILL (TBD)	Step IIb	Internal
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Laura Maschoff/DataQual (Data Validator)	Step IIa	External
Documentation of Field QC Sample Results	Establish that all required QAPP QC samples were run and met limits.	Project Chemist/CH2M HILL Laura Maschoff/DataQual (Data Validator)	Step IIb	External
Third-Party Data Validation (PCB)[2]	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 SOP No. HW-37 Revision 3 Polychlorinated Biphenyl (PCB) Aroclor Data Validation (EPA, May 2013). Note that HW-37 is written to accompany EPA CLP SOM01.2 and because there are no EPA Region II SOPs for data validation of 8082 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Additional guidance from "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (EPA-540-R-08-01, June 2008) may also be applicable.	Laura Maschoff/DataQual (Data Validator)	Step IIa and IIb	External
Third-Party Data Validation (METAL)[2]	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 SOP No. HW-2a Revision 15 ICP-AES Data Validation (EPA, January 2012). Note that HW-2a is written to accompany EPA CLP ISM01.X and because there are no EPA Region II SOPs for data validation of 6010 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Additional guidance from "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (EPA 540-R-10-011, January 2010) may also be applicable.	Laura Maschoff/DataQual (Data Validator)	Step IIa and IIb	External

Notes:

1. I = verification
   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]
   Should CH2M HILL find discrepancies during the verification or validation procedures identified in the table above, an email documenting the issue will be circulated to the 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. 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.

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 area and volume of PCBs, lead, and zinc above PRGs in sediment at SWMU 6, 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 II. 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.

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).

Ten percent of hardcopy analytical data will be checked against the electronic data to identify systematic reporting discrepancies. The basis for verifying 10% 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% 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**.

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.

SAP Worksheet #37—Usability Assessment (continued)

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%.

Completeness is calculated based on the number of non-rejected results compared to the total number of results. Inability to obtain results is an unusual occurrence. If there is breakage (assuming insufficient sample volume) and a resulting data gap is not acceptable, samples are often recollected. Inability to collect a sample results in a moved station or other action based on discussion with the project team. These situations are not due to poor data quality. If this type of situation occurs, it is discussed in the report, as it is a UFP-SAP work plan exception (samples which are planned-for but not collected).

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 PARCC considerations, including common matrices (such as 'sediment') in the investigation, and using common analysis methods (i.e. SW-846 series).

Sensitivity and its effect on usability is examined in great detail in the DQE report, but the procedure for doing so depends on 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.

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% 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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References

CH2M HILL, 2000. *Final Expanded Preliminary Assessment/Site Investigation, U.S. Naval Ammunition Storage Detachment, Vieques Island, Puerto Rico.* October.

CH2M HILL, 2005. *Draft Final Engineering Evaluation/Cost Analysis for Area of Concern J and R, and Solid Waste Management Units 6 and 7, Former Naval Ammunitions Support Detachment, Vieques Island, Puerto Rico*. December.

CH2M HILL, 2007. *Final Remedial Investigation Report, Solid Waste Management Unit (SWMU) 6, Former Naval Ammunition Support Detachment, Vieques Island, Puerto Rico.* February.

CH2M HILL 2008a. *Pre-Removal Waste Characterization Human Health Risk Assessment for SWMU 6, U.S. Naval Ammunition Support Detachment, Vieques Island, Puerto Rico.* October.

CH2M HILL 2008b. *Pre-Removal Waste Characterization Ecological Risk Assessment for AOCs J and R, SWMUs 6 and 7, U.S. Naval Ammunition Support Detachment, Vieques Island, Puerto Rico.* October.

CH2M HILL, 2008c. *Technical Memorandum, Determination of the Disposition of Excavated Soils at SWMU 6, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*. December.

CH2M HILL, 2010a. *Final Post-Removal Supplemental Confirmatory Sampling and Analysis Plan Solid Waste Management Unit (SWMU) 6, Former Naval Ammunition Support Detachment Vieques , Puerto Rico*. December.

CH2M HILL. 2010b. *Master Standard Operating Procedures, Protocols, and Plans*, Environmental Restoration Program, Vieques, Puerto Rico. April.

CH2M HILL, 2011a. *SWMU 6 Human Health Risk Assessment Pre-interim Deliverable (Tables and Figures)*. October.

CH2M HILL, Inc. 2011b. *Draft Interim Deliverable for the Ecological Risk Assessment – SWMU 6, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*. June.

CH2M HILL, 2012. *Final Post-Removal Supplemental Confirmatory Sampling and Analysis Plan Addendum, SWMU 6, Former Naval Ammunition Support Detachment Vieques, Puerto Rico.* January.

CH2M HILL, 2013. *Final Feasibility Study Report, Solid Waste Management Unit (SWMU) 6, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*. January.

Program Management Company, 2000. *Final Environmental Baseline Survey, Naval Ammunition Support Detachment, Vieques, Puerto Rico.* October.

Shaw Environmental and Infrastructure, Inc. [Shaw], 2007. *Final Work Plan, Removal Actions, SWMU 6, SWMU 7, AOC J, and AOC R, Former Naval Support Detachment, Vieques, Puerto Rico.* December.

Shaw, 2010. *Final Completion Report, Removal Actions SWMU 6, SWMU 7, AOC J, and AOC R, Former Naval Ammunitions Support Detachment, Vieques, Puerto Rico.* March.

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Tables

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TABLE 1

Post-Removal Sediment Detection and Exceedance Summary

SWMU 6 Contaminant Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan

Vieques, Puerto Rico

Station ID	CLEAN Vieques (West) Background for SWMU 6 Kiani & El Pobre	CLEAN Vieques (West) Background for SWMU 6 Punta Arenas Max	CLEAN Vieques (West) Background for SWMU 6 UTL SD	Nov 2011 RSL Residential Soil Adjusted	Eco Marine - Sediment	Site: VWW06-SD001	VWW06-SD002	VWW06-SD003	VWW06-SD004	VWW06-SD005	VWW06-SD006		VWW06-SD007	VWW06-SD008[1]	VWW06-SD009	VWW06-SD010	VWW06-SS012[1]
Sample ID						VWW06-SD001-0211	VWW06-SD002-0211	VWW06-SD003-0211	VWW06-SD004-0211	VWW06-SD005-0211	VWW06-SD006-0211	VWW06-SD006P-0211	VWW06-SD007-0211	VWW06-SD008-0211	VWW06-SD009-0211	VWW06-SD010-0211	VWW06-SS012-0211
Sample Date						02/08/11	02/08/11	02/04/11	02/04/11	02/04/11	02/04/11	02/04/11	02/04/11	02/04/11	02/04/11	02/04/11	02/07/11
Chemical Name																	
Volatile Organic Compounds (UG/KG)																	
2-Butanone	--	--	--	2,800,000	--	30.5 J	28.5 J	23.9 J	4.4 UJ	19.5	13.4 J	7.2 J	5.6 J	2.9 U	47.3 J	13.9 J	NA
Acetone	--	--	--	6,100,000	--	207 J	104 J	80.7 J	29.6 J	86.9	49.8 J	4.3 UJ	112 J	2.7 U	158 J	70	NA
Carbon disulfide	--	--	--	82,000	--	17 J	9.5 J	4 J	3.1 UJ	3 U	3.4 J	3.3 U	4.4 UJ	2.1 U	13 J	2.8 U	NA
Tetrachloroethene	--	--	--	8,600	57	12 J	10.3 J	2.8 J	2.2 J	1.8 J	2.4 J	3.1 U	4.1 UJ	2 J	6.5 UJ	1.6 J	NA
Semivolatile Organic Compounds (UG/KG)																	
Acenaphthene	--	--	--	340,000	16	9 UJ	66.8 UJ	20.4 U	11.9 J	17 UJ	18 UJ	36.4 UJ	4.1 UJ	2.6 UJ	33.1 UJ	17 UJ	NA
Acenaphthylene	--	--	--	--	44	9 UJ	66.8 UJ	20.4 U	19.6 U	17 UJ	18 UJ	20 J	4.1 UJ	2.6 UJ	33.1 UJ	17 UJ	NA
Anthracene	--	--	--	1,700,000	85.3	9.9 J	66.8 UJ	20.4 U	28.2	17 UJ	9.4 J	18.8 J	4.1 UJ	2.6 UJ	33.1 UJ	17 UJ	NA
Benzo(a)anthracene	--	--	--	150	261	10.1 J	70.3 UJ	39.7	66.7	22.6 J	59.9 J	102 J	4.7 J	2.7 UJ	63.2 J	20.2 J	NA
Benzo(a)pyrene	--	--	--	15	430	11.2 UJ	83.6 UJ	**77.8 J**	**65.1**	**24.5 J**	**62.5 J**	**110 J**	6.7 J	3.3 UJ	**96.7 J**	**25.2 J**	NA
Benzo(b)fluoranthene	--	--	--	150	1,800	11.2 UJ	83.6 UJ	124 J	87.4	40.5 J	96.1 J	**160 J**	10.7 J	3.3 UJ	**155 J**	36.1 J	NA
Benzo(g,h,i)perylene	--	--	--	--	670	11.2 UJ	83.6 UJ	60 J	38.8	21.3 UJ	32.1 J	62.2 J	5.1 UJ	3.3 UJ	58.8 J	21.3 UJ	NA
Benzo(k)fluoranthene	--	--	--	1,500	1,800	11.2 UJ	83.6 UJ	39.8 J	31.5	16.2 J	37.8 J	63.4 J	4.2 J	3.3 UJ	59.7 J	15.1 J	NA
Chrysene	--	--	--	15,000	384	6.2 J	65.3 UJ	49.5	63.1	21.1 J	54.1 J	92.4 J	6.8 J	2.5 UJ	86.3 J	18.2 J	NA
Fluoranthene	--	--	--	230,000	600	14.8 J	66.8 UJ	49 J	91.7	29.5 J	72.9 J	122 J	8.5 J	2.6 UJ	92.6 J	25.2 J	NA
Fluorene	--	--	--	230,000	19	9 UJ	66.8 UJ	20.4 U	11.6 J	17 UJ	18 UJ	36.4 UJ	4.1 UJ	2.6 UJ	33.1 UJ	17 UJ	NA
Indeno(1,2,3-cd)pyrene	--	--	--	150	600	11.2 UJ	83.6 UJ	50.5 J	34.9	21.3 UJ	33.7 J	61.4 J	5.1 UJ	3.3 UJ	55.5 J	21.3 UJ	NA
Phenanthrene	--	--	--	--	240	4.6 J	66.8 UJ	27	111	9.1 J	9.8 J	36.4 UJ	4.1 UJ	2.6 UJ	26 J	8.7 J	NA
Pyrene	--	--	--	170,000	665	10 J	66.8 UJ	67.4	125	31.9 J	63.6 J	106 J	7.3 J	2.6 UJ	108 J	32.8 J	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)																	
4,4'-DDD	--	--	--	2,000	1.22	2.6 UJ	**1.5 J**	**59 J**	**14 J**	**4.6 J**	2.7 UJ	**2.8 J**	3.2 UJ	1 UJ	**34 J**	**5.4 J**	NA
4,4'-DDE	--	1.3	--	1,400	2.2	1.4 UJ	1.1 J	**94 J**	**28 J**	**9.7 J**	**2.9 J**	**5.9 J**	1.7 UJ	0.54 UJ	**66 J**	**7.5 J**	NA
4,4'-DDT	--	--	--	1,700	1.19	2 UJ	1.5 UJ	**3.2 J**	2.3 U	2 UJ	2 UJ	2.1 UJ	2.4 UJ	0.76 UJ	3.7 UJ	2 UJ	NA
Aroclor-1254	--	--	--	110	63.3	49 UJ	37 UJ	29 U	**160**	32 J	25 UJ	30 J	30 UJ	19 UJ	**260 J**	48 J	**98**
Total Metals (MG/KG)																	
Aluminum	29,200	10,600	35,000	7,700	18,000	14,500 J	12,600 J	8,980 J	7,820 J	10,700 J	7,030 J	5,720 J	5,460 J	2,120 J	14,400 J	6,030 J	NA
Antimony	--	--	--	3.1	2	1.1 UJ	0.924 UJ	**3.19 J**	1.12 J	0.631 UJ	**3.88 J**	**3.04 J**	0.717 UJ	0.456 UJ	**2.2 J**	0.396 J	NA
Arsenic	6.2	2.1	28.8	0.39	8.2	4 J	5.8 J	3.9	2.4	2.2 J	4 J	4.8 J	1.2 J	1.2 J	7.8 J	4.4 J	NA
Barium	19.8	11.3	20.5	1,500	48	12.2 J	10.7 J	**25.8**	15.1	18.5 J	13.3 J	9.73 J	7.39 J	10.3 J	**33.8 J**	14.8 J	NA
Beryllium	0.648	--	0.718	16	--	0.733 UJ	0.337 J	3.27 U	3.16 U	2.76 UJ	2.88 UJ	3.23 UJ	3.55 UJ	2.85 UJ	5.01 UJ	2.73 UJ	NA
Cadmium	--	0.175	--	7	1.2	**0.302 J**	0.192 UJ	**1.98 J**	**1.75 J**	**4.14 J**	**1.65 J**	**1 J**	**0.903 J**	**0.775 J**	**5.69 J**	**1.62 J**	NA
Calcium	53,000	30,900	66,700	--	--	**101,000 J**	48,000 J	**114,000**	**94,400**	**87,100 J**	**140,000 J**	**106,000 J**	**93,800 J**	**105,000 J**	**72,900 J**	**110,000 J**	NA
Chromium	15.1	20	21.9	--	81	13.6 J	13.8 J	16.7	12.2	12.5 J	14.3 J	14.2 J	5.9 J	3.3 J	**37 J**	19.3 J	NA
Chromium (hexavalent)	36.8	150	219	0.29	--	38.6 J	36.9 J	5.28	0.891 U	0.836 UJ	0.988 J	2.99 J	6.43 J	1.84 J	12 J	1.92 J	NA
Cobalt	8.48	4.47	9.37	2.3	10	4.95 J	5.82 J	5.14	4.13 J	7.89 J	3.1 J	3.12 J	1.77 J	0.925 J	9 J	3.81 J	NA
Copper	47.6	37.1	54.1	310	34	27.5 J	37.4 J	**138 J**	**73.4 J**	**71.5 J**	54.1 J	46.7 J	13.6 J	5.08 J	**204 J**	**56.9 J**	NA
Iron	35,300	14,400	43,900	5,500	220,000	17,400 J	21,400 J	26,700	18,800	26,400 J	17,100 J	16,500 J	6,750 J	3,310 J	**45,900 J**	18,600 J	NA
Lead	12.6	7.08	15.1	400	46.7	6.7 J	**25.8 J**	**442**	**185**	**157 J**	**93 J**	**79.3 J**	11.8 J	6.8 J	**612 J**	**134 J**	NA
Magnesium	10,300	15,800	17,500	--	--	10,900 J	9,290 J	6,430 J	5,390 J	7,660 J	7,720 J	4,390 J	3,580 J	3,110 J	11,900 J	4,100 J	NA
Manganese	359	196	455	180	260	187 J	219 J	294	245	266 J	123 J	116 J	60.1 J	89.4 J	356 J	164 J	NA
Mercury	0.0985	0.131	0.138	0.78	0.15	0.039 J	0.104 J	0.088	0.0642	0.0446 J	0.0288 J	0.0336 J	0.0205 J	0.00742 J	0.129 J	0.0554 J	NA
Nickel	8.6	7.3	9.68	150	20.9	5.94 J	6.92 J	**10.2 J**	6.41 J	**11.4 J**	8.36 J	5.54 J	3.55 UJ	2.85 UJ	**19.1 J**	6.66 J	NA
Potassium	5,360	4,190	6,090	--	--	3,910 J	3,320 J	1,760	1,700	1,940 J	1,360 J	1,210 J	1,380 J	699 J	3,450 J	1,170 J	NA
Selenium	4.4	--	4.34	39	1	1.5 UJ	1.5 UJ	0.93 U	0.92 U	0.61 UJ	0.62 UJ	0.63 UJ	0.84 UJ	0.47 UJ	1.4 UJ	0.57 UJ	NA
Silver	--	--	--	39	1	0.733 UJ	0.616 UJ	0.295 J	0.246 J	0.42 UJ	0.406 UJ	0.492 UJ	0.478 UJ	0.304 UJ	0.787 UJ	0.368 UJ	NA
Sodium	40,600	74,700	96,400	--	--	44,900 J	32,900 J	12,600 J	12,600 J	9,270 J	10,300 J	9,700 J	12,400 J	10,900 J	27,800 J	8,010 J	NA
Thallium	1.7	--	1.69	0.078	--	1.56 UJ	1.32 J	6.96 U	6.72 U	**5.17 J**	6.13 UJ	6.86 UJ	7.55 UJ	6.05 UJ	10.6 UJ	5.8 UJ	NA
Vanadium	56.3	58.6	71.7	39	57	40.8 J	43 J	38.6	32.6	59.7 J	26.7 J	21.5 J	17.6 J	9.58 J	66.1 J	29.8 J	NA
Zinc	76	42.2	87.3	2,300	150	39.6 J	64.7 J	**440**	**262**	**237 J**	**206 J**	**162 J**	25.4 J	11 J	**849 J**	**164 J**	NA
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)																	
Acid volatile sulfide	--	--	--	--	--	8.9	7.4	0.17	0.53	0.15	0.38	NA	3.2	1.8	0.029 U	2.7	NA
Cadmium, SEM	--	--	--	--	--	0.005 U	7.40E-04 J	0.0072	0.0039	0.016	0.0028	NA	0.0043	0.0014 U	0.0035 U	0.024	NA
Copper, SEM	--	--	--	--	--	0.051 U	0.036 U	0.32	0.17	0.32	0.11	NA	0.12	0.013 J	0.092	0.22	NA
Lead, SEM	--	--	--	--	--	0.026	0.081	1.3	0.43	0.54	0.24	NA	0.34	0.02	0.067	1.3	NA
Mercury, SEM	--	--	--	--	--	1.10E-04 U	7.50E-05 U	1.40E-05 J	4.60E-05 U	4.10E-05 U	3.90E-05 U	NA	4.80E-05 U	3.00E-05 U	7.60E-05 U	4.00E-05 U	NA
Nickel, SEM	--	--	--	--	--	0.013 J	0.012 J	0.044	0.022 J	0.032 J	0.023 J	NA	0.024 J	0.0029 J	0.0097 J	0.048	NA
Zinc, SEM	--	--	--	--	--	0.31	0.48	3.8	1.4	2	1.6	NA	3.1	0.16	0.35	5.1	NA
Wet Chemistry																	
Ammonia (mg/kg)	--	--	--	--	--	351	167	60.6	62.5	53.1	41.5	NA	60.3	27.2	141	40.4	NA
pH (ph)	--	--	--	--	--	7.4	7.65	7.75	7.8	7.85	7.76	NA	7.45	8.11	7.83	7.82	NA
Redox (MV) (mv)	--	--	--	--	--	-1.81E+02	-1.30E+02	543	541	544	546	NA	526	532	536	538	NA
Sulfide (mg/kg)	--	--	--	--	--	140	170	99	130	160	130	NA	70	19	54	89	NA
Total organic carbon (TOC) (mg/kg)	--	--	--	--	--	35,000 J	45,000 J	18,000 J	16,000 J	13,000 J	16,000 J	NA	13,000 J	7,500	24,000 J	6,700	NA

Notes:

Exceeds All Background
Exceeds All Background and Adjusted RSL for Residential Soil
Exceeds All Background and Eco Marine - Sediment
Exceeds All Background, Adjusted RSL for Residential Soil and Eco Marine - Sediment

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

NJ - Qualitative identification questionable due to poor resolution, presumptively present at approximate quantity

U - Not detected or not detected at significantly greater than that in an associated blank

UJ - Analyte not detected, quantitation limit may be inaccurate

MG/KG - Milligrams per kilogram

MV - Millivolts

PH - pH units

UG/KG - Micrograms per kilogram

UMOL/G - Micromoles per gram

[1] Samples screened only against Background and Eco Marine - Sediment criteria

TABLE 1
Post-Removal Sediment Detection and Exceedance Summary
SWMU 6 Contaminant Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

