N69321.AR.000082
VIEQUES EAST
5090.3a

Final
Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan Addendum Site Inspection for Photo-Identified (PI) Site 21

Atlantic Fleet Weapons Training Area - Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

NAVFAC
Naval Facilities Engineering Command

Prepared for

Department of the Navy
ATLANTIC

Contract No.
N62470-08-D-1000
CTO-0037

February 2013

Prepared by

CH2MHILL

ES041712003051TPA

FINAL

Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan Addendum
Site Inspection for Photo-Identified (PI) Site 21

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Contract Task Order 0037

February 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

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

Prepared by

CH2MHILL

Virginia Beach, Virginia

Page intentionally left blank

Executive Summary

The objective of a Site Inspection (SI) is "release assessment." More specifically, an SI is intended to:

- Determine whether a release of hazardous waste or hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related activities and, if so,
- Determine whether the suspected release warrants further investigation or action

This Sampling and Analysis Plan (SAP) Addendum outlines the activities that will be performed to conduct an SI at PI 21, potential former gun position, at the Former Vieques Naval Training Range (VNTR) on east Vieques, Puerto Rico. The location of the PI 21 within the former VNTR is shown in Figure 1. PI 21 is a photo-identified (PI) site and was identified via historical aerial photograph analysis. The historic photos and a summary of the associated observations are also shown in Figure 1 along with previous sample locations.

Evaluation of historical information, observations made during inter-agency site visits, and inter-agency discussions determined that a vertical tank observable in historical aerial photographs represents the only potential source of a CERCLA-related release warranting investigation. Therefore, in accordance with the standard Vieques soil sampling protocol (CH2M HILL, 2010), surface and subsurface soil samples will be collected at five locations at and around the coordinates of the center of the former vertical tank. Vegetation clearing and observations made during the site visits have determined the tank is no longer present. The data collected during the PI 21 SI will be evaluated using the 7-step release assessment decision process developed for sites in the SI phase on Vieques (Figure 2).

As this SI/ESI SAP Addendum is an addendum to the *Final Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2009), it contains only those worksheets that were replaced/substantively revised from those contained in the original SAP. The reader is referred to the original SAP (included in Attachment A) for information not provided herein as it remains applicable to the sampling covered under this SAP addendum. Specifically, the following worksheets are incorporated by reference from the original SAP; 8, 12, 19, 20, and 23 through 37. Those worksheets not incorporated by reference generally contain only the information that has been modified or is specific to PI 21. Worksheets 1, 2, 4, 9, 10, and 13 through 18 contain information specific to PI 21 and are new. Worksheets 3, 5, 6, 7, 11, 21, and 22 contain updated information and only the changes are provided herein. The original SAP contains the original worksheets and information. Worksheet 28 is incorporated by reference, but it has been retained as it contains references to specific tables in the original SAP to help the reviewer locate the tables relevant to this SAP Addendum.

SAP Format

This SI/ESI SAP addendum has been prepared in general accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (USEPA, 2005) and the USEPA Guidance for QAPPs, USEPA QA/G-5, QAMS (USEPA, 2002). It contains attachments that support the information presented in the worksheets to facilitate review of this SAP addendum. Investigative procedures to be followed during the SI are the applicable Standard Operating Procedures (SOPs) and protocols in the Master Standard Operating Procedures, Protocols, and Plans document (CH2M HILL, 2010).

Page intentionally left blank

TABLE ES-1
SI/ESI SAP Addendum Summary Table
Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Site	Pertinent Historical Information	SI/ESI SAP Addendum Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
PI 21	PI 21 is a 22.67 acre photo-identified site presumed to be a former gun position or amphibious landing area. The site was identified based on aerial photographic analysis performed by ERI in 2000 (ERI, 2000). However, several site visits by the Navy and regulatory agencies and the aerial photographic analysis did not identify any former gun position. A vertical tank of unknown contents was identified during the aerial photographic analysis and represents the only potential source area warranting sampling.	Determine whether a release(s) has occurred and the appropriate next step.	Collect surface and subsurface soil samples from five locations at and around the former tank area.	Collect one surface and one subsurface soil sample at five locations at the former tank location. One location will be located at the center of the former tank and four locations 25 feet from the center surrounding the former tank. The surface soil samples will be collected from the top 12 inches of soil. The subsurface soil samples will be collected from a 2-foot interval between the bottom of the surface soil interval (1 foot bgs) to 6 feet (or bedrock or water table if encountered above 6 feet) based on where visual and/or instrument (e.g. OVA) screening suggests the presence of contamination. If no contamination is suspected, the sample will be collected from the deepest 2-ft interval. Sampling will follow the Soil Sample Depth Selection Protocol as outlined in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2010).	VOCs, SVOCs, pesticides, PCBs, inorganics, including mercury and cyanide, total organic carbon (TOC), pH, and grain size.	Release assessment decision analysis (see Figure 2).

Page intentionally left blank

Resumen Ejecutivo

El objetivo de una Inspección del Sitio (SI por sus siglas en inglés) es la “evaluación del derrame”. Más específicamente, la intención de un SI es:

- Determinar si ha ocurrido un derrame de desperdicios peligrosos o de constituyentes peligrosos relacionados a actividades pasadas reguladas por la Ley de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA por sus siglas en inglés), y de ser el caso,
- Determinar si estos supuestos derrames ameritan más investigación o acción

El Apéndice al Plan de Muestreo y Análisis (SAP por sus siglas en inglés) enmarca las actividades que se realizarán para llevar a cabo un SI en PI 21, antigua posición de artillería potencial, en el Antiguo Campo de Adiestramiento Naval de Vieques (VNTR por sus siglas en inglés) en el este de Vieques, Puerto Rico. La ubicación de PI 21 dentro del antiguo VNTR se muestra en la Figura 1. PI 21 es un sitio que fue identificado por fotografía (PI por sus siglas en inglés) a través del análisis de fotografías aéreas históricas. Las fotos históricas y el resumen de las observaciones asociadas también se muestran en la Figura 1 incluyendo la ubicación de de muestreos previos.

La evaluación de la información histórica, observaciones hechas durante las visitas al sitio por las inter-agencias, y las discusiones con las agencias determinaron que un tanque vertical que puede observarse en las fotografías aéreas históricas representa la única fuente potencial de un derrame CERCLA que justifica investigación. Por lo que, de acuerdo con el protocolo estandarizado de muestreo de suelos de Vieques (CH2M HILL, 2010), se obtendrán muestras de suelo superficial y subsuelo de cinco localidades en y alrededor de las coordenadas en el centro del antiguo tanque vertical. Se ha determinado a través de remoción de vegetación y observaciones hechas durante las visitas al sitio que el tanque ya no está presente. Los datos obtenidos durante el SI de PI 21 serán evaluados usando los 7 pasos del proceso de decisión para evaluación del derrame que se desarrolló para los sitios en la fase SI de la investigación (Figure 2).

Como este Apéndice al Plan de Muestreo y Análisis (SAP) del SI/ESI es un apéndice a la *Inspección Final del Sitio/Plan de Muestreo y Análisis de la Inspección Expandida del Sito, 7 Sitios de la Orden de Consentimiento y 16 Sitios PI/PAOC, Antiguo Campo de Adiestramiento Naval de Vieques, Puerto Rico* (CH2M HILL, 2009), solamente contiene las hojas de trabajo que fueron reemplazadas/revisadas sustancialmente de las que se presentaron en el SAP original. El lector debe referirse al SAP original (el cual se incluye en el Anejo B) para obtener la información que no se encuentra en este documento ya que el SAP original todavía aplica al muestreo que se discute en esteApéndice SAP. Específicamente, las siguientes hojas de trabajo fueron incorporadas haciendo referencia al SAP original; 8, 12, 19, 20, y 23 hasta 37. Aquellas hojas de trabajo que no se incorporan por referencia generalmente contienen solamente información que ha sido modificada o es específica para PI 21. Las hojas de trabajo 1, 2, 4, 9, 10, y 13 hasta 18 contienen información específica para PI 21 y son nuevas. Las hojas de trabajo 3, 5, 6, 7, 11, 21, y 22 contienen información actualizada y en este documento solamente se presentan los cambios que se les han hecho. El SAP original contiene las hojas de trabajo y la información originales. Se ha incorporado la hoja de trabajo 28 por referencia, pero se ha incluido aquí para ayudar al lector a localizar las tablas relevantes a este Apéndice SAP ya que contiene referencias a tablas específicas del SAP original.

Formato del SAP

- El Apéndice al SI/ESI SAP ha sido preparado siguiendo las guías generales de los Reglamentos Federales Uniformes que Garantizan la Calidad de los Planes de Proyectos (UFP-QAPP) (USEPA, 2005) y las guías de USEPA para QAPPs, USEPA QA/G-5, QAMS (USEPA, 2002). Éste contiene anejos que apoyan la información presentada en las hojas de trabajo para facilitar la revisión de este apéndice al SAP. Los procedimientos para la investigación que se seguirán durante el SI son los Procedimientos Operacionales Estándares aplicables (SOPs por sus siglas en inglés) y el documento Maestro de los Procedimientos Operacionales, Protocolos y Planes Estándares (CH2M HILL, 2010).

Page intentionally left blank

TABLA ES-1
Tabla de Resumen del Anejo al SI/ESI SAP

Sitio	Información Histórica Pertinente	Objetivo(s) del Anejo al SI/ESI SAP	Alcance de la Investigación	Actividades de la Investigación	Análisis de Muestras	Proceso de Evaluación de Datos
PI 21	PI 21 es un sitio de 22.67 acres que se identificó por fotografía y que se supone fue una posición de artillería o una área de desembarco anfibio. El sitio fue identificado en base al análisis de fotografías aéreas que ERI llevó a cabo en el año 2000 (ERI, 2000). Sin embargo, en varias visitas de la Marina y de las agencias reguladoras, y el análisis de fotografías aéreas no identificaron ninguna antigua posición de artillería. Un tanque vertical con contenido desconocido fue identificado durante el análisis de fotografías aéreas y representa la única fuente potencial que amerita muestreo.	Determinar si es que un derrame(s) han ocurrido y los pasos adecuados a seguir.	Obtener muestras de suelo superficial y subsuelo cinco localidades en y alrededor de la antigua área del tanque.	Obtener muestras de suelo superficial y de subsuelo en cinco localidades en la antigua ubicación del tanque. Una localidad estará en el centro donde se encontraba el antiguo tanque, y cuatro localidades estarán a 25 pies del centro rodeando al antiguo tanque. La muestra de suelo superficial se obtendrá de las primeras 12 pulgadas de suelo. Las muestras de subsuelo se obtendrán a intervalos de 2 pies comenzando desde el fondo del intervalo de suelo superficial (1 pie bgs) a 6 pies (o el lecho de roca, o donde se encuentre agua, si está sobre 6 pies) basado en donde la evaluación visual y/o con instrumentos (por ejemplo OVA) sugieran la presencia de contaminación. Si no se sospecha contaminación, la muestra se obtendrá del intervalo de 2 pies más profundo.	VOCs, SVOCs, plaguicidas, PCBs, inorgánicos, incluyendo mercurio y cianuro, carbono orgánico total (TOC), pH, tamaño del grano.	Presentar el análisis de la decisión de la evaluación (ver Figura 2).

Page intentionally left blank

Contents

Section **Page**

Executive Summary iii

Resumen Ejecutivo vii

Acronyms and Abbreviations xiii

SAP Worksheet #1 — Title and Approval Page 1

SAP Worksheet #2 — SAP Identifying Information 3

SAP Worksheet #3 — Distribution List 5

SAP Worksheet #4 — Project Personnel Sign-Off Sheet 9

SAP Worksheet #5 — Project Organizational Chart 11

SAP Worksheet #6 — Communication Pathways 13

SAP Worksheet #7 — Personnel Responsibilities Table 15

SAP Worksheet #9a — Project Scoping Session Participants Sheet 17

SAP Worksheet #9b — Project Scoping Session Participants Sheet 21

SAP Worksheet #10 — Problem Definition 25

SAP Worksheet #11 — Project Quality Objectives/Systematic Planning Process Statements 27

SAP Worksheet #12 — Field Quality Control Samples 33

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table 35

SAP Worksheet #14 — Summary of Project Tasks 37

SAP Worksheet #15-1 — Reference Limits and Evaluation Table 39

SAP Worksheet #15-2 — Reference Limits and Evaluation Table 43

SAP Worksheet #15-3 — Reference Limits and Evaluation Table 47

SAP Worksheet #15-4 — Reference Limits and Evaluation Table 49

SAP Worksheet #15-5 — Reference Limits and Evaluation Table 51

SAP Worksheet #15-6 — Reference Limits and Evaluation Table 53

SAP Worksheet #16 — Project Schedule/Timeline Table 55

SAP Worksheet #17 — Sampling Design and Rationale 57

SAP Worksheet #18 — Sampling Locations and Methods/SOP Requirements Table 59

SAP Worksheet #20 — Field Quality Control Sample Summary Table 61

SAP Worksheet #21 — Project Sampling SOP References Table 63

SAP Worksheet #22 — Field Equipment Calibration, Maintenance, Testing, and Inspection Table 65

SAP Worksheet #28 — Laboratory QC Samples Table 67

References 69

Figures 71

Tables

Table ES-1 SI/ESI SAP Addendum Summary Table v
Tabla ES-1 Tabla de Resumen del Anejo al SI/ESI SAP..... ix

Figures

1 Site Location Map
2 SI/Expanded SI Evaluation Decision Tree
3 Proposed Additional Sampling Locations

Attachments (provided on CD)

A Final Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009)

B Lab Accreditation

C Final Response to USEPA Comments

Acronyms and Abbreviations

AOC	Area of Concern
AST	aboveground storage tank
ASTM	American Society for Standards and Materials
AVGAS	aviation gasoline
BTEX	benzene, toluene, ethylbenzene, xylene
CA	corrective action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CLP	Contract Laboratory Program
COC	chain of custody
CRDL	contract-required detection limit
CSM	Conceptual Site Model
CTO	Contract Task Order
°C	degrees Celsius
DAF	dilution/attenuation factor
DoD	Department of Defense
DOI	Department of the Interior
DQE	data quality evaluation
DQI	data quality indicator
DQO	data quality objective
DRO	diesel range organics
EIS	Environmental Information Specialist
EQB	Environmental Quality Board
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
°F	degrees Fahrenheit
FID	Flame Ionization Detector
FSP	Field Sampling Plan
ft	foot/feet
FTL	Field Team Leader
GC	gas chromatograph
GPS	Global Positioning System
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
ICP	inductively coupled plasma
IDW	investigation-derived waste
IDWMP	Investigation-derived Waste Management Plan
LCS	laboratory control sample
lf	linear feet
LFB	laboratory fortified blank
LIMS	Laboratory Information Management Systems
LOD	Limit of detection
LOQ	Limit of quantitation

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MACTEC	MACTEC Inc.
MCL	maximum contaminant level
MDL	method detection limit
mg/kg	milligrams per kilogram
MOGAS	unleaded gasoline
MPC	measurement performance criteria
MS	mass spectrometer
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl tert butyl ether
N/A	not applicable
Navy	Department of the Navy
NIRIS	Navy Installation Restoration Information System
NPL	National Priorities List
OU	operable unit
OVM	organic vapor monitor
PAL	project action limit
PAOC	potential area of concern
PCB	polychlorinated biphenyl
PDF	portable document format
PI	photo-identified site
PID	photoionization detector
PM	Project Manager
POC	Point of Contact
PQO	project quality objective
PREQB	Puerto Rico Environmental Quality Board
PT	proficiency testing
QA	quality assurance
QAMS	Quality Assurance Management Section
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RL	Reporting Limit
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RSL	Regional Screening Level
RT	retention time
SAP	Sampling and Analysis Plan
SB	Subsurface Soil Sample
SD	Sediment Sample
SS	Surface Soil Sample
SSC	Site Safety Coordinator
SSC-HW	Site Safety Coordinator Hazardous Waste

SD	standard deviation
SDG	sample delivery group
SMP	Site Management Plan
SOP	standard operating procedure
SRM	standard reference material
SSL	soil screening level
SVOA	semivolatile organic analytes
SVOC	semivolatile organic compounds
SW	surface water
SWMU	solid waste management unit
TCLP	Toxicity Characteristic Leaching Procedure
TCLPV	Toxicity Characteristic Leaching Procedure, Volatiles
TCLPS	Toxicity Characteristic Leaching Procedure, Semi-volatiles
TCLPH	Toxicity Characteristic Leaching Procedure, Herbicides
TCLPM	Toxicity Characteristic Leaching Procedure, Metals
TCLPP	Toxicity Characteristic Leaching Procedure, Pesticides
TBD	to be determined
TSA	Technical Systems Audit
U.S.	United States
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UTL	upper tolerance limit
VNTR	Vieques Naval Training Range
VOA	volatile organic analytes
VOC	volatile organic compound

Page intentionally left blank

SAP Worksheet #1 — Title and Approval Page

Final
Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan Addendum
Site Inspection for Photo-Identified (PI) Site 21

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico
Contract Task Order 0037
February 2013

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Atlantic Division
6506 Hampton Boulevard
Norfolk, VA 23508-1278

Prepared by:

CH2MHILL

5701 Cleveland Street, Suite 200
Virginia Beach, VA 23462
Office phone # 757-671-6219

Prepared under:
Navy CLEAN 1000 Program
Contract N62470-08-D-1000
Contract Task Order – 0037

QA Review Signature:

G. Brett Doerr Digitally signed by G. Brett Doerr DN: cn=G. Brett Doerr, o=CH2M HILL, ou, email=brett.doerr@ch2m.com, c=US Date: 2013.02.13 15:05:42 -05'00'

Brett Doerr
Vieques Activity Manager

Other Approval Signatures:

CLOE.KEVIN.R.1229533947 Digitally signed by CLOE.KEVIN.R.1229533947 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=CLOE.KEVIN.R.1229533947 Date: 2013.02.13 16:31:34 -05'00'

Kevin Cloe
NAVFAC – Remedial Project Manager

2/19/2013

Daniel Rodriguez
USEPA Region 2 – Remedial Project Manager

2/19/2013

Wilmarie Rivera
PREQB – Remedial Project Manager

Richard Henry Digitally signed by Richard Henry DN: cn=Richard Henry, o, ou=US Fish and Wildlife Service, email=richard_henry@fws.gov, c=US Date: 2013.02.14 15:46:46 -05'00'

Richard Henry
USFWS – Remedial Project Manager

Page intentionally left blank

SAP Worksheet #2 — SAP Identifying Information

Site Name/Number: Potential former gun position or amphibious landing area
Operable Unit (OU): PI 21
Contractor Name: CH2M HILL
Contract Number: N62470-08-D-1000
Contract Title: Navy Comprehensive Long-term Environmental Action—Navy (CLEAN) Program 1000
Work Assignment Number (optional): Contract Task Order (CTO) 037 (PI 21 Site Inspection/Expanded Site Inspection Sampling and Analysis Plan [SI/ESI SAP] Addendum)

1. This SAP Addendum was prepared in general accordance with the requirements of the Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP) (USEPA, 2005) and United States (U.S.) Environmental Protection Agency (USEPA) Guidance for QAPPs, USEPA QA/G-5, Quality Assurance Management Section (QAMS) (USEPA, 2002)
2. Regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
3. This SAP addendum is site-specific
4. Dates of scoping sessions:

Scoping Session	Date
SI scoping session – Technical Subcommittee Meeting	February 22, 2012
Multi-agency site visit—Vieques, Puerto Rico	March 14, 2012

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

Title	Date
Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program (ERP), Vieques, Puerto Rico	May 2010
Final Site Inspection/Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico.	February 2009

SAP Worksheet #2—SAP Identifying Information (continued)

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 CERCLA Vieques ERP implemented by lead organization
   - **United States Fish and Wildlife Service (USFWS) –** Land owner of land transferred from lead organization and on which ERP activities are conducted
   - **National Oceanic and Atmospheric Administration (NOAA) –** Marine habitat stakeholder and technical advisor 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:
   - The Final Site Inspection/Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites (CH2M HILL, 2009) contains the applicable SAP elements not found in this SAP addendum.

SAP Worksheet #3 — Distribution List

Refer to Worksheet #3 of the *Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2009). Worksheet 3 below provides a summary of the changes to the referenced worksheet. Individuals no longer on the distribution list are identified with "(Deleted)" next to their name and added individuals are identified with "(Added)" next to their names.

Name of SAP Recipients	Title/Project Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	D	DF	F
Andrea Colby (Deleted)	Project Manager	Katahdin Analytical Services, Inc.	207-874-2400	acolby@katahdinlab.com			HC
Chris Penny (Deleted)	Vieques Program Coordinator/No project-specific role	Navy	757-322-4815	christopher.penny@navy.mil	CL	CL	CL
John Noles (Deleted)	Biologist/Technical input	Navy	757-322-4891	john.noles@navy.mil	HC		A
Laura Pugh (Deleted)	Senior Staff Consultant	TechLaw	763-208-2828	lpugh@techlawinc.com	A		A
Andrew Smyth (Deleted)	Technical Support Consultant for EQB//EQB contractor Project Manager (PM)	TRC	978-656-3568	asmyth@trcsolutions.com	A		A
Matt Connolly (Deleted)	Refuge Manager/No project-specific role	USFWS	787-741-2138	matt_connolly@fws.gov			A
William Tucker (Deleted)	Technical Support Consultant for USFWS/USFWS contractor primary POC	MACTEC	352-332-3318	watucker@mactec.com	A		A
Roberta W. Britton (Deleted)	Not Applicable (N/A)	Restoration Advisory Board (RAB)	978-463-9660	bdbritt7@gmail.com		CD	
Michael P. Connelly (Deleted)	N/A	RAB	787-741-4442	mpcbieke@yahoo.com		A	
Michael Diaz (Deleted)	N/A	RAB	787-667-2804	diazmmdo@aol.com		CD	
Gladys Costa & Emilio García Cordero (Deleted)	N/A N/A	RAB	787-741-4836	zulmiracosta@hotmail.com		CD	
Nilda Medina Diaz (Deleted)	N/A	RAB	787-741-8651	oficina@prorescatevieques.org		A	

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
Sixto H. Pérez Espina (Deleted)	N/A	RAB	787-748-8373	bieque@caribe.net		CD	
Hector Julian Camacho (Deleted)	N/A	RAB	787-741-8261	vieques357@yahoo.com		A	
Cristina Corrada Emmanuel (Deleted)	N/A	RAB	939-243-3388	N/A		HC	
Debora Santana (Deleted)	N/A	RAB	N/A	dsantana@earthlink.net		CD	
Adalina Cruz Colón (Deleted)	N/A	RAB	787-741-4562	N/A		CL	
Mayor Evelyn Delerme (Deleted)	N/A	RAB	787-741-5000	evelyn.delerme.gmv@gmail.com		A	
Ricardo Jordán (Deleted)	N/A	RAB	939-640-4879	rickjord@aol.com		CL	
Dan Waddill (Added)	NAVFAC Vieques Coordinator	NAVFAC	757-322-4815	Dan.waddill@navy.mil	CL	CL	CL
Mike Barandiaran (Added)	Acting Refuge Manager	UUSFWS	787-741-2138	Mike_barandiaran@fws.gov	CD		A
Angela Carpenter (Added)	EPA Coordinator	USEPA	212-637-4435	Carpenter.angela@epa.gov	CL	CL	CL
Monica Marrow (Added)	Document Control Assistant	CH2M HILL	757-671-6272	Monica.marrow@ch2m.com			A
Bradley Martin (Added)		TechLaw, Inc.	312-345-8960	BMARTIN@TECHLAWINC.COM	A		A
Elizabeth Denly (Added)	Senior QA Chemist	TRC Environmental Corp.	978-656-3577	N/A	A		
Scott Heim (Added)	Senior Ecologist	TRC Environmental Corp.	978-656-3577	sheim@trcsolutions.com	CD		
Marya B. Mahoney (Added)	Project Geologist	TRC Environmental Corp.	860-298-6226	N/A	A		
Jennifer Obrin (Added)	Project Manager	Katahdin Analytical Services, Inc.	207-874-2400	jobrin@katahdinlab.com			HC
Carl Soderberg (Deleted)	Caribbean Environmental Protection Division Director	USEPA	787-977-5814	soderberg.carl@epa.gov	CL		CL
Jose Font (Added)	Caribbean Environmental Protection Division Director	USEPA	787-977-5814	Font.jose@epa.gov	CL		CL

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
TBD (Added)	Field Team Leader	CH2M HILL	NA	NA			A
Stephen Brand (Deleted)	Field Team Leader	CH2M HILL	757-674-6211	Stephen.brand@ch2m. com			A
Bhavana Reddy (Added)	Critigen Project Data Manager	Critigen	703-608-1488	Bhavana.reddy@critigen.com			CD
Chris Anderson (Added)	Laboratory Project Manager	TestAmerica	802-660-1990	Chris.Anderson@testamericainc.com			CD

A = All
CL = Cover Letter
CD = Compact Disc
D = Draft
DF = Draft Final
F = Final
HC = Hard Copy

Page intentionally left blank

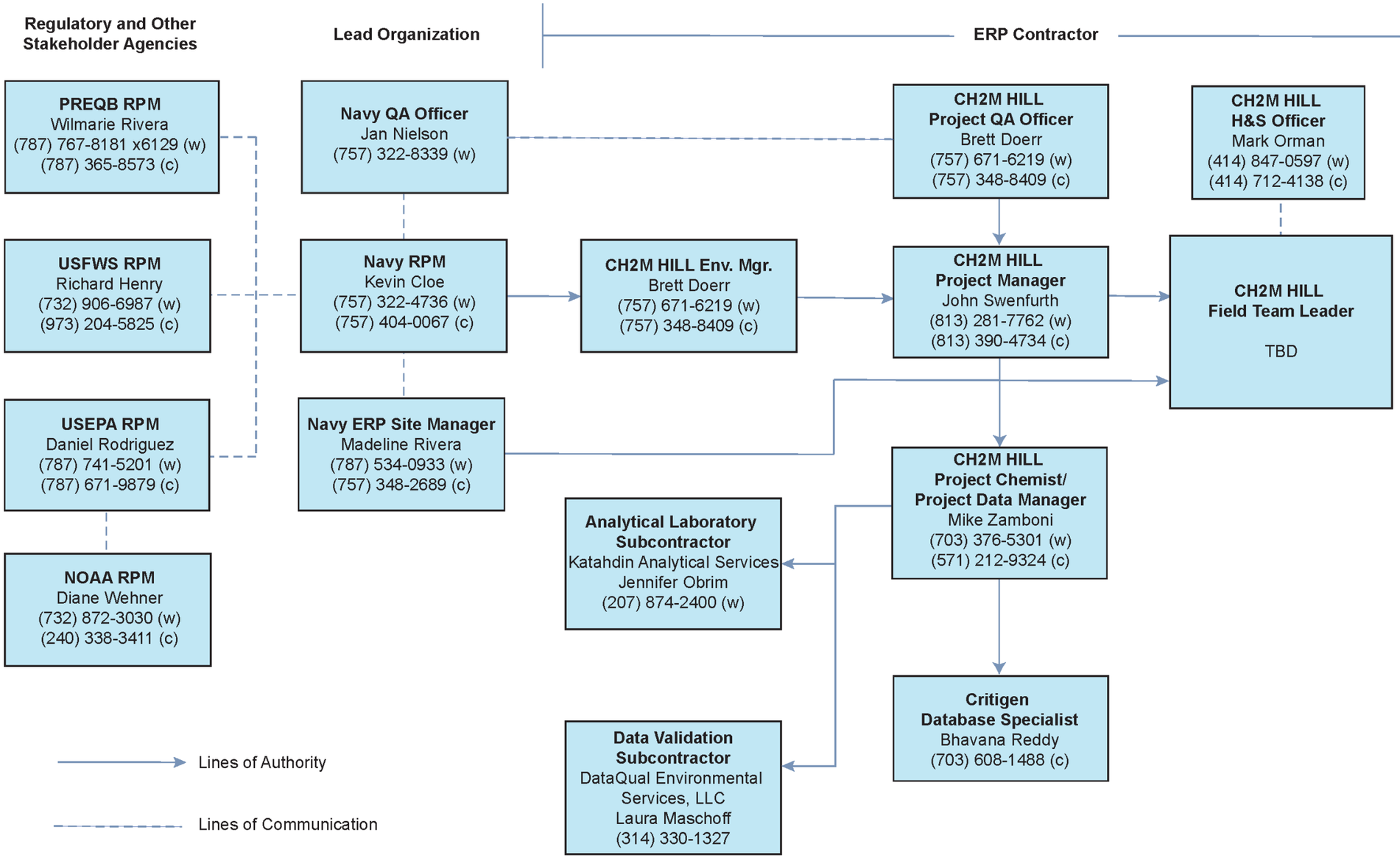
SAP Worksheet #4 — Project Personnel Sign-Off Sheet

Name	Organization/Title/Project Role	Telephone Number (optional)	Signature/ email receipt	SAP Section Reviewed	Date SAP Read
Kevin Cloe	NAVFAC Atlantic/ Vieques RPM/ Lead Agency POC	757-322-4736			
Daniel Rodriguez	USEPA/ Vieques RPM/ Regulatory Agency POC	787-741-5201 787-671-9879 (cell)			
Wilmarie Rivera	PREQB/Vieques RPM/ Regulatory Agency POC	787-767-8181 (x6129)			
Brett Doerr	CH2M HILL/Contractor Environmental Manager/Navy contractor primary POC/Quality Assurance Officer (QAO)/SAP review	757-671-6219			
Anita Dodson	CH2M HILL/Navy Program Chemist/ SAP review	757-671-6218			
John Swenfurth	CH2M HILL/Contractor PM/Logistics and administration	813-281-7762 813-390-4734 (cell)			
Mark Orman	CH2M HILL/Contractor health and safety Lead/Health and safety officer	414-847-0277			
Bhavana Reddy	Critigen/Data Manager	703-608-1488			
TBD	CH2M HILL/Field Team Leader	NA			
Mike Zamboni	Project Chemist	703-376-5301			
Michael Zamboni	Project Data Manager	703-376-5301			
Jennifer Obrin	Katahdin/Chemist/Laboratory PM	207-874-2400			
Chris Anderson	TestAmerica/Laboratory PM	802-660-1990			
Richard Henry	USFWS/Vieques RPM/Land Management Agency POC	732-906-6987			
Diana Wehner	National Oceanic and Atmospheric Administration/Regional Resource Coordinator	240-338-3411			
TBD	CH2M HILL/Field Team				

Page intentionally left blank

SAP Worksheet #5 — Project Organizational Chart

ES041712003051TPA - 408040.FI.FK.01



SAP Worksheet #5
Project Organization Chart
Sampling and Analysis Plan Addendum, PI 21
Atlantic Fleet Weapons Training Area - Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Page intentionally left blank

SAP Worksheet #6 — Communication Pathways

Refer to Worksheet #6 of the *Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2009). Worksheet 6 below provides a summary of the changes to the referenced worksheet. Individuals no longer included on the worksheet are identified with "(Deleted)" next to their name and added individuals are identified with "(Added)" next to their names.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Navy Quality Assurance (QA)/Quality Control (QC) input	Navy QAO	Sherri Eng (Deleted)	757-322-4366	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.
Navy Quality Assurance (QA)/Quality Control (QC) input	Navy QAO	Jan Nielsen (Added)	757-322-8339	Provides review comments to Navy contractor on pre-draft SAP via e-mail through Kevin Cloe. Provides overall Navy guidance via direct communication with Navy contractor QAO, as warranted.
SAP changes in the field	CH2M HILL FTL	Stephen Brand (Deleted) Kenji Butler (Deleted)	757-671-6211 757-285-7685 (c)	Documentation of deviations from work plan made in field logbooks and rationale for deviations; deviations made only with approval from contractor PM and/or environmental manager.
Field corrective actions	CH2M HILL FTL	Stephen Brand (Deleted) Kenji Butler (Deleted)	757-671-6211 757-285-7685 (c)	See Worksheet 32 Assessment Findings and Corrective Action (CA) Responses and Worksheet 32-1 CA Form.
Daily Field Progress Reports	CH2M HILL Field Team Leader (FTL)	Stephen Brand (Deleted) Kenji Butler (Deleted)	757-671-6211 757-285-7685 (c)	FTL will e-mail or fax daily field progress reports to contractor PMs weekly; telephone communication with PMs on as-needed basis
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	Navy RPM	Kevin Cloe (Added)	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. Regulatory approval for SAP changes or deviations is not necessary during implementation of SAP; however, regulators will have the opportunity to evaluate whether the changes or deviations affect the ability to achieve the project objectives during report review.
Ensure staff health and safety in the field	CH2M HILL Site Safety Coordinator (SSC)	Stephen Brand (Deleted) Kenji Butler (Deleted) TBD (Added)	757-671-6211 757-285-7685 (c) NA	Daily safety tailgates; daily observations; real-time discussions of observations and changes to be implemented with field staff.
Data tracking from collection through upload to database	CH2M HILL EIS	Chelsea Bennet (Deleted)	757-671-6208	EIS 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. EIS communicates with CH2M HILL project chemist, laboratory PM, and data validator PM, as warranted, to ensure adherence to project analysis and validation requirements. EIS also coordinates data upload with contractor database manager.

SAP Worksheet #6 — Communication Pathway (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Data tracking from collection through upload to database	CH2M HILL PDM	Mike Zamboni (Added)	703-376-5301	PDM 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. PDM communicates with CH2M HILL project chemist, laboratory PM, and data validator PM, as warranted, to ensure adherence to project analysis and validation requirements. PDM also coordinates data upload with contractor database specialist.
Health and Safety Expectations and Procedures	CH2M HILL Safety Officer	Steve Beck (Deleted) Mark Orman (Added)	414-847-0277 414-847-0597	Review of Health and Safety Plan (HASP). Direct communication (via email, telephone, hard copy, or in person, as warranted) To/From Navy contractor project staff to ensure implementation of appropriate health and safety procedures.
Uploading project data and maintaining the database to ensure data are stored properly and can be retrieved by the EIS.	Critigen Database Specialist	Bhavana Reddy	703-608-1488 (Added)	Once contractor chemist ensures data are appropriate for upload to database, PDM submits data electronically to contractor database specialist, who uploads data to database.
Reporting Lab Data Quality Issues	Laboratory (Katahdin) PM	Andrea Colby (Deleted) Jennifer Obrin (Added)	207-775-4029 (Deleted) 207-874-2400	All QA/QC issues with project field samples will be reported by the lab to the EIS, 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.
Analytical CAs	Analyst, Supervisor	Andrea Colby (Deleted) Jennifer Obrin (Added)	207-775-4029 (Deleted) 207-874-2400	See Worksheets 24, 25, and 28 for analytical CAs.
Validated data	DataQual 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.

SAP Worksheet #7 — Personnel Responsibilities Table

Refer to Worksheet #7 of the *Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2009). Worksheet 7 below provides a summary of the changes to the referenced worksheet. Individuals no longer listed on the worksheet are identified with "(Deleted)" next to their name and added individuals are identified with "(Added)" next to their names.

Name	Title	Organizational Affiliation	Responsibilities
Sherri Eng (Deleted) Jan Nielsen (Added)	QAO	Navy	Navy review of SAP and QA input
Paul Favara (Deleted)	Project QAO	CH2M HILL	Oversees compliance with program and project-specific quality requirements
Steve Beck (Deleted) Mark Orman (Added)	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
Kenji Butler (Deleted) Stephen Brand (Deleted) TBD (Added)	FTL and SSC	CH2M HILL	Supervises field sampling and coordinates all field activities; ensures onsite compliance with work plan; oversees and ensures safety of onsite personnel
Chelsea Bennet (Deleted)	Environmental Systems Specialist	CH2M HILL	Manages sample tracking; coordinates assimilation of data from field collection through analysis, validation, and upload to environmental database; performs data queries for data evaluation and report writing
Mike Zamboni (Added)	Project Data Manager	CH2M HILL	Manages sample tracking; coordinates assimilation of data from field collection through analysis, validation, and upload to environmental database; performs data queries for data evaluation and report writing
Andrea Colby (Deleted) Jennifer Obrin (Added)	PM	Katahdin Analytical Services	Laboratory POC and overall manager for analytical work
Laura Maschoff (Added)	Project Manager	DataQual Environmental Services, LLC	Responsible for validating analytical data in accordance with project-specific UFP-SAP
TBD (Deleted)	TBD	Drilling Subcontractor	Responsible for performing slide-hammer, direct-push, or similar means for soil sampling; responsible for monitoring well installation
TBD (Deleted)	TBD	Vegetation Clearance Subcontractor	Responsible for vegetation clearance, as necessary, to access sites and sample locations
TBD (Deleted)	TBD	Excavation Subcontractor	Responsible for performing test pitting at SWMU 1, soil excavation at AOC A, drum removal at PI 7, and debris removal at PAOC X.
TBD (Deleted)	TBD	Surveying Subcontractor	Responsible for horizontal coordinate and vertical elevation surveying of newly installed monitoring wells
TBD (Deleted)	TBD	Geophysics Subcontractor	Responsible for completing the horizontal delineation of the SWMU 1 landfill boundary and subsurface geophysics between PAOC N and PAOC S
TBD (Deleted)	TBD	Investigation Derived Waste (IDW) Subcontractor	Responsible for transport and disposal of IDW deemed necessary for offsite disposal

[1] Resumes are maintained by the individuals' organizations and are available upon request; upon execution of the project, staff may be removed (if unnecessary to project execution) and other staff may be added or substituted, as necessary and available.

Page intentionally left blank

SAP Worksheet #9a — Project Scoping Session Participants Sheet

Project Name: PI 21 SI/ESI SAP Addendum,	
Projected Date(s) of Sampling: 4th Quarter 2012 through 1st Quarter 2013	**Site Name:** East Vieques Former Vieques Naval Training Range (VNTR)
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Session: February 22-24, 2012 **Scoping Session Purpose:** Discuss and document regarding subject sites, including PI 21.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC.
Daniel Hood	Vieques RPM	NAVFAC	757-322-4630	Daniel.r.hood@navy.mil	No project-specific role
Dan Waddill	NAVFAC Atlantic	Navy	757-322-4983	Dan.waddill@navy.mil	Navy Vieques Coordinator
Sergio Lopez	Technical Support	USEPA	732-321-6778	Lopez.sergio@epa.gov	Investigative QC Specialist
Julio Vazquez	EPA RPM	USEPA	212-637-4323	Vazquez.Julio@epamail.epa.gov	Co-Primary USEPA POC
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (c)	Rodriguez.daniel@epamail.gov	Co-Primary USEPA POC
Michael Sivak	Human Health Risk Assessment Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and review of human health risk evaluation and related aspects of SI/Expanded SI.
Angela Carpenter	Technical Sup[port Special Projects Branch	USEPA	212-637-4435	Carpenter.angela@epa.gov	Technical Support for EPA
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 x6129	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 evaluation and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC
Diane Wehner	Ecological Risk Assessor	NOAA	732-872-3030	Diane.wehner@noaa.com	Ecological risk technical support
Richard Henry	Vieques RPM	USFWS	732-906-6987	Richard_henry@fws.gov	Primary USFWS POC/No project-specific role

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

Project Name: PI 21 SI/ESI SAP Addendum	
Projected Date(s) of Sampling: 4th Quarter 2012 through 1st Quarter 2013	**Site Name:** East Vieques Former Vieques Naval Training Range (VNTR)
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Session: February 22-24, 2012 **Scoping Session Purpose:** Discuss and document regarding subject sites, including PI 21.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 ext 226	Felix_lopez@fws.gov	No project-specific role
Sandy Martininez	Meeting Facilitator	Fulton Communications	702-934-5877	fultoncom@fultoncom.com	No project-specific role
Tom Hall	MEC Support Contractor to EPA	TechLaw	N/A	N/A	Technical input and review of munitions related issues on behalf of PREQB
John Tomik	Activity Manager	CH2M HILL	757-671-6259	John.Tomik@CH2M.com	Navy CLEAN Activity Manager for CH2M HILL
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.Doerr@CH2M.com	Scope development and technical review. Primary CH2M HILL POC.
Barrie Selcoe	Human Health Risk Assessor	CH2M HILL	281-246-4322	Barrie.Selcoe@CH2M.com	Human health risk technical support
John Martin	Ecological Risk Assessor	CH2M HILL	352-384-7122	John.Martin@CH2M.com	Ecological risk technical support
Bill Hannah	Senior Technical Consultant	CH2M HILL	757-671-6277	Bill.Hannah@CH2M.com	Senior Technical Consultant

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

Meeting Minutes (Abridged to include PI 21 discussion only)

Final Meeting Minutes

ERP/MRP Subcommittee Meeting
Vieques Superfund Site
February 22 - 24, 2012: New York, NY

Agenda Topics

Wednesday, February 22, 2012
PI21 SI SAP Scoping Session

PI 21 SI SAP Scoping Session

Discussion Objective

Concur on CSM, technical approach, and data evaluation/decision process for PI21 SI

Key Discussion Points

Brett initiated the PI 21 SAP Scoping Session. The team had discussions on the features outlined in the historical aerial photographs. Danny noted that there was a question from one of his reviewers as to whether the features identified as having green and brown liquid in them should be sampled. Brett noted that the Navy and CH2M HILL visited the site in December 2011 and that the green and brown features identified in the aerial photographs were observed to be just low-lying areas where water temporarily accumulates such that algae can grow. During the December site visit, dead algae were observed at the bottom of the small low-lying areas. Felix emphasized that build-up of the beach area with rip-rap created the low-lying areas where water could accumulate.

Brett added that during the Navy's site visit in December, the vertical tank could not be identified in the dense vegetation, but appeared to no longer be present. He added that access to the areas will be cleared of vegetation for the March 2012 regulatory site visit and that GPS coordinates can be used to pinpoint the tank location. Danny requested that full TCL/TAL analytical suite be performed since the contents of the tank are unknown.

Consensus Decision

The team concurred to proceed with preparing the SI SAP for PI21 as defined in the seed file with the caveat that the March 2012 site visit will be used to confirm the approach in the seed file or to make modifications, as warranted, and analysis for full TCL/TAL.

Page intentionally left blank

SAP Worksheet #9b — Project Scoping Session Participants Sheet

Project Name: PI 21 SI/ESI SAP Addendum,	
Projected Date(s) of Sampling: 4th Quarter 2012 through 1st Quarter 2013	**Site Name:** East Vieques Former Vieques Naval Training Range (VNTR)
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Session: March 14, 2012 **Scoping Session Purpose:** Review site conditions and finalize investigative approach at PI 21.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC.
Daniel Hood	Vieques RPM	NAVFAC	757-322-4630	Daniel.r.hood@navy.mil	No project-specific role
Dan Waddill	NAVFAC Atlantic	Navy	757-322-4983	Dan.waddill@navy.mil	Navy Vieques Coordinator
Mike Green	NAVFAC	Navy	N/A	N/A	UXO Support
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (c)	Rodriguez.daniel@epamail.gov	Co-Primary USEPA POC
Diana Cutt	Technical Support	USEPA	212-637-4311	Cutt.Diana@epa.gov	Technical Support
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 x6129	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 evaluation and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC.
Marya Mahoney	Technical Support	TRC	860-298-6226	N/A	Technical Support
Diane Wehner	Ecological Risk Assessor	NOAA	732-872-3030	Diane.wehner@noaa.com	Ecological risk technical support

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

Project Name: PI 21 SI/ESI SAP Addendum	
Projected Date(s) of Sampling: 4th Quarter 2012 through 1st Quarter 2013	**Site Name:** East Vieques Former Vieques Naval Training Range (VNTR)
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Session: March 14, 2012 **Scoping Session Purpose:** Review site conditions and finalize investigative approach at PI 21.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Rich Henry	Vieques RPM	USFWS	732-906-6987	Richard_henry@fws.gov	Primary USFWS POC/No project-specific role
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 ext 226	Felix_lopez@fws.gov	No project-specific role
Mike Barandiaran	Acting Refuge Manager	USFWS	787-741-2138	Mike_Barandiaran@fws.gov	Acting Refuge Manager
Law Enforcement	N/A	USFWS	N/A	N/A	N/A
Jim Pastoric	Technical Support	UXO Pro	703-548-5300	Jim@UXOPRO.COM	Technical Support
John Tomik	Activity Manager	CH2M HILL	757-671-6259	John.Tomik@CH2M.com	Navy CLEAN Activity Manager for CH2M HILL
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.Doerr@CH2M.com	Scope development and technical review. Primary CH2M HILL POC.
John Martin	Ecological Risk Assessor	CH2M HILL	352-384-7122	John.Martin@CH2M.com	Ecological risk technical support
Bill Hannah	Senior Technical Consultant	CH2M HILL	757-671-6277	Bill.Hannah@CH2M.com	Technical Support
Phil Balvocius	Technical Support	CH2M HILL	919-875-4311	Phil.Balvocius@ch2m.com	UXO Support

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

Meeting Minutes (Abridged to include PI 21 discussion only)

Final Meeting Minutes

ERP/MRP Subcommittee Site Visit
Vieques Superfund Site
March 14-15, 2012: Vieques, PR

Agenda Topics

Wednesday, March 14, 2012

ERP Technical Subcommittee Site Visit to PI 21

PI 21

Objective

Concur on sampling location for the Site Inspection (SI)

Key Discussion Points

The attendees visited the features noted on the historical aerial photographs to evaluate them as potential sources of contamination. Each area was cleared of vegetation for the site visit. The site visit confirmed that the aerial photographic analysis was likely inaccurate in portraying potential sources of contamination at the site.

Consensus Decision

The attendees agreed to sample as proposed in the seed file, where one co-located surface soil sample and subsurface soil sample will be collected at the suspected former vertical tank location.

Page intentionally left blank

SAP Worksheet #10 — Problem Definition

General

In general, the objective of an SI is "release assessment." More specifically, an SI is intended to:

- Determine whether a release of hazardous waste or hazardous constituents has occurred from past CERCLA-related activities and, if so,
- Determine whether a suspected release warrants further investigation or action

Conceptual Site Model Development

In that PI 21 is in the release assessment phase, much of the information contained in a comprehensive conceptual site model (CSM) is not warranted at this time. In other words, a simplified CSM is warranted at the release assessment phase versus what might be warranted in a Remedial Investigation (RI) where full nature and extent determination is performed. The CSM information pertinent to developing the SI approach (e.g., historical activities, potential release mechanisms, and potential constituents released [if known or suspected]) is included in this worksheet, together with the site-specific problem definitions and environmental questions to be answered. The ocean is approximately 70 feet away from the suspected former tank location (i.e., sampling locations) and groundwater is expected to be within several feet of the ground surface and saline.

Background and Potential Release History

Although there are no records of past releases at PI 21, review of historical photographs indicates the presence of a vertical storage tank between 1959 and mid 1970. The 1964 aerial photograph indicates the vertical tank was less than about 20 feet in diameter. Review of historical records did not indicate what material may have been stored in the tank, and may have been used for water storage. However, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection at its location. Therefore, a SI is warranted to determine if a CERCLA-related release(s) occurred from the vertical tank.

Synopsis of Secondary Data

In December 2002, three surface soil samples were collected from a small area of discolored soil near the remains of a small sheet metal structure, with pipes protruding from the embankment. The samples were analyzed for VOCs, SVOCS, metals, herbicides, pesticides, PCBs, perchlorate, TPH-DRO, and TPH-GRO. The sample locations are shown on Figure 1. The samples were collected as part of an Environmental Baseline Survey (EBS) (NAVFACENGCOM, 2003). The EBS concluded that "no further action" was required at PI 21. However, based on evaluation of the EBS data using the 7-step release assessment decision process, no site-related contamination was detected in this area. This information was presented and discussed at the February Vieques Technical Subcommittee Meeting. The Technical Subcommittee determined that the suspected former vertical tank is the only potential source of a release at the site warranting sampling (see Worksheets #9a and 9b, and associated meeting minutes). The three samples collected during the EBS are located approximately 1,000 feet from the suspected former vertical tank location. Therefore, the data from these samples is not relevant to characterizing potential releases associated with the suspected former vertical tank. However, the data will be considered in making the release assessment determinations for the site as a whole.

A Preliminary Range Assessment (PRA) (NAVFACENGCOM, 2003) was completed in 2003 to identify past range operations and/or management practices that may have had the potential to result in adverse environmental impacts. A field reconnaissance, archive records search, and aerial photographic analysis were conducted as part of the PRA at PI 21. The PRA did not identify the presence of possible munitions and explosives of concern (MEC) at PI 21.

SAP Worksheet #10 — Problem Definition (continued)

PI 21 soil data and historical information were reviewed in the *Draft RCRA Facility Investigation* (RFI) *Report* (CH2M HILL, 2004). The RFI included a review of the ERI aerial photo analysis (ERI, 2000), other historical documents, and data presented in the EBS report (NAVFACENGCOM, 2003). A site visit was also conducted. No apparent activity was evident at the site, and no signs of potential releases (i.e., no stained surface soils or stressed vegetation) were visible. The terrain suggested that the site could have possibly been used as a landing area for amphibious maneuvers, given the presence of a slope in the otherwise vertical 20-ft bluff.

Problem Definition

Although there are no records of past releases at PI 21, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the former presence of a vertical tank from which leaks or spills may have occurred. Therefore, an SI is warranted to determine if a CERCLA-related release(s) occurred at the location of the former vertical tank, and, if so, whether it warrants further investigation or action. Because the past use of the vertical tank is unknown, analysis of the full suite of Target Contaminant List/Target Analyte List (TCL/TAL) is warranted.

Environmental Questions to be Answered by the SI

1. **Was there a release of contaminants from the tank to the underlying soil?**

   This question will be answered by collecting one surface soil and one subsurface soil sample from five locations at the former vertical tank location. The sample locations will be based on GPS coordinates using historical aerial photographs. Because the contents of the former vertical tank are unknown, both samples will be analyzed for TCL VOCs and SVOCs, pesticides, PCBs, TAL metals, including mercury and cyanide, TOC, pH, and grain size.

2. **If a potential release from the former vertical tank is identified, is further investigation or action warranted?**

   This question will be answered by evaluating the data collected during the SIusing the 7-step decision analysis process (Figure 2).

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

1. **Who will use the data and what will the data be used for?**

   In that the scope of work covered by this SI/ESI SAP Addendum comprises release assessment, the Navy, USEPA, EQB, and FWS will use the data collected during the SI to make determinations of whether a CERCLA-related release took place and, if so, whether further investigation or action is warranted.

2. **What are the Project Action Limits (PALs)?**

   The PALs are listed by constituent group in Worksheet #15. In general, the PALs are:

   - Vieques human health screening values for soil are the current Regional Screening Levels (RSLs) (adjusted for a hazard quotient [HQ] of 0.1 for non-carcinogens).
   - Vieques ecological screening values for soil are derived from multiple sources, which are listed in the Ecological Risk Assessment Protocol contained in the Master Standard Operating Procedures, Protocols, and Plans document (CH2M HILL, 2010)
   - Vieques soil-to-groundwater leaching screening values are the current Regional SSLs.

3. **What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?**

   Worksheets #10 and #17 define the rationale for the matrix and analytical groups for PI 21. Because of the nature of SI activities and the unknown use of the former vertical tank, the target analyses are not restricted to particular analytes; they are intentionally broad.

   - Soil sampling and related activities will be done in general accordance with the applicable SOP(s) provided in the Master Standard Operating Procedures, Protocols, and Plans document (CH2M HILL, 2010).
   - Sample analyses will be conducted by an offsite laboratory in accordance with Worksheets #15, 19, 23, 24, 25, 28, and 30, except as noted below.

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

   Several types of data will be collected during the SI. How good the data need to be is discussed by data type below.

   - **Visual Observations and PID Readings** – Visual observations and PID readings will be used at PI 21 to help select soil sampling intervals. As such, the data are considered qualitative in that they do not need to provide an exact or quantified value. Rather, they need to be of sufficient quality to facilitate consideration relative to other data in the same area. For example, if a soil sample is to be collected in the boring from the interval of the highest PID reading, it is not the actual PID reading that is relevant; it is the highest PID reading relative to the other PID readings that is relevant. As such, calibrating and operating the PID in accordance with the manufacturer's recommendations are sufficient to provide data of appropriate quality for making this decision.
   - **Offsite Analytical Data** – In that this SAP Addendum is for an SI, the offsite data need to be "good" enough to make determinations of whether a CERCLA-related release has occurred and, if so, whether the release warrants further investigation or action. Ensuring data are "good" enough for this purpose is done via employing appropriate analytical protocol, validating the resulting data, including QA/QC samples to verify proper sampling and analysis protocol, and performing a data quality evaluation (DQE) to assess the availability and usability of the data for the intended purpose. Each of these is further discussed below:
   - **Appropriate Analytical Protocol** – See Worksheets #15, 19, 23, 24, 25, 28, and 30 and Item 5 below.
   - **Data Validation –** Refer to Worksheet #11 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009).

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

- **QA/QC Samples** – Refer to Worksheet #11 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009).
- **Data Quality Evaluation** – Refer to Worksheet #11 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009).

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

As concurred upon by the Navy, USEPA, PREQB, and USFWS, one surface soil sample and one subsurface soil sample will be collected from five locations at the former vertical tank location to determine whether a CERCLA-related release occurred and, if so, whether the release warrants further investigation or action. One sample location will be from near the center of the former tank location, and the remaining four locations will be approximately evenly spaced around the former tank location at a radial distance of about 25 feet from the central sample location. This sample layout provides sufficient coverage for identifying whether release(s) occurred from the tank. Note that two soil samples are located in potential migration pathways (such as areas with limited vegetation and potential drainage areas), as shown in Figure 3.

The surface and subsurface soil samples will be collected in accordance with the soil sampling protocol in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2010), which states that (in the absence of land crab habitat) surface soil will be collected from the top 12 inches of soil and subsurface soil will be collected from the 2-foot interval between the bottom of the surface soil interval and 6 feet (or bedrock or water table if encountered above 6 feet). The exact depth of the subsurface samples will be based on field observations as follows: at the depth of suspected contamination (based on visual and/or instrument-aided observation) or, in the absence of suspected contamination, within the 2-foot interval from 4 to 6 feet bgs, just above bedrock, or just above the water table, whichever is shallowest. Note that the land elevation at the former tank location is less than approximately 4 feet above mean sea level (amsl).

All samples will be analyzed for VOCs, SVOCs, pesticides, PCBs, and metals because these constituent groups represent the most likely contaminant types associated with the vertical tank, if the tank was used to store chemicals. Analysis for other constituents, such as perchlorate, nitrosodimethylamine, unsymmetrical dimethylhydrazine, total petroleum hydrocarbons, and herbicides, although potentially associated with military operations, are not likely associated with PI 21 based on its unlikely use for munitions training.

Worksheet #15 contains analytical methodology and quantitation limits. In addition to listing the particular analytes, PALs, and laboratory-specific limits, Worksheets #15 identifies where LODs are higher than PALs. While this information was taken into consideration when planning the analytical protocol for PI 21 and may lead to some uncertainty (varies by the specific analytical protocol for each site), it does not prevent conclusions to be drawn with respect to the objectives of the SI for the following reasons:

- (1) The samples collected at PI 21 are being analyzed for constituent groups versus a specific analyte. This is because the site is in the SI phase, where the primary objective is to determine whether there has been a release or not. There is no single or small group of known constituents suspected of being released at PI 21. Consequently, analyzing for analyte groups is appropriate for satisfying the objective of the SI, as well as making determinations about whether further action is warranted. Even if a particular analyte has an LOD above a screening level, there are sufficient other analytes in the same constituent group that would likely be detected in the event of a release and whose RLs are below the screening values such that further action determinations for the site can be made with sufficient confidence.

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

- (2) The Vieques screening values on which the PALs are based are not of equal importance, so just because a particular LOD is higher than a PAL does not mean decisions regarding that particular constituent cannot be made. For example, there are 47 analytes highlighted due to an exceedance of Regional SSLs. Yet, only arsenic and chromium are highlighted due to residential RSLs or ecological screening values (there are no LODs > SLs for ecological screening values). The SSLs are more qualitative than human health and ecological screening values and past experience on Vieques has shown that they are not reliable predictors of leaching to groundwater (i.e., they are overly conservative). Further, due to the small size of the vertical tank, SSLs at a higher DAF than 1 are likely more appropriate screening levels. USEPA guidance suggests that for areas up to 0.5 acre, a DAF of 20 is likely appropriate (USEPA,1996). At a DAF of 20, using the generic SSLs provided in the Technical Background Document (USEPA 1996a), only 3 analytes (n-nitroso-di-n-propylamine, 2,4-dinitrotoluene, and pentachlorphenol) would have a LOD (or QL) greater than the SSL (DAF 20).
- (3) Even though LODs may be higher than certain PALs, detection limits (DLs) may be closer to or lower than PALs. The laboratory instrument would report a detection for a constituent if detected at greater than its DL and would then be reported as estimated because it is less than the LOQ. For example, in Worksheet #15, for both arsenic and chromium where the LOD exceeds the human health screening values, the DL is less than the human health screening value in both cases.

The three ticks above are just examples of why LODs greater than PALs, while leading to some uncertainty, do not prevent conclusions from being drawn with respect to the objectives of this SI. Results between the DL and LOQ are quantified but are reported as 'estimated' with a J-qualifier because they are less than the LOQ. It is standard practice to use estimated values between the DL and LOQ as reported for performing data evaluation. While it is recognized there is increased uncertainty if the screening level is close to the detected result with estimated concentration, this is true for any result whose concentration is estimated (for whatever reason) and such uncertainty is discussed in the data quality evaluation.

Nondetect results (U-values) are reported at the LOD. When the LOD is greater than the PAL, it is standard practice that nondetects are not treated as a PAL exceedance.

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

The table below lists the target analyte groups, whether the level of detections are above the PALs, and the potential affect on the decision making ability for the site.

Site	Sample Analyses	Target Analyte(s)*	LOD > PALs for Target Analyte(s)	Conclusion
PI 21 – Potential Former Firing Position	VOCs, SVOCs, pesticides, PCBs, inorganics, mercury, cyanide, TOC, pH, and grain size	No target analytes; therefore, analyte groups evaluated	48 Analytes Vinyl chloride, Bromomethane, Methylene chloride, 1,1-Dichloroethane, Carbon tetrachloride, 1,2-Dichloroethane, Trichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane, Tetrachloroethene, 2-Hexanone, 1,2-Dibromoethane, 1,1,2,2-Tetrachloroethane, 1,2-Dibromo-3-chloropropane, bis(2-Chloroethyl)ether, 2,2'-Oxybis(1-chloropropane), n-Nitroso-di-n-propylamine, Hexachloroethane, Nitrobenzene, Isophorone, Naphthalene, 4-Chloroaniline, Hexachlorobutadiene, 2,4,6-Trichlorophenol, 1,1-Biphenyl, 2,4-Dinitrophenol, 4-Nitrophenol, 2,4-Dinitrotoluene, 4-Nitroaniline, 4,6-Dinitro-2-methylphenol, 1,2,4,5-Tetrachlorobenzene, Atrazine, Pentachlorophenol, 3,3'-Dichlorobenzidine, Di-n-octylphthalate, 1,4-Dioxane, alpha-BHC, beta-BHC, delta-BHC, Aldrin, Dieldrin, Aroclor-1221, Aroclor-1232, Arsenic, Chromium, Selenium	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with PQLs (QL) below PALs to make site-specific determinations regarding need for further action.

* Target Analyte is defined here to mean an analyte suspected as part of a release based on previous data or known history

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

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

Figure 3 shows the sampling location for PI 21.

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

CH2M HILL will collect the data. Katahdin Analytical Services and its subcontractor TestAmerica Burlington will generate the offsite analytical data. The data will be evaluated and reported in an SI/ESI SAP Addendum Report. However, if the data suggest an expanded investigation is warranted (i.e., either an ESI or RI), the data and associated evaluation will instead be included in a subsequent SAP as justification for the expanded investigation.

8. How will the data be archived?

The electronic data will be loaded into the Navy Installation Restoration Information System (NIRIS) database. Raw data, as well as data summary tables, will be included in the SI/ESI SAP Addendum Report. Hardcopy data will be archived by CH2M HILL and the Navy in accordance with contract requirements.

9. List the Project Quality Objectives (PQOs) in the form of if/then qualitative and quantitative statements.

The decision analysis process shown in Figure 2 represents the general PQOs for PI 21. The PQO descriptions associated with each step of the decision analysis process are provided in the SI/ESI SAP (CH2M HILL, 2009).

Page intentionally left blank

SAP Worksheet #12 — Field Quality Control Samples

Refer to Worksheet #12-1, #12-2, #12-3, #12-6, #12-7, and #12-8 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009).

Page intentionally left blank

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table

The table below provides general information on how secondary data will be used and the limitations on their use. Following the general table below, secondary data criteria and limitations tables are presented for each site where historical analytical data exist (applicable to the scope of work covered by this SAP), specifically to address the use and limitations of the historical analytical data.

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical report; data used in decisions for sites	Prepared by: Environmental Research Inc. (ERI). Aerial Photographic Analysis Atlantic Fleet Weapons Training Facility and Eastern Maneuver Area, Vieques Island, Puerto Rico. Date: 2000	Photo identification of site and site history (derived).	Site history summary.	More recent information may supersede historical information from this report.
Historical report; data used in decisions for sites	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Site history. Three surface soil samples collected in area of discolored soil. VOCs, SVOCS, metals, herbicides, pesticides, PCBs, perchlorate, TPH-DRO, and TPH-GRO	Data were evaluated and determined not to be associated with a site-related release and as such are not useful in making release assessment determinations within the area of interest.	More recent information may supersede historical information from this report.
Historical report; data used in decisions for sites	Prepared by: CH2M HILL for the Navy Report Title: East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: October 2007	Surface and subsurface soil samples collected on east Vieques and analyzed for inorganics.	Results used to develop background soil inorganic concentrations. Data will be compared to site-specific soil inorganic data to help determine whether site-specific inorganic concentrations are potentially associated with a release or are likely attributable to background.	Background inorganic data alone may not be sufficient to determine if site-specific inorganic concentrations are potentially associated with a release or are likely attributable to background. In some cases, other information, such as knowledge of historical activities, magnitude of exceedances of background, etc. may be used to help distinguish potential releases from background concentrations.
Historical report; data used in decisions for sites	Prepared by: Naval Facilities Engineering Command (NAVFACENGCOM). *Final Draft Preliminary Range Assessment Report, Vieques Naval Training Range*, Vieques, Puerto Rico. Date: April 2003	Site history determination	Data from this report was used to identify past range operations and/or management practices that may have had the potential to result in adverse environmental impacts.	The PRA did not identify the presence of possible munitions and explosives of concern (MEC) at PI 21.

Page intentionally left blank

SAP Worksheet #14 — Summary of Project Tasks

General Protocol

Utility Clearance

NAVFAC Atlantic and USFWS will be contacted for clearance on potential subsurface utilities at all locations prior to the start of field work.

Mobilization

Mobilization will include CH2M HILL staff and subcontractors traveling to the island. Mobilization will occur only after the following tasks have been completed:

- Utility clearance
- The SAP has been approved by the stakeholders

Vegetation Clearance

Vegetation clearance will follow the vegetation clearance SOP (Master Standard Operating Procedures, Protocols, and Plans, CH2M HILL, 2010). USFWS will be consulted prior to vegetation clearing and advised on the area(s) to be cleared.

Technical Subcommittee Pre-SI/ESI SAP Addendum Site Visit

Vegetation clearance was conducted and the proposed sample location was staked on March 12, 2012 prior to the site visit by the Technical Subcommittee March 14, 2012. The Technical Subcommittee concurred with the proposed sample location, which is outlined herein.

Sampling

The suspected tank location is known because it is observable on historical aerial photographs that have reference coordinates. These coordinates will be entered into a Trimble GPS, which has an accuracy greater than or equal to +/- 2.5 ft. Trimbles are self-calibrating.

Sampling will follow the SOPs set forth in the Master Standard Operating Procedures, Protocols, and Plans document. Soil sampling SOPs are in Attachment 1 of the Master Standard Operating Procedures, Protocols, and Plans document, A-1 through A-6. The soil sample depths will be chosen following the soil sample depth collection criteria set forth in the Master Standard Operating Procedures, Protocols, and Plans document. Soil samples will be collected by either drill rig split spoons (SOP A-2), direct push techniques (SOP A-2), slide hammer sampling (SOP A-5), or hand auger (SOP A-2) depending on anticipated depth and site access.

Equipment Decontamination

Equipment decontamination will follow SOPs in Master Standard Operating Procedures, Protocols, and Plans document Attachment E-1 and/or E-2.

Investigation-Derived Waste Management

IDW will be managed and disposed of in accordance with the Waste Management Plan (WMP), found in the Master Standard Operating Procedures, Protocols, and Plans document.

Storage

All analytical data will be stored in the Navy's NIRIS database.

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

Shipments

All analytical samples will be sent by Fed Ex which has on-island staff. All equipment will be shipped upon request and will be sent to the Camp Garcia CH2M HILL office on Vieques. All samples will be shipped in accordance with the SOP in Master Standard Operating Procedures, Protocols, and Plans document Attachment H-5 "Packaging and Shipping Procedures for Samples Not Considered Dangerous Goods."

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 make 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 soil samples. The laboratory will analyze soil samples for various groups of parameters as shown on Worksheets # 15 and #18.

Data Management

The Project Database Specialist, Chelsea Barnes, 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.

Procedures for Recording and Correcting Data

All field data will be recorded in field logbooks.

Project Assessment/Audit: Worksheets #31 and #32 (please refer to the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico [CH2M HILL, 2009]).

Data Validation: Worksheets #35 and #36 (please refer to the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico [CH2M HILL, 2009]).

Data Usability Assessment: Worksheet #37 (please refer to the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico [CH2M HILL, 2009]).

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

Although Worksheet #15 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009) is still applicable, many aspects of it have changed. Specifically, these may include selected concentration range, screening level updates, PQL Goals calculated from the screening levels, and laboratory-specific limits. Instead of QL/MDL, the laboratory will report data using LOQ/LOD/DL. Therefore, a new Worksheet #15 has been prepared to show all analytes applicable to this project.

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[6]
Analysis Group: VOCs

Analyte[1]	CAS[2]	Selected SSL[3,4] (µg/kg)	RSLs Residential Soil Adjusted[4] (µg/kg)	Vieques Eco SO (µg/kg)	PQL Goal[5] (µg/kg)	Laboratory-Specific Limits (µg/kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
						LOQs	LODs	DLs	LCL	UCL	RPD
Dichlorodifluoromethane (Freon-12)	75-71-8	300	9400	NSL	150	10	5	0.92	35	135	30
Chloromethane	74-87-3	49	12000	5000	24.5	10	5	1.4	50	130	30
Vinyl chloride	75-01-4	0.69	60	412	0.345	10	5	0.87	60	125	30
Bromomethane	74-83-9	1.8	730	NSL	0.9	10	5	1.1	30	160	30
Chloroethane	75-00-3	5900	1500000	5000	2500	10	5	1.3	40	155	30
Trichlorofluoromethane(Freon-11)	75-69-4	690	79000	NSL	345	10	5	0.91	25	185	30
1,1-Dichloroethene	75-35-4	2.5	24000	173	1.25	5	2.5	0.93	65	135	30
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	76-13-1	1E+05	910000	NSL	65000	5	2.5	0.9	70	130	30
Acetone	67-64-1	2400	6100000	NSL	1200	25	12.5	5.1	20	160	30
Carbon disulfide	75-15-0	210	82000	NSL	105	5	2.5	0.78	45	160	30
Methyl acetate	79-20-9	3200	7800000	NSL	1600	5	3	2.7	70	130	30
Methylene chloride	75-09-2	1.3	36000	1250	0.65	25	12.5	7.9	55	140	30
trans-1,2-Dichloroethene	156-60-5	29	15000	447	14.5	5	2.5	0.71	65	135	30
Methyl-tert-butyl ether (MTBE)	1634-04-4	2.8	43000	NSL	1.4	5	2.5	1.1	58	123	30
1,1-Dichloroethane	75-34-3	0.68	3300	548	0.34	5	2.5	1.7	75	125	30
cis-1,2-Dichloroethene	156-59-2	21	16000	447	10.5	5	2.5	0.91	65	125	30
2-Butanone	78-93-3	1000	2800000	NSL	500	25	12.5	5.9	30	160	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[6]
Analysis Group: VOCs

Analyte[1]	CAS[2]	Selected SSL[3,4] (µg/kg)	RSLs Residential Soil Adjusted[4] (µg/kg)	Vieques Eco SO (µg/kg)	PQL Goal[5] (µg/kg)	Laboratory-Specific Limits (µg/kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
						LOQs	LODs	DLs	LCL	UCL	RPD
Bromochloromethane	74-97-5	21	16000	NSL	10.5	5	2.5	0.91	70	125	30
Chloroform	67-66-3	22	290	1844	11	5	2.5	0.35	70	125	30
1,1,1-Trichloroethane	71-55-6	70	640000	1025	35	5	2.5	0.42	70	135	30
Cyclohexane	110-82-7	13000	120000	6000	3000	5	2.5	1.4	70	130	30
Carbon tetrachloride	56-23-5	1.9	610	3400	0.95	5	2.5	1.3	65	135	30
Benzene	71-43-2	2.6	1100	6.8	1.3	5	2.5	0.92	75	125	30
1,2-Dichloroethane	107-06-2	1.4	430	2190	0.7	5	2.5	1	70	135	30
Trichloroethene	79-01-6	1.8	440	10	0.9	5	2.5	0.59	75	125	30
Methylcyclohexane	108-87-2	NSL	NSL	NSL	N/A	5	2.5	0.96	70	130	30
1,2-Dichloropropane	78-87-5	1.7	940	38800	0.85	5	2.5	1.4	70	120	30
Bromodichloromethane	75-27-4	22	270	NSL	11	5	2.5	0.6	70	130	30
cis-1,3-Dichloropropene	10061-01-5	0.15	1700	5000	0.075	5	2.5	0.72	70	125	30
4-Methyl-2-pentanone	108-10-1	230	530000	NSL	115	25	12.5	5.9	45	145	30
Toluene	108-88-3	690	500000	40000	345	5	2.5	1.4	70	125	30
trans-1,3-Dichloropropene	10061-02-6	0.15	1700	5000	0.075	5	2.5	0.86	65	125	30
1,1,2-Trichloroethane	79-00-5	1.6	160	2000	0.8	5	2.5	0.97	60	125	30
Tetrachloroethene	127-18-4	2.3	8600	200	1.15	5	2.5	1.2	65	140	30
2-Hexanone	591-78-6	7.9	21000	NSL	3.95	25	12.5	4.8	45	145	30
Dibromochloromethane	124-48-1	21	680	NSL	10.5	5	2.5	1	65	130	30
1,2-Dibromoethane	106-93-4	0.014	34	300	0.007	5	2.5	1.2	70	125	30
Chlorobenzene	108-90-7	68	29000	2400	34	5	2.5	0.51	75	125	30
Ethylbenzene	100-41-4	780	5400	18	9	5	2.5	0.65	75	125	30
o-Xylene	95-47-6	190	69000	2400	95	5	2.5	1.3	75	125	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[6]
Analysis Group: VOCs

Analyte[1]	CAS[2]	Selected SSL[3,4] (µg/kg)	RSLs Residential Soil Adjusted[4] (µg/kg)	Vieques Eco SO (µg/kg)	PQL Goal[5] (µg/kg)	Laboratory-Specific Limits (µg/kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
						LOQs	LODs	DLs	LCL	UCL	RPD
m- and p-Xylene	m&pXYLENE	180	59000	2400	90	10	5	1.7	80	125	30
Styrene	100-42-5	110	630000	64000	55	5	2.5	0.51	75	125	30
Bromoform	75-25-2	21	62000	300	10.5	5	2.5	0.7	55	135	30
Isopropylbenzene	98-82-8	640	210000	NSL	320	5	2.5	0.92	75	130	30
1,1,2,2-Tetrachloroethane	79-34-5	0.026	560	5000	0.013	5	2.5	0.84	55	130	30
1,3-Dichlorobenzene	541-73-1	NSL	NSL	1000	500	5	2.5	0.62	70	125	30
1,4-Dichlorobenzene	106-46-7	72	2400	1280	36	5	2.5	0.44	70	125	30
1,2-Dichlorobenzene	95-50-1	580	190000	1000	290	5	2.5	0.78	75	120	30
1,2-Dibromo-3-chloropropane	96-12-8	0.086	5.4	NSL	0.043	5	2.5	1.5	40	135	30
1,2,4-Trichlorobenzene	120-82-1	200	6200	1270	100	5	2.5	0.79	65	130	30
1,2,3-Trichlorobenzene	87-61-6	15	4900	1150	7.5	5	2.5	0.76	60	135	30
4-Bromofluorbenzene (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*85*	*120*	*N/A*
Toluene-d_8 (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*85*	*115*	*N/A*

Shading represents screening levels which are less than the laboratory-specific LOD. Refer to Worksheet #11 section 5.
1 Target compound list is from SOM01.
2 Some CAS numbers are contractor-specific.
3 "Selected SSLs" are risk-based if MCL-based SSLs do not exist. SSLs are current as of November, 2012.
4 RSLs are current as of November, 2012.
5 The PQL goal is calculated at 1/2 the lesser of applicable criteria.
6 Results for non-aqueous samples are reported on a dry-weight basis.
N/A: "Not applicable".
NSL: "No screening level".
DoD QSM v. 4.1 limits are not available. Nominal limits are provided.
DoD QSM v. 4.1 limits are not available. Statistical limits are provided.

Page intentionally left blank

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: SVOCs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (µg/kg)	RSLs Residential Soil Adjusted[5] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[6] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
							LOQs	LODs	DLs	LCL	UCL	RPD
Benzaldehyde	100-52-7	8270C_SIM	330	780000	NSL	165	20	10	5.1	60	83	30
Phenol	108-95-2	8270C	2600	1800000	1880	940	330	250	140	40	100	30
bis(2-Chloroethyl)ether	111-44-4	8270C_SIM	0.0031	210	NSL	0.00155	20	10	1.7	40	105	30
2-Chlorophenol	95-57-8	8270C_SIM	57	39000	500	28.5	100	50	5.3	45	105	30
2-Methylphenol	95-48-7	8270C_SIM	580	310000	1000	290	100	50	8.5	40	105	30
2,2'-Oxybis(1-chloropropane)	108-60-1	8270C_SIM	0.11	4600	NSL	0.055	20	10	2.1	20	115	30
Acetophenone	98-86-2	8270C	450	780000	NSL	225	330	250	178	52	86	30
4-Methylphenol	106-44-5	8270C_SIM	1100	610000	1000	500	100	50	9.9	40	105	30
n-Nitroso-di-n-propylamine	621-64-7	8270C_SIM	0.007	69	NSL	0.0035	20	10	1.9	40	115	30
Hexachloroethane	67-72-1	8270C_SIM	0.48	4300	NSL	0.24	20	10	2	35	110	30
Nitrobenzene	98-95-3	8270C_SIM	0.079	4800	2260	0.0395	20	10	4.8	40	115	30
Isophorone	78-59-1	8270C_SIM	22	510000	NSL	11	100	50	17	45	110	30
2-Nitrophenol	88-75-5	8270C_SIM	57	39000	1000	28.5	100	50	15	40	110	30
2,4-Dimethylphenol	105-67-9	8270C_SIM	320	120000	1000	160	20	10	3.2	30	105	30
bis(2-Chloroethoxy)methane	111-91-1	8270C_SIM	11	18000	NSL	5.5	20	10	6.4	45	110	30
2,4-Dichlorophenol	120-83-2	8270C_SIM	41	18000	500	20.5	20	10	2.2	45	110	30
Naphthalene	91-20-3	8270C_SIM	0.47	3600	NSL	0.235	20	10	2.6	30	90	30
4-Chloroaniline	106-47-8	8270C_SIM	0.13	2400	500	0.065	100	50	TBD	10	100	30
Hexachlorobutadiene	87-68-3	8270C_SIM	0.5	6100	NSL	0.25	20	10	2.3	40	115	30
Caprolactam	105-60-2	8270C	1900	3100000	NSL	950	330	250	144	14	125	30
4-Chloro-3-methylphenol	59-50-7	8270C_SIM	1300	610000	500	250	100	50	4.3	45	115	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: SVOCs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (µg/kg)	RSLs Residential Soil Adjusted[5] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[6] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
							LOQs	LODs	DLs	LCL	UCL	RPD
2-Methylnaphthalene	91-57-6	8270C_SIM	140	23000	NSL	70	20	10	2.2	40	110	30
Hexachlorocyclopentadiene	77-47-4	8270C_SIM	160	37000	2000	80	20	10	1.5	24	120	30
2,4,6-Trichlorophenol	88-06-2	8270C_SIM	13	6100	580	6.5	100	50	3.3	45	110	30
2,4,5-Trichlorophenol	95-95-4	8270C_SIM	3300	610000	1350	675	100	50	2.5	50	110	30
1,1-Biphenyl	92-52-4	8270C_SIM	8.7	5100	13600	4.35	20	10	1.1	64	87	30
2-Chloronaphthalene	91-58-7	8270C	2900	630000	NSL	1450	330	250	87	50	105	30
2-Nitroaniline	88-74-4	8270C_SIM	62	61000	NSL	31	20	10	2.3	45	120	30
Dimethyl phthalate	131-11-3	8270C	NSL	NSL	10640	5320	330	250	78	50	110	30
2,6-Dinitrotoluene	606-20-2	8270C_SIM	20	6100	8500	10	20	10	4.3	50	110	30
Acenaphthylene	208-96-8	8270C	4100	340000	NSL	2050	330	250	70	50	105	30
3-Nitroaniline	99-09-2	8270C	NSL	NSL	NSL	N/A	820	615	94	25	110	30
Acenaphthene	83-32-9	8270C	4100	340000	NSL	2050	330	250	65	45	110	30
2,4-Dinitrophenol	51-28-5	8270C_SIM	34	12000	20000	17	100	75	63	15	130	30
4-Nitrophenol	100-02-7	8270C_SIM	0.079	4800	380	0.0395	100	50	8	15	140	30
Dibenzofuran	132-64-9	8270C_SIM	110	7800	NSL	55	20	10	1.9	50	105	30
2,4-Dinitrotoluene	121-14-2	8270C_SIM	0.28	1600	11000	0.14	20	10	7	50	115	30
Diethylphthalate	84-66-2	8270C	4700	4900000	26800	2350	330	250	80	50	115	30
Fluorene	86-73-7	8270C	4000	230000	NSL	2000	330	250	81	50	110	30
4-Chlorophenyl-phenylether	7005-72-3	8270C	1500	31000	NSL	750	330	250	78	45	110	30
4-Nitroaniline	100-01-6	8270C_SIM	1.4	24000	NSL	0.7	20	10	1.3	35	115	30
4,6-Dinitro-2-methylphenol	534-52-1	8270C_SIM	2	490	1000	1	200	100	24	30	135	30
n-Nitrosodiphenylamine	86-30-6	8270C_SIM	57	99000	1090	28.5	20	10	6.9	50	115	30
1,2,4,5-Tetrachlorobenzene	95-94-3	8270C	5.8	1800	1000	2.9	330	250	135	59	81	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: SVOCs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (µg/kg)	RSLs Residential Soil Adjusted[5] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[6] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
							LOQs	LODs	DLs	LCL	UCL	RPD
4-Bromophenyl-phenylether	101-55-3	8270C	NSL	NSL	NSL	N/A	330	250	85	45	115	30
Hexachlorobenzene	118-74-1	8270C_SIM	13	300	1000	6.5	20	10	1.8	45	120	30
Atrazine	1912-24-9	8270C_SIM	1.9	2100	11.9	0.95	20	10	1	45	120	30
Pentachlorophenol	87-86-5	8270C_SIM	10	890	5000	5	100	50	14	25	120	30
Phenanthrene	85-01-8	8270C	42000	1700000	NSL	21000	330	250	83	50	115	30
Anthracene	120-12-7	8270C	42000	1700000	NSL	21000	330	250	84	55	110	30
Carbazole	86-74-8	8270C	NSL	NSL	NSL	N/A	330	250	111	45	115	30
Di-n-butylphthalate	84-74-2	8270C	1700	610000	40000	850	330	250	101	55	110	30
Fluoranthene	206-44-0	8270C	70000	230000	NSL	35000	330	250	106	55	115	30
Pyrene	129-00-0	8270C	9500	170000	NSL	4750	330	250	101	50	130	30
Butylbenzylphthalate	85-68-7	8270C_SIM	200	260000	30000	100	100	50	4	50	125	30
3,3'-Dichlorobenzidine	91-94-1	8270C_SIM	0.71	1100	NSL	0.355	20	10	3	10	130	30
Benzo(a)anthracene	56-55-3	8270C_SIM	10	150	NSL	5	20	10	1.9	50	110	30
Chrysene	218-01-9	8270C	1100	15000	NSL	550	330	250	95	55	110	30
bis(2-Ethylhexyl)phthalate	117-81-7	8270C	1400	35000	30000	700	330	250	98	45	125	30
Di-n-octylphthalate	117-84-0	8270C_SIM	53000	35000	30000	15000	100	50	46	40	130	30
Benzo(b)fluoranthene	205-99-2	8270C_SIM	35	150	NSL	17.5	20	10	2.4	46	116	30
Benzo(k)fluoranthene	207-08-9	8270C_SIM	350	1500	NSL	175	20	10	3.1	60	120	30
Benzo(a)pyrene	50-32-8	8270C_SIM	240	15	NSL	7.5	20	10	3.3	53	113	30
Indeno(1,2,3-cd)pyrene	193-39-5	8270C_SIM	200	150	NSL	75	20	10	1.9	32	92	30
Dibenz(a,h)anthracene	53-70-3	8270C_SIM	11	15	NSL	5.5	20	10	1.8	40	100	30
Benzo(g,h,i)perylene	191-24-2	8270C	9500	170000	NSL	4750	330	250	104	40	125	30
2,3,4,6-Tetrachlorophenol	58-90-2	8270C_SIM	1100	180000	500	250	100	50	2.7	18	98	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: SVOCs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (µg/kg)	RSLs Residential Soil Adjusted[5] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[6] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
							LOQs	LODs	DLs	LCL	UCL	RPD
1,4-Dioxane	123-91-1	8270C_SIM	0.14	4900	NSL	0.07	100	50	1.1	30	150	30
2-Fluorobiphenyl (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*45*	*105*	*N/A*
Terphenyl-d_{14} (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*30*	*125*	*N/A*
2,4,6-Tribromophenol (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*35*	*125*	*N/A*
2-Fluorophenol (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*35*	*105*	*N/A*
Phenol-d_5/d_6 (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*40*	*100*	*N/A*
Nitrobenzene-d_5 (surrogate)	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*35*	*100*	*N/A*

Shading represents screening levels which are less than the laboratory-specific LOD. Refer to Worksheet #11 section 5.
1 Target compound list is from SOM01 (including 1,4-Dioxane as an SVOC).
2 Some CAS numbers are contractor-specific.
3 Concentration range is implied by the method column (i.e. 8270C v. 8270C_SIM).
4 "Selected SSLs" are risk-based if MCL-based SSLs do not exist. SSLs are current as of November, 2012.
5 RSLs are current as of November, 2012.
6 The PQL goal is calculated at 1/2 the lesser of applicable criteria.
7 Results for non-aqueous samples are reported on a dry-weight basis.
N/A: "Not applicable".
NSL: "No screening level".
DoD QSM v. 4.1 limits are not available. Nominal limits are provided.
DoD QSM v. 4.1 limits are not available. Statistical limits are provided.

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: PEST/PCBs

Analyte[1,6]	CAS[2]	Selected SSL[3,4] (µg/kg)	RSLs Residential Soil Adjusted[4] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[5] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
						LOQs	LODs	DLs	LCL	UCL	RPD
alpha-BHC	319-84-6	0.036	77	226	0.018	1.7	0.85	0.34	60	125	30
beta-BHC	319-85-7	0.13	270	342	0.065	1.7	0.85	0.33	60	125	30
delta-BHC	319-86-8	0.13	270	226	0.065	1.7	0.85	0.32	55	130	30
gamma-BHC (Lindane)	58-89-9	1.2	520	7.75	0.6	1.7	0.85	0.27	60	125	30
Heptachlor	76-44-8	33	110	52.9	16.5	1.7	0.85	0.29	50	140	30
Aldrin	309-00-2	0.65	29	3.63	0.325	1.7	0.85	0.28	45	140	30
Heptachlor epoxide	1024-57-3	4.1	53	52.9	2.05	1.7	0.85	0.22	65	130	30
Endosulfan I	959-98-8	1100	37000	6.32	3.16	1.7	0.85	0.24	15	135	30
Dieldrin	60-57-1	0.061	30	10.5	0.0305	3.3	1.65	0.22	65	125	30
4,4'-DDE	72-55-9	46	1400	114	23	3.3	1.65	0.19	70	125	30
Endrin	72-20-8	81	1800	1.95	0.975	3.3	1.65	0.85	60	135	30
Endosulfan II	33213-65-9	1100	37000	6.32	3.16	3.3	1.65	0.34	35	140	30
4,4'-DDD	72-54-8	6.4	2000	583	3.2	3.3	1.65	0.2	30	135	30
Endosulfan sulfate	1031-07-8	1100	37000	6.32	3.16	3.3	1.65	0.58	60	135	30
4,4'-DDT	50-29-3	67	1700	100	33.5	3.3	1.65	0.31	45	140	30
Methoxychlor	72-43-5	2200	31000	500	250	17	8.5	0.5	55	145	30
Endrin ketone	53494-70-5	68	1800	1.95	0.975	3.3	1.65	0.4	65	135	30
Endrin aldehyde	7421-93-4	68	1800	1.95	0.975	3.3	1.65	0.49	35	145	30
alpha-Chlordane	5103-71-9	13	1600	11	5.5	1.7	0.85	0.21	65	120	30

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: PEST/PCBs

Analyte[1,6]	CAS[2]	Selected SSL[3,4] (µg/kg)	RSLs Residential Soil Adjusted[4] (µg /kg)	Vieques Eco SO (µg /kg)	PQL Goal[5] (µg /kg)	Laboratory-Specific Limits (µg /kg)			Laboratory-Specific Accuracy/Precision Limits (%)		
						LOQs	LODs	DLs	LCL	UCL	RPD
gamma-Chlordane	5103-74-2	13	1600	11	5.5	1.7	0.85	0.23	65	125	30
Toxaphene	8001-35-2	460	440	500	220	33	16.5	7	30	122	30
Decachlorobiphenyl	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*55*	*130*	*N/A*
TCMX	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*70*	*125*	*N/A*
Aroclor-1016	12674-11-2	92	390	8000	46	3.4	1.7	1.2	40	140	30
Aroclor-1221	11104-28-2	0.069	140	8000	0.0345	3.4	1.7	1.58	N/A	N/A	N/A
Aroclor-1232	11141-16-5	0.069	140	8000	0.0345	3.4	2	1.86	N/A	N/A	N/A
Aroclor-1242	53469-21-9	5.3	220	8000	2.65	3.4	1.7	1.16	N/A	N/A	N/A
Aroclor-1248	12672-29-6	5.2	220	8000	2.6	3.4	1.7	1.22	N/A	N/A	N/A
Aroclor-1254	11097-69-1	8.8	110	8000	4.4	3.4	1.7	0.94	N/A	N/A	N/A
Aroclor-1260	11096-82-5	24	220	8000	12	3.4	1.7	1.2	60	130	30
Aroclor-1262	37384-23-5	NSL	NSL	NSL	N/A	3.4	1.7	0.5	N/A	N/A	N/A
Aroclor-1268	11100-14-4	NSL	NSL	NSL	N/A	3.4	1.7	0.5	N/A	N/A	N/A
Decachlorobiphenyl	*SURR*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*60*	*125*	*N/A*

Shading represents screening levels which are less than the laboratory-specific LOD. Refer to Worksheet #11 section 5.
1 Target compound list is from SOM01.
2 Some CAS numbers are contractor-specific.
3 "Selected SSLs" are risk-based if MCL-based SSLs do not exist. SSLs are current as of November, 2012.
4 RSLs are current as of November, 2012.
5 The PQL goal is calculated at 1/2 the lesser of applicable criteria.
6 Low-level method option for Aroclors: By using 2mL as the final volume, Katahdin returns LOQ/LOD/DL 5X lower than usual. This is reflected in the numbers above.
7 Results for non-aqueous samples are reported on a dry-weight basis.
N/A: "Not applicable".
NSL: "No screening level".
DoD QSM v. 4.1 limits are not available. Nominal limits are provided.
DoD QSM v. 4.1 limits are not available. Statistical limits are provided.

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: METALs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (mg/kg)	RSLs Residential Soil Adjusted[5] (mg/kg)	Vieques Eco SO (mg/kg)	PQL Goal[6] (mg/kg)	Laboratory-Specific Limits (mg/kg)		
							LOQs	LODs	DLs
Aluminum	7429-90-5	6020	23000	7700	NSL	3850	30	4	0.51
Antimony	7440-36-0	6020	0.27	3.1	78	0.135	0.1	0.05	0.02
Arsenic	7440-38-2	6020	0.29	0.39	18	0.145	0.5	0.4	0.15
Barium	7440-39-3	6020	82	1500	330	41	0.2	0.1	0.037
Beryllium	7440-41-7	6020	3.2	16	40	1.6	0.1	0.02	0.0041
Cadmium	7440-43-9	6020	0.38	7	32	0.19	0.1	0.02	0.0076
Calcium	7440-70-2	6020	NSL	NSL	NSL	N/A	10	8	3.83
Chromium	7440-47-3	6020	180000	0.29	64	0.145	0.4	0.3	0.05
Cobalt	7440-48-4	6020	0.21	2.3	13	0.105	0.1	0.03	0.0054
Copper	7440-50-8	6020	46	310	70	23	0.3	0.2	0.071
Iron	7439-89-6	6020	270	5500	NSL	135	10	6	2.4
Lead	7439-92-1	6020	14	400	120	7	0.1	0.05	0.007
Magnesium	7439-95-4	6020	NSL	NSL	NSL	N/A	10	8	1.37
Manganese	7439-96-5	6020	21	180	220	10.5	0.2	0.1	0.042
Mercury	7439-97-6	7471	0.1	2.3	0.1	0.05	0.033	0.017	0.0052
Nickel	7440-02-0	6020	20	150	38	10	0.2	0.12	0.026
Potassium	7440-09-7	6020	NSL	NSL	NSL	N/A	100	40	4.6
Selenium	7782-49-2	6020	0.26	39	0.52	0.13	0.5	0.3	0.039
Silver	7440-22-4	6020	0.6	39	560	0.3	0.1	0.04	0.0066
Sodium	7440-23-5	6020	NSL	NSL	NSL	N/A	100	40	2.6
Thallium	7440-28-0	6020	0.14	0.078	1	0.039	0.1	0.04	0.0094
Vanadium	7440-62-2	6020	78	39	130	19.5	0.5	0.4	0.11

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[7]
Analysis Group: METALs

Analyte[1]	CAS[2]	Method[3]	Selected SSL[4,5] (mg/kg)	RSLs Residential Soil Adjusted[5] (mg/kg)	Vieques Eco SO (mg/kg)	PQL Goal[6] (mg/kg)	Laboratory-Specific Limits (mg/kg)		
							LOQs	LODs	DLs
Zinc	7440-66-6	6020	290	2300	120	60	1	0.8	0.13
Cyanide	57-12-5	9012B	2	2.2	15.8	1	0.5	0.4	0.222

Shading represents screening levels which are less than the laboratory-specific LOD. Refer to Worksheet #11 section 5.

1 Target analyte list is from ILM05 (including Hg and CN).

2 Some CAS numbers are contractor-specific.

3 Concentration range is implied by the method column (i.e. 6010 v. 6020).

4 "Selected SSLs" are risk-based if MCL-based SSLs do not exist. SSLs are current as of November, 2012.

5 RSLs are current as of November, 2012.

6 The PQL goal is calculated at 1/2 the lesser of applicable criteria.

7 Results for non-aqueous samples are reported on a dry-weight basis.

N/A: "Not applicable".

NSL: "No screening level".

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

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[3]
Analysis Group: WCHEM

Analyte	CAS[1]	Preferred Units	Laboratory-Specific Limits[2]		
			LOQs	LODs	DLs
pH	PH	PH	N/A	N/A	N/A
Total Organic Carbon (TOC)	TOC	MG_KG	400	200	99.1

1 Some CAS numbers are contractor-specific.
2 There are no PALs or PILs for these WCHEM data, which are used by the Ecological Risk Assessors to evaluate site conditions. TOC data may also be used to calculate site-specific SSLs if deemed necessary.
3 Results for non-aqueous samples are reported on a dry-weight basis.
N/A: "Not applicable".

Page intentionally left blank

SAP Worksheet #15-6 — Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

Matrix: Soil[4]
Analysis Group: GRAINSIZE

Analyte[1]	CAS[2]	Preferred Units[3]
GS03 Sieve 3" (75 mm)	SIEVE75.0	PCT_R
GS05 Sieve 2" (50 mm)	SIEVE50.0	PCT_R
GS06 Sieve 1.5" (37.5 mm)	SIEVE37.5	PCT_R
GS07 Sieve 1" (25.0 mm)	SIEVE25.0	PCT_R
GS08 Sieve 0.75" (19.0 mm)	SIEVE19.0	PCT_R
GS10 Sieve 0.375" (9.5 mm)	SIEVE9.5	PCT_R
Sieve No. 004 (4.75 mm)	SIEVE4.75	PCT_R
Sieve No. 010 (2.00 mm)	SIEVE2.0	PCT_R
Sieve No. 020 (850 um)	SIEVE850	PCT_R
Sieve No. 040 (425 um)	SIEVE425	PCT_R
Sieve No. 060 (250 um)	SIEVE250	PCT_R
Sieve No. 140 (106 um)	SIEVE106	PCT_R
Sieve No. 200 (75um)	SIEVE75	PCT_R
Gravel (%)	GRAVEL	PCT
Sand (%)	14808-60-7	PCT
Coarse Sand (%)	COARSESAND	PCT
Medium Sand (%)	MEDIUMSAND	PCT
Fine Sand (%)	FINESAND	PCT
Fines (%)	FINES	PCT

1 GRAINSIZE list is specific to TestAmerica-Burlington.
2 Some CAS numbers are contractor-specific.
3 There are no PALs or PILs for these GRAINSIZE data, which are used by the Ecological Risk Assessors to evaluate site conditions.
4 Results for non-aqueous samples are reported on a dry-weight basis.

Page intentionally left blank

SAP Worksheet #16 — Project Schedule/Timeline Table

The official project schedule for the PI-21 site will be included in the Site Management Plan (SMP) schedule that is developed and distributed separately.

Page intentionally left blank

SAP Worksheet #17 — Sampling Design and Rationale

Given that the scope of work under this SAP Addendum is SI/Expanded SI, the general sampling rationale and design are based on the objective of determining whether a release has occurred and, if so, whether it warrants further investigation or action. Based on this objective, the sampling design is based on a judgmental (i.e., biased) approach.

Based on review of historical information, the Navy, USEPA, PREQB, and USFWS concurred that the area of PI 21 where a CERCLA-related release may have occurred is the location of the former vertical tank. Since no samples have been collected in this area, collection of a surface soil and a subsurface soil sample at five locations at the location of the former vertical tank is warranted to determine if past releases occurred. Because the historic use of the tank is unknown, a broad suite of analyses (i.e., full TCL/TAL) is warranted.

Page intentionally left blank

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

Site ID	Station ID	Sample ID[2]	Matrix	Depth[1]	Analytical Group	Number of Samples	Sampling SOP Reference
VE-PI-21	VE-PI-21-SB01	VEP21-SS01-0001	SS	0-1' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	Refer to Worksheet #21
		VEP21-SS01P-0001			VOC, SVOC, PEST/PCB, METAL	1 (FD)	
		VEP21-SB01-0406	SB	4-6' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
	VE-PI-21-SB02	VEP21-SS02-0001	SS	0-1' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
		VEP21-SB02-0406	SB	4-6' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
		VEP21-SB02-0406-MS			VOC, SVOC, PEST/PCB, METAL	1 (MS)	
		VEP21-SB02-0406-SD			VOC, SVOC, PEST/PCB, METAL	1 (MSD)	
	VE-PI-21-SB03	VEP21-SS03-0001	SS	0-1' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
		VEP21-SB03-0406	SB	4-6' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
	VE-PI-21-SB04	VEP21-SS04-0001	SS	0-1' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
		VEP21-SB04-0406	SB	4-6' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
	VE-PI-21-SB05	VEP21-SS05-0001	SS	0-1' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
		VEP21-SB05-0406	SB	4-6' BGS	VOC, SVOC, PEST/PCB, METAL, WCHEM, GRAINSIZE	1	
	VE-PI-21-QC	VEP21-TB01-MMDDYY	AQ	N/A	VOC	1 (TB)	
		VEP21-EB01-MMDDYY	AQ	N/A	VOC, SVOC, PEST/PCB, METAL	1 (EB)	

1 The depths above are provided assuming no contamination is suspected. Refer to Table ES-1 for the depth selection process.
2 SS and SB samples end in "-TTBB" for top depth bottom depth (in feet).

Page intentionally left blank

SAP Worksheet #20 — Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations[1]	No. of Field Duplicates	No. of MS/MSDs	No. of Equipment Blanks	No. of VOA Trip Blanks	Total No. of Samples to Lab
SS	VOC	5	1		1	1	8
	SVOC	5	1		1		7
	PEST/PCB	5	1		1		7
	METAL	5	1		1		7
	WCHEM (pH and TOC)	5					5
	GRAINSIZE	5					5
SB	VOC	5		1			7
	SVOC	5		1			7
	PEST/PCB	5		1			7
	METAL	5		1			7
	WCHEM (pH and TOC)	5					5
	GRAINSIZE	5					5

[1] The number of samples shown above reflect that in Worksheet #18.

Page intentionally left blank

SAP Worksheet #21 — Project Sampling SOP References Table

Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, April 2010) Reference numbers refer to the SOP number in the Master Standard Operating Procedures, Protocols and Plans document, Environmental Restoration Program, Vieques, Puerto Rico.

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP A-1	Soil Boring Drilling and Abandonment, April 2010	CH2M HILL	Drill Rig	N	
SOP A-2	Soil Sampling, April 2010	CH2M HILL	Drill Rig	N	
SOP A-3	Homogenization of Soil and Sediment Samples, April 2010	CH2M HILL	Sample containers, stainless steel spoons and stainless steel bowls	N	
SOP A-4	Soil Sampling for VOCs Using the EnCore Sampler, April 2010	CH2M HILL	EnCore Sampler	N	
SOP E-1	Decontamination of Personnel and Equipment, April 2010	CH2M HILL	Decon equipment	N	
None	Waste Management Plan, April 2010	CH2M HILL	Water and soil drums	N	
SOP H-5	Packaging and Shipping Procedures for Samples Not Considered Dangerous Goods, April 2010	CH2M HILL	SOP	N	
SOP H-6	Equipment Blank Preparation, April 2010	CH2M HILL	Sample containers	N	
SOP I-1	Vegetation clearance SOP for Environmental Investigations, April 2010	CH2M HILL	Vegetation clearance equipment	N	

Page intentionally left blank

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Resp. Person	SOP Reference
PID	Calibrate using ambient air and isobutylene 100ppm calibration gas	Recharge battery daily	Visual Inspection	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	Ambient air reads 0.0 ppm +/- 3% Isobutylene gas reads 100 ppm +/- 3% ambient air reads 0.0 ppm ±3%: (if possible).	Follow instructions in manual to clean sensor. Do not use this instrument if unable to calibrate properly.	FTL	None, follow manufacturer's recommendation
GPS	Self calibrating when turned on	Recharge battery daily	Visual inspection	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	GPS gives accuracy which depends on number and position of satellites available. Use only if position shows ±2.5 M or better accuracy	Do not use if insufficiently accurate readings. Wait for better satellite positions.	FTL	None, follow manufacturer's recommendation

Page intentionally left blank

SAP Worksheet #28 — Laboratory QC Samples Table

Refer to Worksheet #28-1, #28-2, #28-3, #28-6, #28-7, and #28-8 of the Final Site Inspection/ Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009). Prior references to the QL refer to the LOQ in this addendum.

For metals and MS or MSD recovery exceedances, perform post-digestion spike for all elements, except Ag, at 2X the indigenous level or 2X the PQL, whichever is greater. Acceptance limits are 75-125%. Corrective action is to run all associated samples by method of standard additions (MSA) or to apply J-flag to specific analytes in the parent sample where acceptance criteria are not met.

Page Intentionally left blank

References

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

CH2M HILL. 2009. *Final Site Inspection /Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico.* February.

CH2M HILL. 2007. *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.

CH2M HILL. 2004. *Draft Phase I RCRA Facility Investigation Report, Former Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico.*

Environmental Research, Inc. (ERI). 2000. *Aerial Photographic Analysis Atlantic Fleet Weapons Training Facility And Eastern Maneuver Area,* Vieques Island, Puerto Rico.

Naval Facilities Engineering Command (NAVFACENGCOM), 2003b. *Final Draft Preliminary Range Assessment Report, Vieques Naval Training Range*, Vieques, Puerto Rico. April.

USEPA. 2002. *Guidance for QAPPs, USEPA QA/G-5, Quality Assurance Management Section (QAMS).* EPA QA/G-5.

USEPA, 1996a. *Soil Screening Guidance: Technical Background Document.* Office of Solid Waste and Emergency Response. Publication 9355.4-17A. EPA540/R-96/128. May.

USEPA, 1996. *Soil Screening Guidance: User's Guide.* Office of Solid Waste and Emergency Response. Publication 9355.4-23. EPA540/R-96/018. April.

Page intentionally left blank

Figures

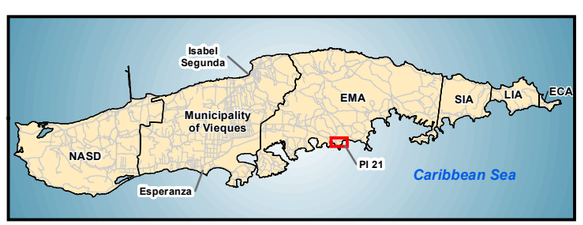
Page Intentionally left blank

(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\PI_21_Site_Features\Figure_1_PI_21_Historical_Imagery_Findings.mxd12/29/2011fcain

ERI Historic Aerial Photo Findings

- 1959 Findings
- 1962 Findings
- 1964 Findings
- 1970 Findings
- 1985 Findings
- 1994 Findings

- Sample Locations
- PI 21

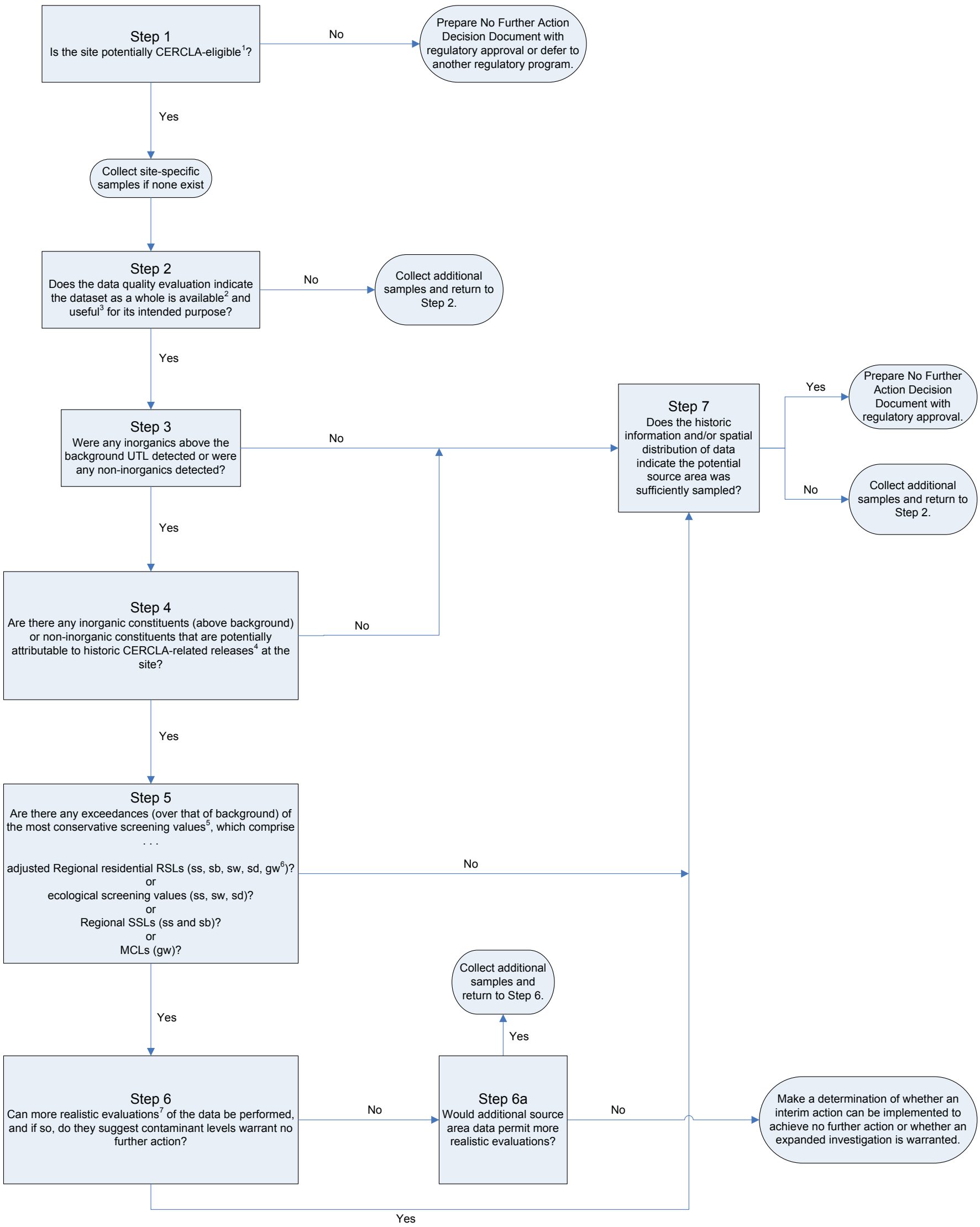


N
W E
S

0 100 200 400 Feet

Figure 1
ERI Historic Aerial Photo Findings
PI 21
Atlantic Fleet Weapons Training Area-Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

CH2MHILL



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

[1] Determination of CERCLA eligibility is described in Worksheet #11 and in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

[2] "Available" data are described in Worksheet #37

[3] "Useful" data are described in Worksheet #37

[4] CERCLA-related releases are defined in Worksheet #11 and in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

[5] For UST sites, PREQB UST Corrective Action Criteria are also included in the evaluation

[6] ss = surface soil; sb = subsurface soil; sw = surface water; sd = sediment; gw = groundwater

[7] Examples of the types of more realistic evaluations that may be performed are described in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

Figure 2
Decision Tree
PI 21
Atlantic Fleet Weapons Training Area - Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\PI_21_Site_Features\Figure 3 - PI21 Proposed Sample Locations.mxd4/11/2013

Legend

- Proposed Sample Location
- PI-21 Boundary

N
W E
S

0 100 200 Feet

2010 Aerial Imagery

Figure 3
Proposed Sample Locations
Sampling and Analysis Plan
PI-21
Atlantic Fleet Weapons Training Area - Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

CH2MHILL®

Attachments

Page Intentionally left blank

Attachment A
Final Site Inspection/ Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M HILL, 2009)

Page Intentionally left blank

Final

Site Inspection/Expanded Site Inspection Sampling and Analysis Plan

7 Consent Order Sites and 16 PI/PAOC Sites

Former Vieques Naval Training Range
Vieques, Puerto Rico

Prepared for

Department of the Navy

NAVFAC ATLANTIC

Contract No. N62470-02-D-3052
CTO-039

February 2009

Prepared by

CH2MHILL

ES072008004TPA

This page intentionally left blank.

Contents

Section **Page**

Contents i

Acronyms and Abbreviations ix

Executive Summary 1

Resumen Ejecutivo 15

SAP Worksheet #1 — Title and Approval Page 29

SAP Worksheet #2 — SAP Identifying Information 31

SAP Worksheet #3 — Distribution List 33

SAP Worksheet #4 — Project Personnel Sign-Off Sheet 37

SAP Worksheet #5 — Project Organizational Chart 39

SAP Worksheet #6 — Communication Pathways 41

SAP Worksheet #7 — Personnel Responsibilities and Qualifications Table 43

SAP Worksheet #8 — Special Personnel Training Requirements Table 47

SAP Worksheet #9a — Project Scoping Session Participants Sheet 49

SAP Worksheet #9b — Project Scoping Session Participants Sheet 50

SAP Worksheet #9c — Project Scoping Session Participants Sheet 59

SAP Worksheet #9d — Project Scoping Session Participants Sheet 65

SAP Worksheet #10 — Problem Definition 73

SAP Worksheet #10a — SWMU 1 (Camp Garcia Landfill) Problem Definition 76

SAP Worksheet #10b — SWMU 2 (Fuels Offloading Site) Problem Definition 80

SAP Worksheet #10c — SWMUs 6/7 (Waste Oil and Paint Accumulation Areas) Problem Definition 83

SAP Worksheet #10d — SWMU 10 (Sewage Treatment Lagoons) Problem Definition 85

SAP Worksheet #10e — AOC A (Diesel Fuel Fill Pipe Area) Problem Definition 87

SAP Worksheet #10f — AOC G (Pump Station and Chlorination Building at Sewage Treatment Lagoons) Problem Definition 89

SAP Worksheet #10g — PI 4 (Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage) Problem Definition 91

SAP Worksheet #10h — PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) Problem Definition 94

SAP Worksheet #10i — PAOC L (Former Paint and Transformer Storage Area) Problem Definition 96

SAP Worksheet #10j — PAOC N (Former Fuel Farm and Filling Station) and PAOC S (Former Power Plant) Problem Definition....98

SAP Worksheet #10k — PI 5 (Former Airfield and Associated Ditches) Problem Definition....100

SAP Worksheet #10l — PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) Problem Definition....103

SAP Worksheet #10m — PI 8 (Former Motor Pool Maintenance Area) Problem Definition....107

SAP Worksheet #10n — PI 10 (Former Wastewater Leach Field) Problem Definition....111

SAP Worksheet #10o — PAOC I (Former Power Plant and Mechanics Shop) Problem Definition....113

SAP Worksheet #10p — PAOC M (Former Fuel Facility) Problem Definition....115

SAP Worksheet #10q — PAOC O (Former Boiler Room in Heat Plant Building 238) Problem Definition....117

SAP Worksheet #10r — PAOC P (Former Water Treatment Pumphouse) Problem Definition....119

SAP Worksheet #10s — PAOC Q/R (Former Boiler Room in Heat Plant Buildings 607 and 617) Problem Definition....121

SAP Worksheet #10t — PAOC X (Debris Area in Ephemeral Stream) Problem Definition....123

SAP Worksheet #10u — Regional Groundwater Problem Definition....125

SAP Worksheet #10u — Regional Groundwater Problem Definition (continued)....126

SAP Worksheet #11 — Project Quality Objectives/Systematic Planning Process Statements....127

SAP Worksheet #12-1 — Measurement Performance Criteria Table....143

SAP Worksheet #12-2 — Measurement Performance Criteria Table....144

SAP Worksheet #12-3 — Measurement Performance Criteria Table....145

SAP Worksheet #12-4 — Measurement Performance Criteria Table....146

SAP Worksheet #12-5 — Measurement Performance Criteria Table....147

SAP Worksheet #12-6 — Measurement Performance Criteria Table....148

SAP Worksheet #12-7 — Measurement Performance Criteria Table....149

SAP Worksheet #12-8 — Measurement Performance Criteria Table....150

SAP Worksheet #12-9 — Measurement Performance Criteria Table....151

SAP Worksheet #12-10 — Measurement Performance Criteria Table....152

SAP Worksheet #12-11 — Measurement Performance Criteria Table....153

SAP Worksheet #12-12 — Measurement Performance Criteria Table....154

SAP Worksheet #12-13 — Measurement Performance Criteria Table....155

SAP Worksheet #12-14 — Measurement Performance Criteria Table....156

SAP Worksheet #12-15 — Measurement Performance Criteria Table 157
SAP Worksheet #12-16 — Measurement Performance Criteria Table 158
SAP Worksheet #12-17 — Measurement Performance Criteria Table 159
SAP Worksheet #12-18 — Measurement Performance Criteria Table 160
SAP Worksheet #12-19 — Measurement Performance Criteria Table 161
SAP Worksheet #12-20 — Measurement Performance Criteria Table 162
SAP Worksheet #12-21 — Measurement Performance Criteria Table 163
SAP Worksheet #12-22 — Measurement Performance Criteria Table 164
SAP Worksheet #12-23 — Measurement Performance Criteria Table 165
SAP Worksheet #12-24 — Measurement Performance Criteria Table 166
SAP Worksheet #13 — Secondary Data Criteria and Limitations Table 167
SAP Worksheet #14 — Summary of Project Tasks 177
SAP Worksheet #15-1 — Reference Limits and Evaluation Table.....185
SAP Worksheet #15-1a — Reference Limits and Evaluation Table.....187
SAP Worksheet #15-1b — Reference Limits and Evaluation Table 189
SAP Worksheet #15-1c — Reference Limits and Evaluation Table 191
SAP Worksheet #15-2 — Reference Limits and Evaluation Table.....193
SAP Worksheet #15-2a — Reference Limits and Evaluation Table.....196
SAP Worksheet #15-2b — Reference Limits and Evaluation Table 199
SAP Worksheet #15-3 — Reference Limits and Evaluation Table.....202
SAP Worksheet #15-3a — Reference Limits and Evaluation Table.....203
SAP Worksheet #15-3b — Reference Limits and Evaluation Table 204
SAP Worksheet #15-4 — Reference Limits and Evaluation Table.....205
SAP Worksheet #15-4a — Reference Limits and Evaluation Table.....206
SAP Worksheet #15-4b — Reference Limits and Evaluation Table 207
SAP Worksheet #15-5 — Reference Limits and Evaluation Table.....208
SAP Worksheet #15-6 — Reference Limits and Evaluation Table.....209
SAP Worksheet #15-6a — Reference Limits and Evaluation Table.....211
SAP Worksheet #15-6b — Reference Limits and Evaluation Table 213
SAP Worksheet #15-7 — Reference Limits and Evaluation Table.....214
SAP Worksheet #15-8 — Reference Limits and Evaluation Table.....215
SAP Worksheet #15-9 — Reference Limits and Evaluation Table.....216
SAP Worksheet #15-9a — Reference Limits and Evaluation Table.....218
SAP Worksheet #15-10 — Reference Limits and Evaluation Table.....220

SAP Worksheet #15-10a — Reference Limits and Evaluation Table 223
SAP Worksheet #15-11 — Reference Limits and Evaluation Table 226
SAP Worksheet #15-11a — Reference Limits and Evaluation Table 227
SAP Worksheet #15-12 — Reference Limits and Evaluation Table 228
SAP Worksheet #15-12a — Reference Limits and Evaluation Table 229
SAP Worksheet #15-13 — Reference Limits and Evaluation Table 230
SAP Worksheet #15-14 — Reference Limits and Evaluation Table 231
SAP Worksheet #15-14a — Reference Limits and Evaluation Table 232
SAP Worksheet #15-15 — Reference Limits and Evaluation Table 233
SAP Worksheet #15-15a — Reference Limits and Evaluation Table 234
SAP Worksheet #15-16 — Reference Limits and Evaluation Table 235
SAP Worksheet #15-17 — Reference Limits and Evaluation Table 236
SAP Worksheet #15-18 — Reference Limits and Evaluation Table 237
SAP Worksheet #15-19 — Reference Limits and Evaluation Table 238
SAP Worksheet #15-20 — Reference Limits and Evaluation Table 239
SAP Worksheet #15-21 — Reference Limits and Evaluation Table 240
SAP Worksheet #15-22 — Reference Limits and Evaluation Table 241
SAP Worksheet #15-23 — Reference Limits and Evaluation Table 242
SAP Worksheet #15-24 — Reference Limits and Evaluation Table 243
SAP Worksheet #16 — Project Schedule/Timeline Table 245
SAP Worksheet #17 — Sampling Design and Rationale 255
SAP Worksheet #18 — Sampling Locations and Methods/SOP Requirements Table 257
SAP Worksheet #19 — Analytical SOP Requirements Table 277
SAP Worksheet #20 — Field Quality Control Sample Summary Table 279
SAP Worksheet #21 — Project Sampling SOP References Table 285
SAP Worksheet #22 — Field Equipment Calibration, Maintenance, Testing, and Inspection Table 287
SAP Worksheet #23 — Analytical SOP References Table 289
SAP Worksheet #24 — Analytical Instrument Calibration Table 293
SAP Worksheet #25 — Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table 301
SAP Worksheet #26 — Sample Handling System 305
SAP Worksheet #27 — Sample Custody Requirements Table 307
SAP Worksheet #28-1 — Laboratory QC Samples Table 309
SAP Worksheet #28-1a — LCS, MS/MSD and Surrogate Recovery Limits 311