						Site (continued)		Background										
Station ID	**CLEAN Vieques (West) Background for SWMU 6 Kiani & El Pobre**	**CLEAN Vieques (West) Background for SWMU 6 Punta Arenas Max**	**CLEAN Vieques (West) Background for SWMU 6 UTL SD**	**Nov 2011 RSL Residential Soil Adjusted**	**Eco Marine - Sediment**	VWW06-SS013 [1]		VWW06-SD014	VWW06-SD015	VWW06-SD016	VWW06-SD017	VWW06-SD018	VWW06-SD019	VWW06-SD020	VWW06-SD021	VWW06-SD022	VWW06-SD023	
Sample ID						VWW06-SS013-0211	VWW06-SS013P-0211	VWW06-SD014-0211	VWW06-SD015-0211	VWW06-SD016-0211	VWW06-SD017-0211	VWW06-SD018-0211	VWW06-SD019-0211	VWW06-SD020-0211	VWW06-SD021-0211	VWW06-SD022-0211	VWW06-SD023-0211	VWW06-SD023P-0211
Sample Date						02/07/11	02/07/11	02/07/11	02/07/11	02/07/11	02/07/11	02/08/11	02/08/11	02/08/11	02/08/11	02/08/11	02/08/11	02/08/11
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
2-Butanone	--	--	--	2,800,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	--	--	--	6,100,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	--	--	82,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	--	--	--	8,600	57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)																		
Acenaphthene	--	--	--	340,000	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	--	--	--	--	44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	--	--	--	1,700,000	85.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	--	--	--	150	261	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	--	--	15	430	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	--	--	150	1,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	--	--	--	--	670	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	--	--	1,500	1,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	--	--	15,000	384	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	--	--	--	230,000	600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	--	--	--	230,000	19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	--	--	150	600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	--	--	--	--	240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	--	--	--	170,000	665	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)																		
4,4'-DDD	--	--	--	2,000	1.22	NA	NA	3.4 UJ	2.2 UJ	3.1 UJ	3.8 UJ	3.9 UJ	3.9 UJ	4.1 UJ	4.2 UJ	4.5 UJ	3.6 UJ	3.5 UJ
4,4'-DDE	--	1.3	--	1,400	2.2	NA	NA	1.3 J	1.1 UJ	1.6 UJ	2 UJ	2.1 UJ	2.1 UJ	2.2 UJ	2.2 UJ	2.4 UJ	1.9 UJ	1.8 UJ
4,4'-DDT	--	--	--	1,700	1.19	NA	NA	2.6 UJ	1.6 UJ	2.3 UJ	2.8 UJ	2.9 UJ	2.9 UJ	3 UJ	3.1 UJ	3.4 UJ	2.6 UJ	2.6 UJ
Aroclor-1254	--	--	--	110	63.3	16 U	16 U	64 UJ	40 UJ	58 UJ	70 UJ	44 UJ	44 UJ	46 UJ	47 UJ	51 UJ	40 UJ	39 UJ
Total Metals (MG/KG)																		
Aluminum	29,200	10,600	35,000	7,700	18,000	NA	NA	8,470 J	9,890 J	7,980 J	10,600 J	27,000 J	24,500 J	29,200 J	16,200 J	14,000 J	16,900 J	16,600 J
Antimony	--	--	--	3.1	2	NA	NA	1.33 UJ	0.89 UJ	1.35 UJ	1.51 UJ	1.01 UJ	1.17 UJ	1.03 UJ	1.02 UJ	1.09 UJ	0.974 UJ	0.835 UJ
Arsenic	6.2	2.1	28.8	0.39	8.2	NA	NA	2.5 UJ	2 J	1.4 UJ	2.1 J	5.9 J	5.5 J	2.6 J	6 J	6.2 J	3.1 J	2.8 J
Barium	19.8	11.3	20.5	1,500	48	NA	NA	8.21 J	7.11 J	9.6 J	11.3 J	14.8 J	14 J	19.8 J	11.6 J	9.56 J	12 J	11.3 J
Beryllium	0.648	--	0.718	16	--	NA	NA	0.89 UJ	0.593 UJ	0.902 UJ	1 UJ	0.648 J	0.478 J	0.612 J	0.678 UJ	0.38 J	0.395 J	0.339 J
Cadmium	--	0.175	--	7	1.2	NA	NA	0.175 J	0.185 UJ	0.282 UJ	0.314 UJ	0.211 UJ	0.244 UJ	0.214 UJ	0.212 UJ	0.227 UJ	0.203 UJ	0.174 UJ
Calcium	53,000	30,900	66,700	--	--	NA	NA	30,900 J	14,000 J	17,600 J	11,400 J	6,260 J	8,510 J	4,750 J	53,000 J	14,200 J	25,400 J	25,400 J
Chromium	15.1	20	21.9	--	81	NA	NA	10.9 J	20 J	10.3 J	6.7 J	14.9 J	13.7 J	15 J	14.1 J	14.8 J	15 J	15.1 J
Chromium (hexavalent)	36.8	150	219	0.29	--	NA	NA	24.8 J	150 J	30.5 J	101 J	33.9 J	36.8 J	34.1 J	24.6 J	9.34 J	30.4 J	3.63 J
Cobalt	8.48	4.47	9.37	2.3	10	NA	NA	3.81 J	3.94 J	3.3 J	4.47 J	8.48 J	7.33 J	7.01 J	5.03 J	5.08 J	5.26 J	5.18 J
Copper	47.6	37.1	54.1	310	34	NA	NA	29.7 J	23.4 J	37.1 J	28.5 J	44.6 J	42.4 J	47.6 J	32.1 J	32.5 J	39.6 J	37.4 J
Iron	35,300	14,400	43,900	5,500	220,000	NA	NA	10,400 J	9,300 J	14,400 J	8,870 J	35,300 J	34,000 J	29,400 J	19,600 J	20,000 J	23,500 J	22,800 J
Lead	12.6	7.08	15.1	400	46.7	NA	NA	3.94 J	4.64 J	6.38 J	7.08 J	12.6 J	11.3 J	12.2 J	6.18 J	6.06 J	6.94 J	6.35 J
Magnesium	10,300	15,800	17,500	--	--	NA	NA	13,000 J	9,920 J	11,000 J	15,800 J	9,660 J	9,420 J	8,880 J	9,550 J	10,300 J	9,390 J	8,700 J
Manganese	359	196	455	180	260	NA	NA	159 J	115 J	196 J	63 J	359 J	341 J	334 J	174 J	191 J	250 J	248 J
Mercury	0.0985	0.131	0.138	0.78	0.15	NA	NA	0.0988 J	0.0669 J	0.131 J	0.0771 J	0.0985 J	0.0858 J	0.0707 J	0.043 J	0.0611 J	0.0754 J	0.0676 J
Nickel	8.6	7.3	9.68	150	20.9	NA	NA	7.15 J	7.3 J	5.8 J	5.16 J	8.43 J	7.88 J	8.6 J	7.1 J	6.79 J	7.44 J	7.15 J
Potassium	5,360	4,190	6,090	--	--	NA	NA	3,720 J	2,750 J	3,260 J	4,190 J	5,360 J	4,860 J	5,290 J	3,860 J	3,750 J	3,910 J	3,490 J
Selenium	4.4	--	4.34	39	1	NA	NA	2.5 UJ	1.1 UJ	1.4 UJ	2.1 UJ	1.6 UJ	1.4 J	1.9 J	4.4 J	2.6 J	1.6 J	1.5 J
Silver	--	--	--	39	1	NA	NA	0.89 UJ	0.593 UJ	0.902 UJ	1 UJ	0.674 UJ	0.78 UJ	0.684 UJ	0.678 UJ	0.726 UJ	0.649 UJ	0.557 UJ
Sodium	40,600	74,700	96,400	--	--	NA	NA	62,000 J	39,400 J	56,700 J	74,700 J	36,300 J	37,000 J	30,800 J	37,700 J	40,600 J	32,200 J	28,800 J
Thallium	1.7	--	1.69	0.078	--	NA	NA	1.89 UJ	1.26 UJ	1.92 UJ	2.14 UJ	1.43 UJ	1.7 J	1.45 UJ	1.44 UJ	1.54 UJ	1.24 J	0.707 J
Vanadium	56.3	58.6	71.7	39	57	NA	NA	29.4 J	42.4 J	20.7 J	58.6 J	54.7 J	46.8 J	56.3 J	44.5 J	43.7 J	33.6 J	35.2 J
Zinc	76	42.2	87.3	2,300	150	NA	NA	40.4 J	42.2 J	31.9 J	34.9 J	76 J	70.9 J	67.8 J	43.1 J	43.4 J	51.4 J	49.6 J
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)																		
Acid volatile sulfide	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, SEM	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																		
Ammonia (mg/kg)	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	--	--	--	--	--	NA	NA	7.22	7.17	7.26	7.07	7.3	7.25	7.05	7.52	7.3	7.23	6.96
Redox (MV) (mv)	--	--	--	--	--	NA	NA	-1.58E+02	-1.48E+02	-1.52E+02	-1.56E+02	-1.21E+02	-1.25E+02	-1.54E+02	-1.19E+02	-1.05E+02	-1.54E+02	-1.51E+02
Sulfide (mg/kg)	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/kg)	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Exceeds All Background
Exceeds All Background and Adjusted RSL for Residential Soil
Exceeds All Background and Eco Marine - Sediment
Exceeds All Background, Adjusted RSL for Residential Soil and Eco Marine - Sediment

NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
NJ - Qualitative identification questionable due to poor resolution, presumptively present at approximate quantity
U - Not detected or not detected at significantly greater than that in an associated blank
UJ - Analyte not detected, quantitation limit may be inaccurate
MG/KG - Milligrams per kilogram
MV - Millivolts
PH - pH units
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram
[1] Samples screened only against Background and Eco Marine - Sediment criteria

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Background									
Sample ID	VWW06-CRB06-0112	VWW06-CRB07-0112	VWW06-CRB08-0112	VWW06-FS06-0112	VWW06-FS07-0112	VWW06-CRB05-0212	VWW06-CRB05P-0212	VWW06-FS05-0212	VWW06-FS05P-0212	VWW06-FS08-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12	02/01/12	02/01/12	02/01/12
Chemical Name										
Polychlorinated Biphenyl Congeners (PG/G)										
2-Chlorobiphenyl (1)	2 U	1.9 U	1.9 U	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
3-Chlorobiphenyl (2)	2 U	1.9 U	1.9 U	9.5 U	3.9 J	1.9 U	2 U	1.9 U	2 U	1.8 J
4-Chlorobiphenyl (3)	0.98 U	0.95 U	0.97 U	4.8 U	1.3 J	0.97 U	0.99 U	1.1 J	0.98 U	1.3 J
2,2'-Dichlorobiphenyl (4)	9.8 U	9.5 U	9.7 U	48 U	9.6 U	9.7 U	9.9 U	9.7 U	9.8 U	9.9 U
2,3'-Dichlorobiphenyl (6)	9.8 U	9.5 U	9.7 U	48 U	9.6 U	9.7 U	9.9 U	9.7 U	9.8 U	9.9 U
2,4'-Dichlorobiphenyl (8)	3.4 J	6.8 J	5.8 J	48 U	9.6 U	9.7 U	9.9 U	9.7 U	9.8 U	9.9 U
3,3'-Dichlorobiphenyl (11)	14 J	12 J	11 J	48 U	13 J	8.6 J	21	8.2 J	9.8 U	11 J
4,4'-Dichlorobiphenyl (15)	9.8 U	9.5 U	9.7 U	48 U	9.6 U	9.7 U	9.9 U	9.7 U	9.8 U	9.9 U
2,2',3-Trichlorobiphenyl (16)	0.98 U	2.2 J	3 J	4.8 U	0.7 J	0.97 U	0.99 U	0.81 J	0.98 U	0.71 J
2,2',4-Trichlorobiphenyl (17)	0.98 U	6.2 J	5.2 J	4.8 U	0.74 J	0.97 U	0.99 U	1.1 J	0.98 U	0.86 J
2,2',6-Trichlorobiphenyl (19)	0.98 U	2.6 J	2.1 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	1.3 J
2,3,4'-Trichlorobiphenyl (22)	0.98 U	10 J	6.7 J	4.8 U	1.8 J	0.97 U	0.99 U	1.2 J	0.98 U	1.6 J
2,3,5-Trichlorobiphenyl (23)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,6-Trichlorobiphenyl (24)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',4-Trichlorobiphenyl (25)	0.98 U	4 J	3 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',6-Trichlorobiphenyl (27)	0.98 U	1.2 J	0.84 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,4',5-Trichlorobiphenyl (31)	1.4 J	35 J	28 J	4.8 U	6.4 J	1.2 J	1.5 J	5 J	2.5 J	7.2 J
2,4',6-Trichlorobiphenyl (32)	0.98 U	12 J	7 J	4.8 U	0.96 U	0.52 J	0.59 J	1.3 J	0.98 U	1.3 J
2,3',5'-Trichlorobiphenyl (34)	0.98 U	0.63 J	0.86 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
3,3',4-Trichlorobiphenyl (35)	2 U	1.9 U	1.9 U	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
3,3',5-Trichlorobiphenyl (36)	0.98 U	4.1 J	2.4 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.74 J
3,4,4'-Trichlorobiphenyl (37)	0.98 U	5 J	2.4 J	4.8 U	1.1 J	0.97 U	0.99 U	1 J	0.98 U	1.3 J
3,4',5-Trichlorobiphenyl (39)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,4-Tetrachlorobiphenyl (41)	0.98 U	1.5 J	1 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,4'-Tetrachlorobiphenyl (42)	0.98 U	15 J	10 J	4.8 U	0.96 U	0.97 U	0.99 U	0.8 J	0.98 U	2.2 J
2,2',3,5-Tetrachlorobiphenyl (43)	0.98 U	1.9 J	1.3 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,6-Tetrachlorobiphenyl (45)	0.98 U	3.3 J	3.9 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,6'-Tetrachlorobiphenyl (46)	0.98 U	1.6 J	1.6 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',4,5-Tetrachlorobiphenyl (48)	0.98 U	8.5 J	6.3 J	4.8 U	0.76 J	0.97 U	0.99 U	0.97 U	0.98 U	1.5 J
2,2',4,6'-Tetrachlorobiphenyl (51)	1.6 J	9.6 J	3.8 J	4.8 U	1.9 J	1.6 J	1 J	1.5 J	1.6 J	1.5 J
2,2',5,5'-Tetrachlorobiphenyl (52)	5.5 J	440	210	14 J	34	2.8 J	3.8 J	34 J	14 J	68
2,2',6,6'-Tetrachlorobiphenyl (54)	0.98 U	0.57 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.66 J
2,3,3',4-Tetrachlorobiphenyl (55)	2 U	1.9 U	1.9 U	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
2,3,3',4'-Tetrachlorobiphenyl (56)	0.98 U	45	27	4.8 U	4.3 J	0.97 U	0.99 U	2.2 J	0.98 U	5.7 J
2,3,3',5-Tetrachlorobiphenyl (57)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',5'-Tetrachlorobiphenyl (58)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,4,4'-Tetrachlorobiphenyl (60)	2 U	24	17 J	9.5 U	3.5 J	1.2 J	2 U	2.1 J	2 U	4.9 J
2,3,4',5-Tetrachlorobiphenyl (63)	0.98 U	8 J	4.7 J	4.8 U	0.98 J	0.97 U	0.99 U	0.97 U	0.98 U	1.2 J
2,3,4',6-Tetrachlorobiphenyl (64)	1 J	55	32	4.8 U	4.8 J	1.3 J	1.2 J	4.5 J	1.9 J	9.3 J
2,3',4,4'-Tetrachlorobiphenyl (66)	4.4 J	190	120	7.7 J	20	6.8 J	8.2 J	12 J	8 J	28
2,3',4,5-Tetrachlorobiphenyl (67)	0.98 U	5.4 J	3.4 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',4,5'-Tetrachlorobiphenyl (68)	2 U	4 J	2.5 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	1.7 J
2,3',5,5'-Tetrachlorobiphenyl (72)	0.98 U	4.8 J	2.7 J	4.8 U	0.69 J	0.97 U	0.99 U	0.97 U	0.98 U	0.69 J
3,3',4,4'-Tetrachlorobiphenyl (77)	0.98 U	8.2	4.3	4.8 U	2	0.77 J	0.54 J	0.97 U	0.98 U	1.7 J
3,3',4,5'-Tetrachlorobiphenyl (79)	0.98 U	4.8 J	2 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.98 J
3,4,4',5-Tetrachlorobiphenyl (81)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4-Pentachlorobiphenyl (82)	0.98 U	35	15 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	1.6 J
2,2',3,3',5-Pentachlorobiphenyl (83)	0.98 U	0.95 U	0.97 U	4.8 U	2.4 J	0.97 U	0.99 U	0.97 U	0.98 U	6.3 J
2,2',3,3',6-Pentachlorobiphenyl (84)	1.9 J	120	47	4.8 U	7 J	0.97 U	1.3 J	4.6 J	2.3 J	15 J

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Background									
Sample ID	VWW06-CRB06-0112	VWW06-CRB07-0112	VWW06-CRB08-0112	VWW06-FS06-0112	VWW06-FS07-0112	VWW06-CRB05-0212	VWW06-CRB05P-0212	VWW06-FS05-0212	VWW06-FS05P-0212	VWW06-FS08-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12	02/01/12	02/01/12	02/01/12
Chemical Name										
2,2',3,4,6'-Pentachlorobiphenyl (89)	0.98 U	3.6 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,5,5'-Pentachlorobiphenyl (92)	2.5 J	230	95	4.8 U	16 J	0.97 U	1.4 J	9.2 J	4.8 J	25
2,2',3,5,6'-Pentachlorobiphenyl (94)	0.98 U	2.2 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,5',6-Pentachlorobiphenyl (95)	5.9 J	540	180	7.6 J	35	2.4 J	3.5 J	26 J	11 J	70
2,2',3,6,6'-Pentachlorobiphenyl (96)	0.98 U	1 J	0.69 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',4,4',5-Pentachlorobiphenyl (99)	9.8 J	580	280	21 J	43	18 J	20 J	24	20 J	54
2,2',4,5',6-Pentachlorobiphenyl (103)	0.98 U	7.1 J	3 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	1.1 J
2,2',4,6,6'-Pentachlorobiphenyl (104)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4,4'-Pentachlorobiphenyl (105)	4.8	270	130	15	20	9.8 J	11	13	13	17
2,3,3',4,6-Pentachlorobiphenyl (109)	2 U	69	31	2.1 J	4.5 J	1.9 J	2.2 J	2.9 J	2.1 J	4.8 J
2,3,3',5,5'-Pentachlorobiphenyl (111)	0.98 U	0.96 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,4,4',5-Pentachlorobiphenyl (114)	0.98 U	19	9.4	4.8 U	0.9 J	0.97 U	0.99 U	0.97 U	0.98 U	0.93 J
2,3',4,4',5-Pentachlorobiphenyl (118)	14	970	440	39	60	32	34	34	34	61
2,3',4,5,5'-Pentachlorobiphenyl (120)	0.98 U	5 J	2.5 J	4.8 U	0.93 J	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',4,5',6-Pentachlorobiphenyl (121)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4',5'-Pentachlorobiphenyl (122)	0.98 U	9.8 J	4.5 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',4,4',5'-Pentachlorobiphenyl (123)	0.98 U	8.2	5.6	4.8 U	0.91 J	0.97 U	0.99 U	0.97 U	0.98 U	1.1 J
3,3',4,4',5-Pentachlorobiphenyl (126)	0.98 U	2.2	1.2 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
3,3',4,5,5'-Pentachlorobiphenyl (127)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,5'-Hexachlorobiphenyl (130)	0.98 U	78	29	4.8 U	4.1 J	1.6 J	2.2 J	1.5 J	0.98 U	4.1 J
2,2',3,3',4,6-Hexachlorobiphenyl (131)	0.98 U	3.9 J	2.9 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,6'-Hexachlorobiphenyl (132)	1.8 J	220	69	4.8 U	7.8 J	0.97 U	0.71 J	4.2 J	3.2 J	11 J
2,2',3,3',5,5'-Hexachlorobiphenyl (133)	0.98 U	18 J	9 J	4.8 U	2.1 J	0.97 U	0.99 U	0.97 U	0.98 U	1.8 J
2,2',3,3',6,6'-Hexachlorobiphenyl (136)	0.71 J	67	27	4.8 U	4.8 J	0.97 U	0.99 U	2.5 J	0.98 U	8.1 J
2,2',3,4,4',5-Hexachlorobiphenyl (137)	0.98 U	42	17 J	4.8 U	2.1 J	0.62 J	0.99 U	0.97 U	0.98 U	1.4 J
2,2',3,4,5,5'-Hexachlorobiphenyl (141)	1.4 J	160	62	4.8 U	9.2 J	0.97 U	1 J	4.4 J	3.6 J	9.2 J
2,2',3,4,5',6-Hexachlorobiphenyl (144)	0.98 U	29	12 J	4.8 U	2.2 J	0.97 U	0.99 U	0.97 U	0.98 U	2.4 J
2,2',3,4,6,6'-Hexachlorobiphenyl (145)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,4',5,5'-Hexachlorobiphenyl (146)	1.5 J	140	64	9 J	13 J	4 J	4.4 J	7.5 J	9.4 J	11 J
2,2',3,4',5,6'-Hexachlorobiphenyl (148)	0.98 U	0.76 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,4',6,6'-Hexachlorobiphenyl (150)	0.98 U	0.83 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,5,6,6'-Hexachlorobiphenyl (152)	0.98 U	0.37 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',4,4',5,6'-Hexachlorobiphenyl (154)	0.98 U	11 J	6.3 J	4.8 U	2 J	0.97 U	0.8 J	0.97 U	0.98 U	1.5 J
2,2',4,4',6,6'-Hexachlorobiphenyl (155)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4,4',6-Hexachlorobiphenyl (158)	1.5 J	120	49	4.8 U	6.1 J	3.4 J	3.5 J	3.2 J	3.6 J	4.9 J
2,3,3',4,5,5'-Hexachlorobiphenyl (159)	0.98 U	2.2 J	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4',5,5'-Hexachlorobiphenyl (162)	0.98 U	6.6 J	3.4 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.97 J
2,3,3',4',5',6-Hexachlorobiphenyl (164)	0.98 U	70	23	4.8 U	2.6 J	0.97 U	0.99 U	0.97 U	0.98 U	2.5 J
2,3,3',5,5',6-Hexachlorobiphenyl (165)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	0.7 J	55	24	4.8 U	3.3	1.8 J	1.6 J	2.3 J	2 J	2.7 J
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	2.5 J	130	67	13 J	16 J	5.8 J	5 J	9.2 J	13 J	12 J
2,2',3,3',4,5,5'-Heptachlorobiphenyl (172)	0.98 U	24	14 J	4.8 U	4.1 J	1.3 J	1.4 J	2.8 J	3.3 J	3.6 J
2,2',3,3',4,5,6'-Heptachlorobiphenyl (174)	0.98 U	100	28	4.8 U	4.8 J	0.97 U	0.99 U	2.4 J	2.3 J	7.3 J
2,2',3,3',4,5',6-Heptachlorobiphenyl (175)	0.98 U	3.8 J	0.97 U	4.8 U	0.86 J	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,6,6'-Heptachlorobiphenyl (176)	0.98 U	7.1 J	4.1 J	4.8 U	0.96 J	0.97 U	0.99 U	0.97 U	0.98 U	0.91 J
2,2',3,3',4,5',6'-Heptachlorobiphenyl (177)	0.98 U	81	26	4.8 U	3.8 J	2.7 J	2.9 J	2.9 J	3.4 J	6.2 J
2,2',3,3',5,5',6-Heptachlorobiphenyl (178)	0.98 U	24	14 J	4.8 U	5.2 J	1.5 J	1.4 J	1.6 J	0.98 U	4.5 J
2,2',3,3',5,6,6'-Heptachlorobiphenyl (179)	0.98 U	29	16 J	4.8 U	3.1 J	0.97 U	0.99 U	0.61 J	0.98 U	3.2 J
2,2',3,4,4',5,6-Heptachlorobiphenyl (181)	2 U	2.9 J	1.3 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Background									
Sample ID	VWW06-CRB06-0112	VWW06-CRB07-0112	VWW06-CRB08-0112	VWW06-FS06-0112	VWW06-FS07-0112	VWW06-CRB05-0212	VWW06-CRB05P-0212	VWW06-FS05-0212	VWW06-FS05P-0212	VWW06-FS08-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12	02/01/12	02/01/12	02/01/12
Chemical Name										
2,2',3,4,4',5,6'-Heptachlorobiphenyl (182)	0.98 U	0.95 U	0.97 U	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,4,4',5',6-Heptachlorobiphenyl (183)	2 U	61	32	4.7 J	10 J	2.6 J	2.6 J	5.8 J	5.6 J	7.6 J
2,2',3,4,4',6,6'-Heptachlorobiphenyl (184)	0.98 U	0.95 U	0.97 U	4.8 U	0.66 J	0.97 U	0.99 U	0.97 U	0.98 U	0.62 J
2,2',3,4,5,5',6-Heptachlorobiphenyl (185)	2 U	7.2 J	3.8 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	0.88 J	120	63	14 J	17 J	4.5 J	4.7 J	15 J	19 J	20 J
2,2',3,4',5,6,6'-Heptachlorobiphenyl (188)	0.98 U	0.95 U	0.97 U	4.8 U	1.4 J	0.97 U	0.99 U	0.97 U	0.98 U	1.3 J
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	0.98 U	4.5	2.8	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4,4',5,6-Heptachlorobiphenyl (190)	0.98 U	21	9.1 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,3,3',4,4',5',6-Heptachlorobiphenyl (191)	0.98 U	6 J	2.3 J	4.8 U	0.92 J	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (194)	0.98 U	25	21	4.8 U	5 J	1.4 J	1.2 J	3.2 J	3.7 J	2.6 J
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	0.98 U	10 J	7.2 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (196)	0.98 U	15 J	9.2 J	5.6 J	5.5 J	1 J	1 J	3.9 J	4.4 J	4.3 J
2,2',3,3',4,4',6,6'-Octachlorobiphenyl (197)	0.98 U	1.2 J	1 J	4.8 U	1.5 J	0.97 U	0.99 U	0.81 J	1.2 J	1.4 J
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (200)	2 U	2 J	2.1 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (201)	0.98 U	4.1 J	3.5 J	2 J	3.4 J	0.97 U	0.99 U	2 J	2 J	3.4 J
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	0.98 U	11 J	8.6 J	4.3 J	7.2 J	0.97 J	1.3 J	2 J	2.6 J	6.2 J
2,2',3,4,4',5,5',6-Octachlorobiphenyl (203)	0.98 U	28	21	4.8 U	2 J	1.2 J	0.92 J	2.8 J	3.2 J	1.5 J
2,3,3',4,4',5,5',6-Octachlorobiphenyl (205)	0.98 U	1.2 J	0.97 J	4.8 U	0.96 U	0.97 U	0.99 U	0.97 U	0.98 U	0.99 U
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	0.98 U	14 J	12 J	4.8 U	1.9 J	0.97 U	0.99 U	4.6 J	6.3 J	3.1 J
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (207)	0.98 U	1.8 J	2 J	4.8 U	0.96 U	0.97 U	0.99 U	1.8 J	2 J	0.99 U
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (208)	0.98 U	6 J	4.8 J	4.8 U	1.8 J	1.5 J	0.88 J	3.8 J	5 J	1.8 J
Decachlorobiphenyl (209)	2 U	4.6 J	5 J	4.4 J	2.3 J	1.9 U	2 U	4.4 J	4.5 J	2 U
Congeners (21/33)	2 U	17 J	11 J	9.5 U	1.8 J	1.9 U	2 U	2.1 J	2 U	2.4 J
Congeners (26/29)	2 U	7.7 J	6.4 J	9.5 U	1.2 J	1.9 U	2 U	0.82 J	0.67 J	1.3 J
Congeners (28/20)	2 U	52	42 J	9.5 U	8.4 J	2.5 J	2.7 J	6.6 J	4.2 J	8.9 J
Congeners (30/18)	2 U	11 J	11 J	9.5 U	1.9 U	1.9 U	2 U	2 J	2 U	2 U
Congeners (40/71)	0.78 J	33 J	16 J	9.5 U	2.1 J	0.85 J	1.1 J	2.2 J	0.84 J	4.3 J
Congeners (44/47/65)	10 J	160	95	14 U	20 J	11 J	11 J	19 J	13 J	33 J
Congeners (50/53)	2 U	20	8.3 J	9.5 U	1.1 J	1.9 U	2 U	1.6 J	2 U	2.1 J
Congeners (59/62/75)	2.9 U	10	6.5 J	14 U	0.73 J	2.9 U	3 U	0.87 J	2.9 U	1.9 J
Congeners (61/70/74/76)	8.5 J	420	210	19 U	44 J	7.6 J	7.4 J	24 J	15 J	65 J
Congeners (69/49)	2.3 J	150	80	9.5 U	11 J	1.1 J	0.85 J	12 J	5.3 J	23 J
Congeners (86/87/97/108/119/125)	7.2 J	520	220	5.6 J	34 J	3 J	3.4 J	18 J	9.8 J	50 J
Congeners (88/91)	1.4 J	100	31 J	9.5 U	6.6 J	1.9 U	1.4 J	5.2 J	2.2 J	13 J
Congeners (93/100)	2 U	5.5 J	1.8 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	2 U
Congeners (98/102)	2 U	17 J	3.7 J	9.5 U	1.9 U	1.9 U	2 U	1.9 U	2 U	1.8 J
Congeners (107/124)	5.9 U	39	16 J	28 U	2.1 J	5.8 U	5.9 U	5.8 U	5.9 U	2.4 J
Congeners (110/115)	15 J	1,100	500	12 J	65	18 J	21 J	33 J	19 J	95
Congeners (113/90/101)	16 J	1,300	550	25 J	90	7.3 J	9.2 J	47 J	28 J	130
Congeners (117/116/85)	2.5 J	170	75	14 U	11 J	4.6 J	4.7 J	6.6 J	3.4 J	12 J
Congeners (128/166)	1.2 J	160	73	9.5 U	8.2 J	4.5 J	4.8 J	5.1 J	6.5 J	7.3 J
Congeners (134/143)	2 U	28 J	14 J	9.5 U	1.3 J	1.9 U	2 U	1.9 U	2 U	1.3 J
Congeners (138/163/129)	10 J	1,100	490	48 J	65	33	35 J	40 J	45	56 J
Congeners (139/140)	2 U	20 J	8.8 J	9.5 U	1.4 J	1.9 U	2 U	1.9 U	2 U	1 J
Congeners (147/149)	5.9 J	610	160	7.9 J	27 J	4.4 J	6.4 J	14 J	8.2 J	40
Congeners (151/135)	2.3 J	210	83	9.5 U	15 J	1.9 U	1.4 J	6 J	3.6 J	18 J
Congeners (153/168)	11 J	900	420	50 J	75	35	37	45	51	63
Congeners (156/157)	1.5 J	150	68	5.6 J	6.2	5.2	4.9	4.7	5.7	5.3
Congeners (171/173)	2 U	44	23 J	9.5 U	5.9 J	1.7 J	1.7 J	1.9 U	2.4 J	3.6 J
Congeners (180/193)	2.7 J	230	120	27 J	40	11 J	12 J	22 J	26	30 J

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Background									
Sample ID	VWW06-CRB06-0112	VWW06-CRB07-0112	VWW06-CRB08-0112	VWW06-FS06-0112	VWW06-FS07-0112	VWW06-CRB05-0212	VWW06-CRB05P-0212	VWW06-FS05-0212	VWW06-FS05P-0212	VWW06-FS08-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12	02/01/12	02/01/12	02/01/12
Chemical Name										
Congeners (198/199)	2 U	45	29	17 J	15 J	2.6 J	2.3 J	12 J	16 J	16 J
Total Dichlorobiphenyls	17	21	17	0 U	13	8.6	21	8.2	0 U	11
Total Heptachlorobiphenyls	7	910	420	58	120	31	32	62	75	99
Total Hexachlorobiphenyls	40	4,200	1,700	120	260	94	100	140	140	250
Total Monochlorobiphenyls	0 U	0 U	1.8	0 U	5.3	0 U	0 U	1.1	0 U	4
Total Nonachlorobiphenyls	0 U	21	18	0 U	4.5	1.5	0.88	10	13	4.9
Total Octachlorobiphenyls	0 U	140	100	28	39	7.3	7.6	27	33	35
Total Pentachlorobiphenyls	83	6,100	2,600	130	400	97	110	220	150	570
Total Tetrachlorobiphenyls	37	1,600	870	55	150	37	37	120	60	260
Total Trichlorobiphenyls	4.8	170	130	11	25	4.9	7.4	22	11	30
Total Non-Dioxin-Like Congeners	160	12,000	5,200	300	920	230	260	560	430	1,200
PCB (total)	180	13000	5900	360	1000	280	320	620	480	1200
Toxic Equivalents (Total TEQ)	6.30E-04	0.26	0.14	0.0018	0.0029	0.0015	0.0016	0.0016	0.0016	0.0028
Total Metals (MG/KG)										
Lead	0.022 J	0.066	0.053	0.008 U	0.017 J	0.033 J	0.037 J	0.008 U	0.008 U	0.02 J
Zinc	13.8	20.7	13.7	13.2	15.2 J	19	19.2	11.3	10.1	16.4
Wet Chemistry (PCT)										
% Solids	40.6	33.4	36.5	27	37.7	34.3	37.3	24.3	27.1	48.7
Lipids (%)	0.32	0.58	0.42	2.5	6.7	0.42	0.46	1.8	2.3	2.8

Notes:

Shading indicates detections

J - Estimated.

U - Nondetect or not detected at significantly greater than that in an associated blank.

MG/KG - Milligrams per kilogram

PCT - Percent

PG/G - Picograms per gram

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Lagoon									
Sample ID	VWW06-CRB01-0112	VWW06-CRB01P-0112	VWW06-CRB02-0112	VWW06-CRB03-0112	VWW06-CRB04-0112	VWW06-FS01-0112	VWW06-FS01P-0112	VWW06-FS04-0112	VWW06-FS02-0212	VWW06-FS03-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12
Chemical Name										
Polychlorinated Biphenyl Congeners (PG/G)										
2-Chlorobiphenyl (1)	2.7 J	3.1 J	1.9 J	2 J	1.9 U	2.2 J	2.8 J	2.1 J	4.4 J	5.8 U
3-Chlorobiphenyl (2)	3.5 J	4.1 J	2.1 J	2.5 J	1.4 J	2 U	1.9 U	1.2 J	1.5 J	6 U
4-Chlorobiphenyl (3)	1.1 J	1.2 J	1.5 J	2 J	1 J	0.89 J	0.91 J	1.6 J	0.86 J	6.2 U
2,2'-Dichlorobiphenyl (4)	9.9 J	8.7 J	4.3 J	10 U	9.7 U	9.7 J	12 J	4.9 J	24	46 U
2,3'-Dichlorobiphenyl (6)	9.8 U	11 J	11 J	7.4 J	9.7 U	7.2 J	8.4 J	7.4 J	20	53 U
2,4'-Dichlorobiphenyl (8)	37	39	37	31	15 J	24	25	32	60	280 J
3,3'-Dichlorobiphenyl (11)	71	72	70	91	47	16 J	25	26	32	310 J
4,4'-Dichlorobiphenyl (15)	10 J	9.1 J	18 J	14 J	8.5 J	9.9 U	9.4 U	4 J	9.6 U	52 U
2,2',3-Trichlorobiphenyl (16)	10 J	11 J	4.2 J	1.4 J	0.97 U	5.9 J	6.9 J	8.9 J	17 J	76 J
2,2',4-Trichlorobiphenyl (17)	28	32	14 J	6.7 J	2.4 J	9.3 J	11 J	25	26	270 J
2,2',6-Trichlorobiphenyl (19)	11 J	11 J	2.3 J	1.6 J	0.97 U	9.8 J	11 J	8 J	29	110 J
2,3,4'-Trichlorobiphenyl (22)	58	63	130	56	27	31	35	37	80	430 J
2,3,5-Trichlorobiphenyl (23)	3.3 J	0.99 U	0.95 U	1 U	0.97 U	0.99 U	0.94 U	0.98 U	0.96 U	11 U
2,3,6-Trichlorobiphenyl (24)	0.98 U	0.99 U	0.95 U	1 U	0.97 U	0.99 U	0.94 U	0.98 U	0.83 J	5.5 U
2,3',4-Trichlorobiphenyl (25)	23	26	18 J	17 J	8.3 J	12 J	13 J	14 J	29	210 J
2,3',6-Trichlorobiphenyl (27)	6.7 J	7.5 J	3.9 J	2.4 J	1 J	3.5 J	3.3 J	5.2 J	7.1 J	68 J
2,4',5-Trichlorobiphenyl (31)	220	250	170	200	90	140	160	130	250	1,900 J
2,4',6-Trichlorobiphenyl (32)	71	76	45	44	20	23	26	50	47	630 J
2,3',5'-Trichlorobiphenyl (34)	0.98 U	3.6 J	3.2 J	1.9 J	0.97 U	2.2 J	1.5 J	3.2 J	3.7 J	12 U
3,3',4-Trichlorobiphenyl (35)	2 U	2 U	3.4 J	2.7 J	1.9 U	2 U	1.9 U	2 U	1.9 U	12 U
3,3',5-Trichlorobiphenyl (36)	20	26	7.3 J	11 J	5.9 J	15 J	17 J	13 J	28	240 J
3,4,4'-Trichlorobiphenyl (37)	33	36	34	45	21	3.1 J	3.5 J	14 J	6.9 J	270 J
3,4',5-Trichlorobiphenyl (39)	0.98 U	1.6 J	3.5 J	1.6 J	0.97 U	0.99 U	0.94 U	1.1 J	0.96 U	11 U
2,2',3,4-Tetrachlorobiphenyl (41)	0.98 U	0.99 U	0.95 U	1 U	0.97 U	0.99 U	1 U	5.4 J	3 J	56 J
2,2',3,4'-Tetrachlorobiphenyl (42)	78	79	44	47	21	9.5 J	9.5 J	60	42	780 J
2,2',3,5-Tetrachlorobiphenyl (43)	10 J	13 J	5.9 J	3.2 J	0.69 J	0.99 U	0.94 U	11 J	0.96 U	140 J
2,2',3,6-Tetrachlorobiphenyl (45)	26	22	3.2 J	2.7 J	1.2 J	13 J	17 J	18 J	34	220 J
2,2',3,6'-Tetrachlorobiphenyl (46)	10 J	10 J	3.2 J	1 U	0.97 U	3.3 J	3.8 J	7.7 J	9.9 J	120 J
2,2',4,5-Tetrachlorobiphenyl (48)	43	44	21	9.9 J	0.97 U	2.5 J	1.8 J	41	8.4 J	460 J
2,2',4,6'-Tetrachlorobiphenyl (51)	40	41	11 J	5.7 J	2.7 J	8.8 J	7.7 J	31	20	420 J
2,2',5,5'-Tetrachlorobiphenyl (52)	2,400	2,700	780	1,300	450	1,900	2,100	1,500	3,100	31,000
2,2',6,6'-Tetrachlorobiphenyl (54)	2 J	2.2 J	0.95 U	1 U	0.97 U	3.2 J	3.8 J	1.4 J	6 J	4.7 U
2,3,3',4-Tetrachlorobiphenyl (55)	2 U	2 U	1.9 U	2 U	1.9 U	2 U	1.9 U	10 J	1.9 U	28 U
2,3,3',4'-Tetrachlorobiphenyl (56)	280	300	140	210	100	37	39	160	130	2,400
2,3,3',5-Tetrachlorobiphenyl (57)	78	0.99 U	2.4 J	2.9 J	1.2 J	33	31 J	2.9 J	70	1,200 J
2,3,3',5'-Tetrachlorobiphenyl (58)	1.1 U	0.99 U	3.1 J	3.1 J	1.1 J	0.99 U	0.97 U	2.5 J	1.5 U	27 U
2,3,4,4'-Tetrachlorobiphenyl (60)	160	170	210	200	80	160	180	82	280	1,400 J
2,3,4',5-Tetrachlorobiphenyl (63)	53	56	93	61	23	57	62	25	92	460 J
2,3,4',6-Tetrachlorobiphenyl (64)	350	360	150	280	130	170	180	200	330	3,700
2,3',4,4'-Tetrachlorobiphenyl (66)	1,200	1,300	1,100	1,200	460	1,300	1,400	580	1,700	11,000
2,3',4,5-Tetrachlorobiphenyl (67)	29	32	21	22	12 J	13 J	15 J	17 J	33	310 J
2,3',4,5'-Tetrachlorobiphenyl (68)	18 J	19 J	27	18 J	8.8 J	23	22 J	10 J	31 J	180 J
2,3',5,5'-Tetrachlorobiphenyl (72)	29	24	21	25	10 J	28	32	16 J	45	320 J
3,3',4,4'-Tetrachlorobiphenyl (77)	52	53	56	72	26	15	17	24	34 J	380
3,3',4,5'-Tetrachlorobiphenyl (79)	71	71	19 J	16 J	7.4 J	19 J	21 J	15 J	38	460 J
3,4,4',5-Tetrachlorobiphenyl (81)	1.1 U	0.99 U	2.8	4.4	1.8 J	0.99 U	2.8 J	2	3.4	30 U
2,2',3,3',4-Pentachlorobiphenyl (82)	160	170	100	74	32	16 J	15 J	120	48	2,100
2,2',3,3',5-Pentachlorobiphenyl (83)	1.7 U	1.1 U	1.3 U	1.3 U	1 U	1.5 U	1.9 U	140	2.2 U	52 U
2,2',3,3',6-Pentachlorobiphenyl (84)	530	560	110	47	21	97	110	380	280	6,900