SAP Worksheet #28-2 — Laboratory QC Samples Table....313
SAP Worksheet #28-2a — LCS, MS/MSD and Surrogate Recovery Limits....317
SAP Worksheet #28-3 — Laboratory QC Samples Table....319
SAP Worksheet #28-3a — LCS, MS/MSD and Surrogate Recovery Limits....323
SAP Worksheet #28-4 — Laboratory QC Samples Table....325
SAP Worksheet #28-5 — Laboratory QC Samples Table....329
SAP Worksheet #28-6 — Laboratory QC Samples Table....331
SAP Worksheet #28-7 — Laboratory QC Samples Table....336
SAP Worksheet #28-8 — Laboratory QC Samples Table....337
SAP Worksheet #28-9 — Laboratory QC Samples Table....339
SAP Worksheet #28-9a — LCS, MS/MSD and Surrogate Recovery Limits....343
SAP Worksheet #28-10 — Laboratory QC Samples Table....345
SAP Worksheet #28-10a — LCS, MS/MSD and Surrogate Recovery Limits....351
SAP Worksheet #28-11 — Laboratory QC Samples Table....353
SAP Worksheet #28-11a — LCS, MS/MSD and Surrogate Recovery Limits....357
SAP Worksheet #28-12 — Laboratory QC Samples Table....359
SAP Worksheet #28-13 — Laboratory QC Samples Table....362
SAP Worksheet #28-14 — Laboratory QC Samples Table....365
SAP Worksheet #28-15 — Laboratory QC Samples Table....370
SAP Worksheet #28-16 — Laboratory QC Samples Table....374
SAP Worksheet #28-17 — Laboratory QC Samples Table....377
SAP Worksheet #28-17a — LCS, MS/MSD and Surrogate Recovery Limits....379
SAP Worksheet #28-18 — Laboratory QC Samples Table....381
SAP Worksheet #28-18a — LCS, MS/MSD and Surrogate Recovery Limits....383
SAP Worksheet #28-19 — Laboratory QC Samples Table....385
SAP Worksheet #28-19a — LCS, MS/MSD and Surrogate Recovery Limits....387
SAP Worksheet #28-20 — Laboratory QC Samples Table....388
SAP Worksheet #28-21 — Laboratory QC Samples Table....390
SAP Worksheet #28-22 — Laboratory QC Samples Table....394
SAP Worksheet #28-23 — Laboratory QC Samples Table....396
SAP Worksheet #28-24 — Laboratory QC Samples Table....397
SAP Worksheet #29 — Project Documents and Records Table....399
SAP Worksheet #29-a — Project Documents and Records Table....400
SAP Worksheet #30 — Analytical Services Tables....401

SAP Worksheet #31 — Planned Project Assessments Table **409**
SAP Worksheet #32 — Assessment Findings and Corrective Action Responses **411**
SAP Worksheet #32-1 — Corrective Action Form. **412**
SAP Worksheet #32-2 — Field Performance Audit Checklist **413**
SAP Worksheet #32-3 — Safe Work Observation Form **415**
SAP Worksheet #33 — QA Management Reports Table **417**
SAP Worksheet #34 — Verification (Step I) Process Table **419**
SAP Worksheet #35 — Validation (Steps IIa and IIb) Process Table **421**
SAP Worksheet #36 — Analytical Data Validation (Steps IIa and IIb) Summary Table **423**
SAP Worksheet #37 — Usability Assessment **425**
References **427**

Attachments:

A Figures

1 SI/Expanded SI Evaluation Decision Tree
2 Site Location Map
3 Camp Garcia Area Sites
4 Proposed Additional Investigation (SWMU 1)
5 Composite Figure of Historical Tank Locations and Proposed Sampling Locations, SWMU 2
6 Proposed Surface Soil and Subsurface Soil Sampling Locations at SWMU 6 and 7
7 SWMU 10 and AOC G Sample Locations, 1983 Aerial Photograph
8 AOC A Approximate Excavation Boundaries and Confirmation Sample Locations
9 Potentiometric Surface Elevation 12-29-08
10 PI 7 Central Subsection – Former Quarry
11 Former Tar Drum Disposal Area
12 Proposed Additional Surface Soil Sample Locations at PAOC L
13 PAOCs N and S Geophysical Investigation, 1983 Aerial Photograph
13-A PAOC S UST Diagram
14 PI-5 1959 Aerial Photograph
15 PI-5 and PI-8 1962 Aerial Photograph
16 PI-5 Sample Locations, 1962 Aerial Photograph
17 PI-5 1964 Aerial Photograph
18 PI-5 2005 Aerial Photograph
19 PI-6 1959 Aerial Photograph
20 PI-6 1962 Aerial Photograph
21 PI-6 1964 Aerial Photograph
22 PI-6 1983 Aerial Photograph
23 PI-6 1985 Aerial Photograph

24 PI-6 1994 Aerial Photograph
25 PI-6 2005 Aerial Photograph
26 PI-8 1959 Aerial Photograph
27 PI-8 Sample Locations, 1962 Aerial Photograph
28 PI-8 1964 Aerial Photograph
29 PI-8 1970 Aerial Photograph
30 PI-8 1985 Aerial Photograph
31 PI-8 2005 Aerial Photograph
32 PI-10 Sample Locations, 1962 Aerial Photograph
33 PI-10 1964 Aerial Photograph
34 PI-10 2005 Aerial Photograph
35 PAOCs I, O 1962 Aerial Photograph
36 PAOCs I, M, O and Q Sample Locations, 1983 Aerial Photograph
37 PAOC I 1994 Aerial Photograph
38 PAOC M 1983 Aerial Photograph
39 PAOC M 2005 Aerial Photograph
40 PAOC M Schematic Map Showing Potential Location of Building
41 PAOC P and X 1964 Aerial Photograph
42 PAOC P and X 1970 Aerial Photograph
43 PAOC P and X 1983 Aerial Photograph
44 PAOC P and X 1985 Aerial Photograph
45 PAOC P and X 1994 Aerial Photograph
46 PAOC P and X 2000 Aerial Photograph
47 PAOC P and X 2004 Aerial Photograph
48 PAOCs P and X Sample Locations, 2005 Aerial Photograph
49 PAOC X 1936-37 Aerial Photograph
50 PAOC X 1959 Aerial Photograph
51 VOC Detections and Exceedances and Inorganic Exceedances in Groundwater
52 Generalized Geology of Former VNTR

B Additional Tables

1 PI-6 Surface Soil Detection and Exceedance Results
2 PI-8 Surface Soil Detection and Exceedance Results
3 PI-10 Surface Soil Detection and Exceedance Results
4 PAOC X Surface Soil Detection and Exceedance Results

C Standard Operating Procedures

C-1 TPH Analysis using Petro-FLAG Field Assay Kit
C-2 Electromagnetic Induction
C-3 Magnetometry

C-4 Vegetation Clearance SOP for Environmental Investigations
C-5 Slide Hammer Soil Sampling

D Data Management Plan

E Final Responses to EPA and EQB Comments on the Draft Site Inspection/Expanded Site Inspection Sampling and Analysis Plan

Acronyms and Abbreviations

AOC	Area of Concern
AST	aboveground storage tank
ASTM	American Society for Standards and Materials
AVGAS	aviation gasoline
BTEX	benzene, toluene, ethylbenzene, xylene
CA	corrective action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CLP	Contract Laboratory Program
COC	chain of custody
CRDL	contract-required detection limit
CSM	Conceptual Site Model
CTO	Contract Task Order
°C	degrees Celsius
DAF	dilution/attenuation factor
DoD	Department of Defense
DOI	Department of the Interior
DQE	data quality evaluation
DQI	data quality indicator
DQO	data quality objective
DRO	diesel range organics
EIS	Environmental Information Specialist
EQB	Environmental Quality Board
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
FID	Flame Ionization Detector
FSP	Field Sampling Plan
ft	foot/feet
FTL	Field Team Leader
GC	gas chromatograph
GPS	Global Positioning System
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
ICP	inductively coupled plasma
IDW	investigation-derived waste
IDWMP	Investigation-derived Waste Management Plan
LCS	laboratory control sample

lf	linear feet
LFB	laboratory fortified blank
LIMS	Laboratory Information Management Systems
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MACTEC	MACTEC Inc.
MCL	maximum contaminant level
MDL	method detection limit
mg/kg	milligrams per kilogram
MOGAS	unleaded gasoline
MPC	measurement performance criteria
MQAPP	Master Quality Assurance Project Plan
MS	mass spectrometer
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl tert butyl ether
N/A	not applicable
Navy	Department of the Navy
NIRIS	Navy Installation Restoration Information System
NPL	National Priorities List
OU	operable unit
OVM	organic vapor monitor
PA/SI	Preliminary Assessment/Site Investigation
PAL	project action limit
PAOC	potential area of concern
PCB	polychlorinated biphenyl
PDF	portable document format
PI	photo-identified site
PID	photoionization detector
PM	Project Manager
POC	Point of Contact
PQO	project quality objective
PREQB	Puerto Rico Environmental Quality Board
PT	proficiency testing
QA	quality assurance
QAMS	Quality Assurance Management Section
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RL	Reporting Limit
RPD	relative percent difference
RPM	Remedial Project Manager

RSD	relative standard deviation
RSL	Regional Screening Level
RT	retention time
SAP	Sampling and Analysis Plan
SB	Subsurface Soil Sample
SD	Sediment Sample
SS	Surface Soil Sample
SSC	Site Safety Coordinator
SSC-HW	Site Safety Coordinator Hazardous Waste
SD	standard deviation
SDG	sample delivery group
SOP	standard operating procedure
SRM	standard reference material
SSL	soil screening level
SVOA	semivolatile organic analytes
SVOC	semivolatile organic compounds
SW	surface water
SWMU	solid waste management unit
TCLP	Toxicity Characteristic Leaching Procedure
TCLPV	Toxicity Characteristic Leaching Procedure, Volatiles
TCLPS	Toxicity Characteristic Leaching Procedure, Semi-volatiles
TCLPH	Toxicity Characteristic Leaching Procedure, Herbicides
TCLPM	Toxicity Characteristic Leaching Procedure, Metals
TCLPP	Toxicity Characteristic Leaching Procedure, Pesticides
TBD	to be determined
TSA	Technical Systems Audit
U.S.	United States
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UTL	upper tolerance limit
VNTR	Vieques Naval Training Range
VOA	volatile organic analytes
VOC	volatile organic compound

Page Intentionally Left Blank

Executive Summary

The objective of a Site Inspection (SI) is "release assessment." More specifically, an SI is intended to:

- Determine whether a release of hazardous waste or hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related activities and, if so,
- Determine whether a suspected release warrants further action

An Expanded SI has generally the same objective as an SI, but differs in that historical data collected during an SI suggest additional data are necessary to draw the release assessment conclusions with sufficient certainty. The decision analysis framework for drawing the release assessment conclusions for an SI/Expanded SI is shown in Figure 1.

This Sampling and Analysis Plan (SAP) comprises the activities that will be performed to conduct an SI at 11 sites and an Expanded SI at 12 sites at the Former Vieques Naval Training Range (VNTR) on east Vieques, Puerto Rico. The locations of the 23 sites within the former VNTR are shown in Figure 2. Seven of the sites are solid waste management units (SWMUs) and areas of concern (AOCs) identified in the Resource Conservation and Recovery Act (RCRA) Consent Order (RCRA-02-99-7301) between the United States Environmental Protection Agency (USEPA) and Navy, issued January 20, 2000. The remaining 15 sites are photo-identified (PI) sites and potential areas of concern (PAOCs), identified via historical aerial photograph analysis or from other historical records.

As noted above, 12 of the 23 sites will undergo an Expanded SI. These 12 sites were previously investigated via an SI (or equivalent investigation), the results, conclusions, and recommendations of which are presented in the *Final Preliminary Assessment/Site Inspection Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2008). The 12 sites that will undergo an Expanded SI are:

- SWMU 1 – Camp Garcia Landfill
- SWMU 2 – Fuels Offloading Site
- SWMU 6/7 – Waste Oil and Paint Accumulation Areas
- SWMU 10 – Sewage Treatment Lagoons
- AOC A – Diesel Fuel Fill Pipe Area
- AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons
- PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage
- PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area
- PAOC L – Former Paint and Transformer Storage Area

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 ha hecho todo lo posible 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.

- PAOC N – Former Fuel Farm and Filling Station
- PAOC S – Former Power Plant

In addition to the 12 sites identified above, 11 PI/PAOC sites have been identified by the Navy, United States Environmental Protection Agency (USEPA), Puerto Rico Environmental Quality Board (PREQB), and United States Fish and Wildlife Service (USFWS) as warranting an SI based on information regarding past activities there. These 11 sites are:

- PI 5 – Former Airfield and Associated Ditches
- PI 6 – Former PCB Storage Pad and Vehicle Wash Pad
- PI 8 – Former Motor Pool Maintenance Area
- PI 10 – Former Wastewater Leach Field
- PAOC I – Former Power Plant and Mechanics Shop
- PAOC M – Former Fuel Facility
- PAOC O – Former Boiler Room in Heat Plant Building 238
- PAOC P – Former Water Treatment Pumphouse
- PAOC Q/R – Former Boiler Room in Heat Plant Building 607 (PAOC Q). Former boiler house Building 617 (PAOC R).
- PAOC X – Debris Area in Ephemeral Stream

In addition to the above sites, groundwater along the downgradient boundary of Camp Garcia will be evaluated due to the existence of multiple sites within Camp Garcia (Figure 3). The purpose of this evaluation is to determine if the quality of the groundwater migrating from beneath Camp Garcia has been affected by any of the sites within the facility boundary, including those sites recommended for no further action (i.e., SWMU 4, PAOC J, and PAOC K) in the Final PA/SI Report (CH2M HILL, 2008) pending this regional groundwater evaluation and sites where no groundwater information has been collected (e.g., SWMUs 6/7). Should the groundwater data along the downgradient boundary of Camp Garcia suggest further evaluation is warranted to identify a potential source of contamination, an individual site or sites may be further evaluated, including those currently recommended for no further action pending the regional groundwater evaluation. The 23 specific sites to be investigated via the SI/Expanded SI are shown in Figures 4 through 51.

Table ES-1 summarizes, by site, the historical information pertinent to release assessment, the site-specific objective(s) of the proposed investigation, the general investigation approach, the specific tasks to be implemented and sample analyses to be performed, and how the resulting data will be evaluated with respect to the specific investigation objective(s). More detail regarding the investigation approach at each site is contained in various worksheets within the SAP, especially Worksheets 10 and 11.

SAP Format

This SAP has been prepared in accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (USEPA, 2005) and the USEPA Guidance for QAPPs, USEPA QA/G-5, QAMS (USEPA, 2002), and contains the 37 worksheets identified in Part 2A. It also contains several attachments that support the information presented in the worksheets. There are several other items of note to facilitate review of the SAP:

- As noted previously, this SAP is for 23 sites. Therefore, several worksheets are organized such that general information or information applicable to all sites is presented initially in a "general" worksheet and then site-specific worksheets are attached to the "general" worksheet to present site-specific information. Worksheet 10 is an example of this, where general information relevant to all sites is presented in an initial worksheet, followed by site-specific problem definition worksheets labeled as "10a," "10b," "10c," etc.
- For the 12 sites where an Expanded SI is to be performed, information provided in this SAP is a summary of the detailed information compiled in the Final Preliminary Assessment/Site Investigation (PA/SI) Report (CH2M HILL, 2008). However, for the 11 sites that will undergo an SI, the historical information has not been previously compiled in a single document. Therefore, more detailed information for these 11 sites is provided in this SAP (both in individual worksheets as well as attached figures and tables) in order to compile the historical information in a single place.
- As noted previously, the overall objective of the SI/Expanded SI is release assessment. However, minor modifications, incidental activities, or other site-specific objectives apply variously to individual sites. These are explained in the appropriate worksheets. Further, they are all intended to help achieve the overall release assessment objective at each site.
- Investigative procedures to be followed during the SI/Expanded SI are the applicable Standard Operating Procedures (SOPs) and protocols in the MQAPP (CH2M HILL, 2007b). SOPs to be followed during the SI/Expanded SI that are not contained within the MQAPP are attached to the SI/Expanded SI SAP.
- Proposed sampling locations shown on the attached figures are approximate. The actual sampling locations will be based on observations made in the field during site visits conducted by the Navy, USEPA, PREQB, and USFWS, and their support contractors.

Page Intentionally Left Blank

TABLE ES-1

SI/Expanded SI Summary Table

Site	Pertinent Historical Information	SI or Expanded SI Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
SWMU 1 - Camp Garcia Landfill	Unlined landfill reportedly used for approximately 25 years for disposal of non-hazardous, municipal waste (paper, cardboard, food packaging, rags, wood, scrap metal, and yard debris) from personnel stationed at Camp Garcia. Soil and groundwater data collected in 2004, but not spatially adequate to sufficiently characterize potential source areas.	1. Finish delineating the horizontal extent of landfill.	Use geophysics to delineate horizontal boundary.	Perform magnetic and electromagnetic surveys at the north and south ends of the landfill to confirm boundary (see Figure 4).	N/A	Interpret geophysical results and update map showing horizontal extent of landfill.
		2. Determine the nature and vertical extent of debris.	Use visual observation in test pits.	Perform test pitting and visual observation of debris at 20 locations (see Figure 4) spaced approximately evenly across the landfill and within each apparent trench observed in historical aerial photographs.	N/A	Describe waste material encountered, especially potential sources of hazardous waste or hazardous constituents.
		3. Determine whether a release(s) has occurred and the appropriate next step.	Collect soil, groundwater, and ephemeral stream samples.	Collect a three-point composite soil sample within the vertical debris profile and a subsurface soil sample directly below the waste in each test pit. Install four monitoring wells; sample all existing and new monitoring wells. Collect four samples (soil if dry; surface water/sediment if saturated) from ephemeral stream adjacent to and upstream of landfill (see Figure 4). Collect one sample (soil if dry; surface water/sediment if saturated) from depositional area near southern boundary of the landfill. Collect one sample (soil if dry; surface water/sediment if saturated) from the terminus of the ephemeral stream just north of Chivas Lagoon..	VOCs, SVOCs, pesticides, PCBs, inorganics, explosives	Release assessment decision analysis (see Figure 1).
SWMU 2 - Fuels Offloading Site	Eight historical above-ground storage tanks (ASTs) used for approximately 25 years to store diesel fuel, leaded/unleaded/aviation gasoline, and JP-5 fuel transferred via pipeline from a shoreline offloading area. Several soil samples collected in 2004, but not spatially adequate to sufficiently characterize potential source areas.	Determine whether a release has occurred and, if so, if further action is warranted.	Collect soil and potentially groundwater samples.	Collect co-located surface/subsurface soil samples beneath each of the eight former ASTs, two along the former pipeline, and four in the fuel offloading area (see Figure 5). If contamination is observed or suspected during soil sampling, collect additional samples laterally to delineate source area and confer with regulatory agencies on the need for groundwater sampling.	BTEX, MTBE, PAHs, lead, TPH-GRO, TPH-DRO	Release assessment decision analysis (see Figure 1).
SWMUs 6/7 - Waste Oil and Paint Accumulation Areas	A concrete pad and former chain-link cage used for approximately 17 years to store waste oil and paint. Staining has been observed just off concrete pad. Surface soil samples collected in 2000 around the perimeter of the concrete pad identified VOCs and SVOCs and several inorganics above background.	Determine if the probable release identified in 2000 surface soil is still present and whether subsurface soil is contaminated and, if so, whether further action is warranted.	Collect soil samples.	Collect co-located surface/subsurface soil samples at 6 locations around the perimeter of the concrete pad (see Figure 6).	VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).

Page Intentionally Left Blank

TABLE ES-1 (continued)

SI/Expanded SI Summary Table

Site	Pertinent Historical Information	SI or Expanded SI Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
SWMU 10 - Sewage Treatment Lagoons	Four unlined lagoons used for approximately 50 years for treatment of domestic sewage from Camp Garcia. Soil and groundwater data from 2000 and 2004 suggest there was not a CERCLA-related release that poses a potentially unacceptable risk. However, there is uncertainty in the thallium results in that the analytical method available at the time was prone to falsely elevated results.	Confirm historical thallium results were falsely elevated and that actual thallium concentrations do not warrant further action.	Re-sample soil and groundwater.	Collect two co-located surface/subsurface soil samples from each of the four lagoons and groundwater samples from the existing monitoring wells (see Figure 7).	Thallium	Historical data (except thallium) and new thallium data via Step 6 of the release assessment decision analysis (Figure 1).
AOC A - Diesel Fuel Fill Pipe Area	15,000-gallon diesel fuel USTs and associated fill pipe used for approximately 25 years to store diesel fuel for a generator at OP-1. USTs and piping removed, as well as some contaminated soil. Confirmatory soil samples suggest a release(s) occurred along the fuel fill pipe, but that the release may be relatively isolated.	Eliminate potential source area and confirm site does not warrant further action.	Remove some additional soil along the length of the former fill pipe and collect confirmatory soil samples.	Following additional soil removal, collect confirmatory soil samples (on each side-wall and bottom of excavation) every 5 linear feet (see Figure 8).	TPH-DRO	Comparison of confirmatory sample results to PREQB TPH Land Pollution Control Corrective Action Levels. Confer with PREQB UST division to determine if sufficient soil removed.
AOC G - Pump Station and Chlorination Building at Sewage Treatment Lagoons	Building used for approximately 20 years to chlorinate and pump effluent from SWMU 10 to the sea. Soil sample data from 2004 (surface soil at AOC G and lagoon material at SWMU 10) suggest there was not a CERCLA-related release at AOC G that poses a potentially unacceptable risk. However, spatial distribution of samples not adequate to sufficiently characterize potential source area at AOC G.	Determine whether a release from potential historical discharge of pump maintenance fluids occurred and, if so, whether it warrants further action.	Collect soil samples.	Collect co-located surface/subsurface soil samples from two locations near the building door in an area where pump maintenance fluids would most likely have been spilled or otherwise discharged (see Figure 7).	VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).
PI 4 - Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas Used for Fuel Bladder Storage	Multiple sources of potential releases but, based on 2006 sample data, potential release likely occurred only from trenched area. Groundwater data collected in this area showed relatively low (several ppb) exceedance of Federal Maximum Contaminant Level (MCL) for TCE. Several other VOCs were detected in groundwater in this area that were not detected in soil.	Confirm initial groundwater data and determine if higher VOC concentrations exist upgradient or downgradient of MCL exceedance. Based on groundwater data, determine the appropriate action for groundwater and whether additional soil investigation is warranted.	Collect groundwater samples.	Confirm groundwater flow direction by measuring water levels in all existing wells. Install a monitoring well upgradient and downgradient of existing well with MCL exceedance (see Figure 9) and collect groundwater samples from existing and newly installed wells.	VOCs	Release assessment decision analysis (see Figure 1). Based on distribution of groundwater data, determine if potential soil source area exists that has not yet been sampled.
PI 7 - Former Quarry, Tar Drum Disposal Area, and Radar Communication Area	Data collected across site in 2006, including immediately around tar drums, suggest there was not a CERCLA-related release that poses a potentially unacceptable risk. However, there is uncertainty whether the drums represent a potential future source of contamination.	Eliminate potential source of release and confirm site does not warrant further action.	Remove drums and confirm they have not released hazardous constituents that pose a potentially unacceptable risk.	Remove drums (see Figures 10 and 11) and collect confirmatory soil samples immediately beneath the drums.	VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).

Page Intentionally Left Blank

TABLE ES-1 (continued)

SI/Expanded SI Summary Table

Site	Pertinent Historical Information	SI or Expanded SI Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
PAOC L - Former Paint and Transformer Storage Area	Small (15 ft x 15 ft) concrete block building. Surface soil data collected in 2006 adjacent to the four building walls identified elevated (relative to other sites on east Vieques) levels of pesticides. Additionally, groundwater data from the well at the site identified two VOCs below MCLs.	Determine the lateral extent of elevated pesticide concentrations in surface soil. Confirm constituent concentrations in groundwater are low (i.e., less than MCLs and/or unlikely to pose unacceptable risk).	Collect surface soil samples and a groundwater sample.	Collect surface soil samples from eight locations around the four 2006 sample locations, but further out from the building (see Figure 12). The sample results from the eight samples will be evaluated and addition samples will be collected if warranted. Re-sample the existing monitoring well.	Soil: pesticides Groundwater: VOCs, SVOCs, pesticides, PCBs, and inorganics	Soil (new and previous): Release assessment decision analysis (see Figure 1). Groundwater: Compare new data to initial data. If new concentrations are higher than initial concentrations, perform release assessment decision analysis (see Figure 1).
PAOC N - Former Fuel Farm and PAOC S - Former Power Plant	Historical data collected in 2006 do not suggest there was a CERCLA-related release at either site that warrants further action, but there is uncertainty regarding the potential presence of an underground fuel line between the two sites due to close proximity and nature of historical activities.	Determine whether there is an underground fuel line between the two sites.	Use geophysics to determine if there is an underground fuel line.	Perform magnetic and electromagnetic surveys within area where underground pipeline would likely have traversed (see Figure 13).	N/A	Interpret geophysical results. If underground fuel line is identified, confer with ERP Technical Subcommittee to determine locations of soil samples. No soil sampling will be necessary if no underground fuel line is identified.
PI 5 - Former Airfield and Associated Ditches	Airfield where potential staining was observed in historical aerial photographs. Drainage ditches around airfield likely received stormwater runoff. No historical soil samples exist to determine whether release(s) occurred.	Determine whether historical activities resulted in a release(s) to the airfield and associated stormwater ditches.	Collect soil samples.	Collect co-located surface/subsurface soil samples on airfield (one location) and within adjacent drainage ditches (seven locations), as shown in Figure 16.	VOCs, SVOCs, inorganics	Release assessment decision analysis (see Figure 1).
PI 6 - Former PCB Storage Pad and Vehicle Wash Pad	No PCBs detected on wipe samples collected from former PCB storage pad. Both PCB storage pad and vehicle wash pad likely allowed runoff to reach soil. PCB storage pad also contains drain to a sump. No historical soil samples exist at these locations to determine whether release(s) occurred.	Determine whether historical activities at the PCB storage pad and/or vehicle wash pad resulted in a release(s).	Collect soil samples.	Collect co-located surface/subsurface soil samples from the sump (one location), adjacent to the PCB storage pad (two locations), and adjacent to the vehicle wash pad (one location), as shown in Figure 22.	PCB storage pad and sump: PCBs Vehicle wash pad: VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).
PI 8 - Former Motor Pool Maintenance Area	Historical information and aerial photographs suggest the area was a motor pool maintenance area; car wash; oil drum storage and disposal area; drum storage area for asphalt emulsions; area of metallic, multi-colored material; a potential storage area for hazardous materials and petroleum products; and had light-toned material observed in the southeast area. Surface soil samples were collected in 2002 from areas of stained soil in the maintenance area, but not spatially adequate to sufficiently characterize potential source areas.	Determine whether historical activities across the site resulted in a release(s).	Collect soil samples.	Collect co-located surface/subsurface soil samples from the motor pool maintenance area (five locations with one of the five also located at a concrete basin with a steel pipe and valve); asphalt emulsion drum storage area, if drums are found using a metal detector (one location); metallic, multi-colored material area (two locations); light-toned material area (two locations); and drainage ditch adjacent to the maintenance area (one location), as shown in Figure 27.	Motor pool maintenance area and adjacent drainage ditch: VOCs, SVOCs, PCBs, and inorganics Asphalt emulsion drum storage area: SVOCs and inorganics Metallic, multi-colored material area: inorganics Light-toned material area: VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).

Page Intentionally Left Blank

TABLE ES-1 (continued)

SI/Expanded SI Summary Table

Site	Pertinent Historical Information	SI or Expanded SI Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
PI 10 - Former Wastewater Leach Field	Six impoundments possibly used as a leach field for wastewater treatment. Surface soil samples collected in 2002, but not spatially adequate to sufficiently characterize potential source area because subsurface soil samples were not collected and site is bermed leach field.	Determine whether historical activities at the site resulted in a release(s).	Collect soil samples.	Collect co-located surface/subsurface soil samples from approximately the same three locations sampled in 2002 (see Figure 32).	VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).
PAOC I - Former Power Plant and Mechanics Shop	Relatively little historical information exists other than building use for boiler- and mechanics-related activities. Site visit to building identified two door and three pipe penetrations. Past use of pipes is unknown.	Determine whether historical activities at the site resulted in a release(s).	Collect soil samples.	Collect co-located surface/subsurface soil samples around building (one set adjacent to each door and pipe penetration), as shown in Figure 36.	VOCs, SVOCs, PCBs, inorganics	Release assessment decision analysis (see Figure 1).
PAOC M - Former Fuel Facility	Relatively little historical information exists other than building use as dispatch office, sleeping quarters, and fuel facility. Building has been demolished.	Determine whether historical activities at the site resulted in a release(s).	Use soil coring and visual/photoionization detector (PID) observations to determine whether release occurred; collect soil samples if release is suspected.	Advance continuous soil borings at four locations around former building footprint and screen visually and with PID. If a release is suspected, collect a soil sample(s) from the suspected contaminated zone.	BTEX, MTBE, PAHs, lead, TPH-GRO, TPH-DRO	If samples are collected, perform release assessment decision analysis (see Figure 1).
PAOC O - Former Boiler Room in Heat Plant Building 238	Relatively little historical information exists other than building use for boiler-related activities. Building has been demolished.	Determine whether historical activities at the site resulted in a release(s).	Collect soil samples.	Collect co-located surface/subsurface soil samples from two locations within former building footprint (see Figure 36).	VOCs, SVOCs, inorganics	Release assessment decision analysis (see Figure 1).
PAOC P - Former Water Treatment Pumphouse	Relatively little historical information exists other than building use as a water treatment pumphouse, which is not a likely source of a CERCLA-related release. Building has been demolished, but a mobile generator was observed at the site during a 2007 site visit.	Determine whether there has been a release(s) from the mobile generator.	Collect soil samples.	Collect a co-located surface/subsurface soil sample beneath the mobile generator (see Figure 48).	SVOCs and inorganics	Release assessment decision analysis (see Figure 1).
PAOC Q/R - Former Boiler Room in Heat Plant Building 607(PAOC Q). Former boiler house Building 617 (PAOC R).	Relatively little historical information exists for PAOC Q/R other than the buildings used for boiler-related activities. Building 607 was identified on a figure and has been demolished. Building 617 was not identified on a figure but a similar building to Building 607 was identified and will be incorporated into this site.	Determine whether historical activities at the site resulted in a release(s).	Collect soil samples.	Collect a co-located surface/subsurface soil sample from one location within former Building 607 footprint and at the former location of a similar structure just north of former Building 607 that may have been used for a similar purpose (see Figure 36).	VOCs, SVOCs, inorganics	Release assessment decision analysis (see Figure 1).

Page Intentionally Left Blank

TABLE ES-1 (continued)

SI/Expanded SI Summary Table

Site	Pertinent Historical Information	SI or Expanded SI Objective(s)	Investigation Approach	Investigation Tasks	Sample Analysis	Data Evaluation Process
PAOC X - Debris Area in Ephemeral Stream	Relatively little historical information exists other than visual observation of construction-related debris and an automobile in the ephemeral stream. Surface soil samples collected in 2002, but not spatially adequate to sufficiently characterize potential source area because subsurface soil samples were not collected beneath debris. Furthermore, the debris is still present, so there is uncertainty whether it represents a potential future source of contamination.	Eliminate potential source of release and confirm site does not warrant further action.	Remove debris and confirm it has not released hazardous constituents that pose a potentially unacceptable risk.	Remove debris (see Figure 48) and collect confirmatory soil samples from four locations immediately beneath the debris. Collect co-located surface/subsurface soil samples from beneath a buried car in the ephemeral stream. Collect one co-located sample (soil if dry; surface water/sediment if saturated) from ephemeral stream downgradient from the buried car in a depositional area. (see Figure 48).	VOCs, SVOCs, and inorganics	Release assessment decision analysis (see Figure 1).
Regional Groundwater	There are multiple environmental sites within Camp Garcia. Although the groundwater data collected on a site-specific basis within Camp Garcia suggest there is not a broad area of groundwater contamination, there are no regionally located wells to confirm this supposition.	Determine if there is a yet-unknown release that has affected groundwater quality migrating from Camp Garcia.	Collect regional groundwater samples.	Install and sample two monitoring wells just downgradient of Camp Garcia.	VOCs, SVOCs, Pesticide/PCBs, and inorganics	Release assessment decision analysis (see Figure 1).

Page Intentionally Left Blank

Resumen Ejecutivo

El objetivo general de una Inspección de Sitio (SI, por sus siglas en inglés) es una "evaluación del escape". En términos más específicos, los objetivos de un SI son:

- Determinar si ha existido un escape de residuos o componentes peligrosos relacionado a actividades pasadas que están regidas por las Ley de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA, por sus siglas en inglés), y de ser ese el caso,
- Determinar si el escape que se sospecha ocurrió, merece atención futura

Generalmente, un SI Expandido tiene los mismos objetivos de un SI, con la diferencia que en el SI Expandido los datos históricos que se recolectan durante el SI sugieren la necesidad de obtener datos adicionales para poder elaborar conclusiones sobre la evaluación del escape con suficiente certeza. La Figura 1 muestra el marco de análisis para obtener conclusiones sobre la evaluación de un escape para un SI/SI Expandido.

Un Plan de Muestreo y Análisis (SAP, por sus siglas en inglés) incluye las actividades que se realizarán para llevar a cabo un SI en 11 sitios y un SI Expandido en 12 sitios en el Antiguo Campo de Adiestramiento Naval en el este de Vieques, Puerto Rico (VNTR, por sus siglas en inglés). La Figura 2 muestra la ubicación de los 23 sitios dentro del VNTR. Siete de los sitios constituyen las Unidades de Manejo de Desperdicios Sólidos (SWUMs, por sus siglas en inglés) y Áreas de Preocupación (AOCs, por sus siglas en inglés) identificadas en la Orden de Consentimiento (RCRA-02-99-7301) regulada por la Ley de Conservación y Recuperación de Recursos (RCRA, por sus siglas en inglés), la Agencia de Protección Ambiental de los EEUU (USEPA, por sus siglas en inglés) y la Marina, y que fue emitida el 20 de enero del 2000. Los sitios restantes son sitios que fueron identificados con fotografías (PI, por sus siglas en inglés) y áreas de preocupación potenciales (PAOCs, por sus siglas en inglés), las que fueron identificadas a través del análisis de fotografías aéreas antiguas y de otros registros históricos.

Como se indicó anteriormente, se llevará a cabo un SI Expandido para 12 de los 23 sitios. Estos 12 sitios fueron investigados previamente dentro de un SI (o una investigación equivalente), los resultados, conclusiones y recomendaciones se presentaron en el *Informe de la Evaluación Preliminar/Inspección del Sitio, 12 Sitios dentro de la Orden de Consentimiento y 8 Sitios PI/PIAC, Antiguo Campo de Adiestramiento Naval de Vieques, Vieques, Puerto Rico* (*Final Preliminary Assessment/Site Inspection Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico)* (CH2M HILL, 2008). Los 12 sitios en los cuales se llevará a cabo un SI Expandido son:

- SWMU 1 – Vertedero del Campamento García
- SWMU 2 – Sitio de Descarga de Combustibles
- SWMU 6/7 – Áreas de Acumulación de Aceite y Pintura de Desecho
- SWMU 10 – Lagunas de Tratamiento de Aguas Sucias

- AOC A – Área de Tuberías de abastecimiento de combustible diesel
- AOC G – Estación de Bombeo y Edificio de Clorinación en las Lagunas de Tratamiento de Aguas Sucias
- PI 4 – Antigua Área de Mantenimiento de Helicópteros, Área de Trincheras, Área de Disturbios, y AreasÁreas de Embalse Superficial para Almacenaje de Bombas de Combustible
- PI 7 – Cantera Antigua, Área de Disposición de barril de brea, y Área de Comunicación con Radares
- PAOC L – Antigua Área de Almacenaje de Pintura y Transformadores
- PAOC N – Antigua Área de Combustible y Estación de Llenado
- PAOC S – Antigua Planta de Energía Eléctrica

Además de los 12 sitios identificados anteriormente, la Marina, USEPA, la Junta de Calidad Ambiental de Puerto Rico (JCA) y el Servicio de Pesca y Vida Silvestre de los Estados Unidos (USFWS, por sus siglas en inglés) identificaron 11 Sitios PI/PAOC autorizando un SI en base a la información de las actividades anteriores. Estos 11 sitios son:

- PI 5 – Antiguo Aeropuerto y Zanjas Asociadas
- PI 6 – Antigua plataforma de Almacenaje de PCB y Lavado de Vehículos
- PI 8 – Antigua Área de Mantenimiento de la flota de vehículos
- PI 10 – Antiguo Campo de Lixiviación de Aguas Sucias
- PAOC I – Antigua Planta de Energía Eléctrica y Taller Mecánico
- PAOC M – Antiguas Instalaciones de Combustible
- PAOC O – Antiguo Cuarto de Calderas en la Planta de Calentamiento del Edificio 238
- PAOC P – Antigua Estación de Bombeo de la Planta de Tratamiento de Aguas
- PAOC Q/R – Antiguo Cuarto de Calderas en la Planta de Calentamiento del Edificio 607 (PAOC Q). Antiguo Cuarto de Calderas en el Edificio 617 (PAOC R)
- PAOC X – Área de Escombros en una Vertiente Efímera

Además de los sitios arriba mencionados, se evaluarán las aguas subterráneas a lo largo de los límites del Campamento García debido a que varios sitios se encuentran dentro del Campamento García (Figura 3). El propósito de esta evaluación es determinar si la calidad del agua subterránea que migra por debajo del Campamento García ha sido afectada por alguno de los sitios dentro de los límites de la instalación, incluyendo aquellos sitios recomendados para no acción adicional (ej., SWMU 4, PAOC J, y PAOC K) en el Informe Final PA/SI (CH2M HILL, 2008) que dependen de esta evaluación regional de aguas subterráneas y aquellos sitios para los cuales no se ha recolectado información de aguas subterráneas (ej., SWMUs 6/7). Si los datos de aguas subterráneas a lo largo de los límites vertiente abajo del Campamento García sugieren la necesidad de evaluaciones adicionales para poder identificar una fuente potencial de contaminación, puede ser que se evalúe un sitio individual o varios sitios, incluyendo aquellos recomendados actualmente para no acción adicional y que dependen de la evaluación regional de aguas subterráneas. Las Figuras 4 a la 50 muestran los 23 sitios específicos a ser investigados a través de un SI/SI Expandido.

La Tabla ES-1 resume, por sitio, la información histórica pertinente a la evaluación de escape, los objetivos de la investigación propuesta para un sitio específico, el acercamiento de investigación general, las actividades específicas a ser implementadas y los análisis de muestreo que se llevarán a cabo, y presenta la manera como los datos resultantes serán evaluados con respecto a los objetivos específicos de la investigación. Las hojas de trabajo dentro del SAP, en especial las hojas de trabajo 10 y 11, contienen información más detallada sobre el acercamiento de la investigación para cada sitio.

Formato SAP

Este SAP se ha preparado de acuerdo con el Reglamento Uniforme Federal para Garantía de Calidad para los Planes del Proyecto (*Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) (USEPA, 2005) y la Guía de *USEPA para la QUAPPs (Guidance for QAPPs, USEPA QA/G-5, QAMS* (USEPA, 2002), y contiene 37 hojas de trabajo identificadas en la Parte 2A. También contiene varios anexos que apoyan la información presentada en las hojas de trabajo. Hay varios puntos que se deben mencionar para facilitar la revisión del SAP:

- Como se mencionó anteriormente, este SAP es para 23 sitios. Por lo que, se han organizado varias hojas de trabajo de manera que la información general o información aplicable a todos los sitios se presenta inicialmente en una hoja de trabajo "general" y luego se adjuntan las hojas de trabajo para los sitios específicos a la hoja de trabajo "general" para presentar información específica del sitio. Un ejemplo de esto es la Hoja de Trabajo 10, donde la información general relevante a todos los sitios se presenta en una hoja de trabajo inicial, seguida por hojas de trabajo con definición de problemas para los sitios-específicos tituladas como "10a," "10b," "10c," etc.
- Para los 12 sitios donde se llevará a cabo un SI Expandido, la información que se provee en este SAP es un resumen de la información detallada recopilada en el Informe de Evaluación Final Preliminar/Investigación del Sitio (PA/SI) (CH2M HILL, 2008). Sin embargo, para los 11 sitios que tendrán un SI, la información histórica no ha sido recopilada en un solo documento. Por lo tanto, este SAP provee información más detallada para estos 11 sitios (tanto en hojas de trabajo individuales así como en figuras anexas y tablas) para así poder recopilar la información histórica en un sólo sitio.
- Como se mencionó anteriormente, el objetivo en general del SI/SI Expandido, es la evaluación de un escape. Sin embargo, las modificaciones menores, actividades incidentales u otros objetivos para un sitio específico son aplicables con variaciones a sitios individuales. Estos objetivos se explican en las hojas de trabajo adecuadas. Más aún, todas tienen la intención de ayudar a lograr el objetivo general de la evaluación de escape para cada sitio.
- Los procedimientos de investigación a seguirse durante el SI/SI Expandido son los Procedimientos Operativos Estándares Aplicables (SOPs, por sus siglas en inglés) y los protocolos en el MQAPP (CH2M HILL, 2007b). Se adjuntarán al SI/SI SAP Expandido los SOPs que se seguirán durante el SI/SI Expandido que no se encuentren dentro del MQAPP.
- Las ubicaciones de muestreo propuestas que se muestran en las figuras anexas son aproximadas. Las ubicaciones de muestreo actuales se basarán en observaciones hechas en el campo durante visitas al sitio llevadas a cabo por la Marina, USEPA, JCA, y USFWS, y sus contratistas de apoyo.

Page Intentionally Left Blank

TABLA ES-1

Tabla de Resumen SI/SI Expandido

Sitio	Información Histórica Pertinente	Objetivo(s) del SI o SI Expandido	Acercamiento de la Investigación	Actividades de la Investigación	Análisis de Muestra	Proceso de Evaluación de Datos
SWMU 1 – Vertedero del Campamento García	Vertedero sin cubierta de fondo, usado aproximadamente por 25 años para la disposición de desperdicios no-peligrosos, desperdicios municipales (papel, cartón, empaques de alimentos, trapos, madera, chatarra, y escombros de patios) de personal asignado al Campamento García. Se recogieron datos de suelos y aguas subterráneas en el año 2004, pero no fueron suficientes para poder caracterizar áreas de fuente potencial.	1. Completar la delineación de la extensión horizontal del vertedero.	Utilizar métodos de geofísica para delinear el límite horizontal.	Llevar a cabo estudios magnéticos y electromagnéticos en el norte y sur del vertedero para confirmar los límites (ver Figura 4).	N/A	Interpretar los resultados geofísicos y modificar el mapa mostrando la extensión horizontal del vertedero.
		2. Determinar la naturaleza y la extensión vertical de los escombros.	Usar observación visual en las excavaciones de prueba	Llevar a cabo pruebas en excavaciones y usar observación visual de los escombros en 20 ubicaciones (ver Figura 4) distribuidas aproximadamente a igual distancia a través del vertedero y dentro de cada trinchera observada en fotografías aéreas históricas.	N/A	Describir el material de desecho encontrado, en especial fuentes potenciales de desperdicios peligrosos o compuestos peligrosos.
		3. Determinar si ha ocurrido un escape(s) y cuál es el siguiente paso apropiado.	Recolectar muestras de suelos, aguas subterráneas y vertientes efímeras.	Recolectar una muestra de suelo compuesta de tres-puntos dentro del perfil vertical de los desechos y una muestra de subsuelos directamente debajo de los desperdicios en cada excavación de prueba. Instalar cuatro pozos de monitoreo; muestrear todos los pozos de monitoreo nuevos y existentes. Recolectar cuatro muestras (suelo si está seco; agua de superficie/sedimento si está saturado) de la vertiente efímera adyacente y corriente arriba del vertedero (ver Figura 4). Si se identifican vertientes efímeras adicionales en la parte oeste del vertedero, recolectar muestras adicionales dentro de la vertiente (número y ubicación en base a observaciones de visitas al sitio). Recolectar una muestra (de suelo si está seco; de agua de superficie/sedimento si está saturado) del área de disposición cerca del límite del vertedero. Recolectar una muestra (de suelo si está seco; de agua de superficie/sedimento si está saturado) del final de la vertiente efímera justo al norte de la laguna Chivas.	VOCs, SVOCs, pesticidas, PCBs, inorgánicos, explosivos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
SWMU 2 – Sitio de Descarga de Combustibles	Ocho tanques sobre tierra históricos (ASTs por sus siglas en inglés) usados por aproximadamente 25 años para almacenar combustible diesel, con plomo/sin plomo/gasolina para aviación, y combustible JP-5 transferido a través de una tubería desde un área de descarga en la costa. Se recolectaron varias muestras de suelo en el año 2004, pero no fueron lo suficientemente para poder caracterizar áreas de fuente potencial.	Determinar si ha ocurrido un escape y, de ser así, si es necesaria acción adicional.	Recolectar muestras de suelos y aguas subterráneas potenciales.	Recolectar muestras co-ubicadas de suelos/subsuelos bajo cada uno de los ocho antiguos ASTs, dos a lo largo de la antigua tubería, y cuatro en el área de descarga de combustible (ver Figura 5). Si se observa contaminación o se sospecha durante el muestreo de suelos, recolectar muestras adicionales lateralmente para delinear el área de la fuente y discutir con las agencias reguladoras la necesidad de muestreo de aguas subterráneas.	BTEX, MTBE, PAHs, plomo, TPH-GRO, TPH-DRO	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).

Page Intentionally Left Blank

TABLA ES-1 (continuaciónued)

Tabla de Resumen SI/SI Expandido

Sitio	Información Histórica Pertinente	Objetivo(s) del SI o SI Expandido	Acercamiento de la Investigación	Actividades de la Investigación	Análisis de Muestra	Proceso de Evaluación de Datos
SWMUs 6/7 - Áreas de Acumulación de Aceite y Pintura Usada	Una plataforma de concreto y una antigua jaula cercada usada por aproximadamente 17 años para almacenar aceite y pintura usada. Se han observado manchas justo fuera de la plataforma de concreto. Se colectaron muestras de suelo de superficie en el 2000 alrededor del perímetro de la plataforma de concreto, se identificaron VOCs y SVOCs y varios inorgánicos sobre los niveles de fondo.	Determinar si el posible escape identificado en la superficie del suelo en el 2000 aún está presente y si se ha contaminado el subsuelo; y de ser así, si es necesaria una acción adicional.	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos en 10 6ubicaciones alrededor del perímetro de la plataforma de concreto (ver Figura 6).	VOCs, SVOCs, e inorgánicos	Análisis de Decisión de Evaluación del Escape (ver Figura 1).
SWMU 10 – Lagunas de Tratamiento de Aguas Servidas	Cuatro lagunas sin cubierta de fondo usadas por aproximadamente 50 años para tratamiento de aguas residuales de uso doméstico del Campamento García. Los datos de suelos y aguas subterráneas del 2000 al 2004 sugieren que es poco probable haya un escape regulado por CERCLA que presente un riesgo potencial no aceptable. Sin embargo, hay alguna incertidumbre sobre los resultados de talio en las muestras tomadas que usaron el método analítico disponible en ese entonces, el que se inclinaba a elevar falsamente los resultados.	Confirmar si los resultados históricos de talio fueron falsamente elevados y determinar si las concentraciones actuales de talio no necesitan acción adicional.	Volver a muestrear suelos y aguas subterráneas.	Recolectar dos muestras co-ubicadas de suelos/subsuelos de cada una de las cuatro lagunas y recolectar muestras de las aguas subterráneas de los pozos de monitoreo existentes (ver Figura 7).	Talio	Datos Históricos (excepto talio) y nuevos datos de talio a través del Paso 6 del Análisis de Decisión de la Evaluación del Escape (Figura 1).
AOC A - Área de Tuberías de abastecimiento de Combustible Diesel	Tanques soterrados de 15,000-galones de combustible diesel y tuberías de abastecimiento asociadas fueron usados por aproximadamente 25 años para almacenar combustible diesel para un generador OP-1. Se removieron los tanques soterrados y la tubería, así como también algunos suelos contaminados. Las muestras confirmatorias de suelo sugieren que ocurrió un escape a lo largo de la tubería de l abastecimiento de combustible, aunque este escape pudo haber sido un caso aislado.	Eliminar el área que es fuente potencial de contaminación y confirmar que el sitio no necesita acción adicional.	Remover algunos suelos adicionales a lo largo de la antigua tubería de abastecimiento y recolectar muestras de confirmación de suelo.	Luego de la remoción de suelos adicionales, recolectar muestras de confirmación de suelo (en cada uno de los lados de la pared y en el fondo de la excavación) cada 5 pies lineales (ver Figura 8).	TPH-DRO	Comparar los resultados de las muestras confirmatorias con los criterios de acción correctivas de TPH de la JCA. Discutir con la división de UST de la JCA para determinar si se removió suficiente suelo.
AOC G - Estación de Bombeo y Edificio de Clorinación en las Lagunas de Tratamiento de Aguas Residuales	El edificio fue usado por aproximadamente 20 años para tratar y bombear el efluente con cloro desde el SWMU 10 hasta el mar. Datos de muestras de suelo del 2004 (suelos de superficie en el AOC G y material de la laguna en el SWMU 10) sugieren que es poco probable que haya ocurrido un escape regulado por CERCLA en AOC G que presente un riesgo potencial no aceptable. Sin embargo, la distribución de muestras es suficientemente adecuada para caracterizar las áreas de fuente potencial en el AOC G.	Determinar si ocurrió algún escape de una descarga histórica potencial de líquidos de mantenimiento de bombas y de ser así, si necesita acción adicional.	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos de dos ubicaciones cercanas a la puerta del edificio en el área donde los líquidos de mantenimiento de las bombas probablemente pudieron ser derramados o descargados (ver Figura 7).	VOCs, SVOCs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).

Page Intentionally Left Blank

TABLA ES-1 (continuedcontinuación)

Tabla de Resumen SI/SI Expandido

Sitio	Información Histórica Pertinente	Objetivo(s) del SI o SI Expandido	Acercamiento de la Investigación	Actividades de la Investigación	Análisis de Muestra	Proceso de Evaluación de Datos
PI 4 - Antigua Área de Mantenimiento de Helicópteros, Área de Trincheras, Área afectada, y Áreas confinadas para almacenaje de bombas de combustible.	Múltiples fuentes de escapes potenciales, pero, en base a los datos de muestreo del 2006, escapes potenciales probablemente ocurrieron sólo en áreas de trincheras. Los datos de las aguas subterráneas recolectados en esta área mostraron excedentes relativamente bajos (varios ppb) de los Niveles Federales de Contaminación Máxima (MCL) para TCE. Se detectaron otros VOCs en aguas subterráneas en esta área que no fueron detectados en los suelos.	Confirmar los datos iniciales del agua subterránea y determinar si existen concentraciones más altas de VOC vertiente arriba y vertiente abajo en excedente del MCL. En base a los datos de aguas subterráneas, determinar la acción adecuada para aguas subterráneas y si son necesarias investigaciones de suelo adicionales.	Recolectar muestras de aguas subterráneas.	Confirmar la dirección del flujo de aguas subterráneas midiendo los niveles de agua en todos los pozos existentes. Instalar un pozo de monitoreo vertiente arriba y vertiente abajo de los pozos existentes con excedentes del MCL (ver Figura 9) y recolectar muestras de aguas subterráneas de pozos existentes y recién instalados.	VOCs	Análisis de Decisión de la Evaluación del Escape (ver Figura 1). En base a la distribución de datos de aguas subterráneas, determinar si existen fuentes potenciales de áreas de suelos sin muestrear.
PI 7 - Antigua Cantera, Área de Disposición de barriles de brea , y Área de Radares de Comunicación	Los datos recopilados a través del sitio en el 2006, incluyendo barriles de brea en los alrededores, sugieren que no hubo un escape regulado por CERCLA que presente un riesgo potencial no aceptable. Sin embargo, hay cierta incertidumbre sobre si los barriles representan una fuente potencial de contaminación.	Eliminar las fuentes potenciales de escapes y confirmar que el sitio no necesita ninguna acción adicional.	Remover los barriles y confirmar que no haya habido ningún escape de compuestos peligrosos que presenten un riesgo no aceptable.	Remover los barriles (ver Figuras 10 y 11) y recolectar muestras de confirmación de suelos inmediatamente debajo de los barriles .barriles.	VOCs, SVOCs, e inorgánicos.	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC L - Antigua Área de Almacenaje de Pintura y Transformadores	Edificio pequeño de bloques de concreto (15 x 15 pies). Los datos recopilados en la superficie de suelos en el 2006, recolectados adyacentes a las cuatro paredes del edificio identificaron niveles elevados de pesticidas (relativo a otros sitios en el este de Vieques). Además, los datos de aguas subterráneas del pozo en el sitio identificaron dos VOCs por debajo del MCLs.	Determinar la extensión lateral de la concentración de pesticidas en la superficie del suelo. Confirmar que las concentraciones de componentes en aguas subterráneas son bajas (ej., menor que los MCLs y/o poco probable que presenten un riesgo no aceptable.	Recolectar muestras de superficie de suelos y una muestra de aguas subterráneas.	Recolectar muestras de superficie de suelos de las ocho ubicaciones alrededor de las cuatro ubicaciones de muestras del 2006, pero más lejos del edificio (ver Figura 12). Volver a muestrear el pozo de monitoreo existente.	Suelos: pesticidas Aguas subterráneas: VOCs, SVOCs, pesticidas, PCBs, e inorgánicos (metales)	Suelos (nuevos y antiguos): Análisis de Decisión de la Evaluación del Escape (ver Figura 1). Aguas Subterráneas: Comparar datos nuevos con los datos iniciales. Si las nuevas concentraciones son mayores que las concentraciones iniciales, llevar a cabo un Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC N - Antigua Granja de Combustible y PAOC S – Antigua Planta de Energía Eléctrica	Los datos históricos recopilados en el 2006 no sugieren que haya ocurrido un escape regulado por CERCLA en ningún sitio que necesite acción adicional, pero existe la incertidumbre relacionada a la presencia potencial de una línea de combustible subterránea entre los dos sitios debido a su cercanía y naturaleza de las actividades históricas.	Determinar si existe una línea de combustible subterránea entre los dos sitios.	Usar métodos geofísicos para determinar si existe una línea de combustible subterránea.	Llevar a cabo estudios magnéticos y electromagnéticos dentro del área donde las líneas subterráneas podrían estar atravesadas (ver Figura 13).	N/A	Interpretar los resultados geofísicos. Si se identifica la línea de combustible subterránea, discutir con el Subcomité Técnico ERP para determinar las ubicaciones de muestras de suelo. No será necesario muestrear el suelo si no se identifican líneas de combustible subterráneas.
PI 5 – Antiguo Aeropuerto y Zanjas Asociadas	Aeropuerto donde se observaron manchas potenciales en fotografías aéreas históricas. Zanjas de drenaje alrededor del aeropuerto probablemente recibieron escorrentías de aguas de lluvia. No existen muestras de suelo históricas para determinar si ocurrió un escape(s).	Determinar si las actividades históricas resultaron en un escape(s) hacia el aeropuerto y zanjas de aguas de lluvia asociadas.	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos en el aeropuerto (una ubicación) y dentro de las zanjas de drenaje adyacentes (siete ubicaciones), como se muestra en la Figura 16.	VOCs, SVOCs, inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).

Page Intentionally Left Blank

TABLA ES-1 (ccontinuaciónontinued)

Tabla de Resumen SI/SI Expandido

Sitio	Información Histórica Pertinente	Objetivo(s) del SI o SI Expandido	Acercamiento de la Investigación	Actividades de la Investigación	Análisis de Muestra	Proceso de Evaluación de Datos
PI 6 - Antigua Losa de Almacenaje de PCB y Lavado de Vehículos	No se detectaron PCBs en las muestras recolectadas con un paño de la antigua plataforma de almacenamiento de PCBs. Tanto la plataforma de almacenaje de PCB y la plataforma de lavado de vehículos probablemente permitieron que la escorrentía llegara al suelo. La plataforma de almacenaje de PCB también contenía un drenaje hacia un sumidero. No hay muestras de suelo históricas en estas ubicaciones para determinar si ocurrió un escape(s).	Determinar si las actividades históricas en la plataforma de almacenaje de PCB y/o plataforma de lavado de vehículos resultaron en un escape.	Recolectar muestras de suelo.	Recolectar muestras co-ubicadas de suelos/subsuelos del sumidero (una ubicación), adyacente a la plataforma de almacenaje de PCB (dos ubicaciones), y adyacentes a la plataforma de lavado de vehículos (una ubicación), según se muestra en la Figura 22.	Plataforma de almacenaje de PCB y sumidero: plataforma de Lavado de Vehículos PCBs: VOCs, SVOCs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PI 8 - Antigua Área de Mantenimiento de la Flota de Vehículos	La información histórica y las fotografías aéreas sugieren que el área fue un área de aglomeración y mantenimiento de motores; lavado de vehículos; almacenaje de barriles de aceite y área de disposición; área de almacenaje de barriles para emulsiones de asfalto; área de materiales metálicos de múltiples colores; un área potencial de almacenaje para materiales peligrosos y productos de petróleo; y se observaron materiales de tonos ligeros en el sureste del área. Se recolectaron muestras de suelos de superficie en el 2002, de áreas de suelos manchados en el área de mantenimiento, pero fueron suficientes para caracterizar fuentes potenciales en el área adecuadamente.	Determinar si las actividades históricas a través del sitio resultaron en un escape(s)	Recolectar muestras de suelo.	Recolectar muestras co-ubicadas de suelos/subsuelos del área de mantenimiento de motores (cinco ubicaciones); área de almacenamiento de barriles con emulsiones de asfalto, si se encuentran los barriles usando un detector de metales (una ubicación); área de material metálico, de múltiples colores (dos ubicaciones); área de materiales de tonos ligeros (dos ubicaciones); y zanja de drenaje adyacente al área de mantenimiento (una ubicación), según se muestra en la Figura 27.	Área de mantenimiento de motores y zanja de drenaje adyacente: VOCs, SVOCs, PCBs, e inorgánicos Área de almacenaje de Flota de Vehículos de emulsión de asfalto: SVOCs e inorgánicos Área de material metálico, área de múltiples colores: inorgánicos Área de Material de tono ligero: VOCs, SVOCs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PI 10 - Antiguo Campo de Lixiviación de Aguas Residuales	Seis áreas cerradas posiblemente usadas como un campo de lixiviación para tratamiento de aguas usadas. Se re colectaron muestras de superficie de suelos en el 2002, pero no lo suficientemente adecuadas para caracterizar las áreas de fuentes potenciales adecuadamente, debido a que no se recolectaron muestras de subsuelos y el sitio es un campo de lixiviación del embalse.	Determinar si las actividades históricas en el sitio resultaron en un escape(s).	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos de aproximadamente las mismas tres ubicaciones muestreadas en el 2002 (ver Figura 32).	VOCs, SVOCs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC I - Antigua Planta de Energía Eléctrica y Taller Mecánico	Existe relativamente muy poca información histórica aparte del uso del edificio en actividades relacionadas a las calderas y actividades mecánicas. Una visita al edificio en el sitio identificó dos puertas y tres penetraciones de tuberías. Se desconoce el uso pasado de las tuberías.	Determinar si las actividades históricas en el sitio resultaron en un escape(s).	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos alrededor de un edificio (uno adyacente a cada puerta y penetración de tubería), según se muestra en la Figura 36.	VOCs, SVOCs, PCBs, inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).

Page Intentionally Left Blank

TABLA ES-1 (continuedcontinuación)						
Tabla de Resumen SI/SI Expandido						
Sitio	**Información Histórica Pertinente**	**Objetivo(s) del SI o SI Expandido**	**Acercamiento de la Investigación**	**Actividades de la Investigación**	**Análisis de Muestra**	**Proceso de Evaluación de Datos**
PAOC M - Antigua Facilidad de Combustible	Existe relativamente muy poca información histórica aparte del uso del edificio como oficina de despacho, dormitorios, y facilidad de combustible. El edificio fue demolido.	Determinar si las actividades históricas en el sitio resultaron en un escape(s).	Usar muestras de suelo (cores) y observación visual/detector de fotoionización de suelos (PID) para determinar si ocurrió algún escape; recolectar muestras de suelos si se sospecha de un escape.	Excavaciones continuas avanzadas en cuatro ubicaciones alrededor del perímetro (footprint) del antiguo edificio y evaluación visual y con PID. Si se sospecha de un escape, recolectar una muestra(s) del suelo de la zona donde se sospecha existe contaminación.	BTEX, MTBE, PAHs, plomo, TPH-GRO, TPH-DRO	Si se recolectan muestras, realizar un Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC O - Antiguo Cuarto de Calderas en la Planta de Calentamiento del Edificio 238	Existe relativamente muy poca información histórica aparte del uso del edificio para actividades relacionadas a las calderas. El edificio fue demolido.	Determinar si las actividades históricas en el sitio resultaron en un escape(s).	Recolectar muestras de suelos.	Recolectar muestras co-ubicadas de suelos/subsuelos de dos ubicaciones dentro del perímetro del antiguo edificio (ver Figura 36).	VOCs, SVOCs, inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC P - Antigua Estación de Bombeo de la Planta de Tratamiento de Aguas	Existe relativamente muy poca información histórica aparte del uso del edificio como estación de bombeo de tratamiento de aguas, el cual es poco probable sea una fuente de escape regulado por CERCLA. El edificio fue demolido, pero se observó un generador móvil en el sitio durante una visita al sitio en el 2007.	Determinar si hubo algún escape(s) del generador móvil.	Recolectar muestras de suelo.	Recolectar muestras co-ubicadas de suelos/subsuelos de debajo del generador móvil (ver Figura 48).	SVOCs e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC Q/R - Antiguo Cuarto de Calderas en la Planta de Calentamiento del Edificio 607 (PAOC Q). Antiguo Cuarto de Calderas en el Edificio 617 (PAOC R)	Existe relativamente muy poca información histórica para PAOC Q/R aparte del uso del edificio para actividades relacionadas a las calderas. El edificio 607 que se identifica en la figura ha sido demolido. El edificio 607 fue identificado y será incorporado a ese sitio	Determinar si las actividades históricas en el sitio resultaron en un escape(s).	Recolectar muestras de suelo.	Recolectar muestras co-ubicadas de suelos/subsuelos de una ubicación dentro del perímetro de antiguo Edificio 607 y en la antigua ubicación de una estructura similar justo al norte del antiguo Edificio 607 que pudo haber sido usado para un propósito similar (ver Figura 36).	VOCs, SVOCs, inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
PAOC X – Área de Escombros en la Corriente Efímera	Existe relativamente muy poca información histórica aparte de la observación visual de escombros de construcción y un automóvil en la corriente efímera. Se recolectaron muestras de suelos de superficie en el 2002, pero no son suficientes para caracterizar áreas de fuentes potenciales adecuadamente debido a que las muestras de subsuelos no se recogieron de debajo de los escombros. Más aun, los escombros aun están presentes, así que hay incertidumbre de que si éstos representan una fuente futura de contaminación.	Eliminar fuentes potenciales de escapes y confirmar que el sitio no necesita ninguna acción adicional.	Remover escombros y confirmar que no hayan liberado componentes peligrosos que presenten un riesgo potencial no aceptable.	Remover escombros (ver Figura 48) y recolectar muestras de confirmación de suelo, de cuatro ubicaciones inmediatamente de debajo de los escombros.	VOCs, SVOCs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).
Aguas Subterráneas Regionales	Existen múltiples sitios ambientales dentro del Campamento García. A pesar de que los datos recolectados a través del agua subterránea en base sitio-específico dentro del Campamento García sugieren que no hay un área amplia de contaminación de aguas subterráneas, no se han ubicado pozos regionales para confirmar esta suposición.	Determinar si hay algún escape desconocido que haya afectado la calidad del agua subterránea emigrando del Campamento García.	Recolectar muestras de aguas subterráneas regionales.	Instalar y muestrear dos pozos de monitoreo vertiente abajo del Campamento García.	VOCs, SVOCs, Pesticidas/PCBs, e inorgánicos	Análisis de Decisión de la Evaluación del Escape (ver Figura 1).

Page Intentionally Left Blank

SAP Worksheet #1 — Title and Approval Page

Final
Site Inspection/Expanded Site Inspection,
7 Consent Order Sites and 16 PI/PAOC Sites,
Former Vieques Naval Training Range,
Vieques, Puerto Rico
February 2009

Prepared for:
Department of the Navy
Naval Facilities Engineering Command
Atlantic Division
6506 Hampton Boulevard
Norfolk, VA 23508-1278

Prepared by:

CH2MHILL

5700 Cleveland Street, Suite 101
Virginia Beach, VA 23462
Office phone # 757-671-6219

Prepared under:
Navy CLEAN III Program
Contract N62470-02-D-3052
Contract Task Order – 039

QA REVIEW SIGNATURE:

PAUL FAVARA, P.E.
CH2M HILL QAM

OTHER APPROVAL SIGNATURES:

KEVIN CLOE
NAVFAC – REMEDIAL PROJECT MANAGER

DANIEL RODRIGUEZ
USEPA REGION 2 – REMEDIAL PROJECT MANAGER

WILMARIE RIVERA
PREQB – REMEDIAL PROJECT MANAGER

RICHARD HENRY
USFWS – REMEDIAL PROJECT MANAGER

Page Intentionally Left Blank

SAP Worksheet #2 — SAP Identifying Information

Site Name/Number:	23 Sites on East Vieques
Operable Unit (OU):	Areas of Concern (AOCs) A and G; Potential Areas of Concern (PAOCs) I, L, M, N, O, P, Q/R, S, and X; Photo-Identified Sites (PIs) 4, 5, 6, 7, 8, and 10; and Solid Waste Management Units (SWMUs) 1, 2, 6/7, and 10
Contractor Name:	CH2M HILL
Contract Number:	N62470-02-D-3052
Contract Title:	Navy Comprehensive Long-term Environmental Action—Navy (CLEAN) Program III
Work Assignment Number (optional):	Contract Task Order (CTO) 039 (Sampling and Analysis Plan [SAP]); CTO 196 (Fieldwork and Reporting)

1. This SAP was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP) (USEPA, 2005) and United States (U.S.) Environmental Protection Agency (USEPA) Guidance for QAPPs, USEPA 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
Site visits—Vieques, Puerto Rico	October 17, 2007
Environmental Technical Subcommittee Meeting—San Juan, Puerto Rico	October 18, 2007
Environmental Technical Subcommittee Meeting—New York, New York	April 2 and 3, 2008

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

Title	Date
Master QAPP (MQAPP[1]), Environmental Restoration Program (ERP), Vieques, Puerto Rico	May 2007

[1] Referred to as MQAPP throughout the document.

SAP Worksheet #2—SAP Identifying Information (continued)

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 CERCLA Vieques ERP implemented by lead organization
   - **United States Fish and Wildlife Service (USFWS) –** Land owner of land transferred from lead organization and on which ERP activities are conducted
   - **National Oceanic and Atmospheric Administration (NOAA) –** Marine habitat stakeholder and technical advisor 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 as all required information is provided in this SAP.

SAP Worksheet #3 — Distribution List

Name of SAP Recipients	Title/Project Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	D	DF	F
Kevin Cloe	Vieques Remedial Project Manager (RPM)/Lead Agency Point of Contact (POC)	Navy	757-322-4736	kevin.cloe@navy.mil	A	CL	A
Chris Penny	Vieques Program Coordinator/No project-specific role	Navy	757-322-4815	christopher.penny@navy.mil	CL	CL	CL
Dan Hood	Vieques RPM/No project-specific role	Navy	757-322-4630	daniel.r.hood@navy.mil	CL	CL	CL
Madeline Rivera	Vieques Environmental Restoration Program Site Manager /On-island coordination	Navy	757-348-2689 (cell)	llamasmad@gmail.com	A		A
John Noles	Biologist/Technical input	Navy	757-322-4891	john.noles@navy.mil	HC		A
Bonnie Capito	Librarian and Records Manager/Final document archiving	Navy	757-322-4785	bonnie.capito@navy.mil			CL
Stephen Brand	Field Team Leader	CH2M HILL	757-674-6211	stephen.brand@ch2m.com			A
John Swenfurth	Project Manager	CH2M HILL	813-874-0777	john.swenfurth@ch2m.com	A	A	A
Mike Zamboni	Project Chemist	CH2M HILL	709-376-5111	mike.zamboni@ch2m.com			A
Brett Doerr	Contractor Environmental Manager/ Navy contractor primary POC	CH2M HILL	757-671-6219	brett.doerr@ch2m.com	A	A	A
Andrea Colby	Project Manager	Katahdin Analytical Services, Inc.	(207) 874-2400	acolby@katahdinlab.com			HC
Laura Maschoff	Project Manager	DataQual Environmental Services, LLC	(314) 330-1327	dataqual@charter.net			CD
Daniel Rodriguez	Vieques RPM/ Regulatory agency POC	USEPA	787-741-5201 787-671-9879 (cell)	rodriguez.daniel@epa.gov	A	CL	A
Carl Soderberg	Caribbean Environmental Protection Division Director	USEPA	787-977-5814	soderberg.carl@epa.gov	CL		CL
Sergio Lopez	QC Specialist/Technical input and draft document review	USEPA	732-321-6778	lopez.sergio@epa.gov	A		A
Michael Sivak	Human Health Risk Assessment (HHRA) Lead/Technical input and draft document review	USEPA	212-637-4310	sivak.michael@epa.gov	A		A
Diana Cutt	Geology/Hydrogeology Lead/Technical input and draft document review	USEPA	212-637-4311	cutt.diana@epa.gov	A		A

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
Mindy Pensak	Ecological Risk Assessment (ERA) Lead/Technical input and draft document review	USEPA	732-321-6705	pensak.mindy@epa.gov	A		A
Laura Pugh	Senior Staff Consultant	TechLaw	763-208-2828	lpugh@techlawinc.com	A		A
Pedro J. Nieves, Esq.	President/No project-specific role	PREQB	787-767-8056	pedronieves@jca.gobierno.pr	CL		CL
Wilmarie Rivera	Vieques RPM/ Regulatory agency POC	PREQB	787-767-8181 x6141 (work) 787-365-8573 (cell)	wilmarierivera@jca.gobierno.pr	A	CL	A
Katarina Rutkowski	Technical Support Consultant for Environmental Quality Board (EQB)/ EQB contractor primary POC	TRC	860-298-6202	krutkowski@trcsolutions.com	A		A
Andrew Smyth	Technical Support Consultant for EQB//EQB contractor Project Manager (PM)	TRC	978-656-3568	asmyth@trcsolutions.com	A		A
Matt Connolly	Refuge Manager/No project-specific role	USFWS	787-741-2138	matt_connolly@fws.gov			A
Susan Silander	Caribbean Islands Refuges Supervisor/No project-specific role	USFWS	787-851-7258 (x38)	susan.silander@fws.gov	CL		CL
Richard Henry	Vieques RPM/ Land management agency POC	USFWS	732-906-6987	richard_henry@fws.gov	A	CL	A
Felix Lopez Arroyo	Environmental Contaminants Specialist/Technical input and draft document review	USFWS	787-851-7297(x226)	felix_lopez@fws.gov	A		A
William Tucker	Technical Support Consultant for USFWS/USFWS contractor primary POC	MACTEC	352-332-3318	watucker@mactec.com	A		A
Diane Wehner	Regional Resource Coordinator/Technical input and draft document review	NOAA	732-872-3030	diane.wehner@noaa.gov	A		A
Roberta W. Britton	Not Applicable (N/A)	Restoration Advisory Board (RAB)	978-463-9660	bdbritt7@gmail.com		CD	
Michael P. Connelly	N/A	RAB	787-741-4442	mpcbieke@yahoo.com		A	
Michael Diaz	N/A	RAB	787-667-2804	diazmmdo@aol.com		CD	
Gladys Costa & Emilio García Cordero	N/A N/A	RAB	787-741-4836	zulmiracosta@hotmail.com		CD	
Colleen McNamara	N/A	RAB	787-380-2545	lacolina@hughes.com		A	

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
Jorge Fernández-Porto & Lirio Marquez-D'Acunti	N/A N/A	RAB	787-726-2839	jfporto@onelinkpr.net; liriomarquez@gmail.com; liriomarquez@onelinkpr.net		CD	
Nilda Medina Diaz	N/A	RAB	787-741-8651	oficina@prorescatevieques.org		A	
Stacie D. Notine	N/A	RAB	N/A	N/A		HC	
Sixto H. Pérez Espina	N/A	RAB	787-748-8373	bieque@caribe.net		CD	
Hector Julian Camacho	N/A	RAB	787-741-8261	vieques357@yahoo.com		A	
Cristina Corrada Emmanuel	N/A	RAB	939-243-3388	N/A		HC	
Debora Santana	N/A	RAB	N/A	dsantana@earthlink.net		CD	
Adalina Cruz Colón	N/A	RAB	787-741-4562	N/A		CL	
Wanda Bermudez	N/A	RAB	787-435-2841	wbromero@yahoo.com		CD	
Mayor Evelyn Delerme	N/A	RAB	787-741-5000	evelyn.delerme.gmv@gmail.com		A	
Luis Lionel Sanchez Carambot	N/A	RAB	787-741-3110	sanchezCarombot@yahoo.com		CD	
Ricardo Jordán	N/A	RAB	939-640-4879	rickjord@aol.com		CL	

A = All
CL = Cover Letter
CD = Compact Disc
D = Draft
DF = Draft Final
F = Final
HC = Hard Copy

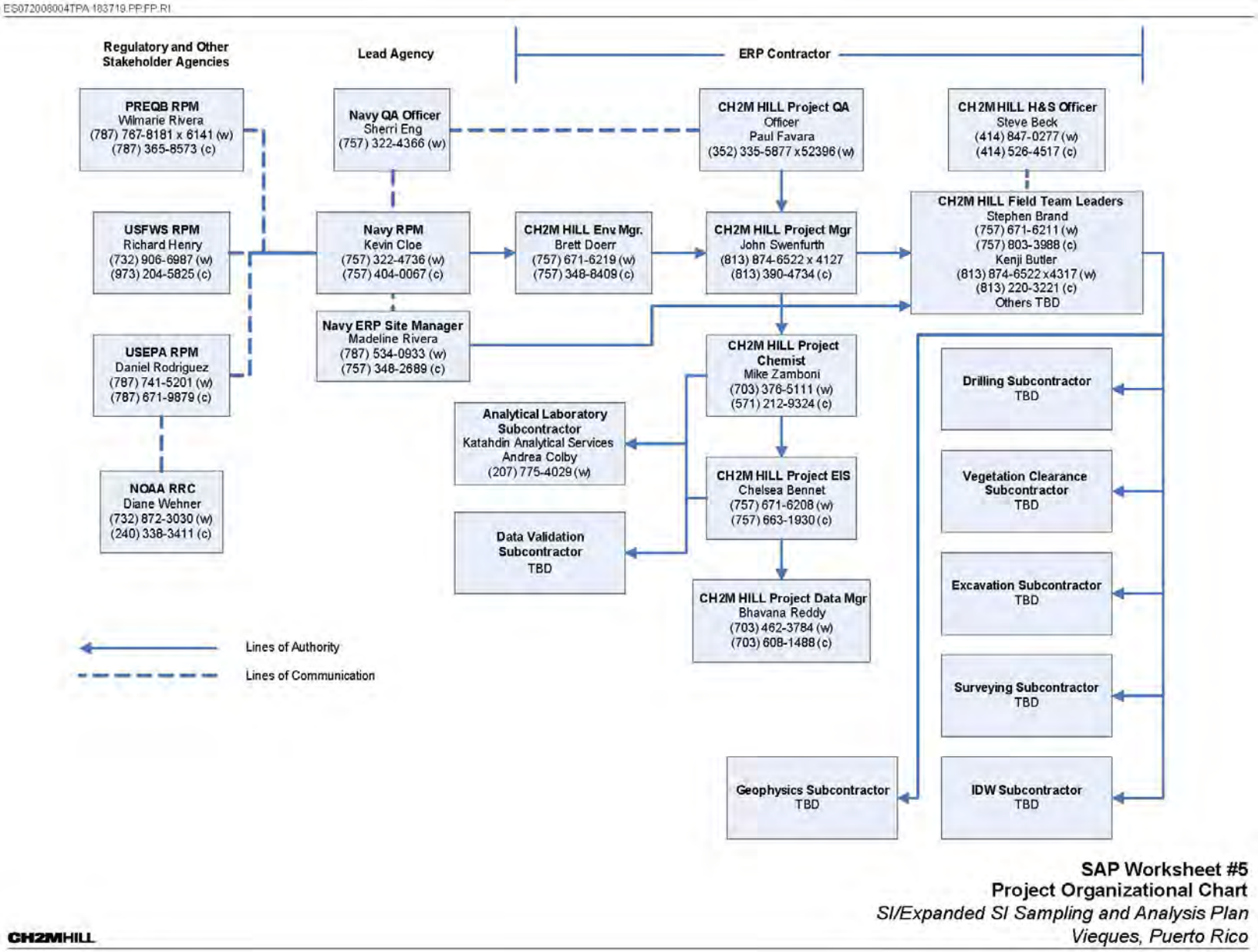
Page Intentionally Left Blank

SAP Worksheet #4 — Project Personnel Sign-Off Sheet

Name	Organization/Title/Project Role	Telephone Number (optional)	Signature/ email receipt	SAP Section Reviewed	Date SAP Read
Kevin Cloe	NAVFAC Atlantic/ Vieques RPM/ Lead agency POC	757-322-4736			
Daniel Rodriguez	USEPA/ Vieques RPM/ Regulatory agency POC	787-741-5201 787-671-9879 (cell)			
Wilmarie Rivera	PREQB/Vieques RPM/ Regulatory Agency POC	787-767-8181 (x6141)			
Paul Favara	CH2M HILL/Quality Assurance Officer (QAO)/SAP review	352-335-5877 (x52396)			
Anita Dodson	CH2M HILL/Navy Program Chemist/ SAP review	757-671-6218			
Brett Doerr	CH2M HILL/ Contractor Environmental Manager/Navy contractor primary POC	757-671-6219			
John Swenfurth	CH2M HILL/Contractor PM/Logistics and administration	813-874-6522 (x4127) 813-390-4734 (cell)			
Steve Beck	CH2M HILL/Contractor health and safety Lead/Health and safety officer	414-847-0277			
Chelsea Bennet	CH2M HILL/Environmental Information Specialist (EIS)/Data tracking and management	757-671-6208			
Kenji Butler and/or Stephen Brand	CH2M HILL/Geologists/ FTLs	813-874-6522 (x4317) 813-220-3221 (cell) 757-671-6211 757-285-7685 (cell)			
Mike Zamboni	Project Chemist	709-376-5111			
Bhavana Reddy	Project/Data Manager	703-462-3784			
Andrea Colby	Katahdin/Chemist/Laboratory PM	207-775-4029			
Richard Henry	USFWS/Vieques RPM/Land Management Agency POC	732-906-6987			
Diana Wehner	National Oceanic and Atmospheric Administration/Regional Resource Coordinator	240-338-3411			
TBD	CH2M HILL/Field Team				

Page Intentionally Left Blank

SAP Worksheet #5 — Project Organizational Chart



Page Intentionally Left Blank

SAP Worksheet #6 — Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Communication to/from Navy (e.g., submission of SAP for review; receipt of regulatory comments, etc.)	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	Daniel Rodriguez	787-741-5201 787-671-9879 (cell)	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	Richard Henry	732-906-6987	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.
Ecological technical input	NOAA RRC	Diane Wehner	732-872-3030	Provides technical input/SAP review directly to ERP Technical Subcommittee and/or USEPA (via e-mail, telephone, hardcopy, or in-person, as warranted).
Navy Quality Assurance (QA)/Quality Control (QC) input	Navy QAO	Sherri Eng	757-322-4366	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.)	CH2M HILL Environmental 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.
Project administration and logistics	CH2M HILL PM	John Swenfurth	813-874-6522 (x4127) 813-390-4734 (cell)	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	Steve Beck	414-847-0277	Review of Health and Safety Plan (HASP). Direct communication (via e-mail, telephone, hardcopy, or in-person, as warranted) to/from Navy contractor project staff to ensure implementation of appropriate health and safety procedures.
SAP changes in the field	CH2M HILL FTL	Stephen Brand Kenji Butler	757-671-6211 757-285-7685 (cell) 813-874-6522 (x4317) 813-220-3221 (cell)	Documentation of deviations from work plan made in field logbooks and rationale for deviations; deviations made only with approval from contractor PM and/or environmental manager.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Field corrective actions	CH2M HILL FTL	Stephen Brand Kenji Butler	757-671-6211 757-285-7685 (c) 813-874-6522 (x4317) 813-220-3221 (c)	See Worksheet 32 Assessment Findings and Corrective Action (CA) Responses and Worksheet 32-1 CA Form.
Daily Field Progress Reports	CH2M HILL Field Team Leader (FTL)	Stephen Brand Kenji Butler	757-671-6211 757-285-7685 (c) 813-874-6522 (x4317) 813-220-3221 (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 Site Safety Coordinator (SSC)	Stephen Brand Kenji Butler	757-671-6211 757-285-7685 (c) 813-874-6522 (x4317) 813-220-3221 (c)	Daily safety tailgates; daily observations; real-time discussions of observations and changes to be implemented with field staff.
Data tracking from collection through upload to database	CH2M HILL EIS	Chelsea Bennet	757-671-6208	EIS 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. EIS communicates with CH2M HILL project chemist, laboratory PM, and data validator PM, as warranted, to ensure adherence to project analysis and validation requirements. EIS 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.	CH2M HILL Database Manager	Bhavana Reddy	703-471-1441	Once contractor chemist ensures data are appropriate for upload to database, EIS submits data electronically to contractor database manager, who uploads data to database.
Reporting Lab Data Quality Issues	Laboratory (Katahdin) PM	Andrea Colby	207-775-4029	All QA/QC issues with project field samples will be reported by the lab to the EIS, 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.
Analytical CAs	Analyst, Supervisor	Andrea Colby	207-775-4029	See Worksheets 24, 25, and 28 for analytical CAs.
Validated data	Data Validator PM	TBD	TBD	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 EIS that data are ready for release (i.e., upload to database).

SAP Worksheet #7 — Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Kevin Cloe	Vieques RPM	Navy	Environmental restoration program activities implemented under this SAP	M.E. Environmental Engineering B.S. Civil Engineering 17 years experience
Sherri Eng	QAO	Navy	Navy review of SAP and QA input	B.S. Chemistry 20 years experience
Madeline Rivera	Vieques ERP Site Manager	Navy	On-island Navy liaison; provides logistical support for implementation of environmental restoration program activities under this SAP	M.S. Engineering Administration B.S. Chemical Engineering, REM, UXO Technician I 14 years experience
Brett Doerr	Environmental Manager	CH2M HILL	Responsible for ERP at Vieques; primary Navy contractor POC; assists in data evaluation and interpretation; reviews report	M.S. Environmental Science/Hydrogeology B.S. Chemistry 16 years experience
Paul Favara	Project QAO	CH2M HILL	Oversees compliance with program and project-specific quality requirements	M.S. Environmental Engineering B.S. Chemistry 21 years experience
John Swenfurth	PM	CH2M HILL	Project administration; coordinates staffing; monitors project performance; directs and oversees project staff	M.S. Hydrogeology 11 years experience
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	B.S. Chemistry 6 years experience

SAP Worksheet #7 — Personnel Responsibilities and Qualifications Table (continued)

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Stephen Brand	FTL and SSC	CH2M HILL	Supervises field sampling and coordinates all field activities; ensures onsite compliance with work plan; oversees and ensures safety of onsite personnel	M.S. Geology 17 years experience
Steve Beck	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	M.S. Occupational Safety and Health 15 years experience
Kenji Butler	FTL and SSC	CH2M HILL	Supervises field sampling and coordinates all field activities; ensures onsite compliance with work plan; oversees and ensures safety of onsite personnel	B.S. Geology 5 years experience
Chelsea Bennet	Environmental Systems Specialist	CH2M HILL	Manages sample tracking; coordinates assimilation of data from field collection through analysis, validation, and upload to environmental database; performs data queries for data evaluation and report writing	B.S. Biology 8 years experience
Bhavana Reddy	Database Manager	CH2M HILL	Uploads validated data to environmental database	B.A. Business Administration and Accounting 12 years experience
Leslie Diamond	QAO	Katahdin Analytical Services	Responsible for laboratory QA program and review of QC data	B.A. Chemistry 17 years experience
Peter Lamay	Organics Department Manager	Katahdin Analytical Services	Responsible for oversight, QC, and data review of organics laboratory	B.A. Chemistry 23 years experience
George Brewer	Inorganics Department Manager	Katahdin Analytical Services	Responsible for oversight, QC, and data review of inorganics laboratory	M.S. Geological Science B.S. Geology 14 years experience
Andrea Colby	PM	Katahdin Analytical Services	Laboratory POC and overall manager for analytical work	B.A. Biology 21 years experience
TBD	TBD	Data Validation Subcontractor	Responsible for validating analytical data in accordance with project-specific UFP-SAP	

SAP Worksheet #7 — Personnel Responsibilities and Qualifications Table (continued)

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
TBD	TBD	Drilling Subcontractor	Responsible for performing slide-hammer, direct-push, or similar means for soil sampling; responsible for monitoring well installation	
TBD	TBD	Vegetation Clearance Subcontractor	Responsible for vegetation clearance, as necessary, to access sites and sample locations	
TBD	TBD	Excavation Subcontractor	Responsible for performing test pitting at SWMU 1, soil excavation at AOC A, drum removal at PI 7, and debris removal at PAOC X.	
TBD	TBD	Surveying Subcontractor	Responsible for horizontal coordinate and vertical elevation surveying of newly installed monitoring wells	
TBD	TBD	Geophysics Subcontractor	Responsible for completing the horizontal delineation of the SWMU 1 landfill boundary and subsurface geophysics between PAOC N and PAOC S	
TBD	TBD	Investigation-derived Waste (IDW) Subcontractor	Responsible for transport and disposal of IDW deemed necessary for offsite disposal	

1 Resumes are maintained by the individuals' organizations and are available upon request; upon execution of the project, staff may be removed (if unnecessary to project execution) and other staff may be added or substituted, as necessary and available.

Page Intentionally Left Blank

SAP Worksheet #8 — Special Personnel Training Requirements Table

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/ Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/ Certificates
Field activities	Hazwoper 40-hour Training, 8 hour refreshers, as applicable	Various qualified training organizations	Training of CH2M HILL and subcontractors will be verified as current prior to starting field activities by SSC	All field personnel	FTLs, field team members, and SSC (CH2M HILL personnel); drilling subcontractor; IDW subcontractor; vegetation clearance subcontractor, excavation subcontractor, geophysical subcontractor, and surveying subcontractor	CH2M HILL Human Resources Department for CH2M HILL personnel; subcontractor organizations for field subcontractors
Field activities	CPR/First Aid Training	Various qualified training organizations	Training will be verified as current prior to starting field activities	CH2M HILL SSC	CH2M HILL SSC	CH2M HILL Human Resources Department
Field activities	SSC-hazardous waste (SSC-HW) training	Various qualified training organizations	Training will be verified as current prior to starting field activities by SSC.	CH2M HILL SSC	CH2M HILL SSC	CH2M HILL Human Resources Department

Page Intentionally Left Blank

SAP Worksheet #9a — Project Scoping Session Participants Sheet

Project Name: SI/Expanded SI for 7 Consent Order and 16 PI/PAOC Sites	
Projected Date(s) of Sampling: February through April 2009	**Site Name:** East Vieques Former Vieques Naval Training Range (VNTR)
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Session: October 17, 2007 **Scoping Session Purpose:** Site visit to 16 PI/PAOC East Vieques sites in advance of scoping session; ultimate goal is to determine which sites require SI and which sites require NFA.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC.
Michael Sivak	Human Health Risk Assessment Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and review of human health risk evaluation and related aspects of SI/Expanded SI.
Diana Cutt	Geology/Hydrogeology Lead	USEPA	212-637-4311	Cutt.diana@epa.gov	Technical input and review of geology/hydrogeology and related aspects of SI/Expanded SI.
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 evaluation and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC.
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.Doerr@CH2M.com	Scope development and technical review. Primary CH2M HILL POC.
John Swenfurth	PM	CH2M HILL	813-874-6522 x4127	John.Swenfurth@CH2M.com	Project management

Comments/Decisions: This site visit purpose was to observe current conditions at 16 PI/PAOC sites to help determine which sites require an SI and which require no further action. For sites where an SI will be conducted, the site visit was also used to select sampling locations. The 16 sites comprised: Photo Identified (PI) 5, 6, 8, 10, 11, and 20 and PAOC I, M, O, P, Q, R, T, V, W, and X.

Action Items: Document decisions during October 18, 2007 Environmental Technical Subcommittee Meeting.

Consensus Decisions: Concurred on sites for NFA and sites for and SI (including sample locations and analyses). See SAP Worksheet #9b.

SAP Worksheet #9b — Project Scoping Session Participants Sheet

Project Name: SI/Expanded SI for 7 Consent Order and 16 PI/PAOC Sites	
Projected Date(s) of Sampling: February through April 2009	**Site Name:** East Vieques Former VNTR
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Sessions: October 18, 2007 **Scoping Session Purpose:** Document decisions made during October 17, 2007 site visit	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC
Johnny Noles	Biologist	Navy	757-322-4891	John.noles@navy.mil	Navy ecological technical input
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (cell)	Rodriguez.daniel@epamail.gov	Primary USEPA POC
Michael Sivak	Human Health Risk Assessment Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and review of human health risk assessment and related aspects of SI/Expanded SI
Diana Cutt	Geology/Hydrogeology Lead	USEPA	212-637-4311	Cutt.diana@epa.gov	Technical input and review of geology/hydrogeology and related aspects of SI/Expanded SI
Mindy Pensak	Ecological Risk Assessment Lead	USEPA	732-321-6705	Pensak.Mindy@epa.gov	Technical input and review of ecological risk evaluation and related aspects of SI/Expanded SI
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 (x6141)	wilmarierivera@jca.gobierno.pr	Primary PREQB POC
Richard Henry	Vieques RPM	USFWS	732-906-6987	Richard_henry@fws.gov	Primary USFWS POC
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 ext 226	Felix_lopez@fws.gov	Technical input and deliverable review
Diane Wehner	Natural Resource Manager	NOAA	240-338-3411	Diane.wehner@noaa.gov	Technical input and review of ecological risk evaluation and related aspects of SI/Expanded SI
Katarina Rutkowski	Technical Support Contractor Human Health Risk Assessment Lead	TRC	860-298-6202	rutkowski@trcsolutions.com	Technical input and review of human health risk assessment and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC.

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

Project Name: SI/Expanded SI for 7 Consent Order and 16 PI/PAOC Sites	
Projected Date(s) of Sampling: February through April 2009	**Site Name:** East Vieques Former VNTR
PM: John Swenfurth	**Site Location:** Vieques, Puerto Rico
Dates of Sessions: October 18, 2007 **Scoping Session Purpose:** Document decisions made during October 17, 2007 site visit	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Bill Tucker	Technical Support Contractor PM	MACTEC	352-332-3318	watucker@mactec.com	Coordinate technical deliverable review on behalf of USFWS.
Joe Foran	Facilitator	The Management Edge	207-232-3080	jforan@maine.rr.com	Facilitate team-based scoping session
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.doerr@ch2m.com	Scope development and technical review. Primary CH2M HILL POC
John Swenfurth	PM	CH2M HILL	813-874-6522 (x4127) 813-390-4734 (cell)	John.Swenfurth@CH2M.com	Project management

Comments/Decisions: See meeting minutes from October 18, 2007 Environmental Subcommittee Meeting below.

Action Items: See below.

Consensus Decisions: See below.

Page Intentionally Left Blank

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

Excerpt from the Final October 18, 2007 Environmental Technical Subcommittee Meeting Minutes

16 remaining PI/PAOC sites in the ERP

The discussion of the 16 remaining PI/PAOC sites in the ERP began with a discussion of the 7-step decision analysis by which each of the 16 sites was evaluated by the Navy in preparation for the meeting. In addition, representatives of the Navy, USEPA, EQB, TRC, and CH2M HILL visited most of the sites prior to the Technical Subcommittee meeting. In general, the 7-step decision analysis process was thought to be reasonable by the team members, although there were several comments about potential refinement. It was noted that the 7-step decision analysis process is the same process used in the upcoming Draft Preliminary Assessment/Site Investigation (PA/SI) Report for the 12 Consent Order and 8 PI/PAOC sites, so reviewers will have the opportunity to provide comment once they've had a chance to see its effectiveness when applied to those 20 sites, as well as to the 16 sites discussed during this Technical Subcommittee meeting.

The following is a summary of the key points of discussion for each of the 16 PI/PAOC sites. The discussion references the notebook passed out to all meeting attendees containing the historical information and decision analysis results for each. The information in the notebook as well as the key points documented below will be included in a work plan for sites where further action will take place and in a no further action decision document for sites where no further action is necessary. Note that the colors will be revised when the tables are re-submitted (in a work plan or no further action decision document, as applicable) to avoid colors that are too similar to each other.

PI 5

The proposed samples and analyses are concurred upon by the team, with the following modifications:

- A surface/subsurface soil sample (SS/SB-7) will be added to the terminus of the north-south ditch containing SS/SB-3 and SS/SB-4, in the cleared area shown on the 1962 aerial photograph.
- Sample SS/SB-5 will be re-located to the north-south ditch at the western end of the runway shown in the 1962 aerial photograph. SS/SB-6 will be moved toward the center of the ditch in which it is shown.
- A surface/subsurface soil sample (SS/SB-8) will be added to the stained area just south of the runway and due east of the "Excavation with Liquid" shown on the 1959 aerial photograph.

Any information from the FWS crab study in the vicinity of the site will be added to the PI 5 background information in the work plan, and will be considered, as applicable, during evaluation of the soil data.

It was noted that the locations of soil samples SS/SB-1 through SS/SB-4 on the 1962 aerial photograph are approximate. The objective of the sample locations is to evaluate depositional areas near the runway, as well as further downstream. The exact locations will be identified in the field during reconnaissance in preparation for sample collection. It was noted that if contamination is found in the samples near the runway, but not further downstream, additional

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

samples between those locations may be necessary. In addition, if contamination is found in all the samples, additional downstream samples may be necessary.

PI 6

The proposed approach for sampling at this site was changed based on the site visit and discovery of a map in the EBS Report as follows:

The former impoundment shown in the PI-6 aerial photographs was found to be for storage of fresh water (map in EBS Report). Therefore, the soil samples proposed for the lagoon (i.e., SS/SB-7 through SS/SB-10, shown in the 1964 and 1983 aerial photographs) will be eliminated.

During the site visit on October 17, 2007, the concrete pad (adjacent to the pump house) on which the polychlorinated biphenyls (PCBs) were stored was noted to have a concrete berm around it. However, on the east side of the pad, the berm was noted to have small openings. In addition, it was noted that the pad had a central trough that led to a sump within the pump house. The sump was observed to have an unknown thickness of soil/leaf litter in it. Therefore, the three proposed surface/subsurface soil samples shown around the pad in the 1983 aerial photograph will be relocated as follows:

One surface/subsurface soil sample will be collected within the sump, if the soil thickness permits. An attempt will be made to determine the thickness of the soil within the sump, the type of bottom the sump has (e.g., concrete, soil), and the general condition of the sump (e.g., cracks, absence of cracks). If the sump does not have a solid bottom, observations of the soil core from the slide hammer will be used to attempt to differentiate the material that accumulated in the sump from native soil. Photographs of the sump and soil, as practical, will be collected during this effort. If there is not enough soil thickness to collect separate surface and subsurface soil samples within the sump, at least one soil sample will be collected at the base of the material in the sump (i.e., at the interface with the sump bottom or native material).

- The remaining two surface/subsurface soil samples will be moved to the east side of the concrete pad, immediately adjacent to the openings in the concrete berm.
- An additional surface/subsurface soil sample will be added at the location of the former wash pad.

PI 8

The proposed samples and analyses are concurred upon by the team, with the following modifications:

- An additional surface/subsurface soil sample (SS/SB-14) will be added to the location of EBS soil sample PI8-3 because only surface soil was collected at this location and toluene was detected in the sample.
- Because the ditch on the western boundary of PI-8 leads to PI-5, a surface/subsurface soil sample (SS/SB-15) will be added to the ditch, where it makes the turn from more north-south trending to more east-west trending in the 1962 aerial photograph.

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

PI 10

The proposed samples and analyses are concurred upon by the team, with the following clarifications:

- The subsurface soil samples will be collected at the base of the sludge, if it can be visually identified from the continuous spoons.
- Sample SS/SB-1 shown in the 1962 aerial photograph will be collected just outside the bermed area, noted by ERI to be an area where liquid was observed outside the lagoons in the 1962 aerial photograph.

PI 11

The team concurred no further action is necessary for the site. In the no further action decision document, the following discussion modifications will be made:

- Instead of defaulting to discussion of soil screening levels (SSLs) at a dilution/attenuation factor (DAF) of 20 if SSLs at a DAF of 1 are exceeded, the lowest DAF where there are no exceedances will be cited.
- It will be noted that surface soil sampling was sufficient because groundwater at the site is so shallow (i.e., about 1 ft bgs).

PI 20

The team concurred no further action is necessary for PI-20. The October 17, 2007 site visit confirmed the site was dug out, not filled in. It is currently a lagoon.

PAOC I

The proposed samples and analyses are concurred upon by the team, with the following clarifications:

- Based on the October 17, 2007 site visit, the four proposed surface/subsurface soil samples will be relocated (and one surface/subsurface soil sample was added) to coincide with the two doors (one adjacent to each entrance on the south and west sides of the building) and the three pipe penetrations (one adjacent to each of the two pipes on the south side of the building and one adjacent to the pipe on the east side of the building).

PAOC M

Rather than no further action, the team concurred that the following will be conducted at PAOC M:

- The slide hammer will be used to collect continuous samples from four locations around the footprint of former little white building shown in the 1983 aerial photograph. The samples will be collected to refusal or 6 feet (ft) bgs, whichever comes first. The soil cores will be screened visually and with a PID. If contamination is suspected, then a soil sample(s) from the suspected contaminated zone will be submitted to a laboratory for analysis of TCL semivolatile organic compounds (SVOCs) and TAL metals.

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

PAOC O

The team concurred on the proposed sampling for PAOC O.

PAOC P

Rather than no further action, the team concurred that the following will be conducted at PAOC P:

- A mobile generator was observed during the site visit. One surface/subsurface soil sample will be collected directly below the generator and analyzed for TCL SVOCs and TAL metals.

PAOC Q/R

The proposed samples and analyses are concurred upon by the team, with the following modifications:

- In the 1983 aerial photograph that shows the former boiler house location (Building 607), there is another former building to the north that looks very similar to Building 607. It is possible that this other building is PAOC R (former boiler house Building 617), although historical maps do not label this building as Building 617. However, because both buildings were very small, one of the proposed surface/subsurface soil samples from Building 607 (PAOC Q/R) will be relocated to the location of the similar structure located to the north in the 1983 aerial photograph. Therefore, one surface/subsurface soil sample will be collected at PAOC Q/R and one surface/subsurface soil sample will be collected at the former location of the similar structure to the north.

PAOC R

See the above discussion regarding PAOC Q/R. In addition, if information is found regarding an exact location of PAOC R, it will be sampled in a manner consistent with PAOC Q.

PAOC T

Based on the data collected at this PAOC T as part of the PAOC U investigation, the team concurred no further action is necessary for PAOC T.

PAOC V

The team concurred no further action is necessary for PAOC V.

PAOC W

Based on information in the Mangrove Forest Health and Status Report by GeoMarine (2002) and on the site visit performed by agency representatives on October 17, 2007, the team concurred no further action is necessary for PAOC W.

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

PAOC X

The proposed samples and analyses are concurred upon by the team, with the following modifications:

- Volatile organic compound (VOC) analysis will be added to the analytical protocol.

Also, FWS noted that petroglyphs were identified in the vicinity of this site, so their location should be identified (if possible) prior to the debris removal in order to avoid any encounter. If possible, the metal debris will be recycled.

Page Intentionally Left Blank

SAP Worksheet #9c — Project Scoping Session Participants Sheet

Project Name: SI/Expanded SI for 7 Consent Order and 16 PI/PAOC Sites	
Projected Date(s) of Sampling: February through April 2009	**Site Name:** East Vieques Former VNTR
PM: Brett Doerr	**Site Location:** Vieques, Puerto Rico
Date of Session: April 2-3, 2008 **Scoping Session Purpose:** Concur upon the scope of work for the sites from the 20 PA/SI Report requiring an Expanded SI.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (cell)	Rodriguez.daniel@epa.gov	Primary USEPA POC
Michael Sivak	Human Health Risk Assessment Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and review of human health risk evaluation and related aspects of SI/Expanded SI
Diana Cutt	Geology/ Hydrogeology Lead	USEPA	212-637-4311	Cutt.diana@epa.gov	Technical input and review of geology/hydrogeology and related aspects of SI/Expanded SI
Mindy Pensak	Ecological Risk Assessment Lead	USEPA	732-321-6705	Pensak.Mindy@epa.gov	Technical input and review of ecological risk evaluation and related aspects of SI/Expanded SI
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 (x6141)	wilmarierivera@jca.gobierno.pr	Primary PREQB POC
Richard Henry	Vieques RPM	USFWS	732-906-6987	Richard_henry@fws.gov	Primary USFWS POC
Sergio Lopez	QC Specialist	USEPA	732-321-6778	Lopez.Sergio@epa.gov	Technical input and review of QA/QC elements of SI/Expanded SI
Diane Wehner	Regional Resource Coordinator	NOAA	240-338-3411	Diane.wehner@noaa.gov	Technical input and review of ecological risk evaluation and related aspects of SI/Expanded SI
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 evaluation and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC.
Mike Smith	Technical Support Contractor	TechLaw	678-765-0815	MSmith@TechLawInc.com	Review technical aspects of deliverables on behalf of USEPA
Joe Foran	Facilitator	The Management Edge	207-232-3080	Jforan1@maine.rr.com	Facilitate team-based scoping session
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.doerr@ch2m.com	Scope development and technical review. Primary CH2M HILL POC

Comments/Decisions: See meeting minutes from April 2-3, 2008 Environmental Subcommittee Meeting below.
Action Items: See below
Consensus Decisions: See below

Page Intentionally Left Blank

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

Excerpts from the Draft April 2-3, 2008 Environmental Technical Subcommittee Meeting Minutes

Discussing and Concurring on the Preliminary Responses to Comments on the Draft PA/SI Report

Figure A from the preliminary responses shows groundwater data from the wells within and immediately adjacent to Camp Garcia in order to graphically depict regional perspective on groundwater quality. It was concurred upon that the figure will be added to the main body of the report and will include the general groundwater flow direction. The data provided on the figure suggest there is no broad contaminant plume in the groundwater. PREQB expressed concern whether the data could alternatively indicate the tail end of groundwater contamination that has migrated further downgradient. USEPA also noted that because there are so many sites within Camp Garcia, it would be helpful to evaluate the groundwater quality leaving the Camp Garcia boundary (i.e., immediately downgradient of the boundary). Therefore, to address both USEPA's and PREQB's concerns, two new wells will be installed during the SI/Expanded SI. One well will be immediately downgradient of the eastern half of Camp Garcia (i.e., downgradient of the SWMU 4/6/7 area) and the other will be installed immediately downgradient of the western half of Camp Garcia (i.e., downgradient of the PAOC J and K area).

For SWMU 1, in the decision analysis steps, it will be clarified that the surface soil samples were collected from the soil cover. In addition, instead of substituting soil samples within the vertical profile of the debris for soil samples beneath the debris, soil samples within the vertical profile of the debris will be collected in addition to soil samples beneath the debris. The recommendations for SWMU 1 will be revised to reflect this.

The potential for there to be an underground fuel line from PAOC N to the power plant portion of PAOC S was discussed due to their close proximity. Although there is no historical information suggesting fuel was supplied to the power plant in this manner, the recommendations sections for PAOC N and PAOC S will be revised to indicate a geophysical evaluation will be conducted between PAOC N and PAOC S to determine if there is an underground pipeline.

Scoping and Discussion of Various UFP-QAPP Elements for the SI/Expanded SI of Various Consent Order and PI/PAOC Sites

Because the worksheets in the UFP-QAPP contain much more information than just QAPP information (i.e., they contain SAP level of information, which comprises the elements of a Field Sampling Plan (FSP) and QAPP), the Navy has adopted the terminology UFP-SAP instead of UFP-QAPP, but all the worksheets and the guidance followed are those of the UFP-QAPP. Sergio Lopez/USEPA noted, however, that the UFP-QAPP guidance designation is "UFP-QAPP," so if new terminology is adopted, it really should not be called a "UFP-QAPP" because it was not agreed upon by the collection of agencies that developed the UFP-QAPP. The Team concurred it would be called a "SAP" and would include a notation that the UFP-QAPP format and guidance were followed.

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

Various worksheets were discussed or touched upon as part of the scoping session. Worksheet 5 (Project Organizational Chart) was revised to include a box for Diane Wehner/NOAA with a communication line to USEPA. Worksheet 7 (Personnel Responsibilities and Qualifications), Worksheet 8 (Special Personnel Training Requirements), and Worksheet 9 (Project Scoping Session Participants) were reviewed briefly. The majority of the remaining discussion focused on the problem definition and scope of investigation for each of the sites in the SI/Expanded SI not discussed in October 2007. The primary discussion points are summarized below and will be incorporated into the various worksheets to be submitted as part of the SI/Expanded SI SAP.

It is recognized that the reporting limit (RL) for some constituents are above the project action limits (PALs). The SAP will identify where this is true and the potential affect on the data usability. This discussion will include an explanation of the main constituents likely to be present at each site as a result of a release. For example, the team looked at SWMU 2, the fuels offloading site. At this site, SVOCs and lead were identified as the primary constituents of interest. Although there are some SVOC RLs above PALs, the RLs for the main SVOCs associated with fuels, such as benzo(a)pyrene, and lead are below the PALs. Therefore, it is not necessary to find alternative SVOC or lead analytical methods for the Expanded SI at SWMU 2.

It was noted that the thallium method is shown as modified in Worksheet 15. The SAP will include an explanation for how the method was modified to achieve the lower reporting level. In addition, a background column should be added for soil inorganics worksheets and a maximum contaminant level (MCL) column should be added for the groundwater worksheets of Worksheet 15.

The decision analysis tree will be revised to add a step between Step 1 and Step 2 for assessing the data availability and usability.

For Worksheet 13, PREQB would like to see a worksheet per site, in which the limitations of the existing data are discussed. This will help show the rationale for the data collection proposed in the SAP. In addition, it should be stated in the Worksheet 13 if/where the historical data are going to be combined with the newly collected data for the purposes of screening.

The laboratory standard operating procedures (SOPs) will be included in the SAP. In addition, where wells are to be installed at a site, the anticipated specifications of the wells (depths, screen lengths, etc.) will be added to site-specific worksheets.

Brett Doerr/CH2M HILL will check with the project chemist to ensure the data validator adds J flags for concentrations below the actual QL, not the CRQL. He will also see if the lab has actual QLs that are below the CRQLs that are currently shown in Worksheet 15.

With respect to the problem definition and scope of investigation for the 12 Consent Order sites and 8 PI/PAOC sites, the following was concurred upon.

SWMU 1

The problem definition will be modified to include identifying the vertical extent of the landfill in addition to horizontal extent. It was noted that the proposed sample locations shown in Figure 3-11 of the Draft PA/SI Report are tentative; the actual locations will be selected during a team site visit. It was suggested that the upstream ephemeral stream sample should be moved to a location further from the road. If the landfill boundary is found to be smaller (based on geophysics), it can be moved south. If the landfill boundary is larger, it can be moved north.

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

For the data needs, magnetics and electromagnetics to identify horizontal extent of landfill will be added. In addition, it will be added that digital photos and field notes of each excavation will be submitted to the Team for real-time review to help determine final locations of wells. In addition, for VOCs, three separate Encores will be collected (rather than compositing in field) and instructions will be provided to lab to combine for a single VOC analysis. Soil samples will be collected as each test pit is opened (versus opening all pits and going back to collect samples) to help avoid volatilization of any volatiles present in the soil. If no soil is encountered within the debris, this will be noted in the field logs and only the subsurface soil sample below the waste will be collected. If an additional ephemeral stream is identified during the pre-mobilization site visit along the southwest portion of the landfill, additional samples will be added.

SWMU 2

The problem definition and scope of investigation in the meeting talking points were concurred upon as proposed (including incorporating relevant SWMU 2 response to comments on Draft PA/SI Report).

SWMU 4

The Team agreed to install a monitoring well downgradient of the eastern half of Camp Garcia, which is immediately downgradient of SWMU 4 to help confirm there was no release from SWMU 4. No additional sampling specifically at SWMU 4 is necessary, pending evaluation of the results of the groundwater sample from the downgradient well. This information will be added to both the PA/SI Report and the SI/Expanded SI SAP.

SWMU 6/7

The problem definition and scope of investigation in the meeting talking points were concurred upon as proposed (including incorporating relevant SWMU 6/7 response to comments on Draft PA/SI Report). In addition, the monitoring well downgradient of the eastern half of Camp Garcia will help confirm whether there was a release from SWMU 6/7 that impacted groundwater.

SWMU 10

The problem definition and scope of investigation in the meeting talking points were concurred upon as proposed (including adding the rationale for not sampling the newer lagoon and incorporating relevant SWMU 10 response to comments on Draft PA/SI Report).

AOC A

The problem definition and scope of work in the meeting talking points were concurred upon as proposed (including adding use of field assay kits for diesel range organics [DRO] to help confirm sufficient soil is removed and incorporating relevant AOC A response to comments on Draft PA/SI Report).

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

AOC G

Although AOC G was proposed for NFA in the Draft PA/SI Report, the potential that pump maintenance fluids were spilled or disposed of adjacent to the chlorination building was discussed. To address this uncertainty, AOC G will be added to the SI/Expanded SI SAP. A co-located surface/subsurface soil sample will be collected from two locations adjacent to the entrance to the building (i.e., potential discharge point). The exact locations will be selected during the Team site visit. The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics.

PI 4

The problem definition and scope of work in the meeting talking points were concurred upon as proposed (including analyzing for only VOCs once the Team evaluated and discussed the results of the other analyses [i.e., Table 14-3 from Draft PA/SI Report] and incorporating relevant PI 4 response to comments on Draft PA/SI Report).

PI 7

The problem definition and scope of work in the meeting talking points were concurred upon as proposed with the addition of the following confirmatory sampling protocol:

Up to 5 drums, collect one 6-inch soil sample beneath removed drums; between 6 and 19 drums, collect two 6-inch soil samples beneath removed drums; 20 or more drums, collect three 6-inch soil samples beneath removed drums. Use professional judgment to ensure appropriate spatial distribution. Use PID/visual observations to bias sample locations. If there is visual or PID evidence of a release, add subsurface soil sample to that location(s) to evaluate vertical extent. Analyze all soil samples for TCL VOCs and SVOCs, and TAL inorganics.

PAOC L

The problem definition and scope of work in the meeting talking points were concurred upon as proposed with the addition of resampling the existing well for the same suite of parameters for which it was originally sampled. The purpose is to confirm the previous results.

SAP Worksheet #9d — Project Scoping Session Participants Sheet

Project Name: SI/Expanded SI for 7 Consent Order and 16 PI/PAOC Sites	
Projected Date(s) of Sampling: February through April 2009	**Site Name:** East Vieques Former VNTR
PM: Brett Doerr	**Site Location:** Vieques, Puerto Rico
Date of Session: January 26 and 27, 2009 **Scoping Session Purpose:** To visit sites to be investigated during the SI/Expanded SI in order to concur upon sampling locations.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kevin Cloe	Vieques RPM	Navy	757-322-4736	Kevin.cloe@navy.mil	Primary Navy POC
Daniel Rodriguez	Vieques RPM	USEPA	787-741-5201 787-671-9879 (cell)	Rodriguez.daniel@epa.gov	Primary USEPA POC
Michael Sivak	Human Health Risk Assessment Lead	USEPA	212-637-4310	Sivak.michael@epa.gov	Technical input and review of human health risk evaluation and related aspects of SI/Expanded SI
Diana Cutt	Geology/Hydrogeology Lead	USEPA	212-637-4311	Cutt.diana@epa.gov	Technical input and review of geology/hydrogeology and related aspects of SI/Expanded SI
Felix Lopez	Environmental Contaminants Specialist	USFWS	787-851-7297 x 226	Felix_lopez@fws.gov	Technical input and deliverable review
Wilmarie Rivera	Vieques RPM	PREQB	787-767-8181 x6141	wilmarierivera@jca.gobierno.pr	Primary PREQB POC
Richard Henry	Vieques RPM	USFWS	732-906-6987	Richard_henry@fws.gov	Primary USFWS POC
Madeline Rivera	Vieques Environmental Restoration Program Site Manager/On-island coordination	Navy	757-348-2689 (cell)	llamasmad@gmail.com	POC for Navy on Vieques.
Laura Pugh	Senior Staff Consultant	TechLaw	763-208-2828	lpugh@techlawinc.com	Technical input and review of documents for EPA.
Diane Wehner	Regional Resource Coordinator	NOAA	240-338-3411	Diane.wehner@noaa.gov	Technical input and review of ecological risk evaluation and related aspects of SI/Expanded SI
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 evaluation and related aspects of SI/Expanded SI on behalf of EQB. Primary TRC POC.
Stephen Brand	Field Team Leader	CH2M HILL	757-671-6211	Stephen.Brand@CH2M.com	Field Team Leader
John Swenfurth	PM	CH2M HILL	813-874-6522 x4127 813-390-4734 (cell)	John.Swenfurth@CH2M.com	Project management
Brett Doerr	Environmental Manager	CH2M HILL	757-671-6219	Brett.doerr@ch2m.com	Scope development and technical review. Primary CH2M HILL POC

Comments/Decisions: See meeting minutes from January 26-28, 2009 Environmental Subcommittee Meeting below.
Action Items: See below
Consensus Decisions: See below

Page Intentionally Left Blank

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

Excerpts from the Draft Meeting Summary – Vieques ERP Technical Subcommittee Site Visits and Meeting on January 26-28, 2009.

On January 26 and 27, 2009, the ERP Technical Subcommittee visited sites to be investigated during the SI/Expanded SI in order to concur upon sampling locations. The following summarizes the key decisions or notations made for each site.

Note – Subsequent to the January 26-27, 2009 Technical Subcommittee site visits, the CH2M HILL field team leadership conducted a "dry run" at each site in preparation for the larger team mobilization. Based on observations made during the "dry run" at SWMU 1, AOC A, and PAOC L, minor aspects of the approach presented in the Draft Final SI/Expanded SI SAP and/or concurred upon during the Technical Subcommittee site visit were modified to improve efficiency, while maintaining the original objective. These modifications are presented in bold at the end of each applicable site visit summary below and denoted by a double asterisk (**).

SWMU 1

- With respect to the test pit and monitoring well locations, the team concurred that the locations shown on the figure are acceptable given that the objective is to collect this information from locations that are approximately evenly spread across the landfill, biased toward areas of geophysical anomalies.
- With respect to the sample locations in the ephemeral stream to the east of the landfill, the team concurred on the following:
  - The location of SW01 is acceptable and was field verified. Prior to the site visit, the potential to move SW01 northward was noted due to its proximity to the north-south road through the landfill. However, upon seeing the location, it was observed that runoff from the road could not enter the stream near SW01 due to the presence of a topographic rise between the road and the ephemeral stream. A car battery was noted in the ephemeral stream near the SW01. The battery will be removed during the field investigation.
  - The CH2M HILL field crew will traverse the ephemeral stream beginning at SW01 and moving south. Location SW02 will be relocated (see text below). Location SW03 will be placed at the approximate mid-point of the landfill (from north to south) in a depositional area, if present. The team will continue to move south along the ephemeral stream until the transition from high-velocity to low-velocity is observed (i.e., via change in streambed grain size, presence of organic matter, presence of vegetation growing in stream channel, widening of stream channel, etc.). SW04 will be collected in this area. SW02 will be collected at the terminus of the ephemeral stream at Chivas Lagoon in the deltaic deposits before it enters the lagoon (i.e., still in the terrestrial environment). A drum was observed near the southern end of the ephemeral stream north of the east-west road. Its location was marked by GPS (Drum1-26-9) and it will be removed during the field investigation. Based on the above, the sample names may be changed to keep them in ascending order from north to south along the streams.

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

- The team identified a second ephemeral stream traversing the landfill parallel and just to the east of the main north-south road through the landfill. One sample location was marked by stake and GPS (SW05) in a depositional area just north of the east-west road near its junction with the north-south road (just east of the gate to SWMU 1). One land crab burrow was identified at this location. However, because this is not normal land crab habitat, the surface soil sample interval will be 0-1 foot bgs (in the absence of shallower water). A second sample will be collected south of the east-west road from a depositional area, if present, near the southern boundary of the landfill, as defined by the geophysics done during the SI/Expanded SI.