TABLE 2
Post-Removal Biota Detection Summary
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to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Lagoon									
Sample ID	VWW06-CRB01-0112	VWW06-CRB01P-0112	VWW06-CRB02-0112	VWW06-CRB03-0112	VWW06-CRB04-0112	VWW06-FS01-0112	VWW06-FS01P-0112	VWW06-FS04-0112	VWW06-FS02-0212	VWW06-FS03-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12
Chemical Name										
2,2',3,4,6'-Pentachlorobiphenyl (89)	14 J	15 J	4.1 J	2.9 J	1.2 U	1.6 U	2.1 U	14 J	2.5 U	170 J
2,2',3,5,5'-Pentachlorobiphenyl (92)	980	1,000	170	290	110	880	990	660	1,100	14,000
2,2',3,5,6'-Pentachlorobiphenyl (94)	8.8 J	9.1 J	6 J	2.6 J	1.1 U	1.6 U	2.1 J	6.6 J	4.2 J	88 J
2,2',3,5',6-Pentachlorobiphenyl (95)	2,500	2,900	400	350	120	780	850	1,600	1,700	35,000
2,2',3,6,6'-Pentachlorobiphenyl (96)	5.8 J	5.7 J	0.95 U	1 U	0.97 U	3.3 J	3.9 J	4.1 J	7.5 J	85 J
2,2',4,4',5-Pentachlorobiphenyl (99)	3,100	3,500	3,700	2,800	1,200	3,800	4,300	1,500	3,700	33,000
2,2',4,5',6-Pentachlorobiphenyl (103)	31	33	6.2 J	7 J	3.6 J	27	29	22	39	430 J
2,2',4,6,6'-Pentachlorobiphenyl (104)	0.98 U	0.57 J	0.95 U	1 U	0.97 U	0.99 U	0.94 U	0.98 U	0.96 U	3.4 U
2,3,3',4,4'-Pentachlorobiphenyl (105)	1,600	1,800	1,800	2,000	740	2,500	2,800	740	2,600	16,000
2,3,3',4,6-Pentachlorobiphenyl (109)	380	400	440	410	150	550	630	180	570	3,300
2,3,3',5,5'-Pentachlorobiphenyl (111)	1.2 U	5.4 J	6.7 J	6.1 J	0.97 U	6.5 J	6.6 J	2.3 J	5.6 J	39 U
2,3,4,4',5-Pentachlorobiphenyl (114)	120	120	150	120	39	170	200	52	170	1,300
2,3',4,4',5-Pentachlorobiphenyl (118)	5,600	6,400	6,400	6,100	2,400	8,200	9,300	2,400	8,200	54,000
2,3',4,5,5'-Pentachlorobiphenyl (120)	22	24	27	29	11 J	42	50	11 J	42	160 J
2,3',4,5',6-Pentachlorobiphenyl (121)	1.4 J	1.4 J	1 U	1 U	0.97 U	2.7 J	2.4 J	1 U	2.1 J	39 U
2,3,3',4',5'-Pentachlorobiphenyl (122)	61	58	48	48	19 J	1.2 U	1.5 U	27	1.8 U	41 U
2,3',4,4',5'-Pentachlorobiphenyl (123)	64	71	81	63	26	82 J	120 J	22	96	530
3,3',4,4',5-Pentachlorobiphenyl (126)	13 J	8.5 J	9.1 J	17	6	26	20	5.5	23	150 J
3,3',4,5,5'-Pentachlorobiphenyl (127)	7.6 J	8 J	5.3 J	6.7 J	0.97 U	13 J	13 J	4.1 J	8.8 J	41 U
2,2',3,3',4,5'-Hexachlorobiphenyl (130)	320	360	160	230	77	320	380	200	340	3,800
2,2',3,3',4,6-Hexachlorobiphenyl (131)	19 J	20 J	11 J	6.4 J	3.6 J	3.9 J	4.1 J	11 J	5.2 J	270 J
2,2',3,3',4,6'-Hexachlorobiphenyl (132)	920	1,000	140	170	62	120	140	650	210	12,000
2,2',3,3',5,5'-Hexachlorobiphenyl (133)	74	83	46	73	21	63	75	46	81	870 J
2,2',3,3',6,6'-Hexachlorobiphenyl (136)	290	310	12 J	9.9 J	4.7 J	48	56	210	85	4,800
2,2',3,4,4',5-Hexachlorobiphenyl (137)	220	240	190	150	55	240	270	110	210	2,400
2,2',3,4,5,5'-Hexachlorobiphenyl (141)	670	690	190	280	110	580	700	430	540	8,800
2,2',3,4,5',6-Hexachlorobiphenyl (144)	120	130	18 J	31	15 J	76	89	84	76	1,800 J
2,2',3,4,6,6'-Hexachlorobiphenyl (145)	1.1 J	0.99 U	0.95 U	1 U	0.97 U	0.99 U	0.94 U	0.98 U	0.96 U	11 U
2,2',3,4',5,5'-Hexachlorobiphenyl (146)	650	710	690	730	270	960	1,100	340	860	6,800
2,2',3,4',5,6'-Hexachlorobiphenyl (148)	3.6 J	3.6 J	1.1 J	1.4 J	0.97 U	4.2 J	5.2 J	2.8 J	0.96 U	13 U
2,2',3,4',6,6'-Hexachlorobiphenyl (150)	3.7 J	4 J	0.95 U	1.1 J	0.97 U	1 J	0.94 U	2.9 J	0.96 U	18 J
2,2',3,5,6,6'-Hexachlorobiphenyl (152)	1.9 J	2.1 J	0.72 J	1 U	0.97 U	0.99 U	0.94 U	0.82 J	0.96 U	24 J
2,2',4,4',5,6'-Hexachlorobiphenyl (154)	56	58	59	55	23	61	73	31	51	600 J
2,2',4,4',6,6'-Hexachlorobiphenyl (155)	0.98 U	1 J	0.95 U	1.6 J	0.97 U	1.8 J	2.1 J	0.98 U	0.96 U	7.9 U
2,3,3',4,4',6-Hexachlorobiphenyl (158)	590	680	600	590	230	790	950	300	670	6,600
2,3,3',4,5,5'-Hexachlorobiphenyl (159)	6.3 J	8.5 J	0.96 J	1.9 J	0.97 U	1.2 U	1.6 U	5.4 J	1.9 U	68 J
2,3,3',4',5,5'-Hexachlorobiphenyl (162)	35	40	33	33	11 J	58	69	14 J	54	350 J
2,3,3',4',5',6-Hexachlorobiphenyl (164)	310	340	130	180	70	87 J	140 J	190	130	3,400
2,3,3',5,5',6-Hexachlorobiphenyl (165)	1.2 J	0.74 J	1 J	1.4 J	0.97 U	0.99 U	1.3 J	0.98 U	0.96 U	12 U
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	280	300	290	280	110	500	590	130	420	2,700
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	1.3 U	1.3 J	0.95 U	1 U	0.97 U	1.3 U	1.7 U	0.98 U	2.1 U	34 U
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	510	590	190	380	150	1,000	1,200	340	760	4,900
2,2',3,3',4,5,5'-Heptachlorobiphenyl (172)	100	120	71	100	40	190	220	64	160	820 J
2,2',3,3',4,5,6'-Heptachlorobiphenyl (174)	360	410	61	120	40	49	60	290	77	3,800
2,2',3,3',4,5',6-Heptachlorobiphenyl (175)	15 J	17 J	4.4 J	11 J	4.5 J	20 J	24	12 J	13 J	180 J
2,2',3,3',4,6,6'-Heptachlorobiphenyl (176)	25	28	3 J	8 J	2.5 J	5.1 J	5.5 J	21	6.3 J	340 J
2,2',3,3',4,5',6'-Heptachlorobiphenyl (177)	300	340	110	240	76	280	310	220	300	2,900
2,2',3,3',5,5',6-Heptachlorobiphenyl (178)	82	94	40	80	26	56	62	63	71	850 J
2,2',3,3',5,6,6'-Heptachlorobiphenyl (179)	100	110	7.8 J	17 J	5.2 J	14 J	16 J	92	17 J	1,400 J
2,2',3,4,4',5,6-Heptachlorobiphenyl (181)	13 J	15 J	13 J	13 J	3.7 J	27	30	8.3 J	14 J	69 J

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation
to Support Feasibility Study Alternative
Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Lagoon									
Sample ID	VWW06-CRB01-0112	VWW06-CRB01P-0112	VWW06-CRB02-0112	VWW06-CRB03-0112	VWW06-CRB04-0112	VWW06-FS01-0112	VWW06-FS01P-0112	VWW06-FS04-0112	VWW06-FS02-0212	VWW06-FS03-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12
Chemical Name										
2,2',3,4,4',5,6'-Heptachlorobiphenyl (182)	5.2 J	5.1 J	4.1 J	3.3 J	1.5 J	4.7 J	4.9 J	3 J	3.1 J	37 J
2,2',3,4,4',5',6-Heptachlorobiphenyl (183)	230	260	200	240	99	450	550	160	340	2,400
2,2',3,4,4',6,6'-Heptachlorobiphenyl (184)	1.2 J	0.94 J	0.57 J	0.9 J	0.97 U	0.99 U	1.6 J	0.98 U	0.96 U	6.8 U
2,2',3,4,5,5',6-Heptachlorobiphenyl (185)	31 J	48 J	1.9 U	2 U	6.4 J	39	1.9 U	23	27 J	22 U
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	540	620	450	690	270	730	850	330	580	4,500
2,2',3,4',5,6,6'-Heptachlorobiphenyl (188)	3.1 J	3 J	1.5 J	2.7 J	1.9 J	4.5 J	5.1 J	1.1 J	2.4 J	14 J
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	19	20	13	20	7.4	35	43	9.8	22 J	150 J
2,3,3',4,4',5,6-Heptachlorobiphenyl (190)	79	82	43	70	28	8.7 J	190	50	130	840 J
2,3,3',4,4',5',6-Heptachlorobiphenyl (191)	24	25	14 J	22	9.2 J	43	50	15 J	32	280 J
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (194)	79	86	28	96	43	150	200	66	110	840 J
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	31	34	9.8 J	28	12 J	65	73	31	43	310 J
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (196)	48	56	32	61	30	75	83	41	54	470 J
2,2',3,3',4,4',6,6'-Octachlorobiphenyl (197)	5.6 J	4.8 J	2.6 J	6.6 J	2.7 J	7.6 J	8.1 J	3.4 J	5.6 J	48 J
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (200)	7.2 J	7.2 J	1.9 U	2 U	1.9 U	1.4 J	2.4 J	8.3 J	1.9 U	68 J
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (201)	17 J	20 J	8.3 J	19 J	9.8 J	24	26	15 J	17 J	150 J
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	36	38	20	45	18 J	37	44	29	37	320 J
2,2',3,4,4',5,5',6-Octachlorobiphenyl (203)	75	83	34	65	31	160	180	78	100	730 J
2,3,3',4,4',5,5',6-Octachlorobiphenyl (205)	2.8 J	3.7 J	0.95 U	1 J	0.97 U	6.3 J	7.5 J	3.7 J	2.5 J	36 J
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	33	39	9.3 J	27	14 J	61	71	40	42	450 J
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (207)	5.8 J	7 J	2.8 J	6.8 J	4.9 J	10 J	11 J	5.4 J	6.6 J	69 J
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (208)	18 J	19 J	8.8 J	19 J	10 J	24	29	17 J	17 J	160 J
Decachlorobiphenyl (209)	13 J	15 J	6.1 J	16 J	9.8 J	21	23	15 J	13 J	130 J
Congeners (21/33)	93	100	57	39 J	15 J	23 J	26 J	88	60	790 J
Congeners (26/29)	48	54	26 J	40	20 J	34 J	39	30 J	65	440 J
Congeners (28/20)	320	350	500	370	160	230	260	180	460	2,600 J
Congeners (30/18)	62	64	23 J	16 J	6.3 J	26 J	28 J	46	79	570 J
Congeners (40/71)	200	210	170	97	48	31 J	29 J	160	75	1,800 J
Congeners (44/47/65)	940	980	700	480	240	420	440	560	850	11,000
Congeners (50/53)	110	110	43	15 J	6.5 J	43	47	68	96	1,000 J
Congeners (59/62/75)	63	64	61	42 J	19 J	52 J	54 J	38	85	630 J
Congeners (61/70/74/76)	2,600	2,800	2,000	2,100	830	2,300	2,400	1,300	3,500	26,000
Congeners (69/49)	870	910	290	390	190	520	560	510	1,000	10,000
Congeners (86/87/97/108/119/125)	2,500	2,700	1,200	920	470	710	820	1,600	1,300	33,000
Congeners (88/91)	470	510	65	160	71	180	190	300	290	6,000
Congeners (93/100)	29	30 J	26 J	19 J	9.5 J	27 J	30 J	17 J	35 J	370 J
Congeners (98/102)	77	82	31 J	16 J	5.4 J	2.2 J	2 U	60	16 J	930 J
Congeners (107/124)	200	220	130	160	55	210	250	110	240	2,100 J
Congeners (110/115)	6,100	6,700	3,600	3,500	1,600	1,200	1,400	3,200	2,600	70,000
Congeners (113/90/101)	5,900	6,600	2,400	3,800	1,400	3,800	4,300	3,600	5,800	80,000
Congeners (117/116/85)	800	860	780	690	270	930	1,100	460	1,100	7,700
Congeners (128/166)	750	840	530	640	270	990	1,200	430	840	8,600
Congeners (134/143)	130	120	35 J	23 J	7 J	14 J	17	88	27 J	1,800 J
Congeners (138/163/129)	5,200	5,600	4,300	5,200	1,900	9,100	11,000	2,800	7,800	59,000
Congeners (139/140)	95	100	84	72	33	100	120	54	82	1,100 J
Congeners (147/149)	2,700	2,900	740	1,400	530	390	450	1,700	560	35,000
Congeners (151/135)	830	900	130	180	69	320	380	610	400	12,000
Congeners (153/168)	4,100	4,600	4,500	4,500	1,700	7,400	8,800	2,200	6,400	46,000
Congeners (156/157)	830	920	870	920	340	1,500	1,700	380	1,300	8,000
Congeners (171/173)	180	210	100	140	62	300	340	110	200	1,700 J
Congeners (180/193)	960	1,100	660	980	390	1,700	2,000	580	1,400	8,500

TABLE 2
Post-Removal Biota Detection Summary
SWMU 6 Contaminant Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan
Vieques, Puerto Rico

Station ID	VWW06-Lagoon									
Sample ID	VWW06-CRB01-0112	VWW06-CRB01P-0112	VWW06-CRB02-0112	VWW06-CRB03-0112	VWW06-CRB04-0112	VWW06-FS01-0112	VWW06-FS01P-0112	VWW06-FS04-0112	VWW06-FS02-0212	VWW06-FS03-0212
Sample Date	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	01/31/12	02/01/12	02/01/12
Chemical Name										
Congeners (198/199)	160	180	97	210	92	230	250	130	160	1,200 J
Total Dichlorobiphenyls	130	150	140	140	70	57	70	75	140	590
Total Heptachlorobiphenyls	3,600	4,100	2,000	3,100	1,200	5,000	6,000	2,400	4,100	34,000
Total Hexachlorobiphenyls	19,000	21,000	14,000	16,000	6,000	21,000	24,000	11,000	19,000	230,000
Total Monochlorobiphenyls	7.4	8.5	5.5	6.6	2.4	4.1	4.7	4.8	6.8	0 U
Total Nonachlorobiphenyls	57	65	21	53	29	96	110	63	66	680
Total Octachlorobiphenyls	460	510	230	530	240	760	870	400	530	4,200
Total Pentachlorobiphenyls	31,000	34,000	22,000	22,000	8,700	25,000	29,000	17,000	33,000	370,000
Total Tetrachlorobiphenyls	9,800	10,000	6,100	6,500	2,700	7,200	7,700	5,400	12,000	110,000
Total Trichlorobiphenyls	1,000	1,100	1,000	850	380	570	650	650	1,200	8,700
Total Non-Dioxin-Like Congeners	57,000	62,000	35,000	39,000	16,000	48,000	56,000	34,000	56,000	660,000
PCB (total)	65000	72000	45000	49000	19000	62000	71000	37000	69000	750,000
Toxic Equivalents (Total TEQ)	1.6	1.2	1.2	2	0.71	3	2.4	0.66	2.7	18
Total Metals (MG/KG)										
Lead	5.14	4.12	3.55	2.07	2.15	0.097 J	0.055 J	0.271	0.057	1.65 J
Zinc	21.6	20.3	19.3	26.4	26.6	16.9 J	10.8 J	13.5	16.1	15.5
Wet Chemistry (PCT)										
% Solids	35.8	31.2	34.8	35.4	34.4	30.0	28.4	22.5	23.4	33.1
Lipids (%)	0.37	0.41	0.24	0.62	0.46	0.38	0.4	0.38	0.8	5.4

Notes:
Shading indicates detections
J - Estimated.
U - Nondetect or not detected at significantly greater than that in an associated blank.
MG/KG - Milligrams per kilogram
PCT - Percent
PG/G - Picograms per gram

TABLE 3

Post-Removal Maximum Biota Tissue PCB and Metal Concentration Summary

SWMU 6 Contaminant Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan

Vieques, Puerto Rico

Sample ID **Sample Date**	**HHRA SL**	**Maximum SWMU 6 Crab Concentrations 1/31/12**	**Maximum Background Crab Concentrations 1/31/12-2/1/12**	**Maximum SWMU 6 Fish Concentrations 1/31/12-2/1/12**	**Maximum Background Fish Concentrations 1/31/12-2/1/12**
Chemical Name					
Polychlorinated Biphenyl Congeners (PG/G)					
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	810	20	4.5	150 J	4.8 U
2,3,3',4,4'-Pentachlorobiphenyl (105)	810	**2,000**	270	**16,000**	20
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	810	300	55	**2,700**	4.8 U
2,3,4,4',5-Pentachlorobiphenyl (114)	810	150	19	**1,300**	4.8 U
2,3',4,4',5-Pentachlorobiphenyl (118)	810	**6,400**	**970**	**54,000**	61
2,3',4,4',5'-Pentachlorobiphenyl (123)	810	81	8.2	530	4.8 U
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	0.81	**1.3 J**	**0.99 U**	**34 U**	**4.8 U**
3,3',4,4',5-Pentachlorobiphenyl (126)	0.24	**17**	**2.2**	**150 J**	**4.8 U**
3,3',4,4'-Tetrachlorobiphenyl (77)	240	72	8.2	**380**	4.8 U
3,4,4',5-Tetrachlorobiphenyl (81)	81	4.4	0.99 U	30 U	4.8 U
Congeners (156/157)	810	**920**	150	**8,000**	6.2
Total Metals (MG/KG)					
Lead	0.47	**5.14**	0.066	**1.65 J**	0.02 J
Thallium	0.00046	**0.004 U**	**0.004 U**	**0.004 U**	**0.004 U**
Zinc	14	**26.6**	**20.7**	**16.9 J**	**16.4**

Notes:

The table only include metals and selected PCB congeners with published RSLs in USEPA RSL Fish Ingestion Table June 2011.

Bolded Values exceeded the HHRA SL;HHRA SL are adapted from Table 15 of Post-Removal SAP Addendum (CH2M HILL, 2012).

Maximum Site Crab Concentrations are maximum value of VWW06-CRB01 through VWW06-CRB04 collected from SWMU 6 lagoon;

Maximum Site Fish Concentrations are maximum value of VWW06-FS01 through VWW06-FS04 collected from SWMU 6 lagoon;

Maximum Background Crab Concentrations are maximum value of VWW06-CRB05 through VWW06-CRB08 collected from Laguna Punta Arenas ;

Maximum Background Fish Concentrations are maximum value of VWW06-FS05 through VWW06-FS08 collected from Laguna Punta Arenas ;

J - Estimated

U - Nondetect or not detected at significantly greater than that in an associated blank.