**** During the traverse of the eastern ephemeral stream, it was observed that the transition from channel flow to more diffuse, overland flow occurs much further north than originally thought during the inter-agency site visit. In addition, a significant depositional area was observed even further north due to a marked topographic rise in the ephemeral stream. The net result was that a fourth sample location was added to the ephemeral stream north of the east-west road. The first "downgradient" sample (i.e., downstream of SW-1) was placed in the significant depositional area just upstream of the marked topographic rise in the ephemeral stream. The next downgradient sample was placed in the transitional area from high-velocity to low-velocity flow (as described above). Because this transitional area is significantly further north than originally thought (i.e., sampling there does not account for much of t he southern half of the landfill), the CH2M HILL team added a fourth sample just north of the east-west road to account for the area of the landfill south of high-velocity/low-velocity transition.**

SWMU 2

- The team concurred upon reducing the number of sample locations at the fuel offloading area from four to two – one sample location on each side of the former pipe support.
- The team concurred on the sampling locations at the former AST locations.
- With respect to the former fuel pipeline, the team found pipeline debris suggestive of an above-ground construction (e.g., pipe valve handles) in one area along the path cut during vegetation clearance. Because additional pipe debris could be seen in the dense vegetation in this area, additional vegetation clearance will be done in this area to help identify the extent of the debris. A geophysical transect will also be added near this location (if possible due to the presence of the pipeline debris). The other geophysical transects proposed in the work plan will also be performed. If the location of the former pipeline can be ascertained from field observations or geophysics, the two samples along the pipeline will be collected at locations based on this information. If not, then the sample locations will be based on the GPS coordinates of the pipeline from historical maps. Sample SS/SB-22 will be relocated to the area along the pipeline in the vicinity of the aforementioned debris. If additional debris or geophysical anomalies are found, a third sample will be added in the area of the identified debris/anomaly. All samples will be collected along the suspected transect of the original pipeline, not necessarily adjacent to existing debris.

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

SWMU 10 and AOC G

- The team concurred on the sampling locations at SWMU 10.
- The two sampling locations at AOC G were moved closer to the building. The sampling concept is to have two sample locations (one on each side of the building door) as close to the building as possible. GPS coordinates of the sample locations were recorded.

PI-8

- During the site visit, a 2.5-inch OD galvanized pipe was observed near the location of EBS sample PI8-2. The Navy and CH2M HILL will attempt to ascertain the extent of the pipe and its past use (e.g., walking the line in either direction, finding historical maps, showing pictures of the pipe to a plumber, etc.). In addition, sample SS/SB-8 will be re-located to be immediately adjacent to the concrete structure around the observed valve. A second pipe valve structure was found when walking back from SS/SB-9 toward SS/SB-10.
- The team concurred that because the former storage area of the asphalt emulsion drums has been cleared and no evidence of drums was visually observed or identified with a metal detector, sample SS/SB-15 will not be collected.
- The location of ephemeral stream sample SS/SB-9 was placed on the point bar (depositional) side at the bend in the ephemeral stream. A GPS coordinate was recorded.

PI-5

- Sample SS/SB-3 was relocated to the first obvious depositional area along the ditch to Puerto Ferro where land crab burrows were observed. A GPS coordinate was recorded.
- The location of SS/SB-4 shown on the work plan figure was concurred upon.
- Sample SS/SB-7 was relocated closer to the discharge point onto the salt flat. A GPS coordinate was recorded.
- Because of the presence of land crabs at locations SS/SB-3 and SS/SB-4, the 0-2-foot surface soil sampling depth protocol will be followed.
- Because land crabs would not be present at location SS/SB-7, the 0-1-foot surface soil sampling depth protocol will be followed.

PI-10

- The staked location of SS/SB-1 was concurred upon. Additional vegetation clearance will be done to better define the bermed areas. The staked locations of SS/SB-2 and SS/SB-3 will be moved so that they are generally in the center of the lagoon boundaries (not on the berms).

PI 4

- The team concurred upon the locations of the two proposed wells.

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

Two Wells South of Camp Garcia

- The easternmost well was moved further south of the road to avoid conflict with road construction activities. A GPS coordinate was recorded.
- The westernmost well was moved further east to be in the projected downgradient direction from PAOC L and nearby sites. A GPS coordinate was recorded.

SWMU 6/7

- The team concurred to reduce the number of sample locations from 10 to 6. Two sample locations will be placed along each long side of the concrete pad. One sample location will be placed along each short side of the concrete pad. The sample locations will be spaced approximately evenly along the sides.

PAOC L

- The team concurred upon the proposed sample locations, and also concurred that another ring of surface soil samples, further out from the building, will be collected and held pending analysis of the proposed ring. Outer samples will not be analyzed if the adjacent inner sample(s) contain pesticide concentrations comparable to the range of pesticides generally found at Vieques sites.

**** During the "dry run" it was realized that if this site is sampled early in the investigation, the team would still be in the field when the data come back from the laboratory. Therefore, it is not necessary to collect and hold a second, outer ring of samples initially. Once the initial data come back from the laboratory, the data can be assessed to determine if/where additional samples are warranted and the team that is still in the field can collect them.**

PAOCs N/S

- The team concurred on the spatial area of geophysics and confirmed that if any anomalies are identified, the team will discuss the necessity of sampling (i.e., if a probable pipeline and/or UST is identified) and, if so, the number and location(s) of samples.

PAOC X

- The Team observed the mounded berms and concurred that the berms will be pulled down to expose the debris. The debris will be segregated and removed and approximately four soil samples will be collected from directly beneath the debris, as defined in the SI/ESI SAP.
- An ephemeral stream sample was added downstream of the automobile roof in the depositional area where tall grasses are growing.

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

PAOC P

- The Team concurred upon the sampling proposed in the SI/ESI SAP.
- The Team also concurred that the removal subcontractor can, at their discretion, refurbish and reuse the mobile generator, water tank, and/or trailers rather than dispose of them as debris. The plates identifying the equipment as Navy property will be removed prior to releasing to the removal subcontractor.

PI 7

- The Team concurred on the proposed approach for PI 7.

**** AOC A – Although not visited by the Technical Subcommittee, during the "dry run" it was realized that because the amount of backfill in the trench is so small, it is not cost efficient to attempt to segregate the backfill soil from the underlying contaminated soil during the soil removal. Therefore, all soil removed from the excavation will be disposed of offsite.**

Page Intentionally Left Blank

SAP Worksheet #10 — Problem Definition

General

In general, the objective of an SI is "release assessment." More specifically, an SI is intended to:

- Determine whether a release of hazardous waste or hazardous constituents has occurred from past CERCLA-related activities and, if so,
- Determine whether a suspected release warrants further action

An Expanded SI has generally the same objective as an SI, but differs in that historical data collected during an SI suggest additional data are necessary to draw the release assessment conclusions with sufficient certainty.

Regulatory Background

Twelve sites on east Vieques were identified in a Resource Conservation and Recovery Act (RCRA) Consent Order (RCRA-02-99-7301) between the USEPA and Navy, issued January 20, 2000. Subsequently, these 12 sites were investigated via a Phase I RCRA Facility Investigation (RFI), which is essentially synonymous with a PA/SI conducted under CERCLA. The results of the Phase I RFI were initially documented in the Draft Phase I RCRA Facility Investigation Report, Former Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico (CH2M HILL, 2004). However, because a background soil inorganics investigation had not yet been conducted (i.e., to produce a background dataset to which to compare the site-specific soil inorganics data), the draft report was never finalized.

On March 15, 2005, Vieques was placed on the National Priorities List (NPL), which required all subsequent environmental restoration activities for Navy Installation Restoration (IR) sites on Vieques to be conducted under CERCLA unless and until removed from CERCLA authority.

In 2006, the east Vieques background soil inorganics investigation was conducted, the results of which are documented in the *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2007a). In addition, eight PI/PAOC sites on east Vieques were investigated via a PA/SI. The results of this investigation, together with the results of the Phase I RFI for the 12 Consent Order sites, were then compiled into a single report, where they were evaluated in accordance with a newly developed decision analysis framework (Figure 1, modified from the PA/SI Report to add the data quality evaluation step) using the most up-to-date regulatory screening criteria and east Vieques background soil inorganics dataset. The comprehensive report is entitled *Final PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2008), hereafter referred to as the Final PA/SI Report.

Based on the recommendations of the Final PA/SI Report, an Expanded SI is being performed at the following 12 sites (7 Consent Order sites and 5 PI/PAOC sites):

- SWMU 1 – Camp Garcia Landfill
- SWMU 2 – Fuels Offloading Site

SAP Worksheet #10 — Problem Definition (continued)

- SWMU 6/7 – Waste Oil and Paint Accumulation Areas
- SWMU 10 – Sewage Treatment Lagoons
- AOC A – Diesel Fuel Fill Pipe Area
- AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons
- PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage
- PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area
- PAOC L – Former Paint and Transformer Storage Area
- PAOC N – Former Fuel Farm and Filling Station
- PAOC S – Former Power Plant

These 12 sites are undergoing an Expanded SI because the results of the Phase I RFI or PA/SI suggested additional data were warranted in order to achieve the objectives of the PA/SI stated previously. Additionally, groundwater along the downgradient boundary of Camp Garcia will be evaluated due to the existence of multiple sites within Camp Garcia.

In addition to the 12 sites identified above, 10 PI/PAOC sites have been identified by the Navy, USEPA, EQB, and FWS as warranting an SI. These 10 sites are:

- PI 5 – Former Airfield and Associated Ditches
- PI 6 – Former PCB Storage Pad and Vehicle Wash Pad
- PI 8 – Former Motor Pool Maintenance Area
- PI 10 – Former Wastewater Leach Field
- PAOC I – Former Power Plant and Mechanics Shop
- PAOC M – Former Fuel Facility
- PAOC O – Former Boiler Room in Heat Plant Building 238
- PAOC P – Former Water Treatment Pumphouse
- PAOC Q/R – Former Boiler Room in Heat Plant Building 607
- PAOC X – Debris Area in Ephemeral Stream

All of the above sites are shown in Figures 2 and/or 3.

Conceptual Site Model Development

In that the sites covered under this SAP are in the release assessment phase, much of the information contained in a comprehensive conceptual site model (CSM) is not warranted at this time. In other words, a simplified CSM is warranted at the release assessment phase versus what might be warranted in a Remedial Investigation (RI) where full nature and extent determination is performed. The CSM information pertinent to developing the SI/Expanded SI approach (e.g., historical activities, potential release mechanisms, and potential constituents released [if known or suspected]) is included in each site-specific Worksheet 10, together with the site-specific problem definitions and environmental questions to be answered.

SAP Worksheet #10 — Problem Definition (continued)

Rather than initially considering potential receptors present at a particular site, the data collected during the SI/Expanded SI (as well as relevant historical data) are compared to conservative (i.e., unrestricted receptor exposure) ecological and human health screening values (see Worksheet 15). If exceedances are identified, more realistic evaluations are conducted (if possible), which in some cases may include consideration of actual or likely receptors. Examples of more realistic evaluations are presented in Section 1.1.2 of the Final PA/SI Report (CH2M HILL, June 2008). When these more realistic evaluations include making estimates of exposure point concentrations (EPCs), the 95% upper confidence limit of the mean concentrations will be calculated for datasets comprising eight or more samples, and the maximum detected concentrations will be used for datasets comprising less than eight samples. This information will then be discussed qualitatively in site-specific sections of the associated report.

SAP Worksheet #10a — SWMU 1 (Camp Garcia Landfill) Problem Definition

Background and Potential Release History

SWMU 1 is shown in Figure 4. Historical information indicates the site is an unlined, non-permitted landfill used for approximately 25 years (1954 to 1978) for disposal of non-hazardous, municipal waste from personnel stationed at Camp Garcia. An aerial photographic analysis of the landfill indicated that the fill area extended over an area of approximately 55 acres. When the landfill was operational, it was reportedly used for the disposal of municipal waste such as waste paper, corrugated containers, cans and food packaging material, rags, wood, scrap metal, and yard waste. Interviews of base employees indicated that one 5-ton dump truck was used every day, 5 days per week, to transport waste to this site. No hazardous materials reportedly were placed in this disposal area. According to the 1995 RFA, approximately 1,800 to 3,120 tons of waste were disposed in the landfill.

It is reported that during the landfill's operation, the trench method of disposal was employed and land clearing was kept to a minimum to minimize erosion potential. A bulldozer was used to dig a trench into which materials were disposed. The trench was then covered with about 6 inches of soil to control blowing of litter. A final 2-ft-thick soil cover was placed over the trench. Other information regarding the physical setting at SWMU 1 and more detailed CSM information can be found in Section 3.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

In 2004, a Phase I RFI was conducted at SWMU 1. During the Phase I RFI, a geophysical survey was conducted to identify where waste material was likely buried. The geophysical survey provided good coverage of the landfill extent (Figure 4), but may not have extended far enough to delimit the northern and southern landfill boundaries. In addition, no invasive procedures were implemented within the landfill boundaries to confirm the type of waste disposed.

During the Phase I RFI, 50 surface soil samples were collected throughout the landfill and 5 monitoring wells were installed upgradient (1) and downgradient (4) of the landfill (Figure 4). All samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. In addition, select soil and groundwater samples were also analyzed for dioxins. It is important to note that while the soil data provide a good indication of surface soil conditions, because they were collected from approximately 0 to 0.7 ft bls, they represent soil cover conditions, not constituent concentrations potentially attributable to landfill releases. Additionally, the groundwater data provide an indication of the groundwater quality immediately downgradient of the landfill, not the groundwater quality directly below the landfilled waste. Further information on the limitations of the secondary data can be found in Worksheet #13.

SAP Worksheet #10a — SWMU 1 (Camp Garcia Landfill) Problem Definition (continued)

Tables 3-1 and 3-2 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in SWMU 1 surface soil and groundwater samples, respectively. The data show that several VOCs, SVOCs, pesticides, PCBs, dioxins, and inorganics were detected in surface soil. However, evaluation of the data via the process outlined in Figure 1 suggests the surface soil is suitable as cover material. Only inorganics were detected in groundwater. However, most, if not all, are representative of background and none likely poses an unacceptable human health risk. These historical data will be used, as appropriate, in conjunction with the data collected during the Expanded SI to evaluate potential releases and make further action determinations for SWMU 1. The rationale for including or excluding particular historical data from the evaluation (for this site and all sites where historical data exist) will be presented in the SI/Expanded SI Report. For example, if historical data are not pertinent to the objectives of the investigation, they may be excluded from the evaluation. Further, if more recent data exist from the same sampling location (e.g., monitoring wells), the historical data may be excluded from the evaluation. Similarly, if newer analytical methods likely provide more reliable results (e.g., thallium), the historical data may be excluded from the evaluation.

Problem Definition

Because the waste materials have not been observed (i.e., confirmed to be non-hazardous), nor have the soil surrounding and beneath the waste, groundwater beneath the waste, and environmental media of the adjacent stream been evaluated, an Expanded SI is warranted to determine if hazardous waste was disposed of in the landfill and whether there has been a release(s) of hazardous constituents from the landfilled material to environmental media.

Based on the CSM and secondary data evaluation, it is possible that a broad range of constituents (i.e., VOCs, SVOCs, pesticides, PCBs, explosives, and inorganics) could have been released as a result of the historical landfilling operations.

Environmental Questions to be Answered by the Expanded SI:

1. **What is the horizontal and vertical extent of the landfill?**
   Delineation of the horizontal extent of landfill will be completed by performing a second geophysical (magnetics and electromagnetics) survey within the approximate areas shown in Figure 4. The actual area covered by the additional geophysical survey will be based on real-time results (i.e., it will continue to move outward from the landfill until there is no indication of buried material). The delineation of the nature and extent of the landfilled waste will be accomplished by performing test pitting at 20 locations spaced approximately evenly across the landfill (Figure 4) through the vertical profile of the waste material and performing visual (and photographic) observation and identification of the material encountered. The actual locations of test pits will be based on consensus made during a site visit by the ERP Technical Subcommittee (Navy, USEPA, EQB, FWS, and NOAA).

2. **What is the nature of the waste materials disposed of in the landfill?**
   See Question #1 above for the procedure to delineate the nature and extent of the landfilled waste.

SAP Worksheet #10a — SWMU 1 (Camp Garcia Landfill) Problem Definition (continued)

3. **Have there been releases of hazardous constituents to the surrounding soil?**
At each of the 20 test pit locations, a three-point composite sample will be collected from the soil surrounding the waste within the waste debris profile (if present) and a grab sample will be collected from the soil immediately beneath (6-inch interval) the waste to help determine whether there have been releases to soil. If no soil is found surrounding the waste within the vertical debris profile in any particular test pit, this will be noted in the field logs and only the subsurface soil beneath waste will be collected. Additionally, the soil samples will be collected immediately upon opening each test pit (versus opening all 20 pits and then collecting all samples; this is to help avoid volatilization of any volatiles potentially present in the soil). Because of the types of material known to have been or potentially disposed of in the landfill and because the landfill material has not previously been characterized, all soil samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs; TAL inorganics; and explosives, including perchlorate.

4. **Have there been releases of hazardous constituents to the underlying groundwater?**
This question will be answered, in part, by installing and sampling four monitoring wells spaced approximately evenly across the landfill, within or adjacent to four of the test pits (Figure 4). One objective for well installation is to provide broad spatial coverage of the landfill. A second objective is to provide data in areas where releases are suspected or otherwise deemed to have higher probability, based on visual (and photographic) observation. Therefore, the actual locations of the monitoring wells will be determined by consensus of the ERP Technical Subcommittee upon examination of the field notes and pictures submitted by the field team during the Expanded SI. In addition to sampling the new wells, the existing five wells will be re-sampled to provide current data upgradient and downgradient of the landfill. Because of the types of material known to have been or potentially disposed of in the landfill and because the landfill material has not previously been characterized, all groundwater samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs; TAL inorganics (total and dissolved); and explosives, including perchlorate.

5. **Have there been releases of hazardous constituents to the adjacent ephemeral stream?**
To answer this question, seven samples (one upstream and six adjacent to and downstream of the landfill) will be collected from the ephemeral stream along the eastern boundary of the landfill and the ephemeral stream traversing the landfill (Figure 4). The samples will be collected from likely depositional areas along the stream channel, if identifiable (e.g., ponded water, basins, accumulation of sediments), as well as from seeps, areas near known source areas and areas near site surface water drainage. If standing water is found at a particular sampling location, a surface water sample and sediment sample will be collected; if not, a surface soil and subsurface soil sample will be collected. Several of the actual locations of ephemeral stream samples are based on consensus made during a site visit by the ERP Technical Subcommittee on January 27, 2009. Location SW-01 is located upgradient of the landfill as shown in Figure 4. SW-02 is located in a significant depositional area just upstream of the marked topographical rise in the ephemeral stream. SW-03 is placed in the approximate mid-point of the landfill (from north to south) in the transitional area area from high-velocity to low-velocity flow. SW-04 is located in the southern portion of the landfill just north of the east-west road to account for the area of the landfill south of high-velocity / low velocity transition.

SAP Worksheet #10a — SWMU 1 (Camp Garcia Landfill) Problem Definition (continued)

6. A second ephemeral stream was identified which traverses the landfill parallel and just to the east of the main north-south road through the landfill. Sample SW-05 will be collected in a depositional area just north of the east-west road near its junction with the north-south road (just east of the gate to SWMU 1). The surface soil depth of this sample will be 0 to 1 foot bgs (one identified land crab hole was located but it is not typical land crab habitat so the 0 to 1 foot bgs interval will be sampled).

   The remaining two ephemeral stream sample locations were not field-selected during the site visit, but the following selection protocol was concurred upon. Location SW-06 (Figure 4) will be collected south of the east-west road from a depositional area, if present, near the southern boundary of the landfill, as defined by geophysics done during the SI/ESI field investigation. Location SW-07 will be collected at the terminus of the ephemeral stream at Chivas Lagoon in the deltaic deposits before it enters the lagoon (i.e., still in the terrestrial environment).

   Because of the types of material known to have been or potentially disposed of in the landfill and because the landfill material has not previously been characterized, all ephemeral stream samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL inorganics (filtered and unfiltered), and explosives, including perchlorate.

7. **If releases to soil, groundwater, and/or the ephemeral stream are identified, what is the appropriate next step?**
   This determination will be made based on evaluation of the analytical data in accordance with the decision analysis tree shown in Figure 1 as well as qualitative evaluation of the nature and extent of the debris material observed.

SAP Worksheet #10b — SWMU 2 (Fuels Offloading Site) Problem Definition

Background and Potential Release History

SWMU 2 is shown in Figure 5. Historical information suggests the site was a former fuels off-loading site with several aboveground storage tanks [ASTs]. Historical aerial photographs indicate that eight different ASTs were located at the site at various times during its operational history (approximately 1953 to 1978/1979). In addition, a buried fuel transfer pipeline was located between the fuels off-loading area and the area of the former ASTs. Tank refueling reportedly occurred approximately every 3 months, consisting of diesel fuel, unleaded gasoline (MOGAS), leaded gasoline, aviation gasoline (AVGAS), and JP-5 fuel offloading operations. Although historical information suggests fuel may have been released to the ocean during flushing of the fuel line, there are no records of past releases to the ground surface at the site and there was no evidence of past releases observed during past site visits. The remaining ASTs and fuel transfer pipeline were reportedly demolished between 1978 and 1979, but it is not known whether the fuel pipeline was removed or abandoned in place. The concrete fuels offloading ramp and steel pipeline supports next to the ramp are the only remaining visual signs of historical activities at the site. Other information regarding the physical setting at SWMU 2 and more detailed CSM information can be found in Section 4.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

In 2004, a Phase I RFI was conducted at SWMU 2. During the Phase I RFI, eight surface soil samples and one subsurface soil sample were collected around the former fuel tanks and four surface soil samples and one subsurface soil sample were collected around the former fuel offloading area (Figure 5). All surface soil samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. Four surface soil samples were additionally analyzed for dioxins. Both subsurface soil samples were analyzed for Appendix IX VOCs and SVOCs. One subsurface soil sample was additionally analyzed for dioxins. It is important to note that soil samples were not collected at all former tank locations and no soil samples were collected along the former fuel transfer pipeline. Further information on the limitations of the secondary data can be found in Worksheet #13.

Tables 4-1 and 4-2 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in SWMU 2 surface soil and subsurface soil samples, respectively. The data show several SVOCs, dioxins, inorganics, and one pesticide were detected in surface soil. No VOCs, herbicides, or explosives were detected. In subsurface soil, no VOCs, SVOCs, or dioxins were detected. The results of screening these data using the decision analysis process (Figure 1) are presented in Section 4.3 of the Final PA/SI Report (CH2M HILL, 2008). While the data are suitable for use in evaluating potential releases at the site, the decision analysis process (Figure 1) indicated the spatial coverage of the samples was not adequate to draw conclusions with respect to historic releases (i.e., the source area was not sufficiently characterized). Therefore, these data will be used, as appropriate, in conjunction with the data collected during the Expanded SI to evaluate potential releases and make further action determinations for SWMU 2.

SAP Worksheet #10b — SWMU 2 (Fuels Offloading Site) Problem Definition (continued)

Problem Definition

Although the data collected during the PA/SI suggest there has not been a CERCLA-related release at the site that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater, the spatial coverage of the samples was inadequate to draw this conclusion with certainty. Therefore, an Expanded SI is necessary to determine if there was a release of hazardous constituents at SWMU 2 and, if so, whether the release warrants further action.

Based on the CSM and secondary data evaluation, it is possible that fuel-related constituents (i.e., benzene, toluene, ethylbenzene, xylene [BTEX], PAHs, methyl tert butyl ether [MTBE], and lead) could have been released as a result of the historical fuel transfer operations. In addition, because the site is an AST site, TPH is included in the type of fuel-related constituents considered to have been potentially released.

Environmental Questions to be Answered by the Expanded SI:

1. **Was the buried pipeline from the fuel offloading area to the ASTs removed or abandoned in place?**
   If the buried pipeline is found using geophysical techniques, then two surface/subsurface soil samples will be collected along the actual pipelines transect at the approximate locations shown in Figure 5. If the geophysical techniques do not find the pipeline, then the two surface/subsurface soil samples will be collected at the locations shown in Figure 5.

   During the January 2009 site visit the team found pipeline debris suggestive of an above-ground construction (e.g., pipe valve handles) in one area along the path cut during vegetation clearance. Because additional pipe debris could be seen in the dense vegetation in this area, additional vegetation clearance will be done in this area to help identify the extent of the debris. A geophysical transect will also be added near this location (if possible due to the presence of the pipeline debris). If the location of the former pipeline can be ascertained from field observations or geophysics, the two samples along the pipeline will be collected at locations based on this information. If not, then the sample locations will be based on the GPS coordinates of the pipeline from historical maps. Sample SS/SB-22 is located in the area along the pipeline in the vicinity of the aforementioned debris. If additional debris or geophysical anomalies are found, a third sample will be added in the area of the identified debris/anomaly. All samples will be collected along the suspected transect of the original pipeline, not necessarily adjacent to existing debris.

2. **Have there been releases of hazardous constituents from within the area of the eight former fuel tanks, fuel offloading area, and former fuel transfer pipeline between the two areas?**
   To answer this question, at a minimum, one soil boring will be advanced in the location of each former AST, two soil borings will be advanced around the fuel offloading area, and two soil borings will be advanced along the former fuel transfer pipeline, as shown in Figure 5. A surface soil sample and subsurface soil sample (if bedrock is deeper than the surface soil interval) will be collected from each boring. The borings will be screened visually and with PID to help determine whether additional borings are warranted. If visual (or PID) evidence of a

SAP Worksheet #10b — SWMU 2 (Fuels Offloading Site) Problem Definition (continued)

release is observed, additional borings will be advanced in the vicinity to sufficiently delineate the extent of the source area. Because of the nature of potential release (i.e., fuel), all samples will be analyzed for BTEX, MTBE, and PAHs; lead, TPH-gas range organics (GRO), and TPH-DRO, no monitoring wells or groundwater sampling will be necessary during the initial mobilization of the Expanded SI. Should evaluation of all site data suggest the need for monitoring wells, they may be installed as part of a follow-up mobilization.

3. **If probable releases are identified (via visual observation and/or PID screening), is groundwater sampling warranted?**
   In addition to the above, if residual soil contamination is observed (visually or with PID) during soil borings, the need for and location(s) of monitoring well(s) will be determined by consensus of the ERP Technical Subcommittee upon examination of field notes and pictures submitted by the field team during the Expanded SI. If deemed necessary, the monitoring well(s) will be installed during this mobilization. If observations made during soil sampling suggest no release occurred or a release that occurred did not reach groundwater, no monitoring wells or groundwater sampling will be necessary.

4. **Were there historical releases to soil and, if so, do they warrant further action?**
   The soil data will be screened using the decision analysis process depicted in Figure 1 to determine if a release to soil has occurred and, if so, whether it warrants further action.

5. **If groundwater sampling is warranted, have releases adversely affected groundwater and, if so, is further action warranted?**
   If groundwater samples are collected, the data will be screened using the decision analysis process depicted in Figure 1 to determine if a release to groundwater has occurred and, if so, whether it warrants further action.

SAP Worksheet #10c — SWMUs 6/7 (Waste Oil and Paint Accumulation Areas) Problem Definition

Background and Potential Release History

SWMUs 6 and 7 are shown in Figure 6. Historical information suggests the co-located sites were used to store waste oil and paint. The site consisted of a concrete pad, on a portion of which a chain-link cage was located. The area became active in approximately 1978 and continued in operation at least until 1995. The waste oil was containerized in 55-gallon drums and potentially other containers, and the paint was housed in small containers. There were no release controls at the site and an area of staining was observed just off the concrete pad in 1995 and 2000, but was not observed during a 2004 site visit. The chain-link cage was removed from the concrete pad in early 2000. Other information regarding the physical setting at SWMUs 6/7 and more detailed CSM information can be found in Section 7.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

In 2000, surface soil sampling was conducted at SWMU 6/7 as part of the transfer of Navy Public Works operations from west Vieques to east Vieques. Ten surface soil samples were collected around the concrete pad (Figure 6). All surface soil samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics. It should be noted that no subsurface soil samples were collected around the former pad, so the vertical extent of the source area was not ascertained. Further information on the limitations of the secondary data can be found in Worksheet #13.

Table 7-1 of the Final PA/SI Report (CH2M HILL, 2008) summarizes the constituents detected in SWMU 6/7 surface soil. The presence of VOCs, SVOCs, and certain inorganics above background (e.g., zinc) in surface soil suggests a CERCLA-related release occurred at SWMU 6 and/or 7. No herbicides or PCBs were detected. Pesticides were detected, but their presence is not considered to be attributable to a CERCLA-related release, but instead is likely associated with normal pesticide use at the site. The results of the screening these data using the decision analysis process (Figure 1) are presented in Section 7.3 of the Final PA/SI Report (CH2M HILL, 2008). Although the surface soil data suggest NFA may be warranted, due to the nature of VOCs, surface soil samples may not be sufficient to characterize the potential source area where waste oil and paint were stored. Therefore, these data will be used, as appropriate, in conjunction with the data collected during the Expanded SI to evaluate potential releases and make further action determinations for SWMU 6/7. Because the data are approximately 8 years old, and because surface soil samples will be re-collected around the concrete pad, the historical surface soil data will likely be used qualitatively to evaluate how constituent concentrations have changed with time. The newly collected data will be screened using the decision analysis process (Figure 1).

SAP Worksheet #10c — SWMUs 6/7 (Waste Oil and Paint Accumulation Areas)
Problem Definition (continued)

Problem Definition

The presence of VOCs, SVOCs, and certain metals above background (e.g., zinc) in surface soil suggests a CERCLA-related release occurred at SWMU 6 and/or 7. Although the surface soil data suggest NFA may be warranted, due to the nature of VOCs, surface soil samples may not be sufficient to characterize the potential source area where waste oil and paint were stored. Therefore, an Expanded SI is necessary to determine if the CERCLA-related release warrants further action.

Based on the CSM and secondary data evaluation, it is possible that waste oil and/or paint-related constituents (i.e., VOCs, SVOCs, and inorganics) could have been released as a result of the historical storage activities.

Environmental Questions to be Answered by the Expanded SI:

1. **Are the concentrations of VOCs, SVOCs, and metals detected in surface soil samples collected in 2000 still present in surface soil?**
   This question will be answered by comparing the data from 2000 to the newly acquired data.

2. **Do the current concentrations of VOCs, SVOCs, and inorganics in surface soil suggest further action is warranted?**
   To answer this question (and question 3), 6 surface soil and subsurface soil samples will be collected around the perimeter of the concrete pad (Figure 6). Because of the nature of potential release (i.e., waste oil and paint), all samples will be analyzed for TCL VOCs and SVOCs and TAL inorganics. The surface soil data collected during the Expanded SI will be screened using the decision analysis process depicted in Figure 1 to determine whether current constituent concentrations warrant further action.

3. **Did the CERCLA-related release result in contamination of subsurface soil such that further action is warranted?**
   The subsurface soil data collected during the Expanded SI will be screened using the decision analysis process depicted in Figure 1 to determine whether the past release resulted in contamination of subsurface soil and, if so, whether it warrants further action.

SAP Worksheet #10d — SWMU 10 (Sewage Treatment Lagoons) Problem Definition

Background and Potential Release History

SWMU 10 is shown in Figure 7. Historical information suggests the site was former treatment lagoons for domestic sewage from Camp Garcia starting in the early 1950s. There were originally four unlined lagoons; raw wastewater discharged from the two polishing lagoons to the sea through a chlorination chamber (AOC G). Although it is possible that wastewater also was discharged to the ground surface south of the chlorination chamber following chlorination, no historical evidence has been found that suggests this occurred. This information was corroborated by an interview with the former Water Program Manager, NAPR Environmental Division. In 1974, after the level of activity and associated domestic wastewater generation rate significantly decreased at Camp Garcia, the treatment lagoons were lined using a 2-ft compacted clay and plastic liner to create a no-discharge system. The lagoons were then utilized as evaporation lagoons until a new no-discharge lagoon was constructed in 2000 immediately northwest of the original lagoons (Figure 7). The new lagoon was constructed with a clay and plastic liner and used only as an evaporation lagoon. The new lagoon was decommissioned and the area filled in with soil from the berms when the property transfer occurred in 2003, and all sanitary effluent was discontinued from Camp Garcia at that time. No historical evidence has been found that suggests the original lagoons were covered with soil fill. Other information regarding the physical setting at SWMU 10 and more detailed CSM information can be found in Section 9.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

In 2000, surface soil and subsurface soil sampling was conducted at SWMU 10 as part of the transfer of Navy Public Works operations from west Vieques to east Vieques. Co-located surface soil and subsurface soil samples were collected from one location in each of the original lagoons (Figure 7). The samples were analyzed for toxicity characteristic leaching procedure (TCLP) VOCs, SVOCs, and inorganics. The subsurface soil samples were also analyzed for Appendix IX VOCs, SVOCs, and inorganics that are on the TCLP list, as well as TPH. In 2004, a Phase I RFI was conducted at SWMU 10 during which surface soil, subsurface soil, and groundwater samples were collected. Co-located surface soil and subsurface soil samples were collected from four locations (one in each quadrant) in each of the original lagoons (Figure 7). The samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. Seven of the surface soil samples, four of the subsurface soil samples, and two groundwater samples were additionally analyzed for dioxins.

Tables 9-1, 9-2, 9-4, 9-5, and 9-6 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in SWMU 10 surface soil (Table 9-1) and subsurface soil (Table 9-2) in 2000 and in surface soil (Table 9-4), subsurface soil (Table 9-5), and groundwater (Table 9-6) in 2004. No VOCs, herbicides, PCBs, or explosives were detected in surface soil. No herbicides, PCBs, or explosives were detected in subsurface soil. No VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins, or explosives were detected in groundwater. The results of the decision analysis process (Figure 1) are presented in Section 9.3 of the Final PA/SI Report (CH2M HILL, 2008); they suggest the spatial coverage, data quantity, and data quality are sufficient to draw the conclusion that no

SAP Worksheet #10d — SWMU 10 (Sewage Treatment Lagoons) Problem Definition (continued)

CERCLA-related release occurred that warrant further action with one exception. Many of the thallium concentrations are elevated with respect to background, leaching, human health, and/or ecological screening values. However, there is uncertainty in the thallium concentrations in that the available analytical method was prone to falsely elevated results. Further information on the limitations of the secondary data can be found in Worksheet #13.

Problem Definition

Although the historical data suggest there has not been a CERCLA-related release at SWMU 10 that has resulted in contamination at concentrations that would pose a potentially unacceptable risk to human or ecological receptors, leaching concern for groundwater, or MCL exceedance, there is uncertainty associated with the thallium concentrations in soil and groundwater. Thallium was detected in soil and groundwater above screening levels, but the thallium results are associated with an analytical method prone to providing falsely elevated results. Therefore, an Expanded SI is necessary to eliminate this uncertainty.

Environmental Question to be Answered by the Expanded SI:

1. **Are the concentrations of thallium in surface and subsurface soil and groundwater at levels that warrant no further action?**
   To answer this question, two co-located surface and subsurface soil samples per lagoon (Figure 7) will be collected and the existing monitoring wells will be re-sampled. All samples will be analyzed for thallium (total and dissolved for groundwater). The new thallium data will be substituted into the historical dataset and re-evaluated in Step 6 of the decision analysis process (Figure 1).

SAP Worksheet #10e — AOC A (Diesel Fuel Fill Pipe Area) Problem Definition

Background and Potential Release History

AOC A is shown in Figure 8. AOC A was the site of a 15,000-gallon diesel fuel underground storage tank (UST) and associated fill pipe. The UST and fuel fill pipe entered service in approximately 1978. The UST, associated piping including the fill pipe, and some surrounding soil were excavated and removed for disposal in 1997. A new UST was installed in 1997 following removal of the existing UST. The UST installed in 1997 was removed in 2003 in response to the closure of VNTR and the transfer the property to the Department of the Interior (DOI). Other information regarding the physical setting at AOC A and more detailed CSM information can be found in Section 11.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

Following the removal of the UST in 2003, confirmatory soil samples were collected from ten locations: six samples around the former tank (two at the bottom of the excavation and one on each of the four sides of the excavation) and four samples along the length of the bottom of the former fuel line that connected the UST to a generator (Figure 8). The samples were analyzed for BTEX, MTBE, TPH-DRO, naphthalene, and lead.

Table 11-1 of the Final PA/SI Report (CH2M HILL, 2008) summarizes the constituents detected in the confirmatory soil samples collected following the 2003 removal. The data show xylenes and TPH-DRO were detected. No other BTEX constituents, MTBE, naphthalene, or lead were detected. The results of screening these data using the decision analysis process (Figure 1) are presented in Section 11.3 of the Final PA/SI Report (CH2M HILL, 2008), which identified TPH-DRO concentrations in soil along the former fuel fill pipe above the PREQB Land Pollution Control Corrective Action Levels.

Problem Definition

Following the UST removal action, concentrations of TPH-DRO above the PREQB Land Pollution Control Corrective Action Levels were identified in confirmatory soil samples directly below the former fill pipe. However, based on confirmatory soil data around the former UST, the extent of contaminated soil is likely spatially limited. To confirm this supposition, incidental soil removal and additional confirmatory soil sampling are warranted. It is important to note that this procedure is consistent with actions conducted under the PREQB UST program. The work is being conducted under CERCLA for programmatic efficiency.

SAP Worksheet #10e — AOC A (Diesel Fuel Fill Pipe Area) Problem Definition (continued)

Environmental Questions to be Answered by the Additional Soil Removal and Associated Confirmatory Sampling:

1. **Has sufficient soil contaminated with TPH-DRO been removed to warrant no further action at the site?**
   Upon removal of additional soil along the length of the former pipeline where the TPH Land Pollution Control Corrective Action Level criterion (100 milligrams per kilogram [mg/kg]) was exceeded, confirmatory soil samples will be collected along the side-walls and bottom of the excavation (every 5 lineal feet [lf]), analyzed for TPH-DRO, and compared to the TPH Land Pollution Control Corrective Action Level criterion to answer this question.

SAP Worksheet #10f — AOC G (Pump Station and Chlorination Building at Sewage Treatment Lagoons) Problem Definition

Background and Potential Release History

Although there are no records of past releases adjacent to the building at the AOC G pump station, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an Expanded SI is warranted to determine if a CERCLA-related release(s) occurred outside the doorway of the pump station and, if so, whether it warrants further action.

Because there were pumps inside the building that surely underwent periodic maintenance during the roughly 20 years of operations, it is possible that fluids generated during the maintenance operations were spilled or discharged adjacent to the building (although there is no record of this taking place).

Synopsis of Secondary Data

In 2004, a Phase I RFI was conducted at AOC G. During the Phase I RFI, five surface soil samples were collected around the pump house and chlorination building (Figure 7). All surface soil samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. One surface soil sample was additionally analyzed for dioxins. It is important to note that no subsurface soil samples were collected to help determine whether historical spills or releases of pump maintenance fluids outside the building occurred. Further information on the limitations of the secondary data can be found in Worksheet #13.

Table 13-1 of the Final PA/SI Report (CH2M HILL, June 2008) summarizes the constituents detected in AOC G surface soil samples. The data show several SVOCs, pesticides, dioxins, and inorganics were detected in surface soil. No VOCs, herbicides, PCBs, or explosives were detected. The results of screening these data using the decision analysis process (Figure 1) are presented in Section 13.3 of the Final PA/SI Report (CH2M HILL, 2008). The spatial distribution and results of the screening suggest that, other than where pump maintenance fluids may have been spilled or discharged, the surface soil at the site (i.e., around the perimeter of the building and contact chamber) was sufficiently characterized. Therefore, the existing surface soil data will be used, as appropriate, in conjunction with the data collected during the Expanded SI to evaluate potential releases and make further action determinations for AOC G.

Problem Definition

Although there are no records of past releases adjacent to the building at the AOC G pump station, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an Expanded SI is warranted to determine if a CERCLA-related release(s) occurred outside the doorway of the pump station and, if so, whether it warrants further action. Based on the CSM and secondary data evaluation, it is possible that constituents associated with pump maintenance fluids (i.e., VOCs, SVOCs, and inorganics) could have been released outside the building as a result of historical pump maintenance.

SAP Worksheet #10f — AOC G (Pump Station and Chlorination Building at Sewage Treatment Lagoons) Problem Definition (continued)

Environmental Questions to be Answered by the Additional Soil Removal and Associated Confirmatory Sampling:

1. **Were pump maintenance fluids released adjacent to the pump house and, if so, does the release warrant further action?**
   This question will be answered by collecting two co-located surface soil and subsurface soil samples near the building door in an area where fluids would most likely have been spilled or otherwise discharged (Figure 7). The actual sample locations will be based on consensus made during a site visit by the ERP Technical Subcommittee (Navy, USEPA, EQB, USFWS, and NOAA). Because of the nature of potential release (i.e., pump maintenance fluids), all samples will be analyzed for TCL VOCs and SVOCs and TAL inorganics. The soil data collected during the Expanded SI, as well as applicable historical sample data, will be screened using the decision analysis process depicted in Figure 1 to determine whether a release to soil has occurred and, if so, whether it warrants further action.

SAP Worksheet #10g — PI 4 (Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage) Problem Definition

Background and Potential Release History

PI 4 is shown in Figure 9. Historical information suggests the site comprised a former helicopter maintenance area, trenched area, disturbed areas, and bermed area for storage of fuel bladders. There is no known historical information suggesting there were CERCLA-related releases at the site. Further, during the 2001 site inspection of PI sites and the 2002 EBS site inspection, no physical evidence of a release was noted. However, as a conservative measure, five potential sources of a release were identified for PA/SI sampling:

- Former trenches
- Area of disturbed ground south of the helicopter maintenance area
- Bermed fuel bladder storage area
- Former helicopter maintenance area
- Disturbed area in the southeast part of the trenched area (Figure 9)

The historical activities at the site no longer occur and there are no structures remaining at the site other than concrete pads (potential relics of building foundations) and concrete vaults believed to have been associated with a sanitary septic system for barracks and mess potentially located at the site. Other information regarding the physical setting of PI 4 and more detailed CSM information can be found in Section 14.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

During the EBS (2002), two surface soil samples were collected within the bermed area formerly used for fuel bladder storage. Both samples were analyzed for TPH-DRO and TPH-GRO. In 2006, a PA/SI was conducted at PI 4. During the PA/SI, co-located surface soil and subsurface soil samples were collected from 15 borings and groundwater samples were collected from five monitoring wells (Figure 9). The surface and subsurface soil samples collected from the six borings in the trenched and associated disturbed area were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics. The surface and subsurface soil samples collected from the two borings in the bermed area were analyzed for TCL VOCs and SVOCs, and TAL inorganics. The surface and subsurface soil samples collected from the five borings around and within the former helicopter maintenance area were analyzed for TCL VOCs, SVOCs, and pesticides; and TAL inorganics. The surface and subsurface soil samples from the two borings in the disturbed area south of the helicopter maintenance area were analyzed for TCL VOCs, SVOCs, and pesticides; and TAL inorganics. All groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.

Tables 14-1 through 14-3 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in PI 4 surface soil, subsurface soil, and groundwater samples, respectively. Within the bermed area used for fuel bladder storage, the data show that one SVOC and several inorganics were detected in surface soil, inorganics were detected in subsurface soil, and inorganics were detected in groundwater. Within the former helicopter maintenance area, two VOCs, pesticides and inorganics were detected in surface soil; pesticides and inorganics were

SAP Worksheet #10g — PI 4 (Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage) Problem Definition (continued)

detected in subsurface soil; and one VOC and inorganics were detected in groundwater. Within one of the disturbed areas (1962 aerial), pesticides and inorganics were detected in surface soil, pesticides and inorganics were detected in subsurface soil, and two VOCs and inorganics were detected in groundwater. Within the former trenched area, and the other disturbed area (1964 aerial), one SVOC, pesticides, one PCB, and inorganics were detected in surface soil; pesticides and inorganics were detected in subsurface soil; and VOCs and inorganics were detected in groundwater. The results of screening these data using the decision analysis process (Figure 1) are presented in Section 14.3 of the Final PA/SI Report (CH2M HILL, 2008). The screening process indicates there has not been a CERCLA-related release at the site that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. However, several VOCs (chloroform, toluene, PCE, TCE, cis-1,2-DCE) were detected in groundwater that were not detected in any of the soil samples (see Worksheet #13 for further information on limitations of secondary data). It is important to note, though, that the concentrations of each of these VOCs were low (with respect to the screening criteria). Only one detected VOC concentration (9.3 micrograms per liter [µg/L] of TCE in well MW-5) is above 1 µg/L and an MCL. Because the five monitoring wells provide good spatial coverage of the site, especially with respect to the suspected source areas, the groundwater data suggest there is not wide-spread groundwater contamination at the site. However, to confirm this supposition, additional data collection is warranted.

Problem Definition

The presence of VOCs in groundwater suggests a CERCLA-related release occurred at PI 4. However, the data collected during the PA/SI suggest this release has not resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Therefore, NFA is likely appropriate for soil at the site. However, this determination cannot be made with appropriate confidence until groundwater is further evaluated, which will help determine if there is a yet-defined source area in the soil. Although, the groundwater data suggest releases to groundwater have been minor and that groundwater contamination is not widespread or at appreciable concentrations (relative to screening levels), an Expanded SI is necessary to determine if further action (including further soil evaluation) is warranted.

Based on the CSM and secondary data evaluation, the only constituent group of concern (i.e., that may warrant further action) is VOCs.

Environmental Questions to be Answered by the Expanded SI:

1. **Are VOC concentrations in groundwater consistent with those detected during the PA/SI?** This question will be answered by collecting another round of groundwater samples from existing wells for TCL VOC analysis and comparing the results to the initial round of VOC data to help evaluate potential trends.

SAP Worksheet #10g — PI 4 (Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage) Problem Definition

2. **What is the extent of VOC contamination above MCLs up- and down-gradient of the single well (MW-5) demonstrating a VOC MCL exceedance during the PA/SI?**
   This question will be answered by installing a well upgradient of MW-5 and a well downgradient of MW-5 (Figure 9) and sampling the two new wells for TCL VOCs. The locations of the new wells will be based on a synoptic round of water levels collected on 12-29-08 (Figure 9).

3. **Do the extent and concentrations of VOCs in groundwater warrant further action?**
   This question will be answered by evaluating the newly collected VOC data using the decision analysis process (Figure 1). See Worksheet 11.

SAP Worksheet #10h — PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) Problem Definition (continued)

Environmental Questions to be Answered by the Drum Removal and Associated Soil Sampling:

1. **Do the soil data suggest there was an historic release(s) from the drums?**
   Following drum removal, confirmatory soil samples will be collected immediately beneath the drums (Figures 10 and 11) in accordance with the confirmatory sample collection criteria detailed in Worksheet #14, under the PI 7 Site-specific Protocol. The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. Evaluation of the data (i.e., through Step 4 of the decision analysis process [Figure 1]) will be used to determine if there was an historical release(s) from the drums.

2. **Does visual or PID observations beneath the drums suggest the presence of contamination?**
   If contamination is suspected directly beneath the drums (either visually or via PID), subsurface soil samples will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol in the Master QAPP (CH2M HILL, 2007b). If collected, the samples will be analyzed for the same parameter list as the surface soil samples.

3. **If so, is further action warranted?**
   This question will be answered by evaluating the soil data, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10h — PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) Problem Definition

Background and Potential Release History

PI 7 is shown in Figures 10 and 11. Historical information suggests the site was a former radar communication area, former quarry, and former tar drum disposal area. A site reconnaissance of the area encompassing the former quarry and drum disposal area was conducted to confirm the areas where drums are located. Two empty 55-gallon drums were found at one location within the boundaries of the former quarry (Figures 10 and 11). Several areas of empty, tar-stained 55-gallon drums were identified in the former drum disposal area. Other than the presence of the 55-gallon drums, there is no historical information, observations, or analytical data that suggest a CERCLA-related release likely occurred at PI 7. Other information regarding the physical setting at PI 7 and more detailed CSM information can be found in Section 15.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

Four surface soil samples were collected during the EBS (NAVFACENGCOM, 2003) in the vicinity of surficial debris and analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics; and explosives, including perchlorate. Two of the samples were also analyzed for TPH-DRO and TPH-GRO. In 2006, a PA/SI was conducted at PI 7. During the PA/SI, three co-located surface soil and subsurface soil samples were collected within the former radar communication area, five co-located surface soil and subsurface soil samples (and two additional surface soil samples) were collected within the former quarry, and ten co-located surface soil and subsurface soil samples (and two additional surface soil samples) were collected in the former tar drum disposal area. Additionally, one monitoring well was installed in the former quarry and two wells were installed in the former tar drum disposal area (Figures 10 and 11). All samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.

Tables 15-1 through 15-3 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in PI 7 surface soil, subsurface soil, and groundwater samples, respectively. The data show that very few constituents, other than inorganics, were detected in soil and groundwater at the site. The results of the screening of these data using the decision analysis process (Figure 1) are presented in Section 15.3 of the Final PA/SI Report (CH2M HILL, 2008). The spatial distribution of the samples and the results of the screening process suggest there has not been a CERCLA-related release at the site that poses a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater.

Problem Definition

Although the existing data suggest no further action is likely necessary for environmental media at PI 7, there is uncertainty associated with the drums being a potential future source of contamination. Therefore, incidental drum removal is necessary in order to collect sufficient samples to complete the release assessment.

Based on the CSM and secondary data evaluation, the constituents potentially associated with releases from the drums are VOCs, SVOCs, and inorganics.

SAP Worksheet #10i — PAOC L (Former Paint and Transformer Storage Area) Problem Definition

Background and Potential Release History

PAOC L is shown in Figure 12. Historical information suggests the site was used to store paint and transformers. While the building is no longer in use, the structure still exists; it is a small (approximately 15 ft × 15 ft), single room, concrete block building. Based on aerial photographs, the structure was built sometime after 1985. No evidence of storage or releases was observed during site visits performed in 2000, 2002, and 2006. Other information regarding the physical setting at PAOC L and more detailed CSM information can be found in Section 18.1 of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

In 2006, a PA/SI was conducted at PAOC L. During the PA/SI, co-located surface soil and subsurface soil samples were collected from four locations around the perimeter of the building (Figure 12). The southernmost boring was finished as a monitoring well. All soil and groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.

Tables 18-1 through 18-3 of the Final PA/SI Report (CH2M HILL, 2008) summarize the constituents detected in PAOC L surface soil, subsurface soil, and groundwater samples, respectively. The data show that a VOC and several SVOCs, pesticides, and inorganics were detected in surface soil; several pesticides and inorganics were detected in subsurface soil; and several VOCs and inorganics were detected in groundwater. No PCBs were detected in any PAOC L media, and SVOCs were not detected in subsurface soil or groundwater.

Pesticide data collected at multiple Vieques sites show that while the concentrations of pesticides vary within and across sites, the concentration of any particular pesticide in any particular sample is generally similar to that found at other sites, with the exception of one site, PAOC L. While the concentrations of individual pesticides across multiple sites (other than PAOC L) vary from less than 1 micrograms per kilogram [μg/kg] to around 1,200 μg/kg, pesticide concentrations more than an order of magnitude higher than at any other site (i.e., up to 67,000 μg/kg) were detected at PAOC L. It is certainly possible that the pesticide concentrations at PAOC L are consistent with normal, legal application. Further, there is no historical information that suggests the building at PAOC L was used to store pesticides. However, because the structure was used to store chemicals (i.e., paints) and because the pesticide concentrations at this location were an order of magnitude higher than any other site, the Navy is taking the conservative approach to evaluate the pesticide concentrations at PAOC L as a potential CERCLA-related release.

In addition, evaluation of the single groundwater sample from the well at PAOC L indicates the presence of two volatile constituents below MCLs, two inorganics below levels that would likely cause an unacceptable risk, and no SVOCs, pesticides, or PCBs. Although no further action is likely appropriate for groundwater at PAOC L, a second round of groundwater data is warranted to confirm this supposition.

SAP Worksheet #10i — PAOC L (Former Paint and Transformer Storage Area) Problem Definition (continued)

Problem Definition

The data collected during the PA/SI suggest there has been a CERCLA-related release of pesticides at PAOC L. However, the spatial distribution of surface soil samples is not sufficient to characterize the source area and make a determination of the need for further action. Further, a second round of groundwater data is warranted to confirm no further action is warranted for PAOC L groundwater. In addition, an Expanded SI is necessary to determine the area of release in soil and if further action is warranted.

Based on the CSM and secondary data evaluation, pesticides are the constituents for which additional source area delineation is warranted. For groundwater, the same constituents analyzed during the PA/SI are appropriate for the confirmation sampling to be performed during the Expanded SI.

Environmental Questions to be Answered by the Expanded SI:

1. **What is the extent of the area of the release?**
   This question will be answered by collecting an outer ring of surface soil samples around the perimeter of the building and analyzing them for TCL pesticides. If the results of these soil samples identify concentrations that would be consistent with a release, additional samples will be collected further from the building and the outer ring of samples to delineate the area of impacted soil.

2. **Based on a comprehensive understanding of the CERCLA-related release of pesticides, is further action warranted?**
   This question will be answered by evaluating the pesticide dataset (newly collected data and data collected during the PA/SI) in accordance with Step 5 of the decision analysis (Figure 1).

3. **Does a second round of groundwater data confirm no further action is necessary for groundwater?**
   This question will be answered by collecting another groundwater sample from the PAOC L monitoring well, analyzing the sample for TCL VOCs, SVOCs, pesticides, PCBs, and TAL total and dissolved inorganics to determine if the levels are consistent with the initial data. If warranted (i.e., concentrations are higher than initial round), the second round of data will be evaluated in accordance with the decision analysis process (Figure 1).

SAP Worksheet #10j — PAOC N (Former Fuel Farm and Filling Station) and PAOC S (Former Power Plant) Problem Definition

Background and Potential Release History

PAOCs N and S are shown in Figure 13. Historical information suggests PAOC N was an AST fuel farm and filling station within Camp Garcia. The location of the former power plant portion of PAOC S is approximately 50 ft from the fuel farm part of PAOC N. The fuel farm was built in 1985 and demolished in 1992. The area later became the Camp Garcia Refueling Station where a two-compartment diesel/gasoline AST was constructed. Although there are no known records regarding the fuel type used by the generator(s) at the power plant portion of PAOC S, it is likely they used diesel fuel. According to Camp Garcia personnel, there are no records of USTs being installed at Camp Garcia and that all fuel tanks were ASTs; however, a design diagram for a UST at the power house facility (shown in Figure 13a) was found. The diagram does not indicate whether the design was ever implemented. Further, no other information was found in reference to whether the UST was installed or, if installed, whether it was removed. Other information regarding the physical setting at PAOCs N and S and more detailed CSM information can be found in Sections 19.1 and 20.1, respectively, of the Final PA/SI Report (CH2M HILL, 2008).

Synopsis of Secondary Data

For the purposes of this SAP, the historical analytical data for PAOCs N and S (power plant) are not relevant because the Expanded SI is focusing on identifying the potential presence of an underground fuel line. The historical data are not relevant for this objective because the data do not suggest the presence of a fuel release at either site.

Problem Definition

The spatial distribution of samples collected and the decision analysis screening process (Figure 1) suggest PAOCs N and S warrant no further action (see Sections 19.3 and 20.3 of the Final PA/SI Report [CH2M HILL, 2008]). However, PREQB expressed concern that due to the close proximity of the former power plant and the former fuel farm (approximately 50 ft), an underground pipeline may have been used to supply diesel directly from the fuel farm to the generator(s) in the power plant. Therefore, an Expanded SI is warranted to determine if an underground pipeline is present. Additionally, due to the presence of the UST design diagram, the Expanded SI will also determine if a UST exists at the location of the former power plant.

Environmental Questions to be Answered by the Expanded SI:

1. **Is there an underground pipeline between the PAOC N former fuel farm and the PAOC S former power plant or a UST at the PAOC S former power plant?**
   This question will be answered by performing a magnetic and electromagnetic geophysical survey between the former fuel farm and the former power plant and throughout the footprint of the former power plant building (Figure 13).

SAP Worksheet #10j — PAOC N (Former Fuel Farm and Filling Station) and PAOC S (Former Power Plant) Problem Definition (continued)

2. **<u>If an underground pipeline is present, were there historical releases that warrant further action?</u>**
   If a pipeline is identified, a figure will be produced showing its location and provided to the ERP Technical Subcommittee to concur upon locations for soil samples, which will then be collected during the same mobilization. If no pipeline is identified, no further action will be necessary at either site.

3. Is there UST at the PAOC S former power plant?
   This question will be answered by performing a magnetic and electromagnetic geophysical survey across the PAOC S former power plant building footprint (Figure 13).

SAP Worksheet #10k — PI 5 (Former Airfield and Associated Ditches) Problem Definition

Background and Potential Release History

Historical information suggests PI 5 was an airfield and associated drainage ditches. It was also the historical location of the fire department and temporary tents. The relatively limited historical information that exists about PI 5 comes from the following five sources:

- Aerial photographic analysis
- Site visits during the RFI, EBS, and SI scoping
- Personnel interviews and historical records review during the EBS
- Sampling of beach matting observed during the EBS
- Sampling of tissue residues in land crabs and fiddler crabs during the 2005 NOAA crab study

PI 5 is shown in a series of aerial photographs taken in 1959, 1962, 1964, and 2005 (Figures 14 through 18), including identification of features observed in aerial photographs or during site visits. Analysis of the historical aerial photographs was conducted by ERI in 2000 (ERI, 2000). ERI did not specifically label any of the features on the aerial photographs. Therefore, the locations of features labeled on Figures 14 through 18 are best professional judgment based on the descriptions provided in the ERI report. The general observation made by ERI for PI 5 was that the site comprised ditches from the airfield that led to cleared areas and a possible fill area near and into Puerto Ferro. The following bulleted list contains the primary observations made by ERI for specific aerial photographs:

- 1959 (Figure 14)
  - Airfield staining and associated ditch to Puerto Ferro. An access road leads to a cleared area at the edge of Puerto Ferro, just west of the ditch. An excavation with liquid is noted farther west.
- 1962 (Figures 15 and 16)
  - Stained area no longer present. Ditches to Puerto Ferro remain. Access road leads to cleared area at edge of Puerto Ferro.
- 1964 (Figure 17)
  - Ditch to Puerto Ferro remains. Receives runoff from airfield and PI 8 (see Worksheet #10m).

It is important to note that features identified by ERI on the aerial photographs are not necessarily accurate because ERI did not perform a site visit to substantiate the features they noted in the aerial photographs, and their photographic analysis was done many years after the aerial photographs were taken. For example, ERI identified "airfield staining," an "excavation with liquid," and a "cleared area" in the 1959 aerial photograph. Because these features were not field-verified, the "staining" may have been simply darker areas on the photograph, areas of vegetation or darker colored soil, or some other feature not associated with a release, as the term "staining" might suggest. Additionally, the feature identified as an "excavation with liquid" was very likely part of the runway surface water runoff diversion ditches or a borrow pit used for runway construction, not an area where liquid was deposited (other than precipitation runoff during rain events). The "cleared areas" are likely washout areas and salt flats around the bay (i.e., not man-made clearings or fill areas). The 2005 aerial photograph shows the only remaining visible features are the runway and cleared areas to the south.

SAP Worksheet #10k — PI 5 (Former Airfield and Associated Ditches) Problem Definition (continued)

The following observations were made during the three site visits conducted at PI 5:

- CH2M HILL visual site inspection, 2001 (CH2M HILL, 2004)
  - No evidence of a past release, soil staining, or stressed vegetation
- EBS (2002)
  - Gravel pile overgrown with grass next to runway (Figure 18)
  - Large rolled-up piles of beach matting
- SI Scoping Session (2007)
  - No excavation with liquid; no obvious staining
  - Two south-trending drainage ditches on south side of runway

The following information was compiled from personnel interviews and historical records review:

- Site comprised surface water drainage from the runway area
- Historically it was also the location of the fire department and temporary tents
- Beach matting was installed

Based on the above information, the potential sources of a CERCLA-related release are areas of staining on the former runway. Contamination from these source areas may have been released to surrounding drainage ditches and carried downgradient during periods of surface water runoff.

Synopsis of Secondary Data

During the 2002 EBS, two samples of the beach matting were collected and analyzed for asbestos. No asbestos was detected.

In 2005, NOAA conducted a study of land and fiddler crabs on Vieques (NOAA, 2006). The primary purpose of the study was to characterize concentrations of explosives, pesticides, PCBs, and trace elements in samples of these organisms. The closest crab sample location was approximately 1,000 ft east of where runoff from PI 5 likely discharges, so the data may not be applicable to PI 5. However, the crab data will be evaluated once the PI 5 soil sampling is completed to see if there is any potential correlation.

Problem Definition

If the apparent staining observed in aerial photographs represents areas of contamination, contaminants may have been transported via runoff into and along drainage ditches. Therefore, an SI is warranted to determine if CERCLA-related releases occurred at/from the former airfield and, if so, whether it warrants further action.

Based on the CSM and synopsis of secondary data, the constituents likely associated with potential releases from the airfield are VOCs, SVOCs, and inorganics.

SAP Worksheet #10k — PI 5 (Former Airfield and Associated Ditches) Problem Definition (continued)

Environmental Questions to be Answered by the SI:

1. **Does the area of apparent staining on the former airfield represent an area of contamination?**
   One co-located surface soil and subsurface soil sample will be collected from an area of apparent staining observed in the 1959 aerial photograph (sample SS/SB-8 in Figure 16). The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **Did runoff from the former airfield (i.e., releases) result in contamination of adjacent ditches?**
   Co-located surface soil and subsurface soil samples will be collected from ditches around the former airfield (samples SS/SB-1 through SS/SB-6 in Figure 16) and cleared area at the terminus of the main south-trending ditch (sample SS/SB-7 in Figure 16). During the January 2009 site visit, the sample location SS/SB-3 was placed in the first obvious depositional area along the ditch to Puerto Ferro where land crab burrows were observed. Sample location SS/SB-7 was placed just into the discharge point onto the salt flat. Because of the presence of land crabs at locations SS/SB-3 and SS/SB-4, the 0-2-foot surface soil sampling depth protocol will be followed. Because land crabs would not be present at location SS/SB-7 (i.e., too often inudated with water), the 0-1-foot surface soil sampling depth protocol will be followed. The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1). It should be noted that the locations of samples SS/SB-1 through SS/SB-4 are approximate. The objective of the sample locations is to evaluate depositional areas near the runway, as well as further downstream. The exact locations will be identified in the field during the sampling event.

3. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data from the samples collected during the SI through Step 7 of the decision analysis process (Figure 1).

SAP Worksheet #10I — PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) Problem Definition

Background and Potential Release History

Historical information suggests PI 6 was a probable water treatment plant with a large impoundment, vehicle wash pad, UST, and concrete pad potentially used to store PCBs. The relatively limited historical information that exists about PI 6 comes from the following four sources:

- Aerial photographic analysis
- Site visits during the RFI, EBS, and SI scoping
- Personnel interviews and historical records review during the EBS
- Collection of surface soil and wipe samples during the EBS

PI 6 is shown in a series of aerial photographs taken in 1959, 1962, 1964, 1983, 1985, 1994, and 2005 (Figures 19 through 25), including identification of features observed in aerial photographs and locations of historical samples. Analysis of the historical aerial photographs was conducted by ERI in 2000 (ERI, 2000). ERI did not specifically label any of the features on the aerial photographs. Therefore, the locations of features labeled on Figures 19 through 25 are best professional judgment based on the descriptions provided in the ERI report. The general observation made by ERI for PI 6 was that the site comprised vertical tanks, a large surface impoundment, and a pump house at a probable water treatment plant. The following bulleted list contains the primary observations made by ERI for specific aerial photographs:

- 1959 (Figure 19)
  - Probable treatment plant. Impoundment with liquid, vertical tanks and six buildings are present. One of the six buildings located in the eastern portion of the site appears to be a pump house.
- 1962 (Figure 20)
  - Impoundment empty. Tanks remain.
- 1964 (Figure 21)
  - Tanks and impoundment remain.
- 1985 (Figure 23)
  - Five vertical tanks and a building are visible. The impoundment area has completely revegetated.
- 1994 (Figure 24)
  - Four vertical tanks and several small structures are visible.

SAP Worksheet #10I — PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) Problem Definition (continued)

The following observations were made during the three site visits conducted at PI 6:

- RFI and EBS (2001 and 2002, respectively)
  - Five abandoned steel ASTs with piping, pump house, 20,000-gallon UST sitting at grade, an electric meter station, concrete pad (potentially used to store PCBs), vehicle wash pad, and partially buried piping.
- SI Scoping Session (2007)
  - Concrete pad (adjacent to the pump house) on which the PCBs were stored was noted to have a concrete berm around it. However, on the east side of the pad, the berm was noted to have small openings. In addition, it was noted that the pad had a central trough that led to a sump within the pump house. The sump was observed to have an unknown thickness of soil/leaf litter in it. Any release on the concrete pad would likely have been directed to the sump via the central trough. However, it is possible contaminants could have runoff through the openings along the east berm.
  - Historical map was identified that showed the impoundment was used to store fresh water. The map is the first historical map (General Site Plan) presented in Appendix G of the EBS (NAVFACENGCOM, 2003).

The following information was compiled from personnel interviews and historical records review:

- Site was historically a bivouac area for the 65th Infantry Division of the U.S. Marine Corps during training exercises
- ASTs possibly used for drinking water storage
- Electric pumps were used at the site; no fuel was ever stored at the site

Based on the above information, the potential sources of a CERCLA-related release are the concrete pad used to store PCBs and the vehicle wash pad. Data collected around the UST (see **Synopsis of Secondary Data** below), as well as its unlikely use for fuel storage at the site, suggest the UST is not a potential source of a CERCLA-related release at PI 6.

Synopsis of Secondary Data

Based on observations made during the EBS site visit, six wipe samples were collected from the concrete pad and pump house and three surface soil samples were collected near the above-ground UST and vehicle wash pad (Figure 24). The wipe samples were analyzed for PCBs (no PCBs were detected). The surface soil samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.

Table 1 (Attachment B) summarizes the constituents detected in PI 6 soil samples. No VOCs, SVOCs, PCBs, TPH-DRO, or TPH-GRO were detected. One pesticide and two herbicides were detected, but are believed to be associated with normal pesticide/herbicide application, not a CERCLA-related release. Six inorganics (arsenic, lead, mercury, selenium, thallium, and zinc) were detected above the east Vieques background upper tolerance limit (UTL) and at least one Vieques human leaching, human health, or ecological screening value.

SAP Worksheet #10I — PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) Problem Definition (continued)

It is important to note that no soil sampling was done around the concrete pad (and associated pump house) where PCBs were stored. In addition, no subsurface soil samples were collected at the former vehicle wash pad and the exact location of the historical samples with respect to the vehicle wash pad observed during the 2007 site visit could not be confirmed. Further information on the limitations of the secondary data can be found in Worksheet #13.

Problem Definition

Surface soil samples collected around the former UST during the EBS (and its unlikely use for fuel storage at the site) suggest no CERCLA-related release occurred from the UST. Further, the ASTs and former impoundment were likely used for storage of fresh water. However, only wipe samples were collected at the concrete pad and it is not certain whether surface soil samples were collected at the former vehicle wash pad. In addition, no subsurface soil samples were collected at the location of the vehicle wash pad. Therefore, an SI is warranted to determine if CERCLA-related releases occurred at/from the concrete pad or vehicle wash pad and, if so, whether it warrants further action.

Based on the CSM and synopsis of secondary data, the constituents likely associated with potential releases from the concrete pad used to store PCBs are PCBs. The constituents likely associated with potential releases from the vehicle wash pad are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the SI:

1. **Did contaminants released on the concrete pad accumulate in the sump?**
   One co-located surface soil and subsurface soil sample will be collected within the sump, if the soil thickness is sufficient (Figure 22). An attempt will be made to determine the thickness of the soil within the sump, the type of bottom the sump has (e.g., concrete, soil), and the general condition of the sump (e.g., cracks, absence of cracks). If the sump does not have a solid bottom, observations of the soil core from the slide hammer will be used to attempt to differentiate the material that accumulated in the sump from native soil. Photographs of the sump and soil, as practical, will be collected during this effort. If there is not enough soil thickness to collect separate surface and subsurface soil samples within the sump, at least one soil sample will be collected at the base of the material in the sump (i.e., at the interface with the sump bottom or native material). The samples will be analyzed for TCL PCBs. This question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **Was there a release(s) from the concrete pad through the openings along the east berm?**
   Two co-located surface soil and subsurface soil samples will be collected just outside the east side of the pad berm, immediately adjacent to the openings in the berm. The samples will be analyzed for TCL PCBs. This question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

SAP Worksheet #10l — PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) Problem Definition (continued)

3. **Were there releases during vehicle washing activities?**
   One co-located surface soil and subsurface soil sample will be collected at the location of the former vehicle wash pad. The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. This question will be answered by evaluating the data will then be evaluated through Step 4 of the decision analysis process (Figure 1).

4. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10m — PI 8 (Former Motor Pool Maintenance Area) Problem Definition

Background and Potential Release History

Historical information suggests PI 8 was a motor pool maintenance area; car wash; oil drum storage and disposal area; drum storage area for asphalt emulsions; area of metallic, multi-colored material; a potential storage area for hazardous materials and petroleum products; and had light-toned material observed in the southeast area. The relatively limited historical information that exists about PI 8 comes from the following four sources:

- Aerial photographic analysis
- Site visit during the EBS
- Personnel interviews and historical records review during the EBS
- Collection of surface soil samples during the EBS

PI 8 is shown in a series of aerial photographs taken in 1959, 1962, 1964, 1970, 1985, and 2005 (Figures 26 through 31), including identification of features observed in aerial photographs and locations of historical samples. Analysis of the historical aerial photographs was conducted by ERI in 2000 (ERI, 2000). ERI did not specifically label any of the features on the aerial photographs. Therefore, the locations of features labeled on Figures 27 and 28 are best professional judgment based on the descriptions provided in the ERI report. The general observation made by ERI for PI 8 was that the site was used for vehicle and equipment maintenance and open storage. The following bulleted list contains the primary observations made by ERI for specific aerial photographs:

- 1959 (Figure 26)
  - Vehicle and equipment storage, maintenance area, and staining.
- 1962 (Figure 27)
  - Open storage of vehicles, equipment, and multi-colored materials (some probably metallic). Heavy staining noted south of probable maintenance buildings. Light-toned material and staining noted in eastern portion of site.
- 1964 (Figure 28)
  - Vehicle and equipment storage remains. Probable metallic material remains to the south. Staining noted to the east.
- 1970 (Figure 29)
  - Only a small amount of open storage materials remain. Probable staining is noted on the north side of a probable maintenance building. The southern portion of the site appears inactive.
- 1985 (Figure 30)
  - Inactive.

The 1962 aerial photograph also shows the location of a drainage ditch between PI 8 and PI 5.

SAP Worksheet #10m — PI 8 (Former Motor Pool Maintenance Area) Problem Definition (continued)

The following observations were made during the site visit conducted at PI 8:

- EBS (2002)
  - Dark colored stained soils in center of site.
  - 5-ft by 8-ft area of construction debris (partially buried reinforced concrete).

The following information was compiled from personnel interviews and historical records review:

- Site was historically a motor pool maintenance area, car wash with water production well, oil drum storage and disposal area, drum storage area for asphalt emulsions (southwest portion of site), and potentially an area for storage of hazardous materials and petroleum products.

Based on the above information, the potential sources of a CERCLA-related release are the areas of potential staining associated with the motor pool maintenance area (central area of site), the potential drum storage area for asphalt emulsions (southwest portion of site), the area of probable metallic material (south-central portion of site), and the area of light-toned material and staining (southeast portion of site), as shown in Figure 27. The location of the car wash and oil drum storage and disposal areas cannot be ascertained from historical aerial photographs, personnel interviews, or historical records review. However, their locations are likely consistent with the motor pool maintenance area or one of the other areas identified as a potential source area. During periods of surface water runoff, any contamination from the motor pool maintenance area may have been released to the adjacent drainage ditch that leads to PI 5.

Synopsis of Secondary Data

Based on observations made during the EBS, four surface soil samples were collected in areas of the stained soil in the former motor pool maintenance area (Figure 27). The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.

Table 2 (Attachment B) summarizes the constituents detected in PI 8 soil samples. No SVOCs, PCBs, TPH-DRO, or TPH-GRO were detected. Three pesticides and two herbicides were detected, but are believed to be associated with normal pesticide/herbicide application, not a CERCLA-related release. Two VOCs (toluene and methylene chloride) were detected, but only the single detection of methylene chloride exceeded a Vieques screening value (Region IX SSL at a DAF of 1). Four inorganics were detected above the east Vieques background UTL and at least one Vieques human leaching, human health, or ecological screening value.

It is important to note that no subsurface soil sampling was done around the former motor pool maintenance area. In addition, no attempt was made to determine if drums remain in the potential drum storage area for asphalt emulsions. Further, no soil samples were collected within the area of probable metallic material in the south-central portion of the site or the area of light-toned material and staining in the southeast portion of site. Further information on the limitations of the secondary data can be found in Worksheet #13.

SAP Worksheet #10m — PI 8 (Former Motor Pool Maintenance Area) Problem Definition (continued)

Problem Definition

Preliminary evaluation of the surface soil sample data collected around the former motor pool maintenance area during the EBS suggests either no CERCLA-related release occurred or that a CERCLA-related release in this area has not resulted in contamination at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. However, only surface soil samples were collected (which are not sufficient to draw conclusions based on likely historical activities and potential contaminants released) and samples were collected only in the vehicle maintenance area (which indicates all potential source areas have not been sufficiently sampled). Therefore, an SI is warranted to determine if a CERCLA-related release occurred at/from the site and, if so, whether it warrants further action.

Based on the CSM and synopsis of secondary data, the constituents likely associated with potential releases at the motor pool maintenance area are VOCs, SVOCs, PCBs, and inorganics. The constituents likely associated with potential releases from the potential drum storage area for asphalt emulsions are SVOCs and inorganics. The constituents likely associated with potential releases from the metallic material are inorganics. The constituents likely associated with potential releases from the area of light-toned material and staining are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the SI:

1. **<u>Were there releases in the "stained" areas of the motor pool maintenance area observed in historic aerial photographs?</u>**
   Five co-located surface soil and subsurface soil samples will be collected in the central portion of the site (SS/SB-5 through SS/SB-8 and SS/SB-14, as shown in Figure 27), including one adjacent to the historical sample that contained toluene (PI8-3). During the January 2009 site visit, a 2.5-inch OD galvanized pipe was observed near the location of EBS sample PI8-2. An attempt will be made to ascertain the extent of the pipe and its past use (e.g., walking the line in either direction, finding historical maps, showing pictures of the pipe to a plumber, etc.). One co-located sample, SS/SB-8, will be located adjacent to the concrete structure around the observed valve that has a metal pipe leading to it. All samples will be analyzed for TCL VOCs, SVOCs, and PCBs; and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **<u>Are there drums containing asphalt emulsion in the southwest portion of the site and, if so, were there releases from these drums?</u>**
   The southwest area of the site, where the drums containing asphalt emulsion were potentially stored, will be traversed with a metal detector. If drum(s) are found, a co-located surface soil and subsurface soil sample will be collected within the area of the drum(s) (SS/SB-15, as shown in Figure 27). The samples will be analyzed for TCL SVOCs and TAL inorganics. The data will then be evaluated through Step 4 of the decision analysis process (Figure 1). If no drums are identified with the metal detector, no samples will be collected and no further investigation will be necessary for this area of PI 8.

SAP Worksheet #10m — PI 8 (Former Motor Pool Maintenance Area) Problem Definition (continued)

3. **Were there releases from the area of probable metallic material observed in historic aerial photographs?**
   Two co-located surface soil and subsurface soil samples will be collected in the south-central portion of the site (SS/SB-10 and SS/SB-11, as shown in Figure 27). The samples will be analyzed for TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

4. **Were there releases in the area of light-toned material observed in historic aerial photographs?**
   Two co-located surface soil and subsurface soil samples will be collected in the southeast portion of the site (SS/SB-12 and SS/SB-13, as shown in Figure 27). The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

5. **Were there releases from PI 8 to the adjacent drainage ditch that leads to PI 5?**
   One co-located surface soil and subsurface soil sample will be collected in the drainage ditch adjacent to the motor pool maintenance area (SS/SB-9, as shown in Figure 27). The samples will be analyzed for TCL VOCs, SVOCs, and PCBs; and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

6. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10n — PI 10 (Former Wastewater Leach Field) Problem Definition

Background and Potential Release History

Historical information suggests PI 10 was a possible leach field for a wastewater treatment plant. The relatively limited historical information that exists about PI 10 comes from the following four sources:

- Aerial photographic analysis
- Site visit during the EBS
- Personnel interviews and historical records review during the EBS
- Collection of surface soil samples during the EBS

PI 10 is shown in a series of aerial photographs taken in 1962, 1964, and 2005 (Figures 32 through 34), including identification of features observed in aerial photographs and locations of historical samples. Analysis of the historical aerial photographs was conducted by ERI in 2000 (ERI, 2000). ERI did not specifically label any of the features on the aerial photographs. Therefore, the locations of features labeled on Figure 32 are best professional judgment based on the descriptions provided in the ERI report. The general observation made by ERI for PI 10 was that the site was a series of four impoundments with liquid. This is assumed to be a misprint because six impoundments are visible in the 1962 aerial photograph. The following bulleted list contains the primary observations made by ERI for specific aerial photographs:

- 1962 (Figure 32)
  - Series of six lagoons containing brown to black liquid. Liquid is also visible outside the lagoons in the north.
- 1964 (Figure 33)
  - Lagoons inactive and re-vegetating. Site still not completely re-vegetated by 1985. Completely re-vegetated by 1994. [It is recognized that these observations are assigned to the 1964 aerial photograph. This is because the text is simply a summary of what was contained in the ERI report for this aerial photograph. Obviously, ERI was observing features in 1985 and 1994 aerial photographs as well.]

The following observations were made during the site visit conducted at PI 10:

- EBS (2002)
  - Two rectangular openings in the forest partially surrounded by the remains of low earthen berms. Dark colored soils observed in portions of the enclosed areas. Trash observed in the area.

The following information was compiled from personnel interviews and historical records review:

- Site was possible leach field for wastewater treatment plant; possible sludge-drying lagoons; possibly historically a tidal lagoon.

Based on the above information, the potential sources of a CERCLA-related release are the former lagoons, as shown in Figure 32.

SAP Worksheet #10n — PI 10 (Former Wastewater Leach Field) Problem Definition (continued)

Synopsis of Secondary Data

Based on observations made during the EBS, three surface soil samples were collected within the rectangular areas and in the vicinity of trash (Figure 32). The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.

Table 3 (Attachment B) summarizes the constituents detected in PI 10 soil samples. No VOCs, SVOCs, pesticides, herbicides, PCBs, TPH-DRO, or TPH-GRO were detected. One inorganic (thallium) was detected above the east Vieques background UTL and at least two of the Vieques human leaching, human health, or ecological screening values. However, the analytical method used for thallium analysis is suspected of providing falsely elevated results.

It is important to note that no subsurface soil sampling was done during the EBS. Further information on the limitations of the secondary data can be found in Worksheet #13.

Problem Definition

Surface soil samples collected during the EBS suggest no CERCLA-related release occurred at the site. However, only surface soil samples have been collected. Due to the nature of the impoundments (i.e., they are bermed areas where releases could be in the subsurface, not just to the surface), collection of surface soil samples is not sufficient to characterize the impoundments. Therefore, an SI is warranted to determine if a CERCLA-related release occurred in the former impoundments and, if so, whether it warrants further action.

Based on the CSM and synopsis of secondary data, the constituents likely associated with potential releases in the former impoundments are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the SI:

1. **Were there hazardous constituents managed in the surface impoundments?**
   Three co-located surface soil and subsurface soil samples will be collected from the approximate locations of the EBS samples (SS/SB-1 through SS/SB-3, as shown in Figure 32). The subsurface soil samples will be sludge material collected at the base of the sludge, if it can be visually distinguished from native material. Samples SS/SB-1 will be collected just outside the bermed area, noted by ERI to be an area where liquid was observed outside the lagoons in the 1962 aerial photograph. All samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **If hazardous constituents are identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10o — PAOC I (Former Power Plant and Mechanics Shop) Problem Definition

Background and Potential Release History

PAOC I is shown in Figures 35, 36, and 37. Historical information indicates PAOC I was a former power plant and mechanics shop. The relatively limited historical information that exists about PAOC I comes from the following two sources:

- Site visits during the RFI, EBS, and SI scoping
- Personnel interviews and historical records review during the EBS

The following observations were made during the site visits conducted at PAOC I:

- RFI and EBS (2001 and 2002, respectively)
  - The building still exists; no evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal.
- SI Scoping Session (2007)
  - The building still exists, but no interior structures remain.
  - Two doors (south and west sides of building) and three pipe penetrations (two on south side of building and one east side of building). Past use of pipes is unknown.

The following information was compiled from personnel interviews and historical records review:

- Site comprises Building 401, a former power plant and mechanics shop at Camp Garcia.

Based on the above information, the potential sources of a CERCLA-related release are the historic boiler- and mechanics-related activities that took place within Building 401. Conceptually, releases from these activities would have taken place via discharge through pipe penetrations and/or building egress points.

Synopsis of Secondary Data

No sampling has been conducted at this site.

Problem Definition

Although there are no records of past releases at PAOC I and there was no evidence of past releases observed during the site visits, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an SI is warranted to determine if a CERCLA-related release occurred at the site and, if so, whether it warrants further action.

Based on the CSM, the constituents likely associated with potential releases from Building 401 are VOCs, SVOCs, PCBs, and inorganics.

SAP Worksheet #10o — PAOC I (Former Power Plant and Mechanics Shop) Problem Definition (continued)

Environmental Questions to be Answered by the SI:

1. **Was there a release(s) of hazardous constituents from the building?**
   Five co-located surface soil and subsurface soil samples will be collected at PAOC I (SS/SB-1 through SS/SB-5, as shown in Figure 36). One co-located surface soil and subsurface soil sample will be collected adjacent to each of the two doors and three pipe penetrations. All samples will be analyzed for TCL VOCs, SVOCs, and PCBs; and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10p — PAOC M (Former Fuel Facility) Problem Definition

Background and Potential Release History

PAOC M is shown in Figures 36, 38, 39, and 40. Historical information indicates the site was a former dispatch office, sleeping quarters, and fuel facility. The relatively limited historical information that exists about PAOC M comes from the following two sources:

- Site visits during the EBS and SI scoping
- Personnel interviews and historical records review during the EBS

The following observations were made during the site visits conducted at PAOC M:

- EBS (2002)
  - No evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal.
- SI Scoping Session (2007)
  - The structure is no longer present. The area has been reworked for restroom construction and is used as a parking area.

The following information was compiled from personnel interviews and historical records review:

- Site comprises former Building 4503, a former dispatch office, fuel facility, and sleeping quarters at Camp Garcia.
- Facility was constructed in 1986 and demolished in 1991.

Based on the above information, the potential source of a CERCLA-related release is the historic fuel facility, if it housed fuel-related materials.

Synopsis of Secondary Data

No sampling has been conducted at this site.

Problem Definition

Although it is unlikely there was a CERCLA-related release(s) at the site, an SI is warranted to confirm this supposition because historical information indicates this site was associated with a fuel facility.

Based on the CSM, the constituents likely associated with potential releases from the fuel facility are BTEX, MTBE, PAHs, and lead. In addition, although it is unlikely that the site had ASTs or USTs, because it was a fuel facility, TPH is included in the type of fuel-related constituents considered to have been potentially released.

SAP Worksheet #10p — PAOC M (Former Fuel Facility) Problem Definition (continued)

Environmental Questions to be Answered by the SI:

1. **Was there a CERCLA-related release(s) of hazardous constituents at this site?**
   Continuous soil borings will be advanced in four locations around the footprint of the former small white building shown in Figure 38 (the soil boring locations are shown in Figure 36). The soil cores will be screened visually and with a PID, and the presence of any odor potentially indicative of contamination will be noted. If contamination is suspected, a soil sample(s) from the suspected contaminated zone will be analyzed for BTEX, MTBE, and PAHs; lead; TPH-DRO; and TPH-GRO. If no contamination is suspected via visual, odor, and /or PID screening, then no release will be suspected. If a soil sample(s) is collected, the question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **If a CERCLA-related release(s) is identified, is further action warranted?**
   If a soil sample(s) is collected, this question will be answered by evaluating the data collected during the SI in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10q — PAOC O (Former Boiler Room in Heat Plant Building 238) Problem Definition

Background and Potential Release History

PAOC O is shown in Figures 35 and 36. Historical information indicates the site was a former boiler room in a heat plant building. The relatively limited historical information that exists about PAOC O comes from the following two sources:

- Site visits during the EBS and SI scoping
- Personnel interviews and historical records review during the EBS

The following observations were made during the site visits conducted at PAOC O:

- EBS (2002)
  - No evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal.
- SI Scoping Session (2007)
  - The structure is no longer present.

The following information was compiled from personnel interviews and historical records review:

- Site comprises former Building 238, a former boiler room in a heat plant building at Camp Garcia.
- Facility was constructed in 1953 and demolished in 1989.

Based on the above information, the potential sources of a CERCLA-related release are the former boiler and boiler-related activities.

Synopsis of Secondary Data

No sampling has been conducted at this site.

Problem Definition

Although there are no records of past releases at the site and there was no evidence of past releases observed during the site visits, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an SI is warranted to determine if a CERCLA-related release(s) occurred at the site and, if so, whether it warrants further action.

Based on the CSM, the constituents likely associated with potential releases from the heat plant facility are VOCs, SVOCs, and inorganics.

SAP Worksheet #10q — PAOC O (Former Boiler Room in Heat Plant Building 238) Problem Definition (continued)

Environmental Questions to be Answered by the SI:

1. **Was there a release(s) of hazardous constituents at this site?**
   Two co-located surface soil and subsurface soil samples will be collected within the former footprint of Building 238 (SS/SB-1 and SS/SB-2, as shown in Figure 36). Both samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10r — PAOC P (Former Water Treatment Pumphouse) Problem Definition

Background and Potential Release History

PAOC P is shown in Figures 41 through 48. Historical information indicates the site was a former water treatment pumphouse. The relatively limited historical information that exists about PAOC P comes from the following two sources:

- Site visits during the EBS and SI scoping
- Personnel interviews and historical records review during the EBS

The following observations were made during the site visits conducted at PAOC P:

- EBS (2002)
  - No evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal.
- SI Scoping Session (2007)
  - The structure is no longer present. A mobile generator was present at the site.

The following information was compiled from personnel interviews and historical records review:

- Site comprises former Building 500, a former water treatment facility pumphouse at Camp Garcia.
- Facility was constructed in 1953 and demolished in 1989.

Based on the above information, the former water treatment facility pumphouse is not a likely source of a CERCLA-related release. However, the mobile generator observed during the 2007 site visit is a potential source of a CERCLA-related release.

Synopsis of Secondary Data

No sampling has been conducted at this site.

Problem Definition

Although it is unlikely there was a CERCLA-related release(s) at the site given the nature of the historical activities, an SI is warranted to confirm this supposition due to the presence of the mobile generator observed at the site.

Based on the CSM, the constituents likely associated with potential releases from the mobile generator are SVOCs and inorganics.

Environmental Questions to be Answered by the SI:

1. **Was there a release(s) from the generator?**
   One co-located surface soil and subsurface soil sample will be collected beneath the mobile generator (SS/SB-1, as shown in Figure 48). The samples will be analyzed for BTEX, MTBE, PAHs, lead, TPH-GRO, and TPH-DRO. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

SAP Worksheet #10r — PAOC P (Former Water Treatment Pumphouse) Problem Definition (continued)

2. **<u>If a CERCLA-related release(s) is identified, is further action warranted?</u>**
   This question will be answered by evaluating the data collected during the SI in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10s — PAOC Q/R (Former Boiler Room in Heat Plant Buildings 607 and 617) Problem Definition

Background and Potential Release History

PAOC Q/R is shown in Figures 36. Historical information indicates PAOC Q was a former boiler house in a heat plant building. A building to the north of PAOC Q, of very similar design appears to be Building 617 (PAOC R), though this building designation does not appear on any identified historical maps. The two sites have been combined into one site because of their similarities. The relatively limited historical information that exists about PAOC Q/R comes from the following two sources:

- Site visits during the EBS and SI scoping
- Personnel interviews and historical records review during the EBS

The following observations were made during the site visits conducted at PAOC Q/R:

- EBS (2002)
  - No evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal at PAOC Q. PAOC R's location has not been positively identified.
- SI Scoping Session (2007)
  - The structures are no longer present.

The following information was compiled from personnel interviews and historical records review:

- PAOC Q/R site comprises former Building 607 (PAOC Q) and Building 617 (PAOC R), former boiler houses in heat plant buildings at Camp Garcia.
- PAOC Q was constructed in 1963 and demolished in 1984. PAOC R was constructed in 1970 and demolished in 1984.
- In the 1983 aerial photograph that shows the former PAOC Q boiler house location (Building 607), there is another former building to the north that looks very similar to Building 607. It is possible that this other building is PAOC R (former boiler house Building 617), although historical maps do not label this building as Building 617. It is also possible, based on the configurations observed in the 1983 aerial photograph, that even if this other building is not PAOC R, that it is a former boiler house.

Based on the above information, the potential sources of a CERCLA-related release are the former boiler(s) and boiler-related activities.

Synopsis of Secondary Data

No sampling has been conducted at this site.

SAP Worksheet #10s — PAOC Q/R (Former Boiler Room in Heat Plant Buildings 607 and 617) Problem Definition (continued)

Problem Definition

Although there are no records of past releases at the site and there was no evidence of past releases observed during the site visits, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an SI is warranted to determine if a CERCLA-related release(s) occurred at the site and, if so, whether it warrants further action.

Based on the CSM, the constituents likely associated with potential releases from the heat plant facility are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the SI:

1. **Was there a release(s) of hazardous constituents at this site (including the location of the former building that looks similar to Building 607)?**
   One co-located surface soil and subsurface soil sample will be collected within the former footprint of Building 607 and one co-located surface soil and subsurface soil sample will be collected at the former location of the similar structure to the north (SS/SB-1 and SS/SB-2, as shown in Figure 36). The samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. The question will be answered by evaluating the data through Step 4 of the decision analysis process (Figure 1).

2. **If a CERCLA-related release(s) is identified, is further action warranted?**
   This question will be answered by evaluating the data collected during the SI in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10t — PAOC X (Debris Area in Ephemeral Stream) Problem Definition

Background and Potential Release History

PAOC X is shown in Figures 41 through 50. Historical information suggests the site is an ephemeral stream containing some construction-related debris and an automobile. The relatively limited historical information that exists about PAOC X comes from the following two sources:

- Site visit during the EBS
- Collection of surface soil samples during the EBS

The following observations were made during the site visits conducted at PAOC X:

- EBS (2002)
  - Automobile body, tires, scrap metal, and construction debris in [ephemeral stream] north of the main road west of Camp Garcia; adjacent to former vehicle maintenance area.

Based on the above information, the potential source of a CERCLA-related release is the debris in the ephemeral stream.

Synopsis of Secondary Data

Based on observations made during the EBS, four surface soil samples were collected in the vicinity of the debris (Figure 48). The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.

Table 4 (Attachment B) summarizes the constituents detected in PAOC X soil samples. No VOCs, herbicides, PCBs, TPH-DRO, or TPH-GRO were detected. One SVOC was detected below Vieques human leaching, human health, and ecological screening values. Three pesticides were detected, but are believed to be associated with normal pesticide application, not a CERCLA-related release. One inorganic (thallium) was detected above the east Vieques background upper tolerance limit (UTL) and at least two of the Vieques screening values. However, the analytical method used for thallium analysis is suspected of providing falsely elevated results.

It is important to note that no subsurface soil sampling was done during the EBS and no samples were collected immediately beneath the debris. In addition, the debris is still present and the EBS samples were collected in 2002. Further information on the limitations of the secondary data can be found in Worksheet #13.

Problem Definition

Even though surface soil samples collected during the EBS suggest no CERCLA-related release in this area has resulted in contamination at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater, there is uncertainty in this conclusion because only surface soil samples were collected and no samples were collected directly beneath the debris. In addition, it is uncertain whether the debris has been a source of contamination since 2002 and/or will present a potential future source of contamination. Therefore, incidental debris removal is necessary in order to collect sufficient samples to complete the release assessment.

SAP Worksheet #10t — PAOC X (Debris Area in Ephemeral Stream) Problem Definition (continued)

Based on the CSM, the constituents likely associated with potential releases from the debris are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the Debris Removal and Associated Soil Sampling:

1. Do the soil data suggest there was an historic release(s) from the debris?
   The debris on the top of the ephemeral stream bank has been pushed into mounds; in order to ensure the debris is identified and removed, the soil mounds will be pulled down to expose the debris. The debris will be segregated and removed as part of "housekeeping. There is also some debris in the ephemeral stream that will be removed as part of "housekeeping." Approximately four confirmatory soil samples (SS-7 through SS-10, as shown in Figure 48) will be collected in the 6-inch interval immediately beneath the debris at the top of the bank; one confirmatory soil sample (SS-5) will be collected in the 6-inch interval immediately beneath the car. A co-located surface/subsurface soil sample (SS/SB-6) will be collected in the depositional area of the ephemeral stream just downstream of the buried car. Because the depositional area is not land crab habitat, the surface soil sample at SS/SB-6 will be collected from 0 to 1 foot bgs. All soil samples will be analyzed for TCL VOCs and SVOCs, and TAL inorganics. Evaluation of the data (i.e., through Step 4 of the decision analysis process [Figure 1]) will be used to determine if there was an historical release(s) from the debris.

2. Does visual or PID observations beneath the debris suggest the presence of contamination?
   If contamination is suspected directly beneath the debris (either visually or via PID), subsurface soil samples will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol in the Master QAPP (CH2M HILL, 2007b). If collected, the samples will be analyzed for the same parameter list as the surface soil samples.

3. **If so, is further action warranted?**
   This question will be answered by evaluating the confirmatory soil data, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

SAP Worksheet #10u — Regional Groundwater Problem Definition

Background and Potential Release History

Figure 51 shows Camp Garcia and the various environmental sites within its boundary, including existing monitoring wells, which have been installed at specific sites. These environmental sites have been identified because historical activities there had the potential to release hazardous constituents into environmental media. If releases from one or more of these sites reached the groundwater, the contamination would likely migrate with regional groundwater flow southward toward the ocean.

Synopsis of Secondary Data

Figure 51 displays all detections and exceedances (of Vieques screening values) of VOCs and exceedances (of Vieques screening values) of inorganics in groundwater collected from wells within and immediately adjacent to Camp Garcia. The figure demonstrates the likely absence of broad, multiple-site groundwater contamination.

Problem Definition

Although the groundwater data collected to date at Camp Garcia (based on installation of site-specific wells) suggest there is not broad, multiple-site groundwater contamination, groundwater data from more regionally located wells will help confirm this supposition. Therefore, an SI is warranted to determine if CERCLA-related release(s) have resulted in a broad area of groundwater contamination migrating from Camp Garcia.

Based on the CSM, the constituents likely associated with potential releases from the various Camp Garcia sites are VOCs, SVOCs, and inorganics.

Environmental Questions to be Answered by the SI:

1. **Do the data for the regional groundwater migrating from Camp Garcia suggest the groundwater has been impacted by a CERCLA-related release?**
   Two wells will be installed just south of the southern (downgradient) boundary of Camp Garcia, one downgradient of the eastern half and one downgradient of the western half. The samples will be analyzed for TCL VOCs and SVOCs; Pesticides/PCBs, and TAL inorganics (total and dissolved). Evaluation of the data (i.e., through Step 4 of the decision analysis process [Figure 1]) will be used to determine if there was an historical release(s) that has resulted in broad-based groundwater contamination. The purpose of this evaluation is to determine if the quality of the groundwater migrating from beneath Camp Garcia has been affected by any of the sites within the facility boundary, including those sites recommended for no further action (i.e., SWMU 4, PAOC J, and PAOC K) in the Final PA/SI Report (CH2M HILL, 2008) pending this regional groundwater evaluation and sites where no groundwater information has been collected (e.g., SWMUs 6/7). Should the groundwater data along the downgradient boundary of Camp Garcia suggest further evaluation is warranted to identify a potential source of contamination, an individual site or sites may be further evaluated, including those currently recommended for no further action pending the regional groundwater evaluation.

SAP Worksheet #10u — Regional Groundwater Problem Definition (continued)

2. **<u>If so, is further action warranted?</u>**
   This question will be answered by evaluating the groundwater data, and relevant historical data, as applicable, in Steps 5 through 7 of the decision analysis process (Figure 1).

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

1. Who will use the data and what will the data be used for?

In that the scope of work covered by this SAP comprises release assessment, the Navy, USEPA, EQB, and FWS will use the data collected during the SI/Expanded SI (as well as relevant historical data) to make determinations of whether CERCLA-related releases took place and, if so, whether further action is warranted. While this is the overall data use for all the sites, the specific data use for each site may vary depending on its status (i.e., whether PA/SI-level evaluation has previously occurred). Therefore, the site-specific data uses are defined in Item 9 of this worksheet.

2. What are the Project Action Limits (PALs)?

The PALs (revised as presented below) are defined in the MQAPP (CH2M HILL, 2007b) and are listed, by constituent group and medium, in Worksheet #15. In general, the PALs are:

- Vieques human health screening values for soil, sediment, groundwater, surface water, and sediment are the current Regional Screening Levels (RSLs) (adjusted for a hazard quotient [HQ] of 0.1 for non-carcinogens). The RSLs have replaced the Region IX PRGs that are cited in the MQAPP. EPA Region 2 concurs with the adoption of the RSLs.
- Vieques ecological screening values for soil, sediment, surface water, and sediment are derived from multiple sources, which are listed in the Ecological Risk Assessment Protocol contained in the MQAPP (CH2M HILL, 2007b)
- Vieques soil-to-groundwater leaching screening values are the current Regional SSLs. The Regional SSLs replace the Region IX SSLs cited in the MQAPP. EPA Region 2 concurs with the adoption of the RSLs.
- Puerto Rico Land Pollution Control Corrective Action Levels for UST/AST sites
- Vieques background soil inorganics screening values are the East Vieques background soil inorganics upper tolerance limits (UTLs) (CH2M HILL, 2007a)
- Where a specific PAL deviates from the above, it is footnoted in the applicable Worksheet #15 table.

3. What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?

Worksheet #10 defines the matrices, analytical groups, and, where applicable, specific target analytes for each site. Because of the nature of SI activities, the target analyses are not generally restricted to particular analytes; they are, however, restricted to analyte groups based on known or suspected historical activities.

Monitoring well installation, soil and groundwater sampling, surface water and sediment sampling, and related activities will be done in general accordance with the applicable SOP(s) in Attachment 1 and the Soil Sample Depth Selection Criteria Protocol in Attachment 7 of the MQAPP (CH2M HILL, 2007b), except as noted below.

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

- **SWMU 1 (Camp Garcia Landfill) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the soil sample collection at this SWMU. Because the objective of soil sampling is to determine if the waste material has released hazardous constituents to the surrounding soil, two types of soil samples will be collected from specific depths in each test pit: (1) a soil sample immediately beneath the waste, and (2) a three-point composite (top, middle, and bottom) soil sample within the vertical extent of the debris. Once the vertical extent of the waste is ascertained, a soil sample from the 6-inch interval immediately below the waste will be collected for the target analyses. For the composite soil sample, soil from the three intervals will be composited and sampled for all target analytes. For the VOC sample, individual Encore samples will be collected from each of the three composite intervals and provided to the laboratory. The laboratory will composite the sample for VOC analysis. Although this will result in a 50-fold increase (approximate) in the QL for VOCs, the QL for most VOCs will still be below the adjusted residential RSLs. For those VOCs whose QL will be above the adjusted residential RSL (vinyl chloride, ethylene dibromide, and 1,2-dibromo-3-chloropropane), the uncertainty is acceptable because the sampling procedure facilitates a more representative characterization of the vertical waste profile and the QLs will be only slightly above the adjusted residential RSLs. The rationale for this is that volatiles are more likely to have volatilized in the shallower intervals and a second sample is already proposed for the deeper interval (i.e., just below the waste). Additionally, one of the monitoring wells (MW-05) was destroyed by recenct construction activities near the main east-west road. This monitoring well will be replaced during this field effort.

- **SWMU 10 (Sewage Treatment Lagoons) -** The Soil Sample Depth Selection Criteria Protocol will not be followed for the subsurface soil sample collection at this SWMU. Because the objective of soil sampling is to confirm whether the historical thallium concentrations in the lagoon material were falsely elevated, all subsurface soil samples will be collected just above the bottom of the lagoon material, if it can be visually distinguished from the native material.

- **AOC A (Diesel Fuel Fill Pipe Area) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the soil sample collection at this AOC. Because the objective of soil sampling is to confirm sufficient soil contaminated with TPH has been removed, confirmatory soil samples will be collected from 0 to 1 ft below the depth of the backfill material along the sidewalls and 0 to 6 inches below the bottom of the excavation. Following excavation of soil by backhoe from the location of the former fuel pipeline, samples will be collected from the side-walls and bottom of the excavation every 5 lf.

- **PI 6 (Former PCB Storage Pad and Vehicle Wash Pad) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the soil sample collection in the sump at this PI. Because the objective of soil sampling in the sump is to characterize the material that accumulated in it, if there is a sufficient depth of material, a surface soil sample (0 to 1 ft) and a subsurface soil sample (bottom of accumulated material) will be collected. If there is not sufficient soil thickness to collect separate surface and subsurface soil samples within the sump, at least one soil sample will be collected at the base of the material (i.e., at the interface with the sump bottom or native material if the sump does not have a concrete bottom).

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

- **PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the surface soil sample collection at this PI. Because the objective of soil sampling is to confirm no releases occurred from the drums, confirmatory surface soil samples will be collected from the 6-inch interval directly beneath the removed drums. Only if contamination is suspected directly beneath the drums (either visually or via PID) will subsurface soil samples be collected. If they are added, they will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol.
- **PI 10 (Former Wastewater Leach Field) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the subsurface soil sample collection at this PI. Because the objective of soil sampling is to characterize the lagoon material, all subsurface soil samples will be collected just above the bottom of the lagoon material, if it can be visually distinguished from the native material.
- **PAOC M (Former Fuel Facility) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the soil sample collection at this PAOC. Because the objective of soil sampling at this site is to confirm the supposition that the former building was not used to store fuel, continuous soil cores will be collected from four locations around the footprint of the former building to a depth of 6 ft bgs or refusal, whichever comes first. If contamination is suspected (through visual observation and/or PID screening of the soil cores), soil sample(s) will be collected from the interval(s) of suspected contamination.
- **PAOC X (Debris Area in Ephemeral Stream) –** The Soil Sample Depth Selection Criteria Protocol will not be followed for the surface soil sample collection at this PAOC. Because the objective of soil sampling is to confirm no releases occurred from the debris, surface soil samples will be collected from the 6-inch interval directly beneath the removed debris. Only if contamination is suspected directly beneath the debris (either visually or via PID) will subsurface soil samples be collected. If they are added, they will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol. The co-located surface/subsurface soil sample in the ephemeral stream will be collected from the 0 to 1 foot interval because the area is not land crab habitat. The susbsurface soil sample at this location will follow the soil sampling protocol procedure.

Sample analyses for all sites will be conducted by an offsite laboratory in accordance with Worksheets #15, 19, 23, 24, 25, 28, and 30, except as noted below.

- **AOC A (Diesel Fuel Fill Pipe Area) –** At AOC A, a TPH field assay kit will be used onsite to help guide the extent of soil removed prior to collection of confirmatory samples for offsite analyses. Specifics on the use of the TPH field assay kit are contained in Attachment C-1. Following removal of the backfill material and excavation of a backhoe bucket width/depth of soil from the location of the former fuel pipeline, samples will be collected from the side-walls and bottom of the excavation in general accordance with the soil sampling protocol described above and tested onsite using the TPH assay kit. In areas where the field assay suggests the TPH concentrations exceed approximately 100 ppm, another backhoe bucket width or depth (depending on the location of the exceedance) will be excavated and a new soil sample(s) collected for onsite testing. Once all field results are approximately 100 ppm or less, confirmatory soil samples will be collected for offsite analysis in accordance with the soil sampling protocol described above.

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

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

Several types of data will be collected during the SI/Expanded SI. How good the data need to be is discussed by data type below.

- **Geophysical Data –** Geophysics will be performed at SWMU 1, SWMU 2, PAOC S, and between PAOCs N and S during the Expanded SI. The data collected during the geophysics need to be sufficient for making determinations of the extent of buried debris at SWMU 1, whether an underground fuel pipeline exists at SWMU 2, whether a UST exists at PAOC S, and whether an underground fuel pipeline exists between PAOCs N and S. The geophysics SOP contained in Attachment C-2 and C-3 describes the quality of the data anticipated from the geophysics survey. The geophysical techniques to be employed during the Expanded SI are the same as those used during the Phase I RFI for the delineation of the SWMU 1 landfill.
- **Visual Observations and PID Readings –** Visual observations and PID readings will be used at various sites to help select soil sampling intervals. As such, the data are considered qualitative in that they do not need to provide an exact or quantified value. Rather, they need to be of sufficient quality to facilitate consideration relative to other data in the same area. For example, if a soil sample is to be collected in a boring from the interval of the highest PID reading, it is not the actual PID reading that is relevant; it is the highest PID reading relative to the other PID readings that is relevant. As such, calibrating and operating the PID in accordance with the OVM SOP in Attachment 1 of the MQAPP (CH2M HILL, 2007b) are sufficient to provide data of appropriate quality for making this decision. Similarly, if a sample is to be collected based on a particular distinguishable quality (e.g., lagoon material versus native material), the professional judgment provided by the education and experience of the field staff is appropriate for making these determinations.
- **Onsite Analytical Data –** At AOC A, a TPH field assay kit will be used to help determine the extent of TPH-contaminated soil removal. However, these data will not be used to make the ultimate determination of when a sufficient extent of TPH-contaminated soil has been removed; rather, they will be used as an indicator of when the extent has been reached and when confirmatory soil samples for offsite analysis should be collected. It is the offsite data that will be used to make the ultimate determination of when a sufficient extent of TPH-contaminated soil has been removed. Therefore, the onsite analytical results need only be good enough to provide an indication of whether the TPH concentrations are above or below 100 ppm; an exact quantitation is not necessary. Specifics on the TPH field assay kit quantitation limit (QL) and precision are provided in Attachment C-1. How "good" the offsite data need to be is discussed below.
- **Offsite Analytical Data –** In that this SAP is for an SI/Expanded SI, the offsite data need to be "good" enough to make determinations of whether a CERCLA-related release has occurred and, if so, whether the release warrants further action. Ensuring data are "good" enough for this purpose is done via employing appropriate analytical protocol, validating the resulting data, including QA/QC samples to verify proper sampling and analysis protocol, and performing a data quality evaluation (DQE) to assess the availability and usability of the data for the intended purpose. Each of these is further discussed below:

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

- **Appropriate Analytical Protocol –** See Worksheets #15, 19, 23, 24, 25, 28, and 30 and Item 5 below.

- **Data Validation –** Validation of data increases the level of confidence in a data set for a particular data use. The particular type and level of validation necessary to achieve acceptable confidence is subjective. In other words, the appropriate type and level of data validation is not an absolute. Rather, it is data use- and data user-specific. For this SI/Expanded SI data set, offsite analyses for potential contaminants (other than TCLP) will be validated by an independent, third party data validator using guidance from the validation criteria outlined by the 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 or quantification, if present.

- **QA/QC Samples –** During the SI/Expanded SI, 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. For this SI/Expanded SI, field duplicates will be collected at a frequency of 1 per 10 field samples per matrix. 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 decontaminated equipment. Equipment blanks help assess equipment decontamination techniques and identify when contamination may have been carrying over from one sample location to another. It is important to maintain this equipment blank frequency because the equipment blank is collected after visiting the most contaminated location, and it is important to not associate too many locations with the potentially-contaminated equipment blank. Trip blanks are collected at a frequency of 1 per cooler containing volatiles. Trip blanks accompany the empty sample containers while they are stored at the laboratory or shipped to the site, and while they are full and shipped back to the laboratory. Trip blanks are useful for assessing whether or not there is any contamination during periods of time when the samples are not directly supervised. No field blanks will be collected unless on a particular day of sampling, the ambient conditions suggest airborne particulates may contaminate the samples being collected.

- **Data Quality Evaluation –** In order to support the environmental decision, each result must be *available* to 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.

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

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

Worksheets #10 contain the number of samples per matrix per analytical group per site. Worksheets #15 contain analytical methodology and quantitation limits. In addition to listing the particular analytes, PALs, and quantitation limits (QLs), Worksheets #15 identify where QLs are higher than PALs. While this information was taken into consideration when planning the analytical protocol for each site and may lead to some uncertainty (varies by the specific analytical protocol for each site), it does not prevent conclusions to be drawn with respect to the objectives of the SI/Expanded SI for the following reasons:

- (1) With only two exceptions (i.e., thallium at SWMU 10 and TPH-DRO at AOC A), the samples collected at the various sites are being analyzed for constituent groups versus a specific analyte. This is because the sites are in the SI phase, where the primary objective is to determine whether there has been a release or not. In fact, for the vast majority of sites, there is no single or small group of known constituents suspected of being released. In this case, analyzing for analyte groups is appropriate for satisfying this objective, as well as making determinations about whether further action is warranted. Even if a particular analyte has an RL above a screening criterion, there are sufficient other analytes in the same constituent group that would likely be detected in the event of a release and whose RLs are below the screening values such that further action determinations for the site can be made with sufficient confidence.

- (2) The Vieques screening values on which the PALs are based are not of equal importance, so just because a particular QL is higher than a PAL does not mean decisions regarding that particular constituent cannot be made. For example, all but one of the VOCs highlighted in Worksheet #15-1 are highlighted due to QL exceedances of Regional SSLs. None are highlighted due to residential RSLs or ecological screening values (other than tetrachloroethene). The SSLs are more qualitative than human health and ecological screening values and past experience on Vieques has shown that they are not reliable predictors of leaching to groundwater (i.e., they are overly conservative).

- (3) Even though QLs may be higher than certain PALs, method detection limits (MDLs) may be closer to or lower than PALs. Theoretically, the laboratory instrument could detect a constituent down to its MDL at concentrations that would then be reported as estimated. For example, in Worksheet #15-1, more than half of the VOCs highlighted have MDLs that are lower than the PALs (e.g., vinyl chloride, methylene chloride, TCE, etc.).

- (4) While the groundwater PALs are based on the lower of the tap water RSLs (adjusted, as appropriate) and the Federal MCL, and the RSL is generally lower than the MCL for any particular analyte, it is ultimately the MCL that would likely be established as the remediation level, if warranted. Therefore, where QLs are greater than the tap water RSLs, the MCLs are taken into consideration when determining the appropriate analytical methodology.

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

The table below lists, by site, the target analyte groups, particular target analytes (as applicable), whether the quantitation limits are above the PALs, and the potential affect on the decision making ability for the site.

Site	Sample Analyses	Target Analyte(s)?*	QLs > PALs for Target Analyte(s)?	Conclusion
SWMU 1 – Camp Garcia Landfill	VOCs, SVOCs, pesticides, PCBs, inorganics, explosives	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), (3), and (4) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
SWMU 2 – Fuels Offloading Site	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	Fuel-related constituents	Benzene, MTBE, hexachloroethane, hexachlorobenzene, pentachlorophenol, benzo(a)anthracene, and dibenzo(a,h)anthracene **QL**s> Regional SSLs. Dibenzo(a,h)anthracene and benzo(a)pyrene **QL**s>RSLs.	See reasons (2) and (3) above; therefore, QLs and MDLs sufficient for making site-specific determinations
SWMU 6/7 – Waste Oil and Paint Accumulation Areas	VOCs, SVOCs, inorganics	Several VOCs, SVOCs, and inorganics (based on Phase I RFI data)	Methylene chloride and 1,2-DCA QL > Regional SSL; As QL > RSL	See reasons (2) and (3) above for SSL exceedances; 1,2-DCA QL < RSL and ECO; 1,2-DCA, and As MDLs < RSLs and SSLs; therefore, QLs and MDLs sufficient for making site-specific determinations
SWMU 10 – Sewage Treatment Lagoons	Thallium	Thallium (based on Phase I RFI data)	Thallium QL > RSL (groundwater)	Thallium MDL close to RSL; Thallium QL = MCL; Thallium MDL < MCL (see reason 4); therefore, QL and MDL sufficient for making site-specific determinations
AOC A – Diesel Fuel Fill Pipe Area	TPH-DRO	TPH-DRO (based on UST removal data)	No	TPH QL < PREQB Land Pollution Control Corrective Action Level

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

Site	Sample Analyses	Target Analyte(s)?*	QLs > PALs for Target Analyte(s)?	Conclusion
AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas Used for Fuel Bladder Storage	VOCs	Several VOCs (based on PA/SI data)	Chloroform QL > RSL (groundwater)	Chloroform MDL approximately equal to RSL; Chloroform QL < MCL (see reason 4); therefore, QL and MDL sufficient for making site-specific determinations.
PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PAOC L – Former Paint and Transformer Storage Area	Pesticides (soil); VOCs, SVOCs, pesticides, PCBs, inorganics (groundwater)	Soil – DDD, DDE, DDT, dieldrin, endrin; Groundwater – Chloroform, TCE (based on PA/SI data);	Soil – Dieldrin, endrin QL > ECO; Groundwater – Chloroform QL > RSL	Soil – DDD, DDE, and DDT primary pesticides detected; dieldrin MDL similar to ECO; Endrin detected in only one sample. Other pesticides detected more frequently and at significantly higher concentrations and are therefore more representative of site conditions; Groundwater – Chloroform MDL approximately equal to RSL; Chloroform QL < MCL (see reason 4); therefore, QLs and MDLs sufficient for making site-specific determinations.
PI 5 – Former Airfield and Associated Ditches	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.

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

Site	Sample Analyses	Target Analyte(s)?*	QLs > PALs for Target Analyte(s)?	Conclusion
PI 6 – Former PCB Storage Pad and Vehicle Wash Pad	VOCs, SVOCs, PCBs, inorganics	No target analytes; therefore, analyte groups evaluated	As QL> RSL	As MDL< RSL See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PI 8 – Former Motor Pool Maintenance Area	VOCs, SVOCs, PCBs, inorganics	Several VOCs and inorganics	Methylene chloride QL > Regional SSL; As QL > RSL	See reason (2) above for SSL exceedances; MDL < SSL; As MDL < RSL; therefore, QLs and MDLs sufficient for making site-specific determinations.
PI 10 – Former Wastewater Leach Field	VOCs, SVOCs, inorganics	Thallium	No for thallium; N/A for others	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PAOC I – Former Power Plant and Mechanics Shop	VOCs, SVOCs, PCBs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PAOC M – Former Fuel Facility	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	No target analytes; therefore, analyte groups evaluated	Benzene, MTBE, hexachloroethane, hexachlorobenzene, pentachlorophenol, benzo(a)anthracene, and dibenzo(a,h)anthracene **QL**s> Regional SSLs. Dibenzo(a,h)anthracene and benzo(a)pyrene **QL**s>RSLs.	See reasons (2) and (3) above; therefore, QLs and MDLs sufficient for making site-specific determinations
PAOC O – Former Boiler Room in Heat Plant Building 238	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.

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

Site	Sample Analyses	Target Analyte(s)?*	QLs > PALs for Target Analyte(s)?	Conclusion
PAOC P – Former Water Treatment Pumphouse	BTEX, MTBE, PAHs, LEAD, TPH-GRO, AND TPH-DRO	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PAOC Q/R – Former Boiler Room in Heat Plant Building 607	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
PAOC X – Debris Area in Ephemeral Stream	VOCs, SVOCs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (2), and (3) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.
Regional Groundwater	VOCs, SVOCs, PCBs, inorganics	No target analytes; therefore, analyte groups evaluated	N/A	See reasons (1), (3), and (4) above; constituent groups sufficient for evaluating potential release; sufficient analytes with QLs below PALs to make site-specific determinations regarding need for further action.

* Target Analyte is defined here to mean an analyte suspected as part of a release based on previous data or known history

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

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

The attached figures show the tentative sampling locations for each site. The samples will be collected following a site visit by members of the ERP Technical Subcommittee to concur upon all sampling locations other than those that will be collected based on field observations and/or measurements. Confirmatory samples at AOC A, PI 7, and PAOC X will be collected following debris/drums and/or soil removal. See Item #3 above and Worksheet #14 for how the data will be collected/generated.

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

CH2M HILL and its subcontractors will collect the data. Katahdin Analytical Services and its subcontractor TestAmerica Burlington will generate the offsite analytical data. Other subcontractors will generate the geophysical data and surveying data. The data will be evaluated and reported in an SI/Expanded SI Report.

8. How will the data be archived?

The electronic data will be loaded into the Navy Installation Restoration Information System (NIRIS) database. Raw data, as well as data summary tables, will be included in the SI/Expanded SI Report. Hardcopy data will be archived by CH2M HILL and the Navy in accordance with contract requirements.