MG/KG - Milligrams per kilogram

PCT - Percent

PG/G - Picograms per gram

Figures

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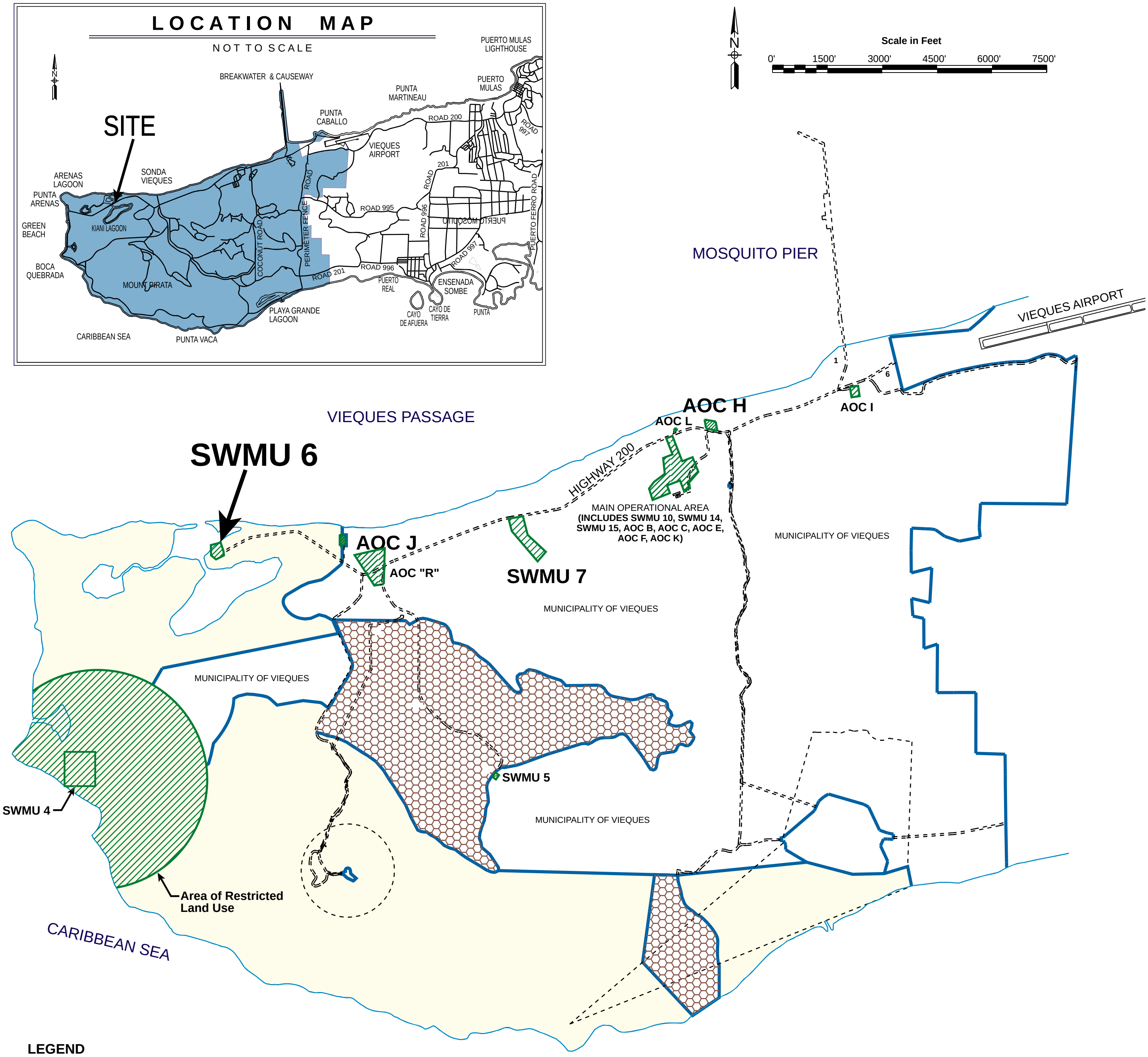
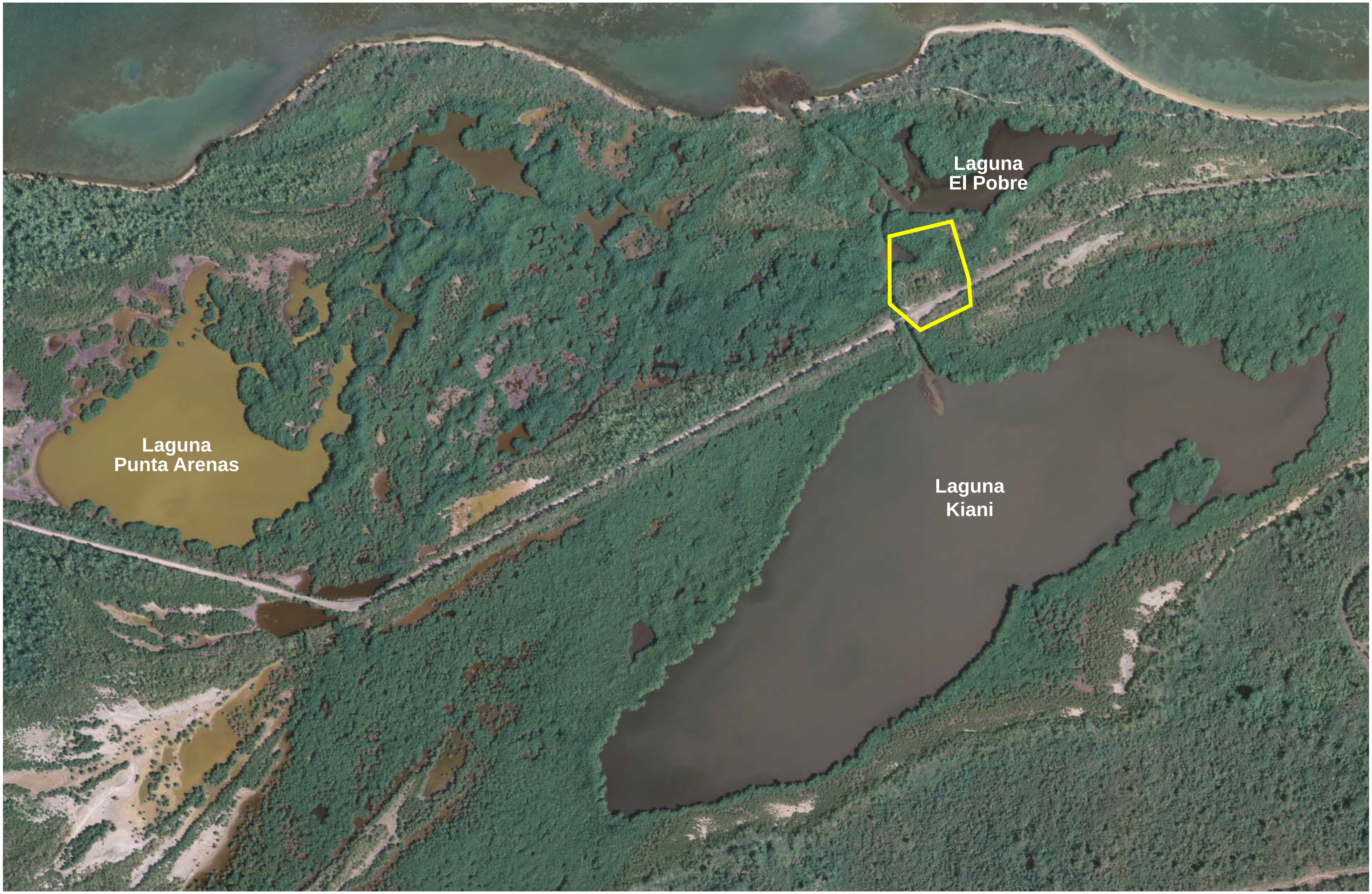


LEGEND

PROPERTY LINE	
EASEMENT LINE	
APPROXIMATE EDGE OF WATER	
UNITED STATES GOVERNMENT\ DEPARTMENT OF THE INTERIOR	
PUERTO RICO CONSERVATION TRUST	
AREA OF RESTRICTED LAND USE AT SWMUs AND AOCs	

SOURCE:
VIEQUES NASD SURVEY LAND TRANSFER & DISPOSAL OVERALL LOCATION SURVEY
PREPARED BY GLENN & SADLER AND LUIS BERRIOS MONTES & ASSOCIATES

FIGURE 1
SWMU 6 Site Location Map
SWMU 6 Contaminant Sediment Delineation Sampling and Analysis Plan
Vieques, Puerto Rico



North

0 300 600 Feet

LEGEND

SWMU 6 Access Restriction Boundary

FIGURE 2
Aerial Photograph of SWMU 6
SWMU 6 Contaminant Sediment
Delineation Sampling and Analysis Plan
Vieques, Puerto Rico

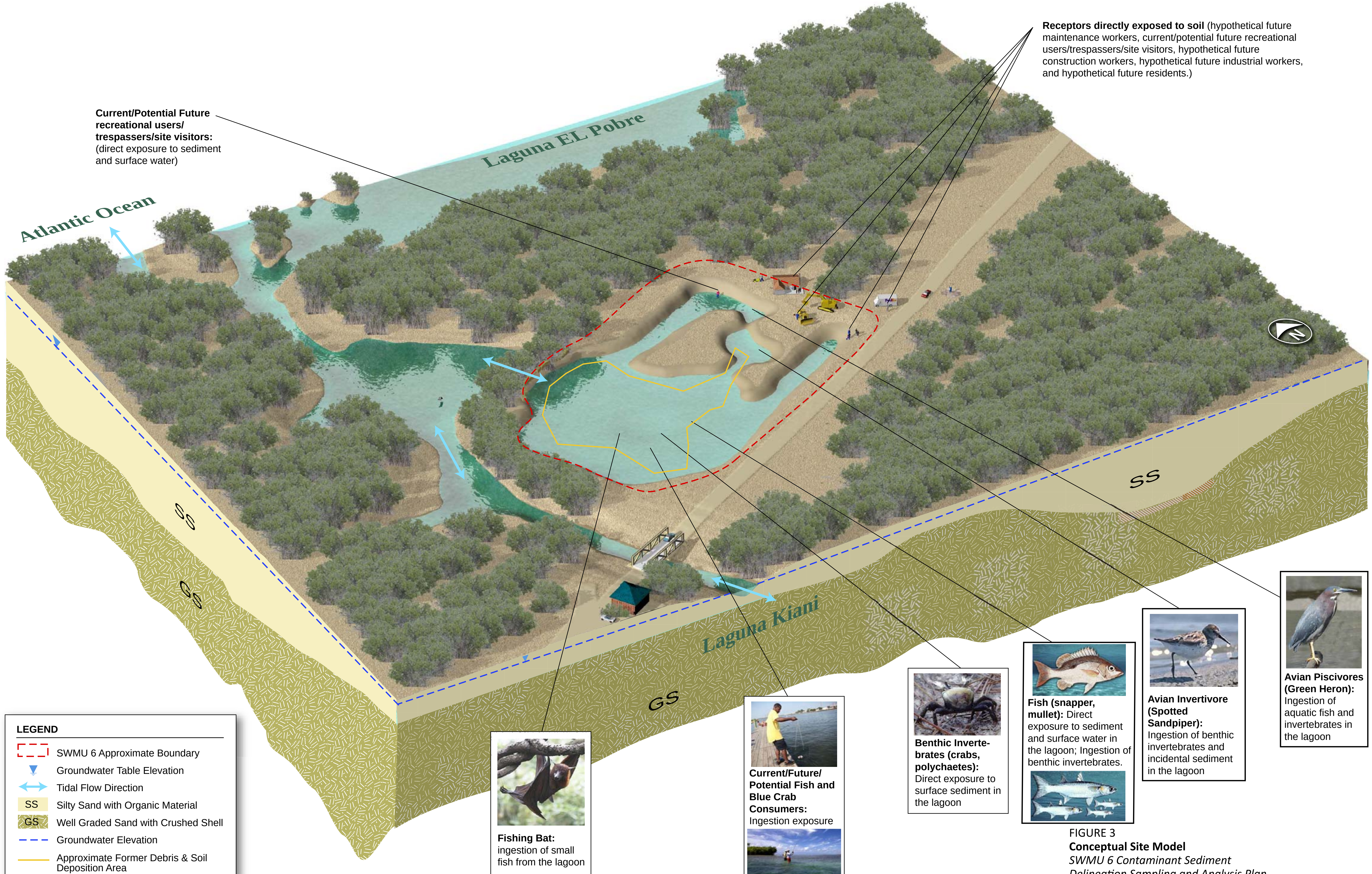


FIGURE 3
Conceptual Site Model
SWMU 6 Contaminant Sediment Delineation Sampling and Analysis Plan
Vieques, Puerto Rico

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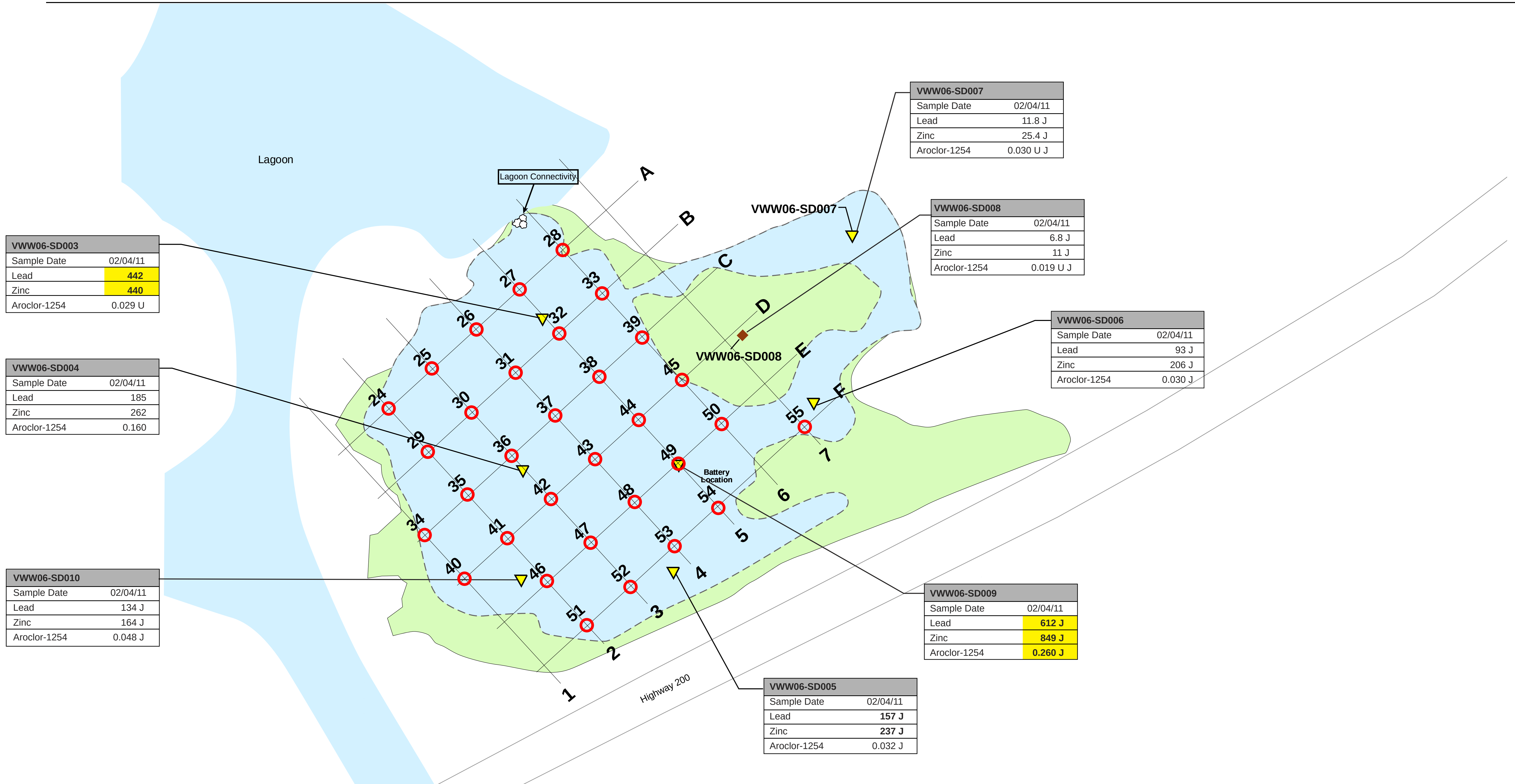

VWW06-SD003	
Sample Date	02/04/11
Lead	**442**
Zinc	**440**
Aroclor-1254	0.029 U

VWW06-SD004	
Sample Date	02/04/11
Lead	185
Zinc	262
Aroclor-1254	0.160

VWW06-SD010	
Sample Date	02/04/11
Lead	134 J
Zinc	164 J
Aroclor-1254	0.048 J

VWW06-SD007	
Sample Date	02/04/11
Lead	11.8 J
Zinc	25.4 J
Aroclor-1254	0.030 U J

VWW06-SD008	
Sample Date	02/04/11
Lead	6.8 J
Zinc	11 J
Aroclor-1254	0.019 U J

VWW06-SD006	
Sample Date	02/04/11
Lead	93 J
Zinc	206 J
Aroclor-1254	0.030 J

VWW06-SD009	
Sample Date	02/04/11
Lead	**612 J**
Zinc	**849 J**
Aroclor-1254	**0.260 J**

VWW06-SD005	
Sample Date	02/04/11
Lead	**157 J**
Zinc	**237 J**
Aroclor-1254	0.032 J

Legend

Sample Locations

- Proposed Sediment Sample
- Historical Surface Soil Sample
- Historical Sediment Sample
- Shallow, Sparse Mangroves
- 24 Sample Number

- Lagoon Outline Low Tide (Approximate)
- NTCRA Lead Hot Spot Excavation Area
- NTCRA Removal Area North of Road

North

0 15 30 Feet

COCs	PRGs
Lead	218
Zinc	410
Aroclor	0.2

Notes:

All units in mg/kg.
J - Estimated value
U - Not Detected
Bolded and highlighted values exceeded the Preliminary Remedial Goals (PRGs)
Sample IDs will follow the format VWW06-SD0##-DDDD where ## indicates the sample number (shown above) and DDDD indicates the sample depth.

FIGURE 4
Proposed Sediment Delineation Samples
SWMU 6 Contaminant Sediment
Refinement Sampling and Analysis Plan
Vieques, Puerto Rico

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Attachment A
DoD ELAP Letter

Certificate # L2226

Scope of Accreditation
For
Empirical Laboratories, LLC

621 Mainstream Drive, Suite 270
Nashville, TN 37228
Marcia K. McGinnity
877-345-1113

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 Empirical Laboratories, LLC to perform the following tests:

Accreditation granted through: November 30, 2015

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B; EPA 624	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B; EPA 624	1,1,1-Trichloroethane (1,1,1-TCA)
GC/MS	EPA 8260B; EPA 624	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B; EPA 624	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113; Freon 113)
GC/MS	EPA 8260B; EPA 624	1,1,2-Trichloroethane
GC/MS	EPA 8260B; EPA 624	1,1-Dichloroethane (1,1-DCA)
GC/MS	EPA 8260B; EPA 624	1,1-Dichloroethene (1,1-DCE)
GC/MS	EPA 8260B; EPA 624	1,1-Dichloropropene
GC/MS	EPA 8260B; EPA 624	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B; EPA 624	1,2,3-Trichloropropane
GC/MS	EPA 8260B; EPA 624	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B; EPA 624	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B; EPA 624	1,2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260B; EPA 624	1,2-Dibromoethane (EDB)
GC/MS	EPA 8260B; EPA 624	1,2-Dichlorobenzene
GC/MS	EPA 8260B; EPA 624	1,2-Dichloroethane (EDC)
GC/MS	EPA 8260B; EPA 624	1,2-Dichloropropane
GC/MS	EPA 8260B; EPA 624	1,3,5-Trimethylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B; EPA 624	1,3-Dichlorobenzene
GC/MS	EPA 8260B; EPA 624	1,3-Dichloropropane
GC/MS	EPA 8260B; EPA 624	1,4-Dichlorobenzene
GC/MS	EPA 8260B; EPA 624	1,4-Dioxane
GC/MS	EPA 8260B; EPA 624	1-Chlorohexane
GC/MS	EPA 8260B; EPA 624	2,2-Dichloropropane
GC/MS	EPA 8260B; EPA 624	2-Butanone (Methyl ethyl ketone; MEK)
GC/MS	EPA 8260B; EPA 624	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B; EPA 624	2-Chlorotoluene
GC/MS	EPA 8260B; EPA 624	2-Hexanone (Methyl butyl ketone; MBK)
GC/MS	EPA 8260B; EPA 624	4-Chlorotoluene
GC/MS	EPA 8260B; EPA 624	4-Methyl-2-pentanone (Methyl isobutyl ketone; MIBK)
GC/MS	EPA 8260B; EPA 624	Acetone
GC/MS	EPA 8260B; EPA 624	Acetonitrile
GC/MS	EPA 8260B; EPA 624	Acrolein
GC/MS	EPA 8260B; EPA 624	Acrylonitrile
GC/MS	EPA 8260B; EPA 624	Allyl chloride
GC/MS	EPA 8260B; EPA 624	Benzene
GC/MS	EPA 8260B; EPA 624	Bromobenzene
GC/MS	EPA 8260B; EPA 624	Bromochloromethane
GC/MS	EPA 8260B; EPA 624	Bromodichloromethane
GC/MS	EPA 8260B; EPA 624	Bromoform
GC/MS	EPA 8260B; EPA 624	Bromomethane
GC/MS	EPA 8260B; EPA 624	Carbon Disulfide
GC/MS	EPA 8260B; EPA 624	Carbon Tetrachloride
GC/MS	EPA 8260B; EPA 624	Chlorobenzene
GC/MS	EPA 8260B; EPA 624	Chloroethane
GC/MS	EPA 8260B; EPA 624	Chloroform
GC/MS	EPA 8260B; EPA 624	Chloromethane
GC/MS	EPA 8260B; EPA 624	Chloroprene
GC/MS	EPA 8260B; EPA 624	cis-1,2-Dichloroethene (cis-1,2-DCE)
GC/MS	EPA 8260B; EPA 624	cis-1,3-Dichloropropene
GC/MS	EPA 8260B; EPA 624	cis-1,4-Dichloro-2-butene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B; EPA 624	Cyclohexane
GC/MS	EPA 8260B; EPA 624	Dibromochloromethane
GC/MS	EPA 8260B; EPA 624	Dibromomethane
GC/MS	EPA 8260B; EPA 624	Dichlorodifluoromethane (CFC-12)
GC/MS	EPA 8260B; EPA 624	Di-isopropyl ether
GC/MS	EPA 8260B; EPA 624	ETBE
GC/MS	EPA 8260B; EPA 624	Ethyl methacrylate
GC/MS	EPA 8260B; EPA 624	Ethylbenzene
GC/MS	EPA 8260B; EPA 624	Hexachlorobutadiene
GC/MS	EPA 8260B; EPA 624	Hexane
GC/MS	EPA 8260B; EPA 624	Iodomethane
GC/MS	EPA 8260B; EPA 624	Isobutyl alcohol
GC/MS	EPA 8260B; EPA 624	Isopropylbenzene (Cumene)
GC/MS	EPA 8260B; EPA 624	Methacrylonitrile
GC/MS	EPA 8260B; EPA 624	Methyl Acetate
GC/MS	EPA 8260B; EPA 624	Methyl methacrylate
GC/MS	EPA 8260B; EPA 624	Methyl Tertiary Butyl Ether (MTBE)
GC/MS	EPA 8260B; EPA 624	Methylcyclohexane
GC/MS	EPA 8260B; EPA 624	Methylene Chloride, or Dichloromethane
GC/MS	EPA 8260B; EPA 624	Naphthalene
GC/MS	EPA 8260B; EPA 624	n-Butylbenzene
GC/MS	EPA 8260B; EPA 624	n-Propylbenzene
GC/MS	EPA 8260B; EPA 624	p-Isopropyltoluene
GC/MS	EPA 8260B; EPA 624	Propionitrile
GC/MS	EPA 8260B; EPA 624	sec-Butylbenzene
GC/MS	EPA 8260B; EPA 624	Styrene
GC/MS	EPA 8260B; EPA 624	t-Butyl alcohol
GC/MS	EPA 8260B; EPA 624	tert-Amyl methyl ether
GC/MS	EPA 8260B; EPA 624	tert-Butylbenzene
GC/MS	EPA 8260B; EPA 624	Tetrachloroethene (PCE; PERC)
GC/MS	EPA 8260B; EPA 624	Tetrahydrofuran
GC/MS	EPA 8260B; EPA 624	Toluene
GC/MS	EPA 8260B; EPA 624	trans-1,2-Dichloroethene (trans-1,2-DCE)

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Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B; EPA 624	trans-1,3-Dichloropropene
GC/MS	EPA 8260B; EPA 624	trans-1,4-Dichloro-2-butene
GC/MS	EPA 8260B; EPA 624	Trichloroethene (TCE)
GC/MS	EPA 8260B; EPA 624	Trichlorofluoromethane (CFC-11)
GC/MS	EPA 8260B; EPA 624	Vinyl acetate
GC/MS	EPA 8260B; EPA 624	Vinyl Chloride (VC)
GC/MS	EPA 8260B; EPA 624	m,p-Xylenes
GC/MS	EPA 8260B; EPA 624	o-Xylene
GC/MS	EPA 8260B; EPA 624	Xylenes (Total)
GC/MS	EPA 8270C/D; EPA 625	1,1'-Biphenyl
GC/MS	EPA 8270C/D; EPA 625	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C/D; EPA 625	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/D; EPA 625	1,2-Dichlorobenzene
GC/MS	EPA 8270C/D; EPA 625	1,2-Diphenylhydrazine
GC/MS	EPA 8270C/D; EPA 625	1,3-Dichlorobenzene
GC/MS	EPA 8270C/D; EPA 625	1,4-Dichlorobenzene
GC/MS	EPA 8270C/D; EPA 625	1,4-Dioxane
GC/MS	EPA 8270C/D; EPA 625	1-Methylnaphthalene
GC/MS	EPA 8270C/D; EPA 625	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/D; EPA 625	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D; EPA 625	2,4,6-Trichlorophenol (TCP)
GC/MS	EPA 8270C/D; EPA 625	2,4-Dichlorophenol (DCP)
GC/MS	EPA 8270C/D; EPA 625	2,4-Dimethylphenol
GC/MS	EPA 8270C/D; EPA 625	2,4-Dinitrophenol
GC/MS	EPA 8270C/D; EPA 625	2,4-Dinitrotoluene (DNT)
GC/MS	EPA 8270C/D; EPA 625	2,6-Dichlorophenol
GC/MS	EPA 8270C/D; EPA 625	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D; EPA 625	2-Chloronaphthalene
GC/MS	EPA 8270C/D; EPA 625	2-Chlorophenol
GC/MS	EPA 8270C/D; EPA 625	2-Methylnaphthalene
GC/MS	EPA 8270C/D; EPA 625	2-Methylphenol (o-Cresol)
GC/MS	EPA 8270C/D; EPA 625	2-Nitroaniline
GC/MS	EPA 8270C/D; EPA 625	2-Nitrophenol (ONP)

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Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D; EPA 625	3,3'-Dichlorobenzidine (DCB)
GC/MS	EPA 8270C/D; EPA 625	3-Methylphenol/4-Methylphenol
GC/MS	EPA 8270C/D; EPA 625	3-Nitroaniline
GC/MS	EPA 8270C/D; EPA 625	4,6-Dinitro-2-methylphenol (DNOC)
GC/MS	EPA 8270C/D; EPA 625	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/D; EPA 625	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D; EPA 625	4-Chloroaniline
GC/MS	EPA 8270C/D; EPA 625	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/D; EPA 625	4-Methylphenol (p-Cresol)
GC/MS	EPA 8270C/D; EPA 625	4-Nitroaniline (PNA)
GC/MS	EPA 8270C/D; EPA 625	4-Nitrophenol (PNP)
GC/MS	EPA 8270C/D; EPA 625	Acenaphthene
GC/MS	EPA 8270C/D; EPA 625	Acenaphthylene
GC/MS	EPA 8270C/D; EPA 625	Acetophenone
GC/MS	EPA 8270C/D; EPA 625	Aniline
GC/MS	EPA 8270C/D; EPA 625	Anthracene
GC/MS	EPA 8270C/D; EPA 625	Atrazine
GC/MS	EPA 8270C/D; EPA 625	Benzaldehyde
GC/MS	EPA 8270C/D; EPA 625	Benzidine
GC/MS	EPA 8270C/D; EPA 625	Benzo(a)anthracene
GC/MS	EPA 8270C/D; EPA 625	Benzo(a)pyrene
GC/MS	EPA 8270C/D; EPA 625	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D; EPA 625	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D; EPA 625	Benzo(k)fluoranthene
GC/MS	EPA 8270C/D; EPA 625	Benzoic Acid
GC/MS	EPA 8270C/D; EPA 625	Benzyl alcohol
GC/MS	EPA 8270C/D; EPA 625	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270C/D; EPA 625	bis(2-Chloroethyl)ether (BCEE)
GC/MS	EPA 8270C/D; EPA 625	bis(2-chloroisopropyl)ether, or 2,2'-oxybis (1-Chloropropane)
GC/MS	EPA 8270C/D; EPA 625	bis(2-Ethylhexyl)phthalate (BEHP)
GC/MS	EPA 8270C/D; EPA 625	Butyl benzyl phthalate (BBP)
GC/MS	EPA 8270C/D; EPA 625	Caprolactam
GC/MS	EPA 8270C/D; EPA 625	Carbazole

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D; EPA 625	Chrysene
GC/MS	EPA 8270C/D; EPA 625	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/D; EPA 625	Dibenzofuran (DBF)
GC/MS	EPA 8270C/D; EPA 625	Diethyl phthalate (DEP)
GC/MS	EPA 8270C/D; EPA 625	Dimethyl phthalate (DMP)
GC/MS	EPA 8270C/D; EPA 625	Di-n-butyl phthalate (DBP)
GC/MS	EPA 8270C/D; EPA 625	Di-n-octyl phthalate (DNOP)
GC/MS	EPA 8270C/D; EPA 625	Fluoranthene
GC/MS	EPA 8270C/D; EPA 625	Fluorene
GC/MS	EPA 8270C/D; EPA 625	Hexachlorobenzene (HCB)
GC/MS	EPA 8270C/D; EPA 625	Hexachlorobutadiene (HCBD)
GC/MS	EPA 8270C/D; EPA 625	Hexachlorocyclopentadiene (HCCPD)
GC/MS	EPA 8270C/D; EPA 625	Hexachloroethane (HCE)
GC/MS	EPA 8270C/D; EPA 625	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C/D; EPA 625	Isophorone
GC/MS	EPA 8270C/D; EPA 625	Naphthalene
GC/MS	EPA 8270C/D; EPA 625	Nitrobenzene
GC/MS	EPA 8270C/D; EPA 625	N-Nitrosodimethylamine
GC/MS	EPA 8270C/D; EPA 625	N-Nitroso-di-n-propylamine (NDPA)
GC/MS	EPA 8270C/D; EPA 625	N-nitrosodiphenylamine (NDPHA)
GC/MS	EPA 8270C/D; EPA 625	Pentachlorophenol
GC/MS	EPA 8270C/D; EPA 625	Phenanthrene
GC/MS	EPA 8270C/D; EPA 625	Phenol
GC/MS	EPA 8270C/D; EPA 625	Pyrene
GC/MS	EPA 8270C/D; EPA 625	Pyridine
GC/ECD	EPA 8081A/B	4,4'-DDD
GC/ECD	EPA 8081A/B	4,4'-DDE
GC/ECD	EPA 8081A/B	4,4'-DDT
GC/ECD	EPA 8081A/B	Aldrin
GC/ECD	EPA 8081A/B	alpha-BHC (alpha-HCH)
GC/ECD	EPA 8081A/B	alpha-Chlordane
GC/ECD	EPA 8081A/B	beta-BHC (beta-HCH)
GC/ECD	EPA 8081A/B	delta-BHC (delta-HCH)

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081A/B	Dieldrin
GC/ECD	EPA 8081A/B	Endosulfan I
GC/ECD	EPA 8081A/B	Endosulfan II
GC/ECD	EPA 8081A/B	Endosulfan sulfate
GC/ECD	EPA 8081A/B	Endrin
GC/ECD	EPA 8081A/B	Endrin aldehyde
GC/ECD	EPA 8081A/B	Endrin ketone
GC/ECD	EPA 8081A/B	gamma-BHC (Lindane; gamma-HCH)
GC/ECD	EPA 8081A/B	gamma-Chlordane
GC/ECD	EPA 8081A/B	Heptachlor
GC/ECD	EPA 8081A/B	Heptachlor epoxide
GC/ECD	EPA 8081A/B	Methoxychlor
GC/ECD	EPA 8081A/B	Chlordane (n.o.s.)
GC/ECD	EPA 8081A/B	Toxaphene
GC/ECD	EPA 8082A	Aroclor-1016
GC/ECD	EPA 8082A	Aroclor-1221
GC/ECD	EPA 8082A	Aroclor-1232
GC/ECD	EPA 8082A	Aroclor-1242
GC/ECD	EPA 8082A	Aroclor-1248
GC/ECD	EPA 8082A	Aroclor-1254
GC/ECD	EPA 8082A	Aroclor-1260
GC/ECD	EPA 8082A	Aroclor-1262
GC/ECD	EPA 8082A	Aroclor-1268
GC/ECD	EPA 8151A	2,4,5-T
GC/ECD	EPA 8151A	2,4,5-TP (Silvex)
GC/ECD	EPA 8151A	2,4-D
GC/ECD	EPA 8151A	2,4-DB
GC/ECD	EPA 8151A	Dalapon
GC/ECD	EPA 8151A	Dicamba
GC/ECD	EPA 8151A	Dichlorprop
GC/ECD	EPA 8151A	Dinoseb
GC/ECD	EPA 8151A	MCPA
GC/ECD	EPA 8151A	MCPP (Mecoprop)

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Non-Potable Water		
Technology	**Method**	**Analyte**
HPLC/UV	EPA 8330A/B	1,3,5-Trinitrobenzene
HPLC/UV	EPA 8330A/B	1,3-Dinitrobenzene
HPLC/UV	EPA 8330A/B	2,4,6-Trinitrophenylmethylnitramine (Tetryl)
HPLC/UV	EPA 8330A/B	2,4,6-Trinitrotoluene (TNT)
HPLC/UV	EPA 8330A/B	2,4-Dinitrotoluene (DNT)
HPLC/UV	EPA 8330A/B	2,6-Dinitrotoluene
HPLC/UV	EPA 8330A/B	2-Amino-4,6-dinitrotoluene
HPLC/UV	EPA 8330A/B	2-Nitrotoluene (ONT)
HPLC/UV	EPA 8330A/B	3,5-Dinitroaniline
HPLC/UV	EPA 8330A/B	3-Nitrotoluene
HPLC/UV	EPA 8330A/B	4-Amino-2,6-dinitrotoluene
HPLC/UV	EPA 8330A/B	4-Nitrotoluene (PNT)
HPLC/UV	EPA 8330A/B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
HPLC/UV	EPA 8330A/B	Nitrobenzene
HPLC/UV	EPA 8330A/B	Nitroglycerin
HPLC/UV	EPA 8330A/B	Nitroguanidine
HPLC/UV	EPA 8330A/B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
HPLC/UV	EPA 8330A/B	3,5-Dinitroaniline
HPLC/UV	EPA 8330A/B	PETN
GC/FID	FLPRO	Petroleum Range Organics
GC/FID	EPA 8015B/C	TPH DRO
GC/FID	EPA 8015B/C	TPH ORO
GC/FID	EPA 8015B/C	TPH GRO
GC/FID	RSK-175	Methane
GC/FID	RSK-175	Ethane
GC/FID	RSK-175	Ethene
GC/ECD	EPA 8011	1,2-Dibromoethane (EDB)
GC/ECD	EPA 8011	1,2-Dibromo-3-chloropropane (DBCP)
HPLC/MS	EPA 6850	Perchlorate
ICP	EPA 6010B/C; EPA 200.7	Aluminum
ICP	EPA 6010B/C; EPA 200.7	Antimony
ICP	EPA 6010B/C; EPA 200.7	Arsenic
ICP	EPA 6010B/C; EPA 200.7	Barium

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Non-Potable Water

Technology	Method	Analyte
ICP	EPA 6010B/C; EPA 200.7	Beryllium
ICP	EPA 6010B/C; EPA 200.7	Boron
ICP	EPA 6010B/C; EPA 200.7	Cadmium
ICP	EPA 6010B/C; EPA 200.7	Calcium
ICP	EPA 6010B/C; EPA 200.7	Chromium, total
ICP	EPA 6010B/C; EPA 200.7	Cobalt
ICP	EPA 6010B/C; EPA 200.7	Copper
ICP	EPA 6010B/C; EPA 200.7	Iron
ICP	EPA 6010B/C; EPA 200.7	Lead
ICP	EPA 6010B/C; EPA 200.7	Magnesium
ICP	EPA 6010B/C; EPA 200.7	Manganese
CVAA	EPA 7470A; EPA 245.1	Mercury
ICP	EPA 6010B/C; EPA 200.7	Molybdenum
ICP	EPA 6010B/C; EPA 200.7	Nickel
ICP	EPA 6010B/C; EPA 200.7	Potassium
ICP	EPA 6010B/C; EPA 200.7	Selenium
ICP	EPA 6010B/C; EPA 200.7	Silver
ICP	EPA 6010B/C; EPA 200.7	Sodium
ICP	EPA 6010B/C; EPA 200.7	Strontium
ICP	EPA 6010B/C; EPA 200.7	Thallium
ICP	EPA 6010B/C; EPA 200.7	Tin
ICP	EPA 6010B/C; EPA 200.7	Titanium
ICP	EPA 6010B/C; EPA 200.7	Vanadium
ICP	EPA 6010B/C; EPA 200.7	Zinc
IC	EPA 300.0	Bromide
IC	EPA 300.0	Chloride
IC	EPA 300.0	Fluoride
IC	EPA 300.0	Nitrate
IC	EPA 300.0	Nitrite
IC	EPA 300.0	Sulfate
IC	EPA 9056A	Bromide
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride

Non-Potable Water		
Technology	**Method**	**Analyte**
IC	EPA 9056A	Nitrate
IC	EPA 9056A	Nitrite
IC	EPA 9056A	Sulfate
Colorimetric	SM 4500-NO2 B-2011	Nitrite as N
Titration	SM 2320 B-2011	Alkalinity
Colorimetric	SM 4500-NH3 G-2011	Ammonia
Probe	SM 5210 B-2011	BOD
Probe	SM 5210 B-2011	CBOD
Colorimetric	EPA 410.4	COD
UV/Vis	EPA 7196A SM 3500-Cr B-2011	Hexavalent Chromium
Colorimetric	EPA 353.2 MOD	Nitrocellulose
Colorimetric	EPA 353.2	Nitrate/Nitrite
Gravimetric	EPA 1664A	Oil and Grease
Titration	Chap.7, Sect. 7.3.4 Mod.	Reactive Sulfide
Titration	SM 4500-S2 F-2011	Sulfide
UV/Vis	SM 4500-P B5-2011	Total Phosphorus (as P)
UV/Vis	SM 4500-P E-2011	Ortho-Phosphate (as P)
TOC	EPA 9060A; SM 5310 C-2011	Total Organic Carbon
Gravimetric	SM 2540 C-2011	TDS
Gravimetric	SM 2540 D-2011	TSS
Colorimetric	EPA 9012A/B SM 4500-CN G-2011	Cyanide
Physical	EPA 1010A	Ignitability / Flashpoint
Physical	EPA 9095B	Paint Filter
Probe	EPA 9040B/C SM 4500-H+ B-2011	pH(Corrosivity)
Preparation	**Method**	**Type**
Preparation	EPA 1311	TCLP
Preparation	EPA 3005A	Metals digestion
Preparation	EPA 3010A	Metals digestion
Preparation	EPA 3510C	Organics Liquid Extraction
Preparation	EPA 5030A/B	Purge and Trap Water

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B	1,1,1-Trichloroethane (1,1,1-TCA)
GC/MS	EPA 8260B	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113; Freon 113)
GC/MS	EPA 8260B	1,1,2-Trichloroethane
GC/MS	EPA 8260B	1,1-Dichloroethane (1,1-DCA)
GC/MS	EPA 8260B	1,1-Dichloroethene (1,1-DCE)
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 (DBCP)
GC/MS	EPA 8260B	1,2-Dibromoethane (EDB)
GC/MS	EPA 8260B	1,2-Dichlorobenzene
GC/MS	EPA 8260B	1,2-Dichloroethane (EDC)
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	1-Chlorohexane
GC/MS	EPA 8260B	2,2-Dichloropropane
GC/MS	EPA 8260B	2-Butanone (Methyl ethyl ketone; MEK)
GC/MS	EPA 8260B	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B	2-Chlorotoluene
GC/MS	EPA 8260B	2-Hexanone (Methyl butyl ketone; MBK)
GC/MS	EPA 8260B	4-Chlorotoluene
GC/MS	EPA 8260B	4-Methyl-2-pentanone (Methyl isobutyl ketone; MIBK)
GC/MS	EPA 8260B	Acetone
GC/MS	EPA 8260B	Acetonitrile