9. List the Project Quality Objectives (PQOs) in the form of if/then qualitative and quantitative statements.

The decision analysis process shown in Figure 1 represents the general PQOs for all sites included in this SI/Expanded SI. The general objectives of the decision analysis process are:

(1) To determine if a CERCLA-related release occurred and, if so,
(2) Whether the release warrants further action

The 7-step decision analysis can be subdivided into five PQO categories, as described below. The decision analysis process is discussed in greater detail in Section 1.1 of the Final PA/SI Report (CH2M HILL, 2008).

<u>CERCLA Eligibility (Step 1 of Figure 1)</u>

CERCLA eligibility is determined in general accordance with USEPA guidance (USEPA, 1991, 1999a, and 1999b). The resulting PQO statement is:

> If the site is CERCLA eligible, then collect site-specific samples (if none exist); otherwise, prepare a no further action decision document or defer to another regulatory program.

The decision analysis process potentially applies to all sites initially identified in the Vieques Environmental Restoration Program. For sites included in this SAP, it is assumed that they are all potentially CERCLA-eligible.

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

Data Quality Assessment (Step 2 of Figure 1)

The data quality assessment is performed via the DQE (see Worksheet #37). The resulting PQO statement is:

> If the DQE indicates the data are available and useful for the intended purpose, then perform the release assessment (see Steps 3 and 4); otherwise, collect sufficient additional samples to achieve an available and useful data set.

Release Assessment (Steps 3 and 4 of Figure 1)

The PQO statements for release assessment are:

> If any inorganics above the background UTL or non-inorganics are detected, then a release potentially occurred; otherwise, make a final evaluation of the adequacy of the data set (see Step 7).
>
> If a release potentially occurred, then determine if it is CERCLA-related; otherwise, make a final evaluation of the adequacy of the data set (see Step 7).
>
> If a release is CERCLA-related, then determine if the release warrants further action (see Steps 5 and 6); otherwise, make a final evaluation of the adequacy of the data set (see Step 7).

A "CERCLA-related release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response as defined in CERCLA Sections 101(14) and 101(33). Examples of constituents that may be detected at sites but may not be CERCLA-related are discussed in Section 1.1.1 of the Final PA/SI Report (CH2M HILL, June 2008). They include pesticides and herbicides, dioxins, and PAHs. Dioxin analyses are not included in the analytical protocol for the sites included in this SAP because no dioxin-producing or release activities likely occurred at any of the sites. Where pesticide (SWMU 1 and PAOC L) or PAH analyses (SWMU 2 and PAOC M) are included in the analytical protocol, they are considered to be constituents potentially associated with a CERCLA-related release.

Further Action Determination (Steps 5 and 6 of Figure 1)

Once a potential release is suspected, the need for further action is made by evaluating the data with respect to human health, ecological, leaching, or other regulatory criteria (i.e., Vieques screening values). The PQO statements associated with these steps are:

> If the constituent concentrations exceed Vieques screening values, then determine if more realistic evaluations can be performed; otherwise (i.e., if no exceedances), make a final evaluation of the adequacy of the data set (see Step 7).
>
> If more realistic evaluations can be performed that suggest no further action is warranted, then make a final evaluation of the adequacy of the data set (see Step 7); otherwise, make a determination of whether additional source data would permit more realistic evaluations.
>
> If additional source data would permit more realistic evaluations, then collect the data and make the more realistic evaluations; otherwise, make a determination of whether an interim action or expanded investigation is warranted.

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

If interim action is warranted, then perform interim action and collect confirmatory data for evaluation via the decision analysis process; otherwise, make a determination of the type of expanded investigation that is warranted.

If the data suggest a substantial release has occurred (e.g., release may be widespread and screening suggests risks are potentially very high with respect to regulatory threshold levels), then perform an RI; otherwise, perform an expanded SI.

Examples of more realistic evaluations are presented in Section 1.1.2 of the Final PA/SI Report (CH2M HILL, June 2008).

As stated previously, the 7-step decision analysis process applies to all sites in the SI/Expanded SI phase. Certain sites for which an Expanded SI will take place have additional, related PQOs, as follows:

SWMU 1

In addition to the analytical data being used to determine whether a CERCLA-related release occurred, visual observation of the debris in the landfill (via test pitting) will be used to help determine whether CERCLA and/or solid waste regulations are applicable. The associated PQO statement is:

If the analytical data and/or visual observation of debris in the landfill indicate hazardous waste was disposed of in the landfill, make further action determinations in accordance with CERCLA (and applicable ARARs); otherwise, make further action determinations in accordance with solid waste landfill regulations and other pertinent Puerto Rico regulations.

SWMU 2

At SWMU 2, a minimum of one soil boring will be advanced beneath each former AST. However, additional borings may be advanced if a release is suspected (either through visual observation or PID screening) to sufficiently characterize the source area. In addition, well installation may be necessary if a release is suspected. The associated PQO statements are:

If visual and/or PID screening of soil collected below each former tank suggests a release occurred, then additional borings will be advanced to sufficiently characterize the source area(s). Otherwise, samples will be collected only beneath each former tank.

If visual and/or PID screening of soil collected below each former tank suggests a release occurred that reached groundwater, then the ERP Technical Subcommittee will discuss and concur upon the need for and location(s) of monitoring well(s). Otherwise, if observations made during soil sampling suggest no release occurred or a release that occurred did not reach groundwater, no monitoring wells or groundwater sampling will be necessary.

AOC A

In addition to offsite confirmatory analyses, onsite analyses will be performed to help guide the extent of soil removal and subsequent collection of confirmatory soil samples. The associated PQO statement is:

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

If the onsite test kit sample analyses suggest the TPH-DRO concentration(s) are still above the Puerto Rico UST CA level of 100 mg/kg, then remove additional soil; otherwise; collect confirmatory soil samples for offsite analysis.

For the offsite confirmatory data, the specific PQO statements are:

If the concentrations of the confirmatory soil samples are below the Puerto Rico UST CA criterion of 100 mg/kg, then the excavation will be backfilled and no further action will be necessary at the site.

If any single soil sample is above the Puerto Rico UST CA criterion, then a case-by-case evaluation will be performed in consultation with EQB in order to determine if no further action is warranted.

PI 4

At PI 4, a CERCLA-related release is suspected based on the PA/SI groundwater data collected. However, the concentrations detected were all low with respect to the MCLs. Therefore, one objective of the Expanded SI is to confirm the previous data. The associated PQO statements are:

If the concentrations of VOCs are generally consistent with the concentrations detected in the initial (2006) round of sampling, but still above MCL(s), then additional groundwater monitoring may be necessary, the duration and frequency of which will be determined through inter-agency (Navy, USEPA, PREQB, and USFWS RPMs) discussions.

If the concentrations of VOCs are inconsistent (i.e., either or higher or lower than the MCLs) with those detected during the initial round (by well), then collect a third round of groundwater samples approximately 6 months later to help make trend determinations.

A second objective is to determine whether the groundwater data suggest a yet unknown source area is present. The associated PQO statements are:

If the concentrations of VOCs in the newly installed well(s) are inconsistent with those in well MW-05, determine the appropriate location(s) of additional soil samples to identify whether there is a yet unknown source present in soil; otherwise, an unknown source will not be suspected.

If an additional source area is identified through soil sampling, then determine if additional monitoring wells are warranted based on the source area location.

PAOC L

During the PA/SI, a well was installed at this site. Groundwater data from this well identified the presence of contamination, but at very low levels (e.g., two organics identified, but two orders of magnitude below their MCLs) such that no further action is likely warranted. Based on this information, a second round of data is warranted to confirm the initial results. The associated PQO statement is:

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

If the second round of data is comparable to the first (i.e., less than MCLs and/or background, as applicable), then no further action for groundwater is necessary; otherwise (i.e., constituent concentrations are higher), then evaluate the second round of data using the 7-step decision analysis process and determine if a third round is warranted.

PAOC M

At PAOC M, continuous soil borings will be advanced at four locations within the former building footprint and screened visually and with a PID for the presence of contamination. Soil samples will be collected for offsite analysis only if visual and/or PID screening of the soil cores suggests the presence of a release. The associated PQO statement is:

If visual and/or PID screening of the continuous soil cores suggests contamination is present, soil sample(s) from area(s) of suspected contamination will be collected for offsite analysis. Otherwise, no samples will be collected and no further action will be necessary.

PAOC N and PAOC S

During the Expanded SI at these sites, no sampling will be performed unless an underground storage tank or underground pipeline is identified by the geophysics. The associated PQO statement is:

If geophysics identifies a probable subsurface fuel pipeline between the former ASTs at PAOC N and the power plant at PAOC S or a probable UST at the PAOC S power plant, collect subsurface soil samples to determine whether a release occurred (based on concurrence of sampling locations among ERP Technical Subcommittee members); otherwise, no further action is necessary at PAOC N and PAOC S.

Note:

Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. The objective of the overall completeness goal for this project is set at 95% valid data. This goal is inclusive of both field and laboratory analytical data.

Page Intentionally Left Blank

SAP Worksheet #12-1 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: VOC

Concentration Level: "Low " (SW-846 8260B)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
MS	VOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a	A
MSD	VOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-1a, RPD ≤ 30%	A
Trip Blank	VOC	One per cooler of VOC samples	Bias / Contamination	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	S + A
Field Duplicates	VOC	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	VOC	One per day	Bias / Contamination	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	S + A
Cooler temperature Indicator	VOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples

SAP Worksheet #12-2 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: SVOC

Concentration Level: "Low " (SW-846 8270C) and " SIM" (SW-846 8270-SIM)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Low					
MS	SVOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a	A
MSD	SVOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a, RPD ≤ 50%	A
Field Duplicates	SVOC	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	SVOC	One per day	Bias/Contamination	No analytes detected > QL; up to 5 times QL for phthalate esters..	S + A
Cooler temperature Indicator	SVOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
SIM					
MS	SVOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a	A
MSD	SVOC	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a, RPD ≤ 50%	A
Field Duplicates	SVOC	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	SVOC	One per day	Bias/Contamination	No analytes detected > QL; up to 5 times QL for phthalate esters	S + A
Cooler temperature Indicator	SVOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-3 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: PEST/PCB

Concentration Level: "Low" (SW-846 8081A, 8082)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [(2)]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Matrix Spike (MS)	PEST/PCB	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	A
Matrix Spike Duplicate (MSD)	PEST/PCB	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias and Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a, RPD ≤ 50%	A
Field Duplicates	PEST/PCB	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	PEST/PCB	One per day	Bias/Contamination	No analyte detected >PQL	S + A
Cooler temperature Indicator	PEST/PCB	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-4 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: EXPLO

Concentration Level: "Low" (SW-846 8330, 6850)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Nitroaromatics/Nitroamines					
Matrix Spike (MS)	EXPLO	Per extraction batch	Accuracy/Bias	Nominal Limits: 30-150 %R	A
Matrix Spike Duplicate (MSD)	EXPLO	Per extraction batch	Accuracy/Bias	Nominal Limits: 30-150 %R; 50% RPD	A
Field Duplicates	EXPLO	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	EXPLO	One per day	Bias/Contamination	No analyte detected >PQL	S + A
Cooler temperature Indicator	EXPLO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Perchlorate					
Matrix Spike (MS)	EXPLO	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias	MS spike conc. must be equal to the MRL. 80-120%R	A
Matrix Spike Duplicate (MSD)	EXPLO	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias and Precision	Same as MS	A
Field Duplicates	EXPLO	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	EXPLO	One per day	Bias/Contamination	Less than 1/2 the MRL	S + A
Cooler temperature Indicator	EXPLO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-5 — Measurement Performance Criteria Table

Matrix: Surface Soil and Subsurface Soil

Analytical Group: TPH

Concentration Level: "Medium" (SW-846 8015M)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
TPH-GRO					
Matrix Spike	GRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias	Statistically derived limits: 76-131	A
Matrix Spike Duplicate	GRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias and Precision	Statistically derived limits: 76-131, RPD ≤ 50%	A
Trip Blank	GRO	One per cooler of GRO samples	Bias / Contamination	No target > QL	S + A
Field Duplicates	GRO	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	GRO	One per day	Bias/Contamination	No target > QL	S + A
Cooler temperature Indicator	GRO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
TPH-DRO					
Matrix Spike	DRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias	Statistically derived limits: 60-127	A
Matrix Spike Duplicate	DRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias and Precision	Statistically derived limits: 60-127, RPD ≤ 50%	A
Field Duplicates	DRO	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	DRO	One per day	Bias/Contamination	No target > QL	S + A
Cooler temperature Indicator	DRO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-6 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: METAL

Concentration Level: "Low" (SW-846 6020, 7471A, 9012M)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Metals and Mercury					
MS/MSD	METAL	Once per matrix type or SDG, whichever is more frequent	Accuracy/bias	Recovery ± 25 % of true value if sample < 4x spike value	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	Absolute value < PQL.	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Cyanide					
Matrix Spike (MS)	METAL	One per distillation batch.	Accuracy/Bias	Recovery ± 25 % if sample < 4x spike concentration.	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 30%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	No analyte > PQL	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-7 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment					
Analytical Group: GRAINSIZE					
Concentration Level: N/A (ASTM D422)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-8 — Measurement Performance Criteria Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: WCHEM

Concentration Level: "Medium" (SW-846 9045C, Lloyd Kahn, ASTM D2937)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
pH					
Cooler temperature Indicator	WET CHEM	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
TOC					
Cooler temperature Indicator	WET CHEM	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Dry Bulk Density					
N/A					

1 If information varies within an analytical group, separate by individual analyte.

2 Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-9 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks) and Surface Water

Analytical Group: VOC

Concentration Level: "Low" (SW-846 8260B) and "SIM" (SW-846 8260B-SIM)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Low					
MS	VOC	One MS per every 20 samples	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a	A
MSD	VOC	One MSD per every 20 samples	Accuracy/Bias, Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-9a, RPD ≤ 20%	A
Trip Blank	VOC	One per cooler of VOC samples	Bias / Contamination	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	S + A
Field Duplicates	VOC	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	VOC	One per day	Bias / Contamination	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	S + A
Cooler temperature Indicator	VOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
SIM					
MS	VOC	One MS per every 20 samples	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	A
MSD	VOC	One MSD per every 20 samples	Accuracy/Bias, Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-10a, RPD ≤ 30%	A
Trip Blank	VOC	One per cooler of VOC samples	Bias / Contamination	No analyte detected > QL	S + A
Field Duplicates	VOC	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	VOC	One per day	Bias / Contamination	No analyte detected > QL	S + A
Cooler temperature Indicator	VOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-10 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks), and Surface Water

Analytical Group: SVOC

Concentration Level: "Low" (SW-846 8270C) and "SIM" (SW-846 8270C-SIM)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Low					
MS	SVOC	One MS per every 20 samples	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	A
MSD	SVOC	One MSD per every 20 samples	Accuracy/Bias, Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-10a, RPD ≤ 30%	A
Field Duplicates	SVOC	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	SVOC	One per day	Bias/Contamination	No analytes detected > QL; up to 5 times QL for phthalate esters..	S + A
Cooler temperature Indicator	SVOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
SIM					
MS	SVOC	One MS per every 20 samples	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	A
MSD	SVOC	One MSD per every 20 samples	Accuracy/Bias, Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-10a, RPD ≤ 30%	A
Field Duplicates	SVOC	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	SVOC	One per day	Bias/Contamination	No analytes detected > PQL; up to 5 times PQL for phthalate esters	S + A
Cooler temperature Indicator	SVOC	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-11 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks), and Surface Water

Analytical Group: PEST/PCB

Concentration Level: "Low" (SW-846 8081A/8082)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Matrix Spike (MS)	PEST / PCB	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	A
Matrix Spike Duplicate (MSD)	PEST / PCB	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias and Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a, RPD ≤ 30%	A
Field Duplicates	PEST / PCB	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	PEST / PCB	One per day	Bias/Contamination	No analyte detected >PQL	S + A
Cooler temperature Indicator	PEST / PCB	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-12 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks), and Surface Water
Analytical Group: EXPLO
Concentration Level: "Low" (SW-846 8330, 6850)
Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Nitroaromatics/Nitroamines					
Matrix Spike (MS)	EXPLO	Per extraction batch	Accuracy/Bias	Nominal Limits: 30-150 %R	A
Matrix Spike Duplicate (MSD)	EXPLO	Per extraction batch	Accuracy/Bias	Nominal Limits: 30-150 %R; 30% RPD	A
Field Duplicates	EXPLO	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	EXPLO	One per day	Bias/Contamination	No analyte detected >PQL	S + A
Cooler temperature Indicator	EXPLO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Perchlorate					
Matrix Spike (MS)	EXPLO	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias	MS spike conc. must be equal to the MRL. 80-120%R	A
Matrix Spike Duplicate (MSD)	EXPLO	One for each group of 20 samples of a similar matrix or concentration.	Accuracy/Bias and Precision	Same as MS	A
Field Duplicates	EXPLO	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	EXPLO	One per day	Bias/Contamination	Less than 1/2 the MRL	S + A
Cooler temperature Indicator	EXPLO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-13 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks), and Surface Water

Analytical Group: TPH

Concentration Level: Medium (SW-846 8015M)

MPC Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
TPH-GRO					
Matrix Spike	GRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias	Statistically derived limits: 48-162	A
Matrix Spike Duplicate	GRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias and Precision	Statistically derived limits: 48-162, ≤ 30% RPD	A
Trip Blank	GRO	One per cooler of GRO samples	Bias / Contamination	No analyte detected > QL	S + A
Field Duplicates	GRO	1 per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	GRO	1 per day	Bias / Contamination	No analyte detected > QL	S + A
Cooler temperature Indicator	GRO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
TPH-DRO					
Matrix Spike	DRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias	Statistically derived limits:33-135	A
Matrix Spike Duplicate	DRO	One per prep batch of twenty or fewer samples of similar matrix	Accuracy/Bias and Precision	Statistically derived limits: 33-135, ≤ 30% RPD	A
Field Duplicates	DRO	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	DRO	One per day	Bias / Contamination	No target > QL	S + A
Cooler temperature Indicator	DRO	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-14 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous, and Surface Water

Analytical Group: METAL

Concentration Level: "Low" (SW-846 6020, 7470A, 9012)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Metals					
MS/MSD	METAL	Once per matrix type or SDG, whichever is more frequent	Accuracy/bias/precision	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	Absolute value < PQL.	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Mercury					
MS/MSD	METAL	Once per matrix type or SDG, whichever is more frequent	Accuracy/bias/precision	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	Absolute value < PQL sample results if > 10x the absolute value of the blank result, otherwise redigest.	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Cyanide					
Matrix Spike (MS)	METAL	One per distillation batch.	Accuracy/Bias	75-125% Recovery if sample conc. < 4 X spike	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	No analyte > PQL	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-15 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous, and Surface Water

Analytical Group: FMETAL

Concentration Level: "Low" (SW-846 6020, 7470)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Metals					
MS/MSD	METAL	Once per matrix type or SDG, whichever is more frequent	Accuracy/bias/precision	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	Absolute value < QL.	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
Mercury					
MS/MSD	METAL	Once per matrix type or SDG, whichever is more frequent	Accuracy/bias/precision	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	A
Field Duplicates	METAL	One per 10 samples	Precision	RPD < 20%	S + A
Equipment Rinsate Blanks	METAL	One per day	Bias / Contamination	Absolute value < QL sample results if > 10x the absolute value of the blank result, otherwise redigest.	S + A
Cooler temperature Indicator	METAL	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-16 — Measurement Performance Criteria Table

Matrix: Groundwater, Aqueous (blanks), and Surface Water

Analytical Group: WCHEM

Concentration Level: "Medium" (EPA 300.0, 160.2, SW-846 9060)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Chloride					
Cooler temperature Indicator	WET CHEM	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
TDS					
Cooler temperature Indicator	WET CHEM	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S
TOC					
Cooler temperature Indicator	WET CHEM	One per cooler	Accuracy / Representativeness	4°C (± 2° C)	S

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-17 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: TCLPV					
Concentration Level: "Medium" (SW-846 1311, 8260)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-18 — Measurement Performance Criteria Table

Matrix: Liquid IDW
Analytical Group: TCLPS
Concentration Level: "Medium" (SW-846 1311, 8270)
Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-19 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: TCLPP					
Concentration Level: "Medium" (SW-846 1311, 8081)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-20 — Measurement Performance Criteria Table

Matrix: Liquid IDW

Analytical Group: TCLPH

Concentration Level: "Medium" (SW-846 1311, 8151)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [2]	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-21 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: TCLPM					
Concentration Level: "Medium" (SW-846 1311, 6010, 7470)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group1**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-22 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: REACT					
Concentration Level: Medium (Section 7.3; 9014, 9034)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-23 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: CORR					
Concentration Level: "N/A" (SW-846 9045)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #12-24 — Measurement Performance Criteria Table

Matrix: Liquid IDW					
Analytical Group: IGN					
Concentration Level: "N/A" (Pensky Martens)					
Measurement Performance Criteria Table – Field QC Samples					
QC Sample	**Analytical Group[1]**	**Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria [2]**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
N/A					

[1] If information varies within an analytical group, separate by individual analyte.

[2] Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table

The table below provides general information on how secondary data will be used and the limitations on their use. Following the general table below, secondary data criteria and limitations tables are presented for each site where historical analytical data exist (applicable to the scope of work covered by this SAP), specifically to address the use and limitations of the historical analytical data.

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Site background information	Prepared by: A.T. Kearney, Inc., and K.W. Brown and Associates, Inc. Report Title: Phase II RCRA Facility Assessment of the Atlantic Fleet Weapons Training Facility (LANT) Including The Eastern Maneuver Area Camp Garcia and Inner Range, Vieques, Puerto Rico, USEPA I.D. No. PRD0980536221 Date: October 1988	Site histories for: • AOC A • SWMUs 1, 2, 6/7, and 10	Site history summaries. Understanding of historical activities that led to a potentially CERCLA-related release.	More recent information may supersede historical information from this report.
Site background information	Prepared by: PREQB, Land Pollution Control Area, Hazardous Waste Bureau Report Title: Revised RCRA Facility Assessment Report Atlantic Fleet Weapons Training Facility, Vieques, Puerto Rico, USEPA I.D. No. PRD0980536221 Date: September 1995	Site histories for: • AOC A • SWMUs 1, 2, 6/7, and 10	Site history summaries. Understanding of historical activities that led to a potentially CERCLA-related release.	More recent information may supersede historical information from this report.
Site background information	Prepared by: CH2M HILL for the Navy Report Title: Description of Current Conditions Report Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico, Date: February 2001	Site histories for: • AOC A • PI 4, 5, 6, 7, 8, and 10 • PAOC I and L • SWMU 1, 2, 6/7, and 10	Site history summaries. Understanding of historical activities that led to a potentially CERCLA-related release.	More recent information may supersede historical information from this report.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical report; data used in decisions for sites	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Site histories for: • AOC A • PI 4, 5, 6, 7, 8, and 10 • PAOC I, L, M, O, P, Q, R, and X • SWMU 1, 2, 6/7, and 10 Surface soil data for: • PI 4, 5, 6, 7, 8, 10 and PAOC X PCB wipe samples at PI 6 Asbestos sampling at PI 5	Site history summaries. Understanding of historical activities that led to a potentially CERCLA-related release. Surface soil data will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and whether further action is necessary.	More recent information may supersede historical information from this report. Unvalidated data used to generate report.
Historical report; data used in decisions for sites	Prepared by: CH2M HILL for the Navy Report Title: East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: October 2007	Surface and subsurface soil samples collected on east Vieques and analyzed for inorganics.	Results used to develop background soil inorganic concentrations. Data will be compared to site-specific soil inorganic data to help determine whether site-specific inorganic concentrations are potentially associated with a release or are likely attributable to background.	Background inorganic data alone may not be sufficient to determine if site-specific inorganic concentrations are potentially associated with a release or are likely attributable to background. In some cases, other information, such as knowledge of historical activities, magnitude of exceedances of background, etc. may be used to help distinguish potential releases from background concentrations.
Historical report; data used in decisions for sites	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	Site histories and analytical data for 9 of the 19 sites included in this UFP-SAP: SWMUs 1, 2, 6/7, and 10 AOC A PIs 4 and 7 PAOC L	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and whether further action is necessary.	See site-specific DQEs in Appendix N of PA/SI Report.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical presentation with site information	Prepared by: CH2M HILL in agreement with the Navy for the Environmental Subcommittee. Presentation Title: 16 PI/PAOC Sites, Summary of Historical Information and Recommendations Date: Presented on October 18, 2007	Site histories and analytical data for 10 of the 19 sites included in this UFP-SAP: PIs 5, 6, 8, and 10 PAOCs I, M, O, P, Q, and X	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and whether further action is necessary.	Site-specific DQEs will be prepared as part of SI/Expanded SI
SWMU 1				
Surface soil data (50 locations) and groundwater data (5 monitoring wells) generated during the 2004 Phase I RFI	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	All soil and groundwater samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. In addition, select soil and groundwater samples were also analyzed for dioxins.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data – Sufficient for evaluating surface soil across landfill; not sufficient for characterizing potential releases because data are from soil cover. Groundwater data – Wells located downgradient of landfill; therefore, data not sufficient for determining whether release has occurred that is still within landfill boundaries; sufficient for helping evaluate trend information from existing wells (when used in conjunction with data collected during Expanded SI).

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
SWMU 2				
Surface soil data (12 locations) and subsurface soil data (2 locations) generated during the 2004 Phase I RFI	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	All surface soil samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. Four surface soil samples were additionally analyzed for dioxins. Both subsurface soil samples were analyzed for Appendix IX VOCs and SVOCs. One subsurface soil sample was additionally analyzed for dioxins.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data – Spatial coverage not sufficient to characterize source area without additional data (i.e., not all tank locations, nor the former pipeline, were sampled). Because site is AST site, historical analyses not sufficient because MTBE and TPH not included. Subsurface soil data – Spatial coverage not sufficient to characterize source area without additional data (i.e., not all tank locations, the fuel offloading area, nor the former pipeline, were sampled). MTBE and TPH not included in historical analyses. Because site is AST site, historical analyses not sufficient because MTBE and TPH not included.
SWMU 6/7				
Surface soil data (10 locations) generated during the 2000 evaluation of land during transfer of public works operations from west to east Vieques.	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	All surface soil samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data – Due to the nature of potential releases (spills, runoff from concrete pad), surface soil data not sufficient to characterize potential source area.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
SWMU 10				
Co-located surface soil and subsurface soil data (one in each of four lagoons) generated during the 2000 evaluation of land during transfer of public works operations from west to east Vieques. Co-located surface soil and subsurface soil data (four in each of four lagoons) and groundwater data (five monitoring wells) generated during the 2004 Phase I RFI.	Prepared by: CH2M HILLCH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	2000 – The samples were analyzed for TCLP VOCs, SVOCs, and inorganics. The subsurface soil samples were also analyzed for Appendix IX VOCs, SVOCs, and inorganics that are on the TCLP list, as well as TPH. 2004 – All samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. Seven of the surface soil samples, four of the subsurface soil samples, and two groundwater samples were additionally analyzed for dioxins.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	All data, with the possible exception of thallium, are sufficient for characterizing the potential source area, making the release assessment, and determining whether further action is warranted. Due to the historical thallium method potentially providing falsely elevated concentrations, historical thallium data will be replaced by thallium data collected during Expanded SI.
AOC A				
Confirmatory soil data (10 locations; 6 around former tank and 4 along former fuel fill pipe) generated during the 2003 UST removal.	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	The samples were analyzed for BTEX, MTBE, TPH-DRO, naphthalene, and lead.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Data around tank are sufficient for making determinations for area of tank. Data along pipe suggest additional soil removal warranted.
AOC G				
Surface soil data (5 locations) generated during the 2004 Phase I RFI.	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	All samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, and inorganics; and explosives, including perchlorate. One surface soil sample was additionally analyzed for dioxins.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data from AOC G and lagoon soil data from SWMU 10 are not sufficient for determining potential releases at AOC G without additional surface and subsurface soil data due to possibility of spill or discharge of pump maintenance fluids adjacent to building.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
PI 4				
Surface soil data (2 locations) generated during the 2002 EBS. Co-located surface soil and subsurface soil data (15 locations) and groundwater data (5 monitoring wells) generated during the 2006 PA/SI.	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003 Prepared by: CH2M HILLCH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	2002 – All samples were analyzed for TPH-DRO and TPH-GRO. 2006 – The surface and subsurface soil samples collected from the six borings in the trenched and associated disturbed area were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics. The surface and subsurface soil samples collected from the two borings in the bermed area were analyzed for TCL VOCs and SVOCs, and TAL inorganics. The surface and subsurface soil samples collected from the five borings around and within the former helicopter maintenance area were analyzed for TCL VOCs, SVOCs, and pesticides; and TAL inorganics. The surface and subsurface soil samples from the two borings in the disturbed area south of the helicopter maintenance area were analyzed for TCL VOCs, SVOCs, and pesticides; and TAL inorganics. All groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface and subsurface soil data sufficient for making determinations for soil unless new wells suggest a yet undefined source area exists. Groundwater data yields uncertainty with respect to area and levels of contamination. EBS surface soil data collected. Additional surface and subsurface soil data were collected from approximately the same locations during the PA/SI (see Figure 9). Unvalidated data used to generate report.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
PI 7				
Surface soil data (4 locations) generated during the 2002 EBS. Co-located surface soil and subsurface soil data (5 locations in former quarry; 10 locations in former tar drum disposal area), additional surface soil data (2 locations in former quarry; 2 locations in former tar drum disposal area), and groundwater data (1 monitoring well in former quarry; 2 monitoring wells in former tar drum disposal area) generated during the 2006 PA/SI.	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003 Prepared by: CH2M HILLCH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	2002 – All samples analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics; and explosives, including perchlorate. Two of the samples were also analyzed for TPH-DRO and TPH-GRO. 2006- All samples analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Data sufficient for characterizing soil and groundwater in areas investigated; soil data not sufficient for confirming whether releases occurred beneath drums without confirmatory soil samples collected following drum removal. EBS surface soil data collected. Additional surface and subsurface soil data were collected in the same area during the PA/SI (see Figure 10). Unvalidated data used to generate report.
PAOC L				
Co-located surface soil and subsurface soil data (4 locations) and groundwater data (1 monitoring well) generated during the 2006 PA/SI.	Prepared by: CH2M HILL for the Navy Report Title: PA/SI Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico Date: June 2008	All samples analyzed for TCL VOCs, SVOCs, pesticides, and PCBs; and TAL inorganics.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Spatial extent of surface soil data not sufficient form making release assessment and whether further action is warranted without collecting additional surface soil data. Subsurface soil data sufficient for this purpose. Due to the presence of pesticides in soil and VOCs in groundwater, a single round of groundwater at this site is not sufficient for drawing release assessment conclusions. A second round of groundwater data is necessary to confirm the initial round of data.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
PI 6				
Wipe sample data (6 locations on concrete pad) and surface soil data (3 locations around former UST and vehicle wash pad) generated during the 2002 EBS.	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Wipe samples analyzed for PCBs (no PCBs were detected). Surface soil samples analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Wipe samples not sufficient for making release determinations for PCB storage pad; surface soil samples not sufficient for making release determinations for vehicle wash pad. EBS surface soil and wipe sample data collected. Additional surface and subsurface soil samples will be collected in the vicinity of wipe samples during the SI/Expanded SI (see Figure 22). Unvalidated data used to generate report.
PI 8				
Surface soil data (4 locations in areas of stained soil in former motor pool maintenance area) generated during the 2002 EBS.	Prepared by: Naval Facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Samples analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Spatial coverage not sufficient to characterize source area and make release determinations without subsurface soil data and additional surface soil data. EBS surface soil data collected. Additional surface and subsurface soil samples will be collected in the same area during the SI/Expanded SI (see Figure 27). Unvalidated data used to generate report.

SAP Worksheet #13 — Secondary Data Criteria and Limitations Table (continued)

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
PI 10				
Surface soil data (3 locations) generated during the 2002 EBS.	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Samples analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data alone not sufficient to characterize lagoons without collection of subsurface soil data and additional surface soil data. EBS surface soil data collected. Additional surface and subsurface soil samples will be collected from approximately the same locations during the SI/Expanded SI (see Figure 32). Unvalidated data used to generate report.
PAOC X				
Surface soil data (4 locations in the vicinity of debris) generated during the 2002 EBS.	Prepared by: Naval facilities Engineering Command – Atlantic Division Report Title: Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico Date: April 1, 2003	Samples analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, TPH-DRO, and TPH-GRO.	Data from this report will be incorporated, as appropriate, into comprehensive data set for determining presence of potential releases and the appropriate further action.	Surface soil data not sufficient for confirming whether releases occurred beneath debris without confirmatory soil samples collected following debris removal. EBS surface soil data collected. Additional surface (and potentially subsurface) soil samples will be collected from approximately the same locations (beneath debris) during the SI/Expanded SI (see Figure 48). Unvalidated data used to generate report.

Page Intentionally Left Blank

SAP Worksheet #14 — Summary of Project Tasks

General Protocol

Utility Clearance

NAVFAC Atlantic and USFWS will be contacted for clearance on potential subsurface utilities at all locations prior to the start of field work.

Mobilization

Mobilization will include CH2M HILL staff and subcontractors traveling to the island. Mobilization will occur only after the following tasks have been completed:

- Utility clearance
- The SAP has been approved by the stakeholders

Vegetation Clearance

Vegetation clearance will follow the vegetation clearance SOP (Attachment C-4). USFWS will be consulted prior to vegetation clearing and advised on the area(s) to be cleared.

ERP Technical Subcommittee Pre-SI/Expanded SI Site Visit

Following vegetation clearance and prior to mobilization to conduct the SI/Expanded SI sampling, the tentative sample and well locations shown in the attached figures will be flagged by the sampling team. The ERP Technical Subcommittee will then visit each site to concur upon the actual sample and well locations. The sample location flagging will be adjusted, as appropriate, during the site.

Sampling

Sampling will follow the SOPs set forth in the MQAPP. Soil sampling SOPs are in Attachment 1 of the MQAPP, A1 through A-10. Groundwater sampling SOPs are in MQAPP Attachment 1, B-1 through B-4. Surface water and sediment sampling SOPs are in MQAPP Attachment 1, G-1 through G-5. For all surface/subsurface soil samples, unless otherwise stated below, the soil sample depths will be chosen following the soil sample depth collection criteria set forth in the MQAPP, Attachment 7. Soil samples will be collected by either drill rig split spoons (MQAPP A-7), direct push techniques (MQAPP A-8), slide hammer sampling (Attachment C-5), or hand auger (MQAPP A-1, A-2) depending on anticipated depth and site access.

Monitoring Well Construction

Monitoring wells will be installed using the hollow stem auger and/or air rotary/hammer drilling methods. Rock cores will not be collected during this drilling event. Drilling and monitoring well construction will be in accordance with SOPs (MQAPP Attachment 1, D-1 through D-4). Monitoring wells will be designed with a 10-ft screen interval, such that the top of the screen is near the first encountered groundwater in the borehole. If floating free product is encountered or anticipated to be encountered, the screen interval will be intentionally set across the first encountered water. Monitoring wells completed in bedrock will have boreholes video logged in the bedrock portion of the borehole.

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

Monitoring Well Development

To the extent practicable, the development protocol in the well installation SOP will be followed for any new well (or previously installed well being redeveloped) and any deviation from the SOP will be documented in field notes and the associated report. Existing wells will be redeveloped if turbidity readings do not stabilize to within approximately 10 percent of each other over three consecutive readings during low-flow sampling (assuming the well has sufficient capacity to sustain low-flow purging and sampling).

Equipment Decontamination

Equipment decontamination will follow SOPs in MQAPP Attachment 1 E-1, E-2.

Investigation-Derived Waste Management

IDW will be managed and disposed of in accordance with the IDW Management Plan (IDWMP) (MQAPP Attachment 3).

Surveying

Newly installed monitoring wells and the previously installed monitoring wells on the same site as newly installed wells will be horizontally and vertically located by a licensed surveyor in accordance with the SOP in MQAPP Attachment 1 H-11.

Storage

All analytical data will be stored on CH2M HILL's EnDat database or the NIRIS database if it is available for use at the time the data is received.

Shipments

All analytical samples will be sent by Fed Ex which has on-island staff. All equipment will be shipped upon request and will be sent to the Camp Garcia CH2M HILL office on Vieques. All samples will be shipped in accordance with the SOP in MQAPP Attachment 1 H-9 "Packaging and Shipping Procedures for Low-Concentration Samples."

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 make 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 soil, sediment, groundwater, and surface water samples. The laboratory will analyze soil and groundwater samples for various groups of parameters as shown on Worksheets # 15 and #18.

Data Management

MQAPP Attachment 4, Final Data Management Plan provides guidance on data management steps. The Project EIS, Chelsea Bennett, 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 it's use by the Navy.

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

Procedures for Recording and Correcting Data

All 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.

Site-specific Protocol

SWMU 1

Geophysical Survey: A magnetic and electromagnetic geophysical survey will be performed within the approximate areas shown in Figure 4 and discussed in Worksheet 10a to complete the landfill boundary delineation. The actual area covered by the additional geophysical survey will be based on real-time results. If the geophysical investigation results identify that the landfill boundaries are either further north or further south than the current monitoring well configuration then additional monitoring well(s) will be installed with regulator concurrence on their location.

Waste Characterization: Test pitting will be conducted at 20 locations spaced approximately evenly across the landfill (Figure 4). For details see Worksheet 10a.

Subsurface Soil Characterization within the Waste Material: A three-point composite soil sample will be collected through the vertical waste profile (top, middle, bottom) in each of the 20 test pit locations with a backhoe. An Encore VOC sample will be collected from each of the three zones mentioned above and will be composited by the laboratory. If an additional ephemeral stream is identified along the southwest portion of the landfill during the site visit, additional samples will be added in accordance with Worksheet 10a. The PID reading and VOC sample will be collected from a freshly opened surface in a large piece of soil to prevent volatilization of the sample material. Soil samples will be collected as each test pit is opened (versus opening all test pits and going back to collect samples) to help avoid volatilization of any volatiles present in the soil. All samples will be collected directly from the soil in the backhoe bucket. No entry in the excavation will be allowed. For details see worksheet 10a.

Subsurface Soil Characterization beneath the Waste Material: Subsurface soil samples will be collected beneath the waste material in each of the 20 test pit locations. All samples will be collected directly from the soil in the backhoe bucket; no entry in the excavation will be allowed. For details, see worksheet 10a.

Ephemeral Stream Bed Sampling: Three soil and/or surface water/sediment samples (SW-02 through SW-04) will be collected adjacent to the landfill, one within the landfill boundaries (SW-05), two south of the landfill (SW-06 and SW-07), and one upstream of the landfill (SW-01) in the ephemeral stream. Default locations are shown in Figure 4 but the target areas for the samples will be likely depositional areas along the stream channel. If standing water is found at the sampling locations, a surface water and sediment sample will be collected. The surface water sampling will follow MQAPP SOP G-2, sediment sampling will follow MQAPP SOP G-5. Sediment samples, if collected, will be collected from surface to 0.5 ft below ground surface. If standing water is not observed, a surface soil and subsurface soil sample will be collected. For details see worksheet 10a.

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

Monitoring Well Installation: Four monitoring wells will be installed; one within or adjacent to four of the test pits spaced approximately evenly across the landfill (Figure 4). Additionally, one of the monitoring wells (MW-05) was destroyed by recenct construction activities near the main east-west road. This monitoring well will be replaced during this field effort.

Monitoring Well Development: The four newly installed monitoring wells will be developed. Development may start no sooner than 24 hours after each well is completed. The existing wells may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol.

Monitoring Well Sampling: All new and existing monitoring wells will be sampled. For details see Worksheet 10a.

SWMU 2

Reconnaissance: A reconnaissance will be conducted to determine site accessibility for a direct push rig.

Geophysical Survey: A magnetic and electromagnetic geophysical survey will be conducted at SWMU 2 in an attempt to determine whether the former buried fuel transfer pipeline exists or has been removed.

Surface and Subsurface Soil Sampling: Surface and subsurface soil samples will be collected in the vicinity of the eight historic tanks, the former fuel offloading area, and the former fuel transfer pipeline (if its location can be ascertained), the locations of which are shown in the composite figure (Figure 5). For details see worksheet 10b.

Possible Monitoring Well Installation and Sampling: If residual soil contamination is observed (visually or with PID) during the soil borings, the need for and location of well(s) will be discussed with the regulatory agencies and installed, developed, and sampled during the mobilization. For details see worksheet 10b.

SWMU 6/7

Surface and Subsurface Soil Sampling: Six surface soil and subsurface soil samples will be collected at the locations shown in Figure 6, in the vicinity of the June 2000 surface soil sampling locations to confirm previous findings. If staining is observed during the sampling event, sample(s) will be biased to the location(s) of the staining. For details see worksheet 10c.

SWMU 10

Surface and Subsurface Soil Sampling: Two surface and subsurface soil samples will be collected per lagoon (eight surface and subsurface soil samples total, as shown in Figure 7). For details see Worksheet 10d.

Monitoring Well Redevelopment: If during sampling it is determined that a particular well needs to be redeveloped because the turbidity is not stabilizing, then that well will be redeveloped and its water level allowed to recover to its approximate pre-redevelopment level prior to sampling.

Monitoring Well Sampling: A round of groundwater samples will be collected from each SWMU 10 monitoring well.

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

AOC A

TPH-DRO Contaminated Soil Excavation and Removal: Additional soil will be excavated within the area where the TPH exceedances were identified (i.e., along the former fill pipe length, as shown in Figure 8). The original excavation was backfilled with non-native soil. This backfill material may be stockpiled to the side for re-use as backfill. If stockpiled, this potential backfill material will be composite sampled such that 4 locations for every approximate 10 lf of trench excavation will be combined into one composite sample. The backfill composite samples will be analyzed for TPH-DRO to ensure concentrations are not greater than the PREQB Land Pollution Control Corrective Action Level. If any composite sample TPH-DRO concentration is greater than the PREQB Land Pollution Control Corrective Action Level, soil within the area used to prepare the composite sample will be disposed of with the excavated contaminated soil. It is not anticipated that additional soil will be brought to the site for backfilling; rather some regrading may be performed in the area of excavation. When excavating the TPH contaminated soil, DRO field assay kits (petroFLAG brand) will be used to confirm soil with TPH-DRO concentrations above the PREQB Land Pollution Control Corrective Action Level has been excavated. Soil excavated from below the backfill will be placed in a rolloff pending results of confirmatory sampling for appropriate disposal. Areas in the pipe run trench that show signs of staining will be tested with the field assay kit, and excavated as necessary. The potentially contaminated stockpile will be sampled for disposal. Confirmatory soil samples will be collected along the side-walls (0-1 foot below the depth of backfill) and bottom of the excavated area. Samples will be collected at the frequency of one set of three (each sidewall and bottom) per 5 lf of excavation. The area will be regraded following concurrence between the Navy and EQB that no additional excavation is necessary. For further details see Worksheet 10e.

AOC G

Surface and Subsurface Soil Sampling: Two co-located surface/subsurface soil samples will be collected near the building door in an area where fluids would most likely have been spilled or otherwise discharged. Sample locations will be chosen during the inter-agency site visit. For further details see Worksheet 10f.

PI 4

Synoptic Water Level Event: Directly following vegetation clearance, prior to demobilization of vegetation clearance crew, a round of synoptic water level measurements were collected on 12-29-08 across the site to confirm the groundwater flow direction. The data were used to define monitoring well locations 200 ft upgradient and 200 ft downgradient of MW-5 (Figure 9). Additional vegetation will be cleared to the two proposed new monitoring well locations as necessary.

Monitoring Well Installation: Two additional wells will be installed; one approximately 200 ft upgradient and one well approximately 200 ft downgradient of MW-5 (see Figure 9). The locations of these wells will be based on the results of the synoptic water-level measurements collected on 12-29-08. MW-5 is the well in which the TCE concentration exceeded the MCL in the last round of sampling.

Monitoring Well Development: Both new monitoring wells will be developed. The existing wells may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol.

Monitoring Well Sampling: A round of groundwater samples will be collected from all PI-4 wells.

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

PI 7

Drum Removal: Drums will be removed from the site and placed in covered rolloff(s) or similar containment for disposal pending confirmatory sampling (Figures 10 and 11). Drums will be disposed of following federal and state regulations and the IDW Management Plan. If during the removal of the drums, there is evidence of a release (either visual or PID), the visually contaminated soil will be removed, stockpiled, sampled, and disposed of following based on the results of the confirmatory sample analysis and IDWMP.

Surface and Subsurface Soil Sampling: Soil samples will be collected to a depth of 6-inches from the locations where the drums were removed (one sample for piles of up to 5 drums; two samples for piles between 6 and 19 drums; three samples for piles of 20 or more drums). If there is visual or PID evidence of a release beneath any of the drums, a subsurface soil sample(s) will be collected in accordance with the Soil Sample Depth Selection Criteria protocol. For further details see Worksheet 10h.

PAOC L

Surface Soil Sampling: An additional eight surface soil samples will be collected further out from building than initial samples (see Figure 12). For additional details see worksheet 10i.

Monitoring Well Sampling: An additional groundwater sample will be collected from well EPAL-MW01. For additional details see worksheet 10i.

Monitoring Well Re-development: The existing well may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol.

PAOC N/PAOC S

Geophysical Survey: A magnetic and electromagnetic geophysical survey will be conducted at the PAOC S power plant building to determine if a UST is present and between PAOC N and the power plant portion of PAOC S to determine if an underground pipeline exists between the two.

PI 5

Soil Sampling: Co-located surface and subsurface soil samples will be collected at 8 locations (Figure 16). See Worksheet #10k for sample location rationale and further details.

PI 6

Soil Sampling: Co-located surface and subsurface soil samples will be collected at 4 locations, if possible (Figure 22). One surface/subsurface soil sample will be collected within the sump, if the soil thickness permits. For further details see worksheet 10l. Two surface/subsurface soil samples will be collected off the east side of the concrete pad, immediately adjacent to the openings in the concrete berm. The fourth surface/subsurface soil sample location is at the former wash pad.

PI 8

Soil Sampling: Surface and subsurface soil samples will be collected at 11 locations (Figure 27). For further details see worksheet 10m.

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

PI 10

Soil Sampling: Surface and subsurface soil samples will be collected at 3 locations (Figure 32). Sample SS/SB-1 will be collected just outside the bermed area, in the area noted by ERI to be where liquid was observed outside the lagoons in the 1962 aerial photograph. The subsurface soil samples will be collected at the base of the sludge, sampling in the sludge, if it can be visually identified from the continuous soil samples. For further details see Worksheet 10n.

PAOC I

Soil Sampling: Surface and subsurface soil samples will be collected at 5 locations (Figure 36). The surface/subsurface soil sample locations will coincide with the two doors (one adjacent to each entrance on the south and west sides of the building), and the three pipe penetrations (one adjacent to each of the two pipes on the south side of the building and one adjacent to the pipe on the east side of the building). For further details see Worksheet 10o.

PAOC M

Soil Sampling: Surface and subsurface soil samples will be collected at 4 locations (Figure 36) around the footprint of the former small white building shown in the 1983 aerial photograph. The surface/subsurface soil samples will be collected with a slide hammer to refusal or 6 ft bgs, whichever comes first. The soil cores will be screened visually and with a PID. If contamination is suspected, then a soil sample(s) from the suspected contaminated zone will be submitted to the laboratory for analysis. For further details see Worksheet 10p.

PAOC O

Soil Sampling: Surface and subsurface soil samples will be collected at 2 locations (Figure 36) from within the footprint of the former building. For further details see Worksheet 10q.

PAOC P

Soil Sampling: A surface and subsurface soil sample will be collected (Figure 48) from below the location of the generator observed at the site during the inter-agency site visit on October 17, 2007. For further details see Worksheet 10r.

PAOC Q/R

Soil Sampling: Surface and subsurface soil samples will be collected at two locations (Figure 36), one from within the footprint of the former building and one from within the footprint of the similar building to the north. For further details see Worksheet 10S.

PAOC X

Reconnaissance: A reconnaissance will be conducted to identify (if possible) and avoid the petroglyphs noted by FWS, and to identify the location of the debris piles.

Debris Removal: Debris will be removed, stockpiled in a covered rolloff(s) or similar containment, and disposed of in accordance with state and federal regulations. Debris at the top of the east bank of the ephemeral stream and two 55-gallon drums and a buried car in the ephemeral stream will be removed. A truck locacated on the west embankment of the ephemeral stream will also be removed.

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

Soil Sampling: Surface soil samples and potentially subsurface soil samples will be collected at approximately 4 locations (Figure 48) beneath the removed debris piles along the top of the eastern bank of the ephemeral stream. One surface soil sample and potentially subsurface soil sample will be collected beneath the buried car. One co-located surface/subsurface soil sample will be collected from the depositional area just downstream of the buried car. For further details see worksheet 10t.

Regional Groundwater Investigation South of Camp Garcia

Monitoring Well Installation: Two monitoring wells will be installed immediately downgradient of the southern boundary of Camp Garcia (one downgradient of the eastern half and one downgradient of the western half, as shown in Figure 3).

Monitoring Well Development: The newly installed monitoring wells will be developed. Development may start no sooner than 24 hours after each well is completed.

Monitoring Well Sampling: The newly installed monitoring wells will be sampled.

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

SAP Worksheet #15-1: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
							QLs (ug/kg)[6]	MDLs (ug/kg)
Dichlorodifluoromethane	75-71-8	Low	610	NC	19000	305	10	1.24
Chloromethane	74-87-3	Low	0.46	NC	1700	0.46	10	1.92
Vinyl chloride	75-01-4	Low	0.7	10	60	0.7	10	1.43
Bromomethane	74-83-9	Low	2.2	NC	790	2.2	10	2.27
Chloroethane	75-00-3	Low	6000	NC	1500000	3000	10	1.93
Trichlorofluoromethane	75-69-4	Low	840	NC	80000	420	10	1.45
1,1-Dichloroethene	75-35-4	Low	2.6	100	25000	2.6	5	1.52
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Low	150000	NC	940000	75000	6	1.76
Acetone	67-64-1	Low	4400	NC	6100000	2200	33	10.97
Carbon disulfide	75-15-0	Low	270	NC	67000	135	6	1.88
Methyl acetate	79-20-9	Low	7600	NC	7800000	3800	14	4.48
Methylene chloride	75-09-2	Low	1.3	NC	11000	1.3	25	2.71
trans-1,2-Dichloroethene	156-60-5	Low	32	NC	11000	16	7	2.11
Methyl tert-butyl ether	1634-04-4	Low	2.7	NC	39000	2.7	9	2.9
1,1-Dichloroethane	75-34-3	Low	0.7	20	3400	0.7	6	1.86
cis-1,2-Dichloroethene	156-59-2	Low	21	200	78000	10.5	7	2
2-Butanone	78-93-3	Low	1500	NC	2800000	750	29	9.48
Bromochloromethane	74-97-5	Low	NC	NC	NC	6	6	1.74
Chloroform	67-66-3	Low	0.055	20	300	0.055	6	1.81
1,1,1-Trichloroethane	71-55-6	Low	72	70	680000	35	6	1.84
Cyclohexane	110-82-7	Low	13000	100	120000	50	5	1.17
Carbon tetrachloride	56-23-5	Low	2	1000000	250	2	5	1.44
Benzene	71-43-2	Low	2.8	10	1100	2.8	5	1.53
1,2-Dichloroethane	107-06-2	Low	1.5	20	450	1.5	5	1.37
Trichloroethene	79-01-6	Low	1.9	100	2800	1.9	6	1.71
Methylcyclohexane	108-87-2	Low	14000	NC	71000	7000	5	1.52
1,2-Dichloropropane	78-87-5	Low	1.7	700000	930	1.7	5	1.64
Bromodichloromethane	75-27-4	Low	0.3	NC	10000	0.3	5	1.63
cis-1,3-Dichloropropene	10061-01-5	Low	0.16	NC	1700	0.16	5	1.6
4-Methyl-2-pentanone	108-10-1	Low	440	NC	530000	220	29	9.46
Toluene	108-88-3	Low	760	200000	500000	380	5	1.32
trans-1,3-Dichloropropene	10061-02-6	Low	0.16	NC	1700	0.16	7	2.19
1,1,2-Trichloroethane	79-00-5	Low	1.7	400	1100	1.7	5	1.52
Tetrachloroethene	127-18-4	Low	2.4	2	570	2.4	6	1.9
2-Hexanone	591-78-6	Low	440	NC	530000	220	25	7.98

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

SAP Worksheet #15-1: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
							QLs (ug/kg)[6]	MDLs (ug/kg)
Dibromochloromethane	124-48-1	Low	0.22	NC	5800	0.22	5	1.53
1,2-Dibromoethane	106-93-4	Low	0.015	NC	34	0.015	6	1.74
Chlorobenzene	108-90-7	Low	75	40000	31000	37.5	5	1.51
Ethylbenzene	100-41-4	Low	890	30	5700	15	5	1.22
o-Xylene	95-47-6	Low	1600	100	300000	50	5	1.09
m,p-Xylene	m&pXYLENE	Low	NC	100	NC	50	11	3.55
Styrene	100-42-5	Low	120	300000	650000	60	5	1.19
Bromoform	75-25-2	Low	2.3	NC	61000	2.3	5	1.16
Isopropylbenzene	98-82-8	Low	1300	NC	220000	650	5	1.48
1,1,2,2-Tetrachloroethane	79-34-5	Low	0.028	NC	590	0.028	5	1.06
1,3-Dichlorobenzene	541-73-1	Low	NC	NC	NC	5	5	1.29
1,4-Dichlorobenzene	106-46-7	Low	81	20000	2600	40.5	5	1.42
1,2-Dichlorobenzene	95-50-1	Low	660	NC	200000	330	5	1.11
1,2-Dibromo-3-chloropropane	96-12-8	Low	0.092	NC	5.6	0.092	7	2.06
1,2,4-Trichlorobenzene	120-82-1	Low	110	20000	78000	55	5	1.38
1,2,3-Trichlorobenzene	87-61-6	Low	NC	20000	NC	10000	5	1.5

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 All VOCs in soil (except for soil VOCs at SWMU 2 and PAOC M) will be analyzed by "Low" (SW-846 8260B). VOCs at SWMU 2 and PAOC M will comprise Benzene, Toluene, Ethylbenzene, o-Xylene, m,p-Xylene, and Methyl tert-butyl ether.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-1a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Dichlorodifluoromethane	75-71-8	Low	610	19000	305	10	1.24
Chloromethane	74-87-3	Low	0.46	1700	0.46	10	1.92
Vinyl chloride	75-01-4	Low	0.7	60	0.7	10	1.43
Bromomethane	74-83-9	Low	2.2	790	2.2	10	2.27
Chloroethane	75-00-3	Low	6000	1500000	3000	10	1.93
Trichlorofluoromethane	75-69-4	Low	840	80000	420	10	1.45
1,1-Dichloroethene	75-35-4	Low	2.6	25000	2.6	5	1.52
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Low	150000	940000	75000	6	1.76
Acetone	67-64-1	Low	4400	6100000	2200	33	10.97
Carbon disulfide	75-15-0	Low	270	67000	135	6	1.88
Methyl acetate	79-20-9	Low	7600	7800000	3800	14	4.48
Methylene chloride	75-09-2	Low	1.3	11000	1.3	25	2.71
trans-1,2-Dichloroethene	156-60-5	Low	32	11000	16	7	2.11
Methyl tert-butyl ether	1634-04-4	Low	2.7	39000	2.7	9	2.9
1,1-Dichloroethane	75-34-3	Low	0.7	3400	0.7	6	1.86
cis-1,2-Dichloroethene	156-59-2	Low	21	78000	10.5	7	2
2-Butanone	78-93-3	Low	1500	2800000	750	29	9.48
Bromochloromethane	74-97-5	Low	NC	NC	6	6	1.74
Chloroform	67-66-3	Low	0.055	300	0.055	6	1.81
1,1,1-Trichloroethane	71-55-6	Low	72	680000	36	6	1.84
Cyclohexane	110-82-7	Low	13000	120000	6500	5	1.17
Carbon tetrachloride	56-23-5	Low	2	250	2	5	1.44
Benzene	71-43-2	Low	2.8	1100	2.8	5	1.53
1,2-Dichloroethane	107-06-2	Low	1.5	450	1.5	5	1.37
Trichloroethene	79-01-6	Low	1.9	2800	1.9	6	1.71
Methylcyclohexane	108-87-2	Low	14000	71000	7000	5	1.52
1,2-Dichloropropane	78-87-5	Low	1.7	930	1.7	5	1.64
Bromodichloromethane	75-27-4	Low	0.3	10000	0.3	5	1.63
cis-1,3-Dichloropropene	10061-01-5	Low	0.16	1700	0.16	5	1.6
4-Methyl-2-pentanone	108-10-1	Low	440	530000	220	29	9.46
Toluene	108-88-3	Low	760	500000	380	5	1.32
trans-1,3-Dichloropropene	10061-02-6	Low	0.16	1700	0.16	7	2.19
1,1,2-Trichloroethane	79-00-5	Low	1.7	1100	0.17	5	1.52
Tetrachloroethene	127-18-4	Low	2.4	570	2.4	6	1.9
2-Hexanone	591-78-6	Low	440	530000	220	25	7.98

SAP Worksheet #15-1a — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-1a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Dibromochloromethane	124-48-1	Low	0.22	5800	0.22	5	1.53
1,2-Dibromoethane	106-93-4	Low	0.015	34	0.015	6	1.74
Chlorobenzene	108-90-7	Low	75	31000	37.5	5	1.51
Ethylbenzene	100-41-4	Low	890	5700	445	5	1.22
o-Xylene	95-47-6	Low	1600	300000	800	5	1.09
m,p-Xylene	m&pXYLENE	Low	NC	NC	11	11	3.55
Styrene	100-42-5	Low	120	650000	60	5	1.19
Bromoform	75-25-2	Low	2.3	61000	2.3	5	1.16
Isopropylbenzene	98-82-8	Low	1300	220000	650	5	1.48
1,1,2,2-Tetrachloroethane	79-34-5	Low	0.028	590	0.028	5	1.06
1,3-Dichlorobenzene	541-73-1	Low	NC	NC	5	5	1.29
1,4-Dichlorobenzene	106-46-7	Low	81	2600	40.5	5	1.42
1,2-Dichlorobenzene	95-50-1	Low	660	200000	330	5	1.11
1,2-Dibromo-3-chloropropane	96-12-8	Low	0.092	5.6	0.092	7	2.06
1,2,4-Trichlorobenzene	120-82-1	Low	110	78000	55	5	1.38
1,2,3-Trichlorobenzene	87-61-6	Low	NC	NC	5	5	1.5