Solid and Chemical Materials

Technology	Method	Analyte
GC/MS	EPA 8260B	Acrolein
GC/MS	EPA 8260B	Acrylonitrile
GC/MS	EPA 8260B	Allyl chloride
GC/MS	EPA 8260B	Benzene
GC/MS	EPA 8260B	Bromobenzene
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
GC/MS	EPA 8260B	Chlorobenzene
GC/MS	EPA 8260B	Chloroethane
GC/MS	EPA 8260B	Chloroform
GC/MS	EPA 8260B	Chloromethane
GC/MS	EPA 8260B	Chloroprene
GC/MS	EPA 8260B	cis-1,2-Dichloroethene (cis-1,2-DCE)
GC/MS	EPA 8260B	cis-1,3-Dichloropropene
GC/MS	EPA 8260B	cis-1,4-Dichloro-2-butene
GC/MS	EPA 8260B	Cyclohexane
GC/MS	EPA 8260B	Dibromochloromethane
GC/MS	EPA 8260B	Dibromomethane
GC/MS	EPA 8260B	Dichlorodifluoromethane (CFC-12)
GC/MS	EPA 8260B	Di-isopropyl ether
GC/MS	EPA 8260B	ETBE
GC/MS	EPA 8260B	Ethyl methacrylate
GC/MS	EPA 8260B	Ethylbenzene
GC/MS	EPA 8260B	Hexachlorobutadiene
GC/MS	EPA 8260B	Hexane
GC/MS	EPA 8260B	Iodomethane
GC/MS	EPA 8260B	Isobutyl alcohol
GC/MS	EPA 8260B	Isopropylbenzene (Cumene)

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B	m,p-Xylenes
GC/MS	EPA 8260B	Methacrylonitrile
GC/MS	EPA 8260B	Methyl Acetate
GC/MS	EPA 8260B	Methyl methacrylate
GC/MS	EPA 8260B	Methyl Tertiary Butyl Ether (MTBE)
GC/MS	EPA 8260B	Methylcyclohexane
GC/MS	EPA 8260B	Methylene Chloride, or Dichloromethane
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	p-Isopropyltoluene
GC/MS	EPA 8260B	Propionitrile
GC/MS	EPA 8260B	sec-Butylbenzene
GC/MS	EPA 8260B	Styrene
GC/MS	EPA 8260B	tert-Amyl methyl ether
GC/MS	EPA 8260B	tert-Butyl alcohol
GC/MS	EPA 8260B	tert-Butylbenzene
GC/MS	EPA 8260B	Tetrachloroethene (PCE; PERC)
GC/MS	EPA 8260B	Tetrahydrofuran
GC/MS	EPA 8260B	Toluene
GC/MS	EPA 8260B	trans-1,2-Dichloroethene (trans-1,2-DCE)
GC/MS	EPA 8260B	trans-1,3-Dichloropropene
GC/MS	EPA 8260B	trans-1,4-Dichloro-2-butene
GC/MS	EPA 8260B	Trichloroethene (TCE)
GC/MS	EPA 8260B	Trichlorofluoromethane (CFC-11)
GC/MS	EPA 8260B	Vinyl acetate
GC/MS	EPA 8260B	Vinyl Chloride (VC)
GC/MS	EPA 8260B	Xylenes (Total)
GC/MS	EPA 8270C/D	1,1'-Biphenyl
GC/MS	EPA 8270C/D	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C/D	1,2,4-Trichlorobenzene

Solid and Chemical Materials

Technology	Method	Analyte
GC/MS	EPA 8270C/D	1,2-Dichlorobenzene
GC/MS	EPA 8270C/D	1,2-Diphenylhydrazine
GC/MS	EPA 8270C/D	1,3-Dichlorobenzene
GC/MS	EPA 8270C/D	1,4-Dichlorobenzene
GC/MS	EPA 8270C/D	1,4-Dioxane
GC/MS	EPA 8270C/D	1-Methylnaphthalene
GC/MS	EPA 8270C/D	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/D	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D	2,4,6-Trichlorophenol (TCP)
GC/MS	EPA 8270C/D	2,4-Dichlorophenol (DCP)
GC/MS	EPA 8270C/D	2,4-Dimethylphenol
GC/MS	EPA 8270C/D	2,4-Dinitrophenol
GC/MS	EPA 8270C/D	2,4-Dinitrotoluene (DNT)
GC/MS	EPA 8270C/D	2,6-Dichlorophenol
GC/MS	EPA 8270C/D	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D	2-Chloronaphthalene
GC/MS	EPA 8270C/D	2-Chlorophenol
GC/MS	EPA 8270C/D	2-Methylnaphthalene
GC/MS	EPA 8270C/D	2-Methylphenol (o-Cresol)
GC/MS	EPA 8270C/D	2-Nitroaniline
GC/MS	EPA 8270C/D	2-Nitrophenol (ONP)
GC/MS	EPA 8270C/D	3,3'-Dichlorobenzidine (DCB)
GC/MS	EPA 8270C/D	3-Methylphenol/4-Methylphenol
GC/MS	EPA 8270C/D	3-Nitroaniline
GC/MS	EPA 8270C/D	4,6-Dinitro-2-methylphenol (DNOC)
GC/MS	EPA 8270C/D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D	4-Chloroaniline
GC/MS	EPA 8270C/D	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/D	4-Methylphenol (p-Cresol)
GC/MS	EPA 8270C/D	4-Nitroaniline (PNA)
GC/MS	EPA 8270C/D	4-Nitrophenol (PNP)

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D	Acenaphthene
GC/MS	EPA 8270C/D	Acenaphthylene
GC/MS	EPA 8270C/D	Acetophenone
GC/MS	EPA 8270C/D	Aniline
GC/MS	EPA 8270C/D	Anthracene
GC/MS	EPA 8270C/D	Atrazine
GC/MS	EPA 8270C/D	Benzaldehyde
GC/MS	EPA 8270C/D	Benzidine
GC/MS	EPA 8270C/D	Benzo(a)anthracene
GC/MS	EPA 8270C/D	Benzo(a)pyrene
GC/MS	EPA 8270C/D	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D	Benzo(k)fluoranthene
GC/MS	EPA 8270C/D	Benzoic Acid
GC/MS	EPA 8270C/D	Benzyl alcohol
GC/MS	EPA 8270C/D	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270C/D	bis(2-Chloroethyl)ether (BCEE)
GC/MS	EPA 8270C/D	bis(2-chloroisopropyl)ether, or 2,2'-oxybis (1-Chloropropane)
GC/MS	EPA 8270C/D	bis(2-Ethylhexyl)phthalate (BEHP)
GC/MS	EPA 8270C/D	Butyl benzyl phthalate (BBP)
GC/MS	EPA 8270C/D	Caprolactam
GC/MS	EPA 8270C/D	Carbazole
GC/MS	EPA 8270C/D	Chrysene
GC/MS	EPA 8270C/D	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/D	Dibenzofuran (DBF)
GC/MS	EPA 8270C/D	Diethyl phthalate (DEP)
GC/MS	EPA 8270C/D	Dimethyl phthalate (DMP)
GC/MS	EPA 8270C/D	Di-n-butyl phthalate (DBP)
GC/MS	EPA 8270C/D	Di-n-octyl phthalate (DNOP)
GC/MS	EPA 8270C/D	Fluoranthene
GC/MS	EPA 8270C/D	Fluorene
GC/MS	EPA 8270C/D	Hexachlorobenzene (HCB)

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D	Hexachlorobutadiene (HCBD)
GC/MS	EPA 8270C/D	Hexachlorocyclopentadiene (HCCPD)
GC/MS	EPA 8270C/D	Hexachloroethane (HCE)
GC/MS	EPA 8270C/D	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C/D	Isophorone
GC/MS	EPA 8270C/D	Naphthalene
GC/MS	EPA 8270C/D	Nitrobenzene
GC/MS	EPA 8270C/D	N-Nitrosodimethylamine
GC/MS	EPA 8270C/D	N-Nitroso-di-n-propylamine (NDPA)
GC/MS	EPA 8270C/D	N-nitrosodiphenylamine (NDPHA)
GC/MS	EPA 8270C/D	Pentachlorophenol
GC/MS	EPA 8270C/D	Phenanthrene
GC/MS	EPA 8270C/D	Phenol
GC/MS	EPA 8270C/D	Pyrene
GC/MS	EPA 8270C/D	Pyridine
GC/ECD	EPA 8081A/B	4,4'-DDD
GC/ECD	EPA 8081A/B	4,4'-DDE
GC/ECD	EPA 8081A/B	4,4'-DDT
GC/ECD	EPA 8081A/B	Aldrin
GC/ECD	EPA 8081A/B	alpha-BHC (alpha-HCH)
GC/ECD	EPA 8081A/B	alpha-Chlordane
GC/ECD	EPA 8081A/B	beta-BHC (beta-HCH)
GC/ECD	EPA 8081A/B	delta-BHC (delta-HCH)
GC/ECD	EPA 8081A/B	Chlordane (n.o.s.)
GC/ECD	EPA 8081A/B	Dieldrin
GC/ECD	EPA 8081A/B	Endosulfan I
GC/ECD	EPA 8081A/B	Endosulfan II
GC/ECD	EPA 8081A/B	Endosulfan sulfate
GC/ECD	EPA 8081A/B	Endrin
GC/ECD	EPA 8081A/B	Endrin aldehyde
GC/ECD	EPA 8081A/B	Endrin ketone
GC/ECD	EPA 8081A/B	gamma-BHC (Lindane; gamma-HCH)

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081A/B	gamma-Chlordane
GC/ECD	EPA 8081A/B	Heptachlor
GC/ECD	EPA 8081A/B	Heptachlor epoxide
GC/ECD	EPA 8081A/B	Methoxychlor
GC/ECD	EPA 8081A/B	Toxaphene
GC/ECD	EPA 8082A	Aroclor-1016
GC/ECD	EPA 8082A	Aroclor-1221
GC/ECD	EPA 8082A	Aroclor-1232
GC/ECD	EPA 8082A	Aroclor-1242
GC/ECD	EPA 8082A	Aroclor-1248
GC/ECD	EPA 8082A	Aroclor-1254
GC/ECD	EPA 8082A	Aroclor-1260
GC/ECD	EPA 8082A	Aroclor-1262
GC/ECD	EPA 8082A	Aroclor-1268
HPLC/UV	EPA 8330A	1,3,5-Trinitrobenzene
HPLC/UV	EPA 8330A	1,3-Dinitrobenzene
HPLC/UV	EPA 8330A	2,4,6-Trinitrophenylmethylnitramine (Tetryl)
HPLC/UV	EPA 8330A	2,4,6-Trinitrotoluene (TNT)
HPLC/UV	EPA 8330A	2,4-Dinitrotoluene (DNT)
HPLC/UV	EPA 8330A	2,6-Dinitrotoluene
HPLC/UV	EPA 8330A	2-Amino-4,6-dinitrotoluene
HPLC/UV	EPA 8330A	2-Nitrotoluene (ONT)
HPLC/UV	EPA 8330A	3-Nitrotoluene
HPLC/UV	EPA 8330A	3,5-Dinitroaniline
HPLC/UV	EPA 8330A	4-Amino-2,6-dinitrotoluene
HPLC/UV	EPA 8330A	4-Nitrotoluene (PNT)
HPLC/UV	EPA 8330A	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
HPLC/UV	EPA 8330A	Nitroglycerin
HPLC/UV	EPA 8330A	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
HPLC/UV	EPA 8330A	Nitrobenzene
HPLC/UV	EPA 8330A	Nitroguanidine
HPLC/UV	EPA 8330A	PETN

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
HPLC/UV	EPA 8330B	1,3,5-Trinitrobenzene
HPLC/UV	EPA 8330B	1,3-Dinitrobenzene
HPLC/UV	EPA 8330B	2,4,6-Trinitrophenylmethylnitramine (Tetryl)
HPLC/UV	EPA 8330B	2,4,6-Trinitrotoluene (TNT)
HPLC/UV	EPA 8330B	2,4-Dinitrotoluene (DNT)
HPLC/UV	EPA 8330B	2,6-Dinitrotoluene
HPLC/UV	EPA 8330B	2-Amino-4,6-dinitrotoluene
HPLC/UV	EPA 8330B	2-Nitrotoluene (ONT)
HPLC/UV	EPA 8330B	3-Nitrotoluene
HPLC/UV	EPA 8330B	3,5-Dinitroaniline
HPLC/UV	EPA 8330B	4-Amino-2,6-dinitrotoluene
HPLC/UV	EPA 8330B	4-Nitrotoluene (PNT)
HPLC/UV	EPA 8330B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
HPLC/UV	EPA 8330B	Nitroglycerin
HPLC/UV	EPA 8330B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
HPLC/UV	EPA 8330B	Nitrobenzene
HPLC/UV	EPA 8330B	Nitroguanidine
HPLC/UV	EPA 8330B	PETN
GC/FID	FLPRO	Petroleum Range Organics
GC/FID	EPA 8015B/C	TPH DRO
GC/FID	EPA 8015B/C	TPH ORO
GC/FID	EPA 8015B/C	TPH GRO
HPLC/MS	EPA 6850	Perchlorate
ICP	EPA 6010B/C	Aluminum
ICP	EPA 6010B/C	Antimony
ICP	EPA 6010B/C	Arsenic
ICP	EPA 6010B/C	Barium
ICP	EPA 6010B/C	Beryllium
ICP	EPA 6010B/C	Boron
ICP	EPA 6010B/C	Cadmium
ICP	EPA 6010B/C	Calcium
ICP	EPA 6010B/C	Chromium, total

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP	EPA 6010B/C	Cobalt
ICP	EPA 6010B/C	Copper
ICP	EPA 6010B/C	Iron
ICP	EPA 6010B/C	Lead
ICP	EPA 6010B/C	Magnesium
ICP	EPA 6010B/C	Manganese
CVAA	EPA 7471A/B	Mercury
ICP	EPA 6010B/C	Molybdenum
ICP	EPA 6010B/C	Nickel
ICP	EPA 6010B/C	Potassium
ICP	EPA 6010B/C	Selenium
ICP	EPA 6010B/C	Silver
ICP	EPA 6010B/C	Sodium
ICP	EPA 6010B/C	Strontium
ICP	EPA 6010B/C	Tin
ICP	EPA 6010B/C	Titanium
ICP	EPA 6010B/C	Thallium
ICP	EPA 6010B/C	Vanadium
ICP	EPA 6010B/C	Zinc
IC	EPA 9056A	Bromide
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride
IC	EPA 9056A	Nitrate
IC	EPA 9056A	Nitrite
IC	EPA 9056A	Sulfate
UV/Vis	EPA 7196A	Hexavalent Chromium
TOC	Lloyd Kahn	Total Organic Carbon
Colorimetric	EPA 353.2 MOD	Nitrocellulose

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Colorimetric	EPA 9012A/B	Cyanide
Titration	Chap.7, Sect. 7.3.4 Mod.	Reactive Sulfide
Physical	EPA 1010A	Ignitability/Flashpoint
Titration	EPA 9034	Sulfide
Probe	EPA 9045C/D	pH (Corrosivity)
Preparation	**Method**	**Type**
Preparation	EPA 1311	TCLP
Preparation	EPA 1312	SPLP
Preparation	NJ Modified 3060A	Hexavalent Chromium
Preparation	EPA 3050B	Metals Digestion
Preparation	EPA 3546	Organics Microwave Extraction
Preparation	EPA 3550B/C	Organics Sonication
Preparation	SM 2540 B-1997	Percent Solids (Percent Moisture)
Preparation	EPA 5035 /A	Purge and Trap Solid

Notes:

1) This laboratory offers commercial testing service.

Approved By:________________________ Date: January 30, 2013

R. Douglas Leonard
Chief Technical Officer

Re-issued: 1/30/13

Attachment B
Final Responses to USEPA and PREQB Comments

Final Responses to USEPA Comments on the

Draft Contaminated Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan Solid Waste Management Unit (SWMU) 6

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

General Comments

1. The SAP does not provide the laboratory standard operating procedures (SOPs) and statistically derived quality control (QC) acceptance limits for the proposed methods. This information should be provided to ensure the adequacy of the laboratory methods and to ensure that the laboratory can meet the criteria presented in the SAP (e.g., the Department of Defense Quality Systems Manual [DOD QSM] acceptance limits included in Worksheet #15). Revise the SAP to provide the laboratory SOPs and statistically derived QC limits.

   Navy Response*:*

   As is standard protocol for all Vieques SAPs, laboratory SOPs are not attached to SAPs because they are proprietary and confidential. They are available upon request and are provided in response to this comment. Statistically-derived control limits are not applicable to this project. The laboratory will adhere to the limits that are provided in SAP Worksheet #28s and Worksheet #15s.

2. The procedures for sediment sampling are not discussed in sufficient detail in the SAP. Worksheet #14, Summary of Project Tasks, indicates a macrocore sampler or similar will be used for sediment coring and SOPs from the Master Standard Operation Procedures, Protocols, and Plans, dated April 2010 (Master Protocols), are referenced. However, it is unclear how much water is expected to be present at the site, and if the proposed SOPs are sufficient to sample the sediment given the current site conditions. In addition, the SAP does not discuss how the sample locations will be determined in the field (e.g., measured or use of a global positioning system unit). Revise the SAP to include a more detailed discussion for the sediment sampling procedures.

   Navy Response*:*

   The following language clarifying establishment of sampling locations has been inserted after the first sentence in "Sediment Sampling and Analysis": "The samples will be distributed relatively uniformly across the lagoon so that the estimate (from the FS) of the remediation volume and area can be refined. The sediment sampling locations will be established at or near high tide by placing temporary stakes near the corners of the inundated area and then placing additional stakes at approximately 20-foot spacings to approximate the grid pattern shown in Figure 4. Once all stakes are set, the coordinates for each will be collected using a global positioning system (GPS) unit. Sediment samples will be collected from inundated locations."

3. The SAP indicates that subcontractors for drilling and handling investigation derived waste (IDW) will be procured to support the investigation activities, but the subcontractors that will be used are not

identified. Revise the SAP to identify all subcontractors that will be used during this investigation, or indicate where this information will be provided.

Navy Response:

The names of subcontractors procured prior to finalizing the SAP will be added to the draft final or final version, as applicable. The names of subcontractors procured following finalizing the SAP will be documented in the FS Addendum and can be e-mailed to regulators once procured.

4. The SAP does not discuss the IDW that will be generated and how it will be handled. Revise the SAP to include a discussion for the IDW expected to be generated and how it will be stored, characterized, and disposed.

Navy Response:

The following sentence has been added at the end of the sentence under "Equipment Decontamination" in Worksheet #14: "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."

A new subsection has been added to Worksheet #14 beneath "Equipment Decontamination" entitled "Investigation Derived Waste Management." The following paragraph has been inserted under this new heading: "Other than PPE (discussed under "Equipment Decontamination" above), no solid investigation-derived waste (IDW) will be generated; any excess sediment will be returned to the lagoon. The only liquid IDW anticipated is decontamination fluids, which are anticipated to be only several gallons. 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 of the Master Protocols (CH2M HILL, 2010b)."

5. The preparatory methods identified in Worksheet #19 for the sediment samples are Method 3510C (SOP302 for PCBs) and Method 3005A (SOP100 for metals), but these methods are for the digestion of aqueous samples according to Worksheet #23. Additionally, neither Worksheet #23 nor #19 include information for determining percent moisture/solids. Revise the SAP to clarify the preparatory methods that will be used for the sediment samples, and to provide information for determining percent moisture/solids.

Navy Response:

The following four SOPs have been added to Worksheet #23: SOP173 (Total Residue; Total Solids (TS) and Total Volatile Solids (TVS); also known as Percent Solids); SOP307 (Sulfur Cleanup by EPA Method SW-846 3660B); SOP308 (Acid Cleanup SW-846 Method 3665A); and SOP343 (BNA, Pesticide/PCB and TPH non-Aqueous Matrix (Microwave Extraction) Using SW-846 Method 3546). Worksheet #19 has been updated to reference SW-846 3546 and SOP 343 instead of SW-846 3510C and SOP302 and to reference SW-846 3050B instead of SW-846 3005A.

6. The data management discussion in the SAP does not include sufficient information regarding the procedures that will be used to maintain and manage the project documents and electronic data during the investigation. For example, it is unclear where electronic and hardcopy project documents will be stored (i.e., the location of the project file). In addition, Worksheet #29 discusses hardcopy laboratory reports, but does identify where they will be stored and does not indicate that electronic data deliverables (EDDs) will be prepared by the laboratory as discussed in Worksheet #34-36. It is also unclear how validated data will be incorporated into the final report. Lastly, Worksheet #14 indicates that all validated data will be uploaded to the NIRIS database, but does not discuss verification of the

data for accuracy once uploaded. Revise the SAP to provide greater detail regarding the data management procedures during the investigation.

***Navy Response*:**

The following sentence has been added to Worksheet 14 under "Data Management": "For more data management information, refer to Worksheets 29 and 34-36."

As to where electronic and hardcopy project documents will be stored during the investigation, that information is provided in the footnote of Worksheet 29, which states that the contractor manages project files until the project is closed.

An Electronic Data Deliverables (EDD) row has been added to Worksheet 29 with a statement under the column "Where Maintained" that reads: "The EDD will be prepared by the laboratory and submitted to CH2M HILL and transferred to the Naval Installation Restoration Information Solution (NIRIS) during data mgt process." In the last row of the table in Worksheet 29, entitled "Data Validation Reports," an additional sentence has been added to the "Where Maintained" column that states: "Data validation reports will be included as an appendix to the FS Addendum."

Worksheets #34-36 have been updated to reflect the following additional procedures that will be used to verify the accuracy of data loaded to NIRIS. Post-load checks will include verifying that all field data (i.e. sites, stations, and samples), analysis methods, and field results have been loaded.

7. Worksheet #6, Communication Pathways, and Worksheet #32 reference a "CA Form" for field corrective actions. However, the field CA Form has not been provided. Revise the SAP to provide the field CA Form.

***Navy Response*:**

In Worksheet 32 attachment 32-1, the word "Laboratory" has been deleted from the title. This Corrective Action Form can be used for both laboratory and field activities.

Specific Comments

1. **Worksheet #2, Sampling and Analysis Plan Identifying Information, Page 3:** This worksheet indicates that the crosswalk table is not necessary because all of the information is presented in the SAP. However, there are several references to the Master Protocols within the SAP worksheets. For example, Worksheet #14 references the SOPs of the Master Protocols for the sampling, decontamination, and shipment information. Revise this worksheet to include the crosswalk table with references to other documents when the listed worksheets do not contain the required information.

***Navy Response*:**

The crosswalk table is used when elements of the SAP are omitted; no elements were omitted from this SAP. For clarity, the referenced statement in Worksheet #2 has been revised to read: "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."

Worksheet #21, which lists the SOPs pertinent to the investigation, has been revised to add a footnote beneath the table that states: "SOPs listed in this Worksheet are included in the Final Master Standard Operating Procedures, Protocols, and Plans document (CH2M HILL, 2010b)."

2. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 25:** The text for the first environmental question indicates that Worksheets #17 and #18 discuss sample-specific

turnaround times (TATs) for this investigation, including the rationale for the selected TATs. However, the rationale for the 28-day TAT identified in this section is not discussed in Worksheet #17, and Worksheet #18 does not identify TATs. Revise this worksheet to address this discrepancy.

Navy Response:

The first sentence of the second paragraph of the first question has been revised to read: "The sediment samples will be submitted to the laboratory for a standard (28-day) turn-around time (TAT) analysis of lead and zinc by EPA Method SW-846 6010C and total PCBs by EPA Method SW-846 8082A. Standard turnaround is sufficient for this investigation."

3. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 27:** The text states, "professional judgment will be used to determine if the concentration is close enough to the PRG to use in area and volume estimates suitable for an FS [feasibility study]." However, it is unclear how this determination will be made and how exceedances of PRGs will be addressed if they are considered close enough to the PRG. It is recommended that additional sampling is performed to address and delineate exceedances of the PRGs prior to the FS. Revise the SAP to define how this determination of "close enough" will be made and how these cases will be addressed in the FS. Alternatively, revise the SAP to remove this discussion of concentrations that are close enough to the PRG, and ensure additional sampling will be performed until concentrations less than the PRG are achieved.

Navy Response:

As this investigation is solely to refine the remediation area and volume estimates used in the FS, the statement will remain. Exceedances of PRGs will be addressed by the remediation, not as part of the FS.

USEPA follow up comment:

The original comment states that the text is unclear as to how the professional judgment determination of whether the concentration is close enough to the PRG to use in area and volume estimates, and the response does not provide additional specifics of what considerations will go into the professional judgment determination – for example, if the concentration is within two times the PRG it will be excluded from area and volume estimates, or if the concentration that exceeds the PRG is surrounded on all sides by concentrations below the PRG then it will be excluded from area and volume estimates. More information should be included describing what factors will be considered in the determination.

Navy Response to follow up comment:

The following has been added to the PQO statements in Worksheet #11 to indicate what is "close enough to the PRG to use in area and volume estimates" in the FS: "(i.e., less than approximately 50% above the PRG)."

Please keep in mind that the purpose of the sampling is to provide more detailed volume estimates for the FS. Since it is an FS, the alternatives are still conceptual and assigning an exact target value for determining how much sampling to perform is not necessary. That is why it was originally proposed to use professional judgment instead specifying an exact target value.

4. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 28:** The first decision statement on this page indicates that additional sediment sampling may be performed based on the results of this investigation until concentrations are close the PRGs, but details on this additional sampling are not discussed in this SAP. It is unclear if a proposal for the additional sediment sampling will be submitted to the Vieques Technical Subcommittee (e.g., as a SAP Addendum with details needed to meet the Uniform Federal Policy Quality Assurance Project Plan [UFP QAPP] guidance). Revise the

SAP to either include procedures for additional sampling or to indicate that a SAP Addendum will be prepared with the relevant information.

***Navy Response**:*

The following has been added at the end of the paragraph: "If additional samples are collected, they will approximate the grid spacing and depth profiling protocols presented in this SAP; a SAP addendum will not be necessary."

5. **Worksheet #15-1, Field Sampling Requirements Table, Page 35:** Footnote (5) states that non-detections and results qualified "U" due to blank contamination will be assumed to be zero in the calculation of total PCBs. However, there is no defensible methodology to calculate a total PCB concentration predicated on summation of Aroclor mixtures data. Further, the procedure proposed in the SAP may overestimate (e.g., double-counting for particular congeners) or underestimate total (or residual) concentrations for PCBs (e.g., actual concentrations falling between the reporting limit and zero have an equal probability of occurring). Finally, calculation of total PCB concentrations for the purposes of evaluation of human health risk should only be advanced if based on congener-specific data which allows for the assessment of dioxin-like PCB congeners. Revise the SAP to either indicate that decisions will be made based on individual Aroclor results or to indicate that PCB congener analysis will be performed and used to calculate total PCB concentrations.

***Navy Response**:*

The second sentence of Footnote 5 on Worksheet #15-1 has been revised to read: "For any PCB detected during the SWMU 6 Sediment Contamination Delineation, any non-detect results and results U-qualified due to blank contamination will contribute ½ the LOD to the total PCB concentration. Any PCB not detected during the SWMU 6 Sediment Contamination Delineation will contribute zero to the total PCB concentration. This approach may be reconsidered, with discussion among the Vieques Technical Subcommittee, if LODs are elevated and it is suspected that the associated PCBs are not present."

With respect to PCB analysis to be conducted, please see the last paragraph of Worksheet #9b.

6. **Worksheet #17, Sampling Design and Rationale, Page 39:** This worksheet does not present the rationale for the selected sampling approach and how it was determined that potential contamination in the sediment will be sufficiently characterized such that the data support the project decisions. For example, the depths where the 2011 results exceeded screening levels are not provided, and it is unclear why a maximum depth of 6.5 feet was selected. In addition, the rationale for selecting the sample spacing (i.e., a 20 feet grid spacing and depth intervals of two feet) to characterize the sediment is not discussed. Revise this worksheet to provide the rationale for the sampling approach in order to document that the potential contamination at the site will be sufficiently characterized to support the project decisions.

***Navy Response**:*

The Environmental Technical Subcommittee developed the sampling approach as part of the June 6, 2013 scoping session. The second sentence of the third paragraph in Worksheet #17 has been revised to read: "The distribution and depth profile of the sediment samples were jointly selected by the Navy, USEPA, PREQB, and USFWS to ensure the horizontal and vertical extent of COC concentrations in sediment exceeding the PRGs can be estimated sufficiently for the purposes of refining the remediation area and volume assumed in the SWMU 6 FS Addendum. The sediment locations are designed to encompass the areas where elevated levels of COCs were detected in post-removal confirmatory sediment samples. Due to the relative immobility of PCBs, the sampling depth is anticipated to sufficiently account for potential vertical PCB migration."

7. **Worksheet #18, Location-Specific Sampling Methods/SOP Requirements Table, Pages 41 to 45:** The sample identification information in Worksheet #18 appears to indicate that field duplicate samples will be numbered based on the location where they are collected with a "P" added to the name. However, it is recommended that field duplicates be submitted to the laboratory as blind duplicates. It is recommended that this worksheet be revised to indicate that the sample identification for field duplicates will not include the same number identification as the location where they are collected.

   Navy Response:

   Field duplicates are blind to the laboratory and are not identified as field duplicates in any way. The sample ID and date/time collected are different between the parent and field duplicate. Station ID and depth information is not included on the COC as it is not required.

8. **Worksheet #21, Project Sampling SOP References Table, Page 51:** The title of the first SOP is listed as Macrocore Sediment Sampling, but the SOPs referenced from the Master Protocols are SOP A-2, Soil Sampling, and SOP A-5, Slide Hammer Soil Sampling. Revise this worksheet to correct this discrepancy.

   Navy Response:

   The SOP titles on Worksheet #21 have been revised as listed in the comment above.

9. **Worksheet #28-2, Laboratory QC Samples Table, Page 66:** The Method/SOP QC Acceptance Limits for the post digest spike (PDS) recovery are 75 to 125 percent (%) in this table, but Method 6010C indicates the acceptance criteria for the PDS should be 80 to 120%. Revise this table to identify the recovery acceptance limits for the PDS as 80 to 120%.

   Navy Response:

   Worksheet #28-2 has been updated to reflect 80-120% control limits per the method.

10. **Worksheet #37, Usability Assessment, Pages 83 to 84:** This worksheet does not discuss how representativeness, comparability, and sensitivity will be evaluated. The Notes state that precision, accuracy, representativeness, completeness, and comparability will be discussed in the data quality evaluation (DQE), but sensitivity is not included for discussion and it is unclear if these discussions will include detailed descriptions of the evaluations of these parameters with sufficient information to support the data usability conclusions. Revise this worksheet to indicate how representativeness, comparability, and sensitivity will be evaluated, and to indicate that 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.

    Navy Response:

    The following sentences were added as four bullets at the end of Worksheet #37:

    > "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 PARCC considerations, including common matrices (such as 'sediment') in the investigation, and using common analysis methods (i.e. SW-846 series). Sensitivity and its effect on usability is examined in great detail in the DQE report, but the procedure for doing so depends on 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."

11. **Worksheet #37, Usability Assessment, Page 84:** The calculation of completeness indicates that the amount of valid data will be compared to the total amount of measurements made. 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 following information has been added to Worksheet #37: "Completeness is calculated based on the number of non-rejected results compared to the total number of results. Inability to obtain results is an unusual occurrence. If there is breakage (assuming insufficient sample volume) and a resulting data gap is not acceptable, samples are often recollected. Inability to collect a sample results in a moved station or other action based on discussion with the project team. These situations are not due to poor data quality. If this type of situation occurs, it is discussed in the report, as it is a UFP-SAP work plan exception (samples which are planned-for but not collected)."

Additional Comments sent by e-mail from Julio Vazquez To Kevin Cloe on 12/10/13

Further as noted in SAP Worksheet # 5 – Project Organizational Chart, NOAA is included under "Regulatory and Other Stakeholder Agencies", and therefore should also be included in SAP Worksheet # 2, under "Organizational Partners" and SAP Worksheet # 11 under "Who will use the data and what will the data be used for?".

***Navy Response**:*

NOAA has been added to Worksheets #2 and #11 as requested.

Final Responses to PREQB Comments on the

Draft Contaminated Sediment Delineation to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan Solid Waste Management Unit (SWMU) 6

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

General Comments

1. The Executive Summary and several worksheets (e.g., Worksheets 14 ad 17) state that sediment samples will be collected from four pre-determined depths (i.e., 0 to 6 inches, 24 to 30 inches, 48 to 54 inches, and from 72 to 78 inches) at each sampling location to characterize the vertical and horizontal extend of PCBs, lead, and zinc. These data will be used to estimate the volume of impacted sediments above PRGs. Collecting samples from pre-determined intervals could potentially underestimate the extent of impacts and volume of soil exceeding PRGs. It has been documented that iron and manganese oxides, organic matter, and clays are important sorbents for lead and zinc and that organic matter is a significant sorbent for PCBs (Battelle Pacific Northwest National Laboratory, 1984; McKenzie, R.M. 1980). By sampling predetermined intervals without consideration of these important natural sorbents, concentrations of metals and/or PCBs may be underestimated. Therefore, when selecting samples for analysis from each two foot interval, please give consideration to sampling sediments containing discrete organic layers, visual evidence of iron oxides (i.e., rust colored sediment), or silt/clay layers (in that order), which may or may not be present in the upper 6 inches of each two foot sample interval.

   ***Navy Response*:**

   The appropriate worksheets have been revised to say that sediment samples will be collected from the pre-determined depths unless evidence of an organic layer, "rust colored" sediment, or a silt/clay layer within a sand interval is encountered.

   PREQB Evaluation of Navy Response to General Comment 1:

   The Navy's response indicates that the appropriate worksheets have been revised to say that sediment samples will be collected from the pre-determined depth intervals unless evidence of an organic layer, "rust-colored" sediment, or a silt/clay layer within the sand interval is encountered. Please clarify if the revised worksheets state that these materials will be sampled if encountered within each two foot interval.

   ***Navy Response*:**

   Yes, the revised worksheets will include that the zone containing these materials will be sampled if encountered within each two foot interval.

2. The first two general objectives of the decision analysis process (presented on Page 27, Worksheet #11) are to determine the vertical and horizontal extent of sediment COC concentrations above PRGs and then to develop area/volume estimates for potential removal of sediment containing COC concentrations greater than PRGs. Please clarify the process in the event that if a COC is detected at one or more deep sediment samples but not at shallower sediment samples collected from the same boring.

Please clarify if the remedial area/volume estimates be calculated based on the deeper concentrations that exceed PRGs, and, if so, if the estimates will extend to the surface. Please identify the potential exposure pathway present under this scenario and how this will factor into the decision-making process regarding remedial alternatives.

Navy Response:

The following has been added as a paragraph at the end of the PQO statements: "Note that in the event COC concentrations below PRGs are detected in shallower sample(s) and above PRG(s) in deeper sample(s) for any given sediment sampling station, estimates of remediation area and volume may be affected. However, how they will be affected will depend on actual spatial results obtained. Any affect on the site's conceptual model of exposure and remediation area and volume will be discussed in the FS Addendum Report, which will be provided for regulatory review."

Page-Specific Comments

1. Worksheet 11, PQO/Systematic Planning Process, Page 27, Last Paragraph: This paragraph states "…It is not necessary for all COC concentrations at the boundaries of sampling to be below PRGs in order to make the necessary area and volume estimates suitable for remedial alternatives evaluation. For any boundary (horizontal or vertical) COC concentration above its PRG, professional judgment will be used to determine if the concentration is close enough to its PRG to use in the area and volume estimates suitable for an FS... " PREQB notes that in addition to estimating the volume and area of estimating volumes of impacted sediment and consistent with Table ES-1, an objective of this program is to delineate the vertical and lateral extent of lead, zinc, and PCBs exceeding their respective PRGs. Please identify how high above a PRG a concentration would have to be for professional judgment to warrant additional sampling to delineate the vertical and lateral extent of impact.

Navy Response:

There is no exact level above a PRG which makes a result "close enough" to the PRG. As stated in the text, it is based on professional judgment. However, it is important to emphasize that the sediment contamination refinement is solely for the purposes of refining the FS estimates. Ultimately, it will be necessary for the selected remedial action to satisfy its objectives, which will be subject to regulatory review.

PREQB Evaluation of Navy Response to Page-Specific Comment 1:

While professional judgment may be appropriate for providing estimates of volumes of impacted soil for removal, it introduces a significant level of ambiguity when used to define the vertical and lateral extent of impact in areas where concentrations of constituents of concern may be low but above PRGs. For this reason, PREQB prefers that the vertical and lateral limits of impact be delineated by samples that do not exhibit constituents of concern above the PRG rather than using professional judgment in areas where concentrations may be low but exceed the PRG. However, PREQB will defer to EPA.

Navy Response:

The following has been added to the PQO statements in Worksheet #11 to indicate what is "close enough to the PRG to use in area and volume estimates" in the FS: "(i.e., less than approximately 50% above the PRG)."

Please keep in mind that the purpose of the sampling is to provide more detailed volume estimates for the FS. Since it is an FS, the alternatives are still conceptual and assigning an exact target value for determining how much sampling to perform is not necessary. That is why it was originally proposed to use professional judgment instead specifying an exact target value.

2. SAP Worksheet #14: Include details on how total PCBs will be reported when all PCB Aroclors are not detected. PREQB recommends that the LOD/LOQ for Aroclor 1254 be used as the LOD/LOQ for total PCBs when no Aroclors are detected.

   Navy Response:

   Please see the response to PREQB Page-specific 2nd Comment #4 (on Worksheet #15-1, not on Worksheet #23).

3. SAP Worksheet #19: The preparation methods provided for PCBs (3510C) and metals (3005A) are aqueous preparation methods. Please provide the preparation methods being utilized for sediment samples.

   Navy Response:

   The following four SOPs have been added to Worksheet #23: SOP173 (Total Residue; Total Solids (TS) and Total Volatile Solids (TVS); also known as Percent Solids); SOP307 (Sulfur Cleanup by EPA Method SW-846 3660B); SOP308 (Acid Cleanup SW-846 Method 3665A); and SOP343 (BNA, Pesticide/PCB and TPH non-Aqueous Matrix (Microwave Extraction) Using SW-846 Method 3546). Worksheet #19 has been updated to reference SW-846 3546 and SOP 343 instead of SW-846 3510C and SOP302 and to reference SW-846 3050B instead of SW-846 3005A.

4. SAP Worksheet #23:

   a. The preparation methods provided for PCBs (3510C) and metals (3005A) are aqueous preparation methods. Please provide the preparation methods being utilized for sediment samples.

      Navy Response:

      Please refer to the response to PREQB page-specific comment #3 above.

   b. Please ensure that acid-cleanup and sulfur-cleanup will be performed on all sediment sample extracts for PCB analyses and include these SOPs on this worksheet.

      Navy Response:

      Please refer to the response to PREQB page-specific comment #3 above.

5. Worksheet #15-1: Footnote 5 in this table indicates that non-detect results for PCB Aroclors will contribute zero to the total PCB concentration. Since Aroclor 1254 was previously detected at SWMU 6, it would be reasonable to assume that concentrations of this COC may be present at low concentrations below the detection limit. Therefore, PREQB prefers that one-half the detection limit be used to calculate the contribution of Aroclor 1254 to the total PCB concentration. For the remaining PCB Aroclors, the assumption of zero concentration for non-detect results appears reasonable; however, if any of these Aroclors are subsequently detected in the proposed sediment samples, then PREQB prefers that one-half the detection limit be applied to these Aroclors as well in calculating the total PCB concentration.

   Navy Response:

   The second sentence of Footnote 5 on Worksheet #15-1 has been revised to read: "For any PCB detected during the SWMU 6 Sediment Contamination Delineation, any non-detect results and results U-qualified due to blank contamination will contribute ½ the LOD to the total PCB concentration. Any PCB not detected during the SWMU 6 Sediment Contamination Delineation will contribute zero to the total PCB concentration. This approach may be reconsidered, with discussion among the Vieques Technical Subcommittee, if LODs are elevated and it is suspected that the associated PCBs are not present."

References

Battelle Pacific Northwest Laboratory, 1984. "Chemical attenuation rates, coefficients, and constants in leachate migration, Volume 1: A Critical Review." Environmental Power Research Institute. EPRI EA-3356, Volume 1; Project 2198-1, Final Report, February.

McKenzie, R.M., 1980. "Absorption of lead and other heavy metals on oxides of iron and manganese." *Australian Journal of Soil Research*, Volume 18, No. 1.