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 All VOCs in soil (except for soil VOCs at SWMU 2 and PAOC M) will be analyzed by "Low" (SW-846 8620B). VOCs at SWMU 2 and PAOC M will comprise Benzene, Toluene, Ethylbenzene, o-Xylene, m,p-Xylene, and Methyl tert-butyl ether.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-1b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[6]	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)[4]
Dichlorodifluoromethane	75-71-8	Low	NC	190000	95000	10	1.24
Chloromethane	74-87-3	Low	NC	17000	8500	10	1.92
Vinyl chloride	75-01-4	Low	NC	600	300	10	1.43
Bromomethane	74-83-9	Low	NC	7900	3950	10	2.27
Chloroethane	75-00-3	Low	NC	2200000	1100000	10	1.93
Trichlorofluoromethane	75-69-4	Low	NC	800000	400000	10	1.45
1,1-Dichloroethene	75-35-4	Low	NC	250000	125000	5	1.52
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Low	NC	940000	470000	6	1.76
Acetone	67-64-1	Low	NC	61000000	30500000	33	10.97
Carbon disulfide	75-15-0	Low	NC	260000	130000	6	1.88
Methyl acetate	79-20-9	Low	NC	29000000	14500000	14	4.48
Methylene chloride	75-09-2	Low	NC	110000	55000	25	2.71
trans-1,2-Dichloroethene	156-60-5	Low	NC	110000	55000	7	2.11
Methyl tert-butyl ether	1634-04-4	Low	NC	390000	195000	9	2.9
1,1-Dichloroethane	75-34-3	Low	NC	34000	17000	6	1.86
cis-1,2-Dichloroethene	156-59-2	Low	NC	780000	390000	7	2
2-Butanone	78-93-3	Low	NC	28000000	14000000	29	9.48
Bromochloromethane	74-97-5	Low	NC	NC	6	6	1.74
Chloroform	67-66-3	Low	NC	3000	1500	6	1.81
1,1,1-Trichloroethane	71-55-6	Low	NC	680000	340000	6	1.84
Cyclohexane	110-82-7	Low	NC	120000	60000	5	1.17
Carbon tetrachloride	56-23-5	Low	NC	2500	1250	5	1.44
Benzene	71-43-2	Low	NC	11000	5500	5	1.53
1,2-Dichloroethane	107-06-2	Low	NC	4500	2250	5	1.37
Trichloroethene	79-01-6	Low	NC	28000	14000	6	1.71
Methylcyclohexane	108-87-2	Low	NC	71000	35500	5	1.52
1,2-Dichloropropane	78-87-5	Low	NC	9300	4650	5	1.64
Bromodichloromethane	75-27-4	Low	NC	100000	50000	5	1.63
cis-1,3-Dichloropropene	10061-01-5	Low	NC	17000	8500	5	1.6
4-Methyl-2-pentanone	108-10-1	Low	NC	3200000	1600000	29	9.46
Toluene	108-88-3	Low	NC	930000	465000	5	1.32
trans-1,3-Dichloropropene	10061-02-6	Low	NC	17000	8500	7	2.19
1,1,2-Trichloroethane	79-00-5	Low	NC	11000	5500	5	1.52

SAP Worksheet #15-1b — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-1b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[6]	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)[4]
Tetrachloroethene	127-18-4	Low	NC	5700	2850	6	1.9
2-Hexanone	591-78-6	Low	NC	5300000	265000	25	7.98
Dibromochloromethane	124-48-1	Low	NC	58000	29000	5	1.53
1,2-Dibromoethane	106-93-4	Low	NC	340	170	6	1.74
Chlorobenzene	108-90-7	Low	NC	310000	155000	5	1.51
Ethylbenzene	100-41-4	Low	NC	57000	28500	5	1.22
o-Xylene	95-47-6	Low	NC	300000	150000	5	1.09
m,p-Xylene	m&pXYLENE	Low	NC	NC	11	11	3.55
Styrene	100-42-5	Low	NC	1000000	500000	5	1.19
Bromoform	75-25-2	Low	NC	610000	305000	5	1.16
Isopropylbenzene	98-82-8	Low	NC	310000	155000	5	1.48
1,1,2,2-Tetrachloroethane	79-34-5	Low	NC	5900	2950	5	1.06
1,3-Dichlorobenzene	541-73-1	Low	NC	NC	5	5	1.29
1,4-Dichlorobenzene	106-46-7	Low	NC	26000	13000	5	1.42
1,2-Dichlorobenzene	95-50-1	Low	NC	220000	110000	5	1.11
1,2-Dibromo-3-chloropropane	96-12-8	Low	NC	56	28	7	2.06
1,2,4-Trichlorobenzene	120-82-1	Low	NC	220000	110000	5	1.38
1,2,3-Trichlorobenzene	87-61-6	Low	NC	NC	5	5	1.5

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-1c: Reference Limits and Evaluation Table
Matrix: Subsurface Soil (Three-point composite for vertical profiling)
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Dichlorodifluoromethane	75-71-8	Medium	610	19000	305	500	62
Chloromethane	74-87-3	Medium	0.46	1700	0.46	500	96
Vinyl chloride	75-01-4	Medium	0.7	60	0.7	500	71.5
Bromomethane	74-83-9	Medium	2.2	790	2.2	500	113.5
Chloroethane	75-00-3	Medium	6000	1500000	3000	500	96.5
Trichlorofluoromethane	75-69-4	Medium	840	80000	840	500	72.5
1,1-Dichloroethene	75-35-4	Medium	2.6	25000	2.6	250	76
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Medium	150000	940000	75000	300	88
Acetone	67-64-1	Medium	4400	6100000	2200	1650	548.5
Carbon disulfide	75-15-0	Medium	270	67000	270	300	94
Methyl acetate	79-20-9	Medium	7600	7800000	3800	700	224
Methylene chloride	75-09-2	Medium	1.3	11000	1.3	1250	135.5
trans-1,2-Dichloroethene	156-60-5	Medium	32	11000	32	350	105.5
Methyl tert-butyl ether	1634-04-4	Medium	2.7	39000	2.7	450	145
1,1-Dichloroethane	75-34-3	Medium	0.7	3400	0.7	300	93
cis-1,2-Dichloroethene	156-59-2	Medium	21	78000	21	350	100
2-Butanone	78-93-3	Medium	1500	2800000	1500	1450	474
Bromochloromethane	74-97-5	Medium	NC	NC	300	300	87
Chloroform	67-66-3	Medium	0.055	300	0.055	300	90.5
1,1,1-Trichloroethane	71-55-6	Medium	72	680000	72	300	92
Cyclohexane	110-82-7	Medium	13000	120000	6500	250	58.5
Carbon tetrachloride	56-23-5	Medium	2	250	2	250	72
Benzene	71-43-2	Medium	2.8	1100	2.8	250	76.5
1,2-Dichloroethane	107-06-2	Medium	1.5	450	1.5	250	68.5
Trichloroethene	79-01-6	Medium	1.9	2800	1.9	300	85.5
Methylcyclohexane	108-87-2	Medium	14000	71000	7000	250	76
1,2-Dichloropropane	78-87-5	Medium	1.7	930	1.7	250	82
Bromodichloromethane	75-27-4	Medium	0.3	10000	0.3	250	81.5
cis-1,3-Dichloropropene	10061-01-5	Medium	0.16	1700	0.16	250	80
4-Methyl-2-pentanone	108-10-1	Medium	440	530000	440	1450	473
Toluene	108-88-3	Medium	760	500000	380	250	66
trans-1,3-Dichloropropene	10061-02-6	Medium	0.16	1700	0.16	350	109.5
1,1,2-Trichloroethane	79-00-5	Medium	1.7	1100	0.17	250	76
Tetrachloroethene	127-18-4	Medium	2.4	570	2.4	300	95
2-Hexanone	591-78-6	Medium	440	530000	440	1250	399

SAP Worksheet #15-1c — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-1c -- Reference Limits and Evaluation Table
Matrix: Subsurface Soil (Three-point composite for vertical profiling)
Analytical Group: VOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Dibromochloromethane	124-48-1	Medium	0.22	5800	0.22	250	76.5
1,2-Dibromoethane	106-93-4	Medium	0.015	34	0.015	300	87
Chlorobenzene	108-90-7	Medium	75	31000	75	250	75.5
Ethylbenzene	100-41-4	Medium	890	5700	445	250	61
o-Xylene	95-47-6	Medium	1600	300000	800	250	54.5
m,p-Xylene	m&pXYLENE	Medium	NC	NC	550	550	177.5
Styrene	100-42-5	Medium	120	650000	120	250	59.5
Bromoform	75-25-2	Medium	2.3	61000	2.3	250	58
Isopropylbenzene	98-82-8	Medium	1300	220000	650	250	74
1,1,2,2-Tetrachloroethane	79-34-5	Medium	0.028	590	0.028	250	53
1,3-Dichlorobenzene	541-73-1	Medium	NC	NC	250	250	64.5
1,4-Dichlorobenzene	106-46-7	Medium	81	2600	81	250	71
1,2-Dichlorobenzene	95-50-1	Medium	660	200000	330	250	55.5
1,2-Dibromo-3-chloropropane	96-12-8	Medium	0.092	5.6	0.092	350	103
1,2,4-Trichlorobenzene	120-82-1	Medium	110	78000	110	250	69
1,2,3-Trichlorobenzene	87-61-6	Medium	NC	NC	250	250	75

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

5 VOCs in soil will be analyzed by “medium” when three-point compositing is necessary for vertical profiling. The QLs and MDLs reflect an inherent 50X dilution.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

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

Matrix: Surface Soil

Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs – Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
							QLs (ug/kg)[6]	MDLs (ug/kg)
Benzaldehyde	100-52-7	Low	970	NC	780000	485	360	120
Phenol	108-95-2	Low	8100	30000	1800000	4050	468	156
Bis(2-chloroethyl) ether	111-44-4	Low	0.0027	NC	190	0.0027	330	81
2-Chlorophenol	95-57-8	Low	200	NC	39000	200	492	164
2-Methylphenol	95-48-7	Low	2000	NC	310000	1000	600	200
2,2'-Oxybis(1-choloropropane)	108-60-1	Low	0.09	NC	3500	0.09	330	89
Acetophenone	98-86-2	Low	1100	NC	780000	550	534	178
3- and 4-Methylphenol	m&pCRESOL	Low	190	NC	31000	190	561	187
N-Nitroso-di-n propylamine	621-64-7	Low	0.011	NC	69	0.011	330	83
Hexachloroethane	67-72-1	SIM	3.2	NC	6100	3.2	100	2
Nitrobenzene	98-95-3	Low	2	40000	3100	2	330	91
Isophorone	78-59-1	Low	22	NC	510000	22	330	75
2-Nitrophenol	88-75-5	Low	200	NC	39000	200	501	167
2,4-Dimethylphenol	105-67-9	Low	1200	NC	120000	600	495	165
Bis(2-chloroethoxy) methane	111-91-1	Low	23	NC	18000	23	330	96
2,4-Dichlorophenol	120-83-2	Low	180	NC	18000	180	450	150
Naphthalene	91-20-3	SIM	24	100	15000	24	20	2.6
4-Chloroaniline	106-47-8	Low	50	NC	24000	50	357	119
Hexachlorobutadiene	87-68-3	Low	1.9	NC	6100	1.9	330	83
Caprolactam	105-60-2	Low	5700	NC	3100000	2850	432	144
4-Chloro-3-methylphenol	59-50-7	Low	200	NC	39000	200	498	166
2-Methylnaphthalene	91-57-6	SIM	900	NC	31000	450	20	2.2
Hexachlorocyclopentadiene	77-47-4	Low	180	10000	37000	180	330	82
2,4,6-Trichlorophenol	88-06-2	Low	16	10000	6100	16	465	155
2,4,5-Trichlorophenol	95-95-4	Low	9400	4000	610000	2000	820	155
1,1'-Biphenyl	92-52-4	Low	23000	NC	260000	11500	330	73
2-Chloronaphthalene	91-58-7	SIM	18000	NC	210000	9000	20	3.6
2-Nitroaniline	88-74-4	Low	NC	NC	NC	820	820	75
Dimethylphthalate	131-11-3	Low	NC	200000	NC	100000	330	78
2,6-Dinitrotoluene	606-20-2	Low	34	NC	6100	34	330	79
Acenaphthylene	208-96-8	SIM	27000	NC	340000	13500	20	1.2
3-Nitroaniline	99-09-2	Low	NC	NC	NC	820	820	94

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

SAP Worksheet #15-2: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs – Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
							QLs (ug/kg)[6]	MDLs (ug/kg)
Acenaphthene	83-32-9	SIM	27000	20000	340000	10000	20	1.5
2,4-Dinitrophenol	51-28-5	Low	68	20000	12000	68	1131	377
4-Nitrophenol	100-02-7	Low	NC	7000	NC	3500	927	309
Dibenzofuran	132-64-9	Low	NC	NC	7800	3900	330	79
2,4-Dinitrotoluene	121-14-2	Low	68	NC	12000	68	330	85
Diethylphthalate	84-66-2	Low	13000	100000	4900000	6500	330	80
Fluorene	86-73-7	SIM	33000	30000	230000	15000	20	3.2
4-Chlorophenyl-phenyl ether	7005-72-3	Low	3400	NC	31000	1700	330	78
4-Nitroaniline	100-01-6	Low	NC	NC	NC	820	820	134
4,6-Dinitro-2-methylphenol	534-52-1	Low	NC	NC	NC	1011	1011	337
N-Nitrosodiphenylamine	86-30-6	Low	170	20000	99000	170	657	219
1,2,4,5-Tetrachlorobenzene	95-94-3	Low	28	NC	1800	28	405	135
4-Bromophenyl-phenylether	101-55-3	Low	NC	NC	NC	330	330	85
Hexachlorobenzene	118-74-1	SIM	7	1000000	300	7	100	1.8
Atrazine	1912-24-9	Low	2	0.2	2100	0.2	330	91
Pentachlorophenol	87-86-5	SIM	7	5000	3000	7	100	13.7
Phenanthrene	85-01-8	SIM	450000	100	1700000	50	20	1.8
Anthracene	120-12-7	SIM	450000	100	1700000	50	20	1.2
Carbazole	86-74-8	SIM	77	NC	24000	39	20	1.3
Di-n-butylphthalate	84-74-2	SIM	11000	200000	610000	5500	100	16.8
Fluoranthene	206-44-0	SIM	210000	100	230000	50	20	1.8
Pyrene	129-00-0	SIM	150000	100	170000	50	20	2.1
Butylbenzylphthalate	85-68-7	Low	140000	NC	1200000	70000	330	93
3,3'-dicholorobenzidine	91-94-1	Low	2.3	NC	1100	2.3	342	114
Benzo(a)anthracene	56-55-3	SIM	14	NC	150	14	20	1.9
Chrysene	218-01-9	SIM	1400	NC	15000	700	20	1.7
Bis(2-ethylhexyl) phthalate	117-81-7	SIM	2000	NC	35000	1000	100	32
Di-n-octylphthalate	117-84-0	Low	NC	NC	NC	633	633	211
Benzo(b) fluoranthene	205-99-2	SIM	47	NC	150	23.5	20	2.4
Benzo(k) fluoranthene	207-08-9	SIM	460	NC	1500	230	20	3.1
Benzo(a) pyrene	50-32-8	SIM	310	100	15	15	20	3.3
Indeno(1,2,3,-cd) pyrene	193-39-5	SIM	160	NC	150	75	20	1.9

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

SAP Worksheet #15-2: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs – Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
Dibenzo(a,h) anthracene	53-70-3	SIM	15	NC	15	15	20	1.8
Benzo(g,h,i) perylene	191-24-2	SIM	150000	NC	170000	75000	20	2
2,3,4,6-Tetrachlorophenol	58-90-2	Low	4600	NC	180000	2300	420	140
1,4-Dioxane	123-91-1	SIM	NC	20000	NC	10000	170	1.1

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 SVOCs in soil will be analyzed via the "Low" concentration range (SW-846 8270C). Select SVOCs in soil will be analyzed by "SIM" as noted above under the Concentration Range column.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-2a: Reference Limits and Evaluation Table

Matrix: Subsurface Soil

Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Benzaldehyde	100-52-7	Low	970	780000	485	360	120
Phenol	108-95-2	Low	8100	1800000	4050	468	156
Bis(2-chloroethyl) ether	111-44-4	Low	0.0027	190	0.0027	330	81
2-Chlorophenol	95-57-8	Low	200	39000	200	492	164
2-Methylphenol	95-48-7	Low	2000	310000	1000	600	200
2,2'-Oxybis(1-choloropropane)	108-60-1	Low	0.09	3500	0.09	330	89
Acetophenone	98-86-2	Low	1100	780000	550	534	178
3- and 4-Methylphenol	m&pCRESOL	Low	190	31000	190	561	187
N-Nitroso-di-n propylamine	621-64-7	Low	0.011	69	0.011	330	83
Hexachloroethane	67-72-1	SIM	3.2	6100	3.2	100	2
Nitrobenzene	98-95-3	Low	2	3100	2	330	91
Isophorone	78-59-1	Low	22	510000	22	330	75
2-Nitrophenol	88-75-5	Low	200	39000	200	501	167
2,4-Dimethylphenol	105-67-9	Low	1200	120000	600	495	165
Bis(2-chloroethoxy) methane	111-91-1	Low	23	18000	23	330	96
2,4-Dichlorophenol	120-83-2	Low	180	18000	180	450	150
Naphthalene	91-20-3	SIM	24	15000	24	20	2.6
4-Chloroaniline	106-47-8	Low	50	24000	50	357	119
Hexachlorobutadiene	87-68-3	Low	1.9	6100	1.9	330	83
Caprolactam	105-60-2	Low	5700	3100000	2850	432	144
4-Chloro-3-methylphenol	59-50-7	Low	200	39000	200	498	166
2-Methylnaphthalene	91-57-6	SIM	900	31000	450	20	2.2
Hexachlorocyclopentadiene	77-47-4	Low	180	37000	180	330	82
2,4,6-Trichlorophenol	88-06-2	Low	16	6100	16	465	155
2,4,5-Trichlorophenol	95-95-4	Low	9400	610000	4700	820	155
1,1'-Biphenyl	92-52-4	Low	23000	260000	11500	330	73
2-Chloronaphthalene	91-58-7	SIM	18000	210000	9000	20	3.6
2-Nitroaniline	88-74-4	Low	NC	NC	820	820	75
Dimethylphthalate	131-11-3	Low	NC	NC	330	330	78
2,6-Dinitrotoluene	606-20-2	Low	34	6100	34	330	79
Acenaphthylene	208-96-8	SIM	27000	340000	13500	20	1.2
3-Nitroaniline	99-09-2	Low	NC	NC	820	820	94

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

SAP Worksheet #15-2a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Acenaphthene	83-32-9	SIM	27000	340000	13500	20	1.5
2,4-Dinitrophenol	51-28-5	Low	68	12000	68	1131	377
4-Nitrophenol	100-02-7	Low	NC	NC	927	927	309
Dibenzofuran	132-64-9	Low	NC	7800	3900	330	79
2,4-Dinitrotoluene	121-14-2	Low	68	12000	68	330	85
Diethylphthalate	84-66-2	Low	13000	4900000	6500	330	80
Fluorene	86-73-7	SIM	33000	230000	16500	20	3.2
4-Chlorophenyl-phenyl ether	7005-72-3	Low	3400	31000	1700	330	78
4-Nitroaniline	100-01-6	Low	NC	NC	820	820	134
4,6-Dinitro-2-methylphenol	534-52-1	Low	NC	NC	1011	1011	337
N-Nitrosodiphenylamine	86-30-6	Low	170	99000	170	657	219
1,2,4,5-Tetrachlorobenzene	95-94-3	Low	28	1800	28	405	135
4-Bromophenyl-phenylether	101-55-3	Low	NC	NC	330	330	85
Hexachlorobenzene	118-74-1	SIM	7	300	7	100	1.8
Atrazine	1912-24-9	Low	2	2100	2	330	91
Pentachlorophenol	87-86-5	SIM	7	3000	7	100	13.7
Phenanthrene	85-01-8	SIM	450000	1700000	225000	20	1.8
Anthracene	120-12-7	SIM	450000	1700000	225000	20	1.2
Carbazole	86-74-8	SIM	77	24000	77	20	1.3
Di-n-butylphthalate	84-74-2	SIM	11000	610000	5500	100	16.8
Fluoranthene	206-44-0	SIM	210000	230000	105000	20	1.8
Pyrene	129-00-0	SIM	150000	170000	75000	20	2.1
Butylbenzylphthalate	85-68-7	Low	140000	1200000	70000	330	93
3,3'-dicholorobenzidine	91-94-1	Low	2.3	1100	2.3	342	114
Benzo(a)anthracene	56-55-3	SIM	14	150	14	20	1.9
Chrysene	218-01-9	SIM	1400	15000	700	20	1.7
Bis(2-ethylhexyl) phthalate	117-81-7	SIM	2000	35000	1000	100	32
Di-n-octylphthalate	117-84-0	Low	NC	NC	633	633	211
Benzo(b) fluoranthene	205-99-2	SIM	47	150	23.5	20	2.4
Benzo(k) fluoranthene	207-08-9	SIM	460	1500	230	20	3.1
Benzo(a) pyrene	50-32-8	SIM	310	15	7.5	20	3.3
Indeno(1,2,3,-cd) pyrene	193-39-5	SIM	160	150	75	20	1.9
Dibenzo(a,h) anthracene	53-70-3	SIM	15	15	15	20	1.8

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

SAP Worksheet #15-2a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Benzo(g,h,i) perylene	191-24-2	SIM	150000	170000	75000	20	2
2,3,4,6-Tetrachlorophenol	58-90-2	Low	4600	180000	2300	420	140
1,4-Dioxane	87-61-6	SIM	NC	NC	170	170	1.1

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 SVOCs in soil will be analyzed via the “Low” concentration range (SW-846 8270C). Select SVOCs in soil will be analyzed by “SIM” as noted above under the Concentration Range column.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-2b: Reference Limits and Evaluation Table

Matrix: Sediment

Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Benzaldehyde	100-52-7	Low	NC	1900000	950000	360	120
Phenol	108-95-2	Low	NC	18000000	9000000	468	156
Bis(2-chloroethyl) ether	111-44-4	Low	NC	1900	950	330	81
2-Chlorophenol	95-57-8	Low	NC	390000	195000	492	164
2-Methylphenol	95-48-7	Low	NC	3100000	1550000	600	200
2,2'-Oxybis(1-choloropropane)	108-60-1	Low	NC	35000	17500	330	89
Acetophenone	98-86-2	Low	NC	2300000	1150000	534	178
3- and 4-Methylphenol	m&pCRESOL	Low	NC	310000	155000	561	187
N-Nitroso-di-n propylamine	621-64-7	Low	NC	690	345	330	83
Hexachloroethane	67-72-1	SIM	NC	61000	30500	100	2
Nitrobenzene	98-95-3	Low	NC	31000	15500	330	91
Isophorone	78-59-1	Low	NC	5100000	2550000	330	75
2-Nitrophenol	88-75-5	Low	NC	390000	195000	501	167
2,4-Dimethylphenol	105-67-9	Low	NC	1200000	600000	495	165
Bis(2-chloroethoxy) methane	111-91-1	Low	NC	180000	90000	330	96
2,4-Dichlorophenol	120-83-2	Low	NC	180000	90000	450	150
Naphthalene	91-20-3	SIM	14.65	150000	14.65	20	2.6
4-Chloroaniline	106-47-8	Low	NC	240000	120000	357	119
Hexachlorobutadiene	87-68-3	Low	NC	61000	30500	330	83
Caprolactam	105-60-2	Low	NC	31000000	15500000	432	144
4-Chloro-3-methylphenol	59-50-7	Low	NC	390000	195000	498	166
2-Methylnaphthalene	91-57-6	SIM	NC	310000	155000	20	2.2
Hexachlorocyclopentadiene	77-47-4	Low	NC	370000	185000	330	82
2,4,6-Trichlorophenol	88-06-2	Low	NC	61000	30500	465	155
2,4,5-Trichlorophenol	95-95-4	Low	NC	6100000	3050000	820	155
1,1'-Biphenyl	92-52-4	Low	NC	260000	130000	330	73
2-Chloronaphthalene	91-58-7	SIM	NC	210000	105000	20	3.6
2-Nitroaniline	88-74-4	Low	NC	NC	820	820	75
Dimethylphthalate	131-11-3	Low	NC	NC	330	330	78
2,6-Dinitrotoluene	606-20-2	Low	NC	61000	30500	330	79

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

SAP Worksheet #15-2b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Acenaphthylene	208-96-8	SIM	NC	3400000	1700000	20	1.2
3-Nitroaniline	99-09-2	Low	NC	NC	820	820	94
Acenaphthene	83-32-9	SIM	NC	3400000	1700000	20	1.5
2,4-Dinitrophenol	51-28-5	Low	NC	120000	60000	1131	377
4-Nitrophenol	100-02-7	Low	NC	NC	927	927	309
Dibenzofuran	132-64-9	Low	NC	78000	39000	330	79
2,4-Dinitrotoluene	121-14-2	Low	NC	120000	60000	330	85
Diethylphthalate	84-66-2	Low	NC	49000000	24500000	330	80
Fluorene	86-73-7	SIM	10	2300000	10	20	3.2
4-Chlorophenyl-phenyl ether	7005-72-3	Low	NC	310000	155000	330	78
4-Nitroaniline	100-01-6	Low	NC	NC	820	820	134
4,6-Dinitro-2-methylphenol	534-52-1	Low	NC	NC	1011	1011	337
N-Nitrosodiphenylamine	86-30-6	Low	NC	990000	495000	657	219
1,2,4,5-Tetrachlorobenzene	95-94-3	Low	NC	18000	9000	405	135
4-Bromophenyl-phenylether	101-55-3	Low	NC	NC	330	330	85
Hexachlorobenzene	118-74-1	SIM	NC	3000	1500	100	1.8
Atrazine	1912-24-9	Low	NC	21000	10500	330	91
Pentachlorophenol	87-86-5	SIM	NC	30000	15000	100	13.7
Phenanthrene	85-01-8	SIM	41.9	17000000	20.95	20	1.8
Anthracene	120-12-7	SIM	10	17000000	10	20	1.2
Carbazole	86-74-8	SIM	NC	240000	120000	20	1.3
Di-n-butylphthalate	84-74-2	SIM	NC	6100000	3050000	100	16.8
Fluoranthene	206-44-0	SIM	111	2300000	55.5	20	1.8
Pyrene	129-00-0	SIM	53	1700000	26.5	20	2.1
Butylbenzylphthalate	85-68-7	Low	NC	12000000	6000000	330	93
3,3'-dicholorobenzidine	91-94-1	Low	NC	11000	5500	342	114
Benzo(a)anthracene	56-55-3	SIM	31.7	1500	15.85	20	1.9
Chrysene	218-01-9	SIM	57.1	150000	28.55	20	1.7
Bis(2-ethylhexyl) phthalate	117-81-7	SIM	NC	350000	175000	100	32
Di-n-octylphthalate	117-84-0	Low	NC	NC	633	633	211
Benzo(b) fluoranthene	205-99-2	SIM	NC	1500	750	20	2.4

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

SAP Worksheet #15-2b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: SVOC

Analyte[5]	CAS Number	Concentration Range[5]	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)
Benzo(k) fluoranthene	207-08-9	SIM	27.2	15000	27.2	20	3.1
Benzo(a) pyrene	50-32-8	SIM	31.9	150	31.9	20	3.3
Indeno(1,2,3,-cd) pyrene	193-39-5	SIM	17.32	1500	17.32	20	1.9
Dibenzo(a,h) anthracene	53-70-3	SIM	10	150	10	20	1.8
Benzo(g,h,i) perylene	191-24-2	SIM	NC	1700000	850000	20	2
2,3,4,6-Tetrachlorophenol	58-90-2	Low	NC	1800000	900000	420	140
1,4-Dioxane	87-61-6	SIM	NC	NC	170	170	1.1

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 SVOCs in sediment will be analyzed via the "Low" concentration range (SW-846 8270C). Select SVOCs in sediment will be analyzed by "SIM" as noted above under the Concentration Range column.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-3: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: PEST/PCB

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
						QLs (ug/kg)[5]	MDLs (ug/kg)
alpha-BHC	319-84-6	0.074	3	77	0.074	2.2	0.71
beta-BHC	319-85-7	0.26	9	270	0.26	2.3	0.76
delta-BHC	319-86-8	0.26	NC	270	0.26	3	0.97
gamma-BHC (Lindane)	58-89-9	1.4	0.05	520	0.05	2.2	0.73
Heptachlor	76-44-8	42	0.7	110	0.7	2.5	0.82
Aldrin	309-00-2	0.84	0.06	29	0.06	2.1	0.68
Heptachlor epoxide	1024-57-3	2.1	0.0002	53	0.0002	2.3	0.76
Endosulfan I	959-98-8	9700	0.01	37000	0.01	2.2	0.72
Dieldrin	60-57-1	0.09	0.5	30	0.09	3.3	0.69
4,4'-DDE	72-55-9	60	10	1400	5	3.3	0.7
Endrin	72-20-8	43	0.04	1800	0.04	3.3	0.77
Endosulfan II	33213-65-9	9700	0.01	37000	0.01	3.3	0.69
4,4'-DDD	72-54-8	86	10	2000	5	3.3	0.71
Endosulfan sulfate	1031-07-8	9700	NC	37000	4850	3.3	0.8
4,4'-DDT	50-29-3	87	10	1700	5	3.3	0.82
Methoxychlor	72-43-5	3400	NC	31000	1700	17	0.9
Endrin ketone	53494-70-5	43	100	1800	21.5	3.3	0.77
Endrin aldehyde	7421-93-4	43	100	1800	21.5	3.3	0.91
alpha-Chlordane	5103-71-9	350	NC	1600	175	2.8	0.91
gamma-Chlordane	5103-74-2	350	NC	1600	175	2.5	0.82
Toxaphene	8001-35-2	600	NC	440	220	66	22
Aroclor-1016	12674-11-2	52	40000	390	52	17	5.2
Aroclor-1221	11104-28-2	0.14	40000	170	0.14	30	9.9
Aroclor-1232	11141-16-5	0.14	40000	170	0.14	20	6.6
Aroclor-1242	53469-21-9	3	40000	220	3	17	3.8
Aroclor-1248	12672-29-6	3	40000	220	3	29	9.5
Aroclor-1254	11097-69-1	5.1	40000	110	5.1	21	6.9
Aroclor-1260	11096-82-5	14	40000	220	14	17	3.3

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-3a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: PEST/PCB

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
					QLs (ug/kg)[5]	MDLs (ug/kg)
alpha-BHC	319-84-6	0.074	77	0.074	2.2	0.71
beta-BHC	319-85-7	0.26	270	0.26	2.3	0.76
delta-BHC	319-86-8	0.26	270	0.26	3	0.97
gamma-BHC (Lindane)	58-89-9	1.4	520	1.4	2.2	0.73
Heptachlor	76-44-8	42	110	21	2.5	0.82
Aldrin	309-00-2	0.84	29	0.84	2.1	0.68
Heptachlor epoxide	1024-57-3	2.1	53	2.1	2.3	0.76
Endosulfan I	959-98-8	9700	37000	4850	2.2	0.72
Dieldrin	60-57-1	0.09	30	0.09	3.3	0.69
4,4'-DDE	72-55-9	60	1400	30	3.3	0.7
Endrin	72-20-8	43	1800	21.5	3.3	0.77
Endosulfan II	33213-65-9	9700	37000	4850	3.3	0.69
4,4'-DDD	72-54-8	86	2000	43	3.3	0.71
Endosulfan sulfate	1031-07-8	9700	37000	4850	3.3	0.8
4,4'-DDT	50-29-3	87	1700	43.5	3.3	0.82
Methoxychlor	72-43-5	3400	31000	1700	17	0.9
Endrin ketone	53494-70-5	43	1800	21.5	3.3	0.77
Endrin aldehyde	7421-93-4	43	1800	21.5	3.3	0.91
alpha-Chlordane	5103-71-9	350	1600	175	2.8	0.91
gamma-Chlordane	5103-74-2	350	1600	175	2.5	0.82
Toxaphene	8001-35-2	600	440	220	66	22
Aroclor-1016	12674-11-2	52	390	52	17	5.2
Aroclor-1221	11104-28-2	0.14	170	0.14	30	9.9
Aroclor-1232	11141-16-5	0.14	170	0.14	20	6.6
Aroclor-1242	53469-21-9	3	220	3	17	3.8
Aroclor-1248	12672-29-6	3	220	3	29	9.5
Aroclor-1254	11097-69-1	5.1	110	5.1	21	6.9
Aroclor-1260	11096-82-5	14	220	14	17	3.3

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-3b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: PEST/PCB

Analyte	CAS Number	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
					QLs (ug/kg)[5]	MDLs (ug/kg)
alpha-BHC	319-84-6	NC	770	385	2.2	0.71
beta-BHC	319-85-7	NC	2700	1350	2.3	0.76
delta-BHC	319-86-8	NC	2700	1350	3	0.97
gamma-BHC (Lindane)	58-89-9	0.94	5200	0.94	2.2	0.73
Heptachlor	76-44-8	NC	1100	550	2.5	0.82
Aldrin	309-00-2	NC	290	145	2.1	0.68
Heptachlor epoxide	1024-57-3	0.6	530	0.6	2.3	0.76
Endosulfan I	959-98-8	NC	370000	185000	2.2	0.72
Dieldrin	60-57-1	2.85	300	2.85	3.3	0.69
4,4'-DDE	72-55-9	1.42	14000	1.42	3.3	0.7
Endrin	72-20-8	2.67	18000	2.67	3.3	0.77
Endosulfan II	33213-65-9	NC	370000	185000	3.3	0.69
4,4'-DDD	72-54-8	3.54	20000	3.54	3.3	0.71
Endosulfan sulfate	1031-07-8	NC	370000	185000	3.3	0.8
4,4'-DDT	50-29-3	NC	17000	8500	3.3	0.82
Methoxychlor	72-43-5	NC	310000	155000	17	0.9
Endrin ketone	53494-70-5	NC	18000	9000	3.3	0.77
Endrin aldehyde	7421-93-4	NC	18000	9000	3.3	0.91
alpha-Chlordane	5103-71-9	4.5	16000	2.25	2.8	0.91
gamma-Chlordane	5103-74-2	4.5	16000	2.25	2.5	0.82
Toxaphene	8001-35-2	NC	4400	2200	66	22
Aroclor-1016	12674-11-2	34.1	3900	17	17	5.2
Aroclor-1221	11104-28-2	34.1	1700	34.1	30	9.9
Aroclor-1232	11141-16-5	34.1	1700	17	20	6.6
Aroclor-1242	53469-21-9	34.1	2200	17	17	3.8
Aroclor-1248	12672-29-6	34.1	2200	34.1	29	9.5
Aroclor-1254	11097-69-1	34.1	1100	34.1	21	6.9
Aroclor-1260	11096-82-5	34.1	2200	17	17	3.3

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-4: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: EXPLO

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[5]	Laboratory-specific[2,3]	
						QLs (ug/kg)[6]	MDLs (ug/kg)[4]
Perchlorate	14797-73-0	NC	NC	5500	2750	2.0	0.31
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	7100	NC	310000	155000	100	4.2
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	0.36	NC	4400	0.36	100	20
1,3,5-Trinitrobenzene	99-35-4	2600	NC	180000	90000	100	6.6
1,3-Dinitrobenzene	99-65-0	2.3	NC	610	2.3	100	13
Methyl-2,4,6-trinitrophenylnitramine	479-45-8	650	NC	24000	12000	100	6.1
Nitrobenzene	98-95-3	2	40000	3100	2	100	15
2,4,6-Trinitrotoluene	118-96-7	8.7	NC	3100	8.7	100	11
2-Amino-4,6-dinitrotoluene	35572-78-2	29	NC	12000	29	100	22
4-Amino-2,6-dinitrotoluene	1946-51-0	29	NC	12000	29	100	16
2,4-Dinitrotoluene	121-14-2	68	NC	12000	68	100	14
2,6-Dinitrotoluene	606-20-2	34	NC	6100	34	100	15
2-Nitrotoluene	88-72-2	300	NC	78000	39000	100	22
3-Nitrotoluene	99-08-1	NC	NC	NC	105	105	35
4-Nitrotoluene	99-99-0	3.4	NC	24000	3.4	120	40

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 The Perchlorate MDL (Test America - Burlington) is for the 2007-2008 timeframe and the MDL study will likely be performed again before the sampling event.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-4a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: EXPLO

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[5]	Laboratory-specific[2,3]	
					QLs (ug/kg)[6]	MDLs (ug/kg)[4]
Perchlorate	14797-73-0	NC	5500	2750	2.0	0.31
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	7100	310000	3550	100	4.2
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	0.36	4400	0.36	100	20
1,3,5-Trinitrobenzene	99-35-4	2600	180000	1300	100	6.6
1,3-Dinitrobenzene	99-65-0	2.3	610	2.3	100	13
Methyl-2,4,6-trinitrophenylnitramine	479-45-8	650	24000	325	100	6.1
Nitrobenzene	98-95-3	2	3100	2	100	15
2,4,6-Trinitrotoluene	118-96-7	8.7	3100	8.7	100	11
2-Amino-4,6-dinitrotoluene	35572-78-2	29	12000	29	100	22
4-Amino-2,6-dinitrotoluene	1946-51-0	29	12000	29	100	16
2,4-Dinitrotoluene	121-14-2	68	12000	68	100	14
2,6-Dinitrotoluene	606-20-2	34	6100	34	100	15
2-Nitrotoluene	88-72-2	300	78000	150	100	22
3-Nitrotoluene	99-08-1	NC	NC	105	105	35
4-Nitrotoluene	99-99-0	3.4	24000	3.4	120	40

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 The Perchlorate MDL (Test America - Burlington) is for the 2007-2008 timeframe and the MDL study will likely be performed again before the sampling event.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-4b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: EXPLO

Analyte	CAS Number	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[5]	Laboratory-specific[2,3]	
					QLs (ug/kg)[6]	MDLs (ug/kg)[4]
Perchlorate	14797-73-0	NC	55000	27500	2.0	0.31
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	NC	3100000	1550000	100	4.2
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	NC	44000	22000	100	20
1,3,5-Trinitrobenzene	99-35-4	NC	1800000	900000	100	6.6
1,3-Dinitrobenzene	99-65-0	NC	6100	3050	100	13
Methyl-2,4,6-trinitrophenylnitramine	479-45-8	NC	240000	120000	100	6.1
Nitrobenzene	98-95-3	NC	31000	15500	100	15
2,4,6-Trinitrotoluene	118-96-7	NC	31000	15500	100	11
2-Amino-4,6-dinitrotoluene	35572-78-2	NC	120000	60000	100	22
4-Amino-2,6-dinitrotoluene	1946-51-0	NC	120000	60000	100	16
2,4-Dinitrotoluene	121-14-2	NC	120000	60000	100	14
2,6-Dinitrotoluene	606-20-2	NC	61000	30500	100	15
2-Nitrotoluene	88-72-2	NC	780000	390000	100	22
3-Nitrotoluene	99-08-1	NC	NC	105	105	35
4-Nitrotoluene	99-99-0	NC	240000	120000	120	40

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 The Perchlorate MDL (Test America - Burlington) is for the 2007-2008 timeframe and the MDL study will likely be performed again before the sampling event.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

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

Matrix: Surface Soil and Subsurface Soil

Analytical Group: TPH

Analyte	CAS Number	PREQB Land Pollution Control Corrective Action Level (ug/kg)	Project Quantitation Limit Goal (ug/kg)[3]	Laboratory-specific[1,2]	
				QLs (ug/kg)	MDLs (ug/kg)
TPH-gas range	TPH-GRO	100000	50000	2500	2000
TPH-diesel range	TPH-DRO	100000	50000	5000	950

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

[1] Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

[2] If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

[3] Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

SAP Worksheet #15-6 — Reference Limits and Evaluation Table

SAP Worksheet #15-6: Reference Limits and Evaluation Table
Matrix: Surface Soil
Analytical Group: METAL

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	Vieques Eco SO[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]		Vieques (East) Background Zone KTd SS (ug/kg)[5]	Vieques (East) Background Zone Kv SS (ug/kg)[5]	Vieques (East) Background Zone Qa SS (ug/kg)[5]	Vieques (East) Background Zone TI SS (ug/kg)[5]
						QLs (ug/kg)[7]	MDLs (ug/kg)				
Aluminum	7429-90-5	NC	NC	7700000	3850000	30000	462	35000000	35000000	35000000	35000000
Antimony	7440-36-0	NC	78000	3100	1550	100	27	ND	ND	ND	ND
Arsenic	7440-38-2	NC	18000	390	390	507	169	1600	1600	1600	9170
Barium	7440-39-3	NC	330000	1500000	165000	100	30	147000	212000	212000	212000
Beryllium	7440-41-7	NC	40000	16000	8000	100	9.4	270	270	270	950
Cadmium	7440-43-9	NC	32000	7000	3500	100	6.4	2240	2240	2240	2360
Calcium[6]	7440-70-2	NC	NC	NC	10000	10000	2200	8840000	8840000	11900000	417000000
Chromium	7440-47-3	NC	400	23000	400	300	100	72000	72000	72000	70100
Cobalt	7440-48-4	NC	13000	150000	6500	100	3.8	15800	25500	15800	15800
Copper	7440-50-8	NC	70000	310000	35000	1620	540	65500	94200	52800	94200
Iron	7439-89-6	NC	NC	5500000	2750000	10000	1600	38100000	43200000	38100000	38100000
Lead	7439-92-1	NC	120000	400000	60000	100	22	5400	5400	5400	16000
Magnesium[6]	7439-95-4	NC	NC	NC	10000	10000	623	3710000	22200000	22200000	22200000
Manganese	7439-96-5	NC	220000	180000	90000	108	36	1630000	1630000	1630000	1630000
Mercury	7439-97-6	100	100	2300	100	40	2.4	57	57	57	310
Nickel	7440-02-0	NC	38000	160000	19000	100	24	22200	41000	22200	41000
Potassium[6]	7440-09-7	NC	NC	NC	100000	100000	2300	5270000	5270000	5270000	10800000
Selenium	7782-49-2	NC	520	39000	520	500	64	510	510	510	1300
Silver	7440-22-4	NC	560000	39000	19500	100	15	220	220	220	220
Sodium[6]	7440-23-5	NC	NC	NC	100000	100000	806	2250000	2250000	2250000	2250000
Thallium	7440-28-0	NC	1000	510	255	200	13	130	130	130	130
Vanadium	7440-62-2	NC	2000	55000	1000	500	86	144000	144000	144000	55700
Zinc	7440-66-6	NC	120000	2300000	60000	1000	223	32000	32000	32000	32000
Cyanide	57-12-5	NC	1000	160000	1000	660	220	890	890	890	1000

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Metals background concentrations have been added as a convenience for information purposes. (CH2M HILL. 2007a. *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.) The zones are identified in Figure 52.

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

Page Intentionally Left Blank

SAP Worksheet #15-6a — Reference Limits and Evaluation Table

SAP Worksheet #15-6a: Reference Limits and Evaluation Table
Matrix: Subsurface Soil
Analytical Group: METAL

Analyte	CAS Number	RSLs - Regional SSLs[1] (ug/kg)	RSLs - Residential Soil Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]		Vieques (East) Background Zone KTd SB (ug/kg)[5]	Vieques (East) Background Zone Kv SB (ug/kg)[5]	Vieques (East) Background Zone Qa SB (ug/kg)[5]	Vieques (East) Background Zone Tl SB (ug/kg)[5]
					QLs (ug/kg)[7]	MDLs (ug/kg)				
Aluminum	7429-90-5	NC	7700000	3850000	30000	462	35000000	35000000	35000000	35000000
Antimony	7440-36-0	NC	3100	1550	100	27	ND	ND	ND	ND
Arsenic	7440-38-2	NC	390	390	507	169	1600	1600	1600	9170
Barium	7440-39-3	NC	1500000	750000	100	30	147000	212000	212000	212000
Beryllium	7440-41-7	NC	16000	8000	100	9.4	270	270	270	950
Cadmium	7440-43-9	NC	7000	3500	100	6.4	2240	2240	2240	2360
Calcium[6]	7440-70-2	NC	NC	10000	10000	2200	8840000	8840000	11900000	417000000
Chromium	7440-47-3	NC	23000	11500	300	100	72000	72000	72000	70100
Cobalt	7440-48-4	NC	150000	75000	100	3.8	15800	25500	15800	15800
Copper	7440-50-8	NC	310000	155000	1620	540	65500	94200	52800	94200
Iron	7439-89-6	NC	5500000	2750000	10000	1600	38100000	43200000	38100000	38100000
Lead	7439-92-1	NC	400000	200000	100	22	3340	3340	3340	7700
Magnesium[6]	7439-95-4	NC	NC	10000	10000	623	3710000	22200000	22200000	22200000
Manganese	7439-96-5	NC	180000	90000	108	36	1630000	1630000	1630000	1630000
Mercury	7439-97-6	100	2300	100	40	2.4	57	57	57	310
Nickel	7440-02-0	NC	160000	80000	100	24	22200	41000	22200	41000
Potassium[6]	7440-09-7	NC	NC	100000	100000	2300	2000000	2000000	2000000	10800000
Selenium	7782-49-2	NC	39000	19500	500	64	510	510	510	1300
Silver	7440-22-4	NC	39000	19500	100	15	220	220	220	220
Sodium[6]	7440-23-5	NC	NC	100000	100000	806	2250000	2250000	2250000	2250000
Thallium	7440-28-0	NC	510	255	200	13	130	130	130	130
Vanadium	7440-62-2	NC	55000	27500	500	86	144000	144000	144000	55700
Zinc	7440-66-6	NC	2300000	1150000	1000	223	32000	32000	32000	32000
Cyanide	57-12-5	NC	160000	80000	660	220	890	890	890	1000

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Soil Screening Levels (SSLs) are risk-based when MCL-based SSLs do not exist. Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Metals background concentrations have been added as a convenience for information purposes. (CH2M HILL. 2007a. *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.) The zones are identified in Figure 52.

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

Page Intentionally Left Blank

SAP Worksheet #15-6b — Reference Limits and Evaluation Table

SAP Worksheet #15-6b: Reference Limits and Evaluation Table
Matrix: Sediment
Analytical Group: METAL

Analyte	CAS Number	Vieques Eco Freshwater SD[1] (ug/kg)	RSLs - Res Soil X 10 for SD Adjusted[1] (ug/kg)	Project Quantitation Limit Goal (ug/kg)[4]	Laboratory-specific[2,3]	
					QLs (ug/kg)[6]	MDLs (ug/kg)
Aluminum	7429-90-5	25500000	77000000	12750000	30000	462
Antimony	7440-36-0	NC	31000	15500	100	27
Arsenic	7440-38-2	5900	3900	1950	507	169
Barium	7440-39-3	NC	15000000	7500000	100	30
Beryllium	7440-41-7	NC	160000	80000	100	9.4
Cadmium	7440-43-9	596	70000	596	100	6.4
Calcium[5]	7440-70-2	NC	NC	10000	10000	2200
Chromium	7440-47-3	37300	230000	115000	300	100
Cobalt	7440-48-4	NC	1500000	750000	100	3.8
Copper	7440-50-8	35700	3100000	17850	1620	540
Iron	7439-89-6	188400000	55000000	27500000	10000	1600
Lead	7439-92-1	35000	400000	17500	100	22
Magnesium[5]	7439-95-4	NC	NC	10000	10000	623
Manganese	7439-96-5	630000	1800000	315000	108	36
Mercury	7439-97-6	174	23000	174	40	2.4
Nickel	7440-02-0	18000	1600000	9000	100	24
Potassium[5]	7440-09-7	NC	NC	100000	100000	2300
Selenium	7782-49-2	NC	390000	195000	500	64
Silver	7440-22-4	NC	390000	195000	100	15
Sodium[5]	7440-23-5	NC	NC	100000	100000	806
Thallium	7440-28-0	NC	5100	2550	200	13
Vanadium	7440-62-2	NC	550000	275000	500	86
Zinc	7440-66-6	123100	23000000	61550	1000	223
Cyanide	57-12-5	NC	1600000	800000	660	220

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-7 — Reference Limits and Evaluation Table

SAP Worksheet #15-7: Reference Limits and Evaluation Table
Matrix: Surface Soil, Subsurface Soil, and Sediment
Analytical Group: GRAINSIZE

Analyte	CAS Number	Project Quantitation Limit Goal (%)[4]	Laboratory-specific[1,2]	
			QLs (%)	MDLs (%)[3]
GS03 Sieve 3" (75 mm)	SIEVE75.0	0.0	0.0	N/A
GS05 Sieve 2" (50 mm)	SIEVE50.0	0.0	0.0	N/A
GS06 Sieve 1.5" (37.5 mm)	SIEVE37.5	0.0	0.0	N/A
GS07 Sieve 1" (25.0 mm)	SIEVE25.0	0.0	0.0	N/A
GS08 Sieve 0.75" (19.0 mm)	SIEVE19.0	0.0	0.0	N/A
GS10 Sieve 0.375" (9.5 mm)	SIEVE9.5	0.0	0.0	N/A
Sieve No. 004 (4.75 mm)	SIEVE4.75	0.0	0.0	N/A
Sieve No. 010 (2.00 mm)	SIEVE2.0	0.0	0.0	N/A
Sieve No. 020 (850 um)	SIEVE850	0.0	0.0	N/A
Sieve No. 040 (425 um)	SIEVE425	0.0	0.0	N/A
Sieve No. 060 (250 um)	SIEVE250	0.0	0.0	N/A
Sieve No. 080 (180 um)	SIEVE180	0.0	0.0	N/A
Sieve No. 100 (150 um)	SIEVE150	0.0	0.0	N/A
Sieve No. 200 (75um)	SIEVE75	0.0	0.0	N/A
Gravel (%)	GRAVEL	0.0	0.0	N/A
Sand (%)	14808-60-7	0.0	0.0	N/A
Coarse Sand (%)	COARSESAND	0.0	0.0	N/A
Medium Sand (%)	MEDIUMSAND	0.0	0.0	N/A
Fine Sand (%)	FINESAND	0.0	0.0	N/A
Fines (%)	FINESAND	0.0	0.0	N/A

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

2 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

3 MDLs are not applicable to GRAINSIZE.

4 There are no applicable criteria for GRAINSIZE.

SAP Worksheet #15-8 — Reference Limits and Evaluation Table

SAP Worksheet #15-8: Reference Limits and Evaluation Table

Matrix: Surface Soil, Subsurface Soil, and Sediment

Analytical Group: WCHEM

Analyte	CAS Number	Project Quantitation Limit Goal (ug/kg)[3]	Laboratory-specific[1,2]	
			QLs (ug/kg)	MDLs (ug/kg)[5]
pH	PH	0<pH<14	0<pH<14	N/A
Total organic carbon (TOC)	TOC	400000	400000	45500
Dry Bulk Density	TBD	0.00%	0.00%	N/A

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

[1] Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

[2] If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

[3] Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

SAP Worksheet #15-9 — Reference Limits and Evaluation Table

SAP Worksheet #15-9: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: VOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Dichlorodifluoromethane	75-71-8	Low	39	NC	19.5	2	0.35
Chloromethane	74-87-3	Low	1.8	NC	1.8	2	0.26
Vinyl chloride	75-01-4	SIM	0.016	2	0.016	0.15	0.0093
Bromomethane	74-83-9	Low	0.87	NC	0.87	2	0.33
Chloroethane	75-00-3	Low	2100	NC	1050	2	0.34
Trichlorofluoromethane	75-69-4	Low	130	NC	65	2	0.51
1,1-Dichloroethene	75-35-4	SIM	34	7	3.5	TBD	0.0092
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Low	5900	NC	2950	2.2	0.73
Acetone	67-64-1	Low	2200	NC	1100	6.3	2.1
Carbon disulfide	75-15-0	Low	100	NC	50	1	0.25
Methyl acetate	79-20-9	Low	3700	NC	1850	2.4	0.79
Methylene chloride	75-09-2	Low	4.8	5	4.8	5	0.3
trans-1,2-Dichloroethene	156-60-5	Low	11	100	5.5	1.1	0.35
Methyl tert-butyl ether	1634-04-4	Low	12	NC	6	1.5	0.5
1,1-Dichloroethane	75-34-3	Low	2.4	NC	1.2	1	0.22
cis-1,2-Dichloroethene	156-59-2	Low	37	70	18.5	1	0.24
2-Butanone	78-93-3	Low	710	NC	355	5	1.33
Bromochloromethane	74-97-5	Low	NC	NC	1	1	0.23
Chloroform	67-66-3	Low	0.19	80	0.19	1	0.22
1,1,1-Trichloroethane	71-55-6	Low	910	200	100	1	0.31
Cyclohexane	110-82-7	Low	1300	NC	650	1.2	0.39
Carbon tetrachloride	56-23-5	SIM	0.2	5	0.2	TBD	0.006
Benzene	71-43-2	SIM	0.41	5	0.41	0.05	0.0072
1,2-Dichloroethane	107-06-2	SIM	0.15	5	0.15	TBD	0.0084
Trichloroethene	79-01-6	Low	1.7	5	0.85	1.2	0.37
Methylcyclohexane	108-87-2	Low	630	NC	315	1.2	0.37
1,2-Dichloropropane	78-87-5	Low	0.39	5	0.39	1	0.3
Bromodichloromethane	75-27-4	Low	1.1	80	1.1	1	0.27
cis-1,3-Dichloropropene	10061-01-5	Low	0.43	NC	0.43	1	0.31
4-Methyl-2-pentanone	108-10-1	Low	200	NC	100	5	1.9
Toluene	108-88-3	Low	230	1000	115	1	0.35
trans-1,3-Dichloropropene	10061-02-6	Low	0.43	NC	0.43	1	0.25
1,1,2-Trichloroethane[7]	79-00-5	Low	0.24	5	0.24	1	0.28
Tetrachloroethene	127-18-4	SIM	0.11	5	0.11	0.05	0.01
2-Hexanone	591-78-6	Low	200	NC	100	5.1	1.7
Dibromochloromethane	124-48-1	Low	0.8	80	0.8	1	0.26

SAP Worksheet #15-9 — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-9: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: VOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
1,2-Dibromoethane	106-93-4	Low	0.0065	0.05	0.0065	1	0.28
Chlorobenzene	108-90-7	Low	9.1	100	4.55	1	0.25
Ethylbenzene	100-41-4	Low	1.5	700	1.5	1	0.3
o-Xylene	95-47-6	Low	140	NC	70	1	0.26
m,p-Xylene	m&pXYLENE	Low	NC	NC	2.1	2.1	0.69
Styrene	100-42-5	Low	160	100	50	1	0.27
Bromoform	75-25-2	Low	8.5	80	4.25	1.2	0.37
Isopropylbenzene	98-82-8	Low	68	NC	34	1.1	0.36
1,1,2,2-Tetrachloroethane	79-34-5	SIM	0.067	NC	0.067	0.05	0.021
1,3-Dichlorobenzene	541-73-1	Low	NC	NC	1.1	1.1	0.34
1,4-Dichlorobenzene	106-46-7	SIM	0.43	75	0.43	0.05	0.0060
1,2-Dichlorobenzene	95-50-1	Low	37	600	18.5	1	0.29
1,2-Dibromo-3-chloropropane	96-12-8	Low	0.00032	0.2	0.00032	2	0.64
1,2,4-Trichlorobenzene	120-82-1	Low	19	70	9.5	1.1	0.34
1,2,3-Trichlorobenzene	87-61-6	Low	NC	NC	1	1	0.31

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 VOCs in water will be analyzed by "Low" (SW-846 8260B) and "SIM" (SW-846 8260B-SIM).

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

7 Katahdin may be able to analyze 1,1,2-Trichloroethane via “SIM”, however they have not yet established a QL/MDL.

SAP Worksheet #15-9a — Reference Limits and Evaluation Table

SAP Worksheet #15-9a: Reference Limits and Evaluation Table
Matrix: Surface Water
Analytical Group: VOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Dichlorodifluoromethane	75-71-8	Low	390	NC	195	2	0.35
Chloromethane	74-87-3	Low	18	NC	9	2	0.26
Vinyl chloride	75-01-4	SIM	0.16	2	0.16	0.15	0.0093
Bromomethane	74-83-9	Low	8.7	NC	4.35	2	0.33
Chloroethane	75-00-3	Low	21000	NC	10500	2	0.34
Trichlorofluoromethane	75-69-4	Low	1300	NC	650	2	0.51
1,1-Dichloroethene	75-35-4	SIM	340	0.57	0.57	TBD	0.01
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Low	59000	NC	29500	2.2	0.73
Acetone	67-64-1	Low	22000	NC	11000	6.3	2.1
Carbon disulfide	75-15-0	Low	1000	NC	500	1	0.25
Methyl acetate	79-20-9	Low	37000	NC	18500	2.4	0.79
Methylene chloride	75-09-2	Low	48	470	24	5	0.3
trans-1,2-Dichloroethene	156-60-5	Low	110	700	55	1.1	0.35
Methyl tert-butyl ether	1634-04-4	Low	120	NC	60	1.5	0.5
1,1-Dichloroethane	75-34-3	Low	24	NC	12	1	0.22
cis-1,2-Dichloroethene	156-59-2	Low	370	NC	185	1	0.24
2-Butanone	78-93-3	Low	7100	NC	3550	5	1.33
Bromochloromethane	74-97-5	Low	NC	NC	1	1	0.23
Chloroform	67-66-3	Low	1.9	57	0.95	1	0.22
1,1,1-Trichloroethane	71-55-6	Low	9100	200	100	1	0.31
Cyclohexane	110-82-7	Low	13000	NC	6500	1.2	0.39
Carbon tetrachloride	56-23-5	SIM	2	2.5	1	TBD	0.006
Benzene	71-43-2	SIM	4.1	12	2.05	0.05	0.0072
1,2-Dichloroethane	107-06-2	SIM	1.5	3.8	0.75	TBD	0.0084
Trichloroethene	79-01-6	Low	17	27	8.5	1.2	0.37
Methylcyclohexane	108-87-2	Low	6300	NC	3150	1.2	0.37
1,2-Dichloropropane	78-87-5	Low	3.9	5.2	1.95	1	0.3
Bromodichloromethane	75-27-4	Low	11	NC	5.5	1	0.27
cis-1,3-Dichloropropene	10061-01-5	Low	4.3	NC	2.15	1	0.31
4-Methyl-2-pentanone	108-10-1	Low	2000	NC	1000	5	1.9
Toluene	108-88-3	Low	2300	6800	1150	1	0.35
trans-1,3-Dichloropropene	10061-02-6	Low	4.3	NC	2.15	1	0.25
1,1,2-Trichloroethane[7]	79-00-5	Low	2.4	6	1.2	1	0.28
Tetrachloroethene	127-18-4	SIM	1.1	8	0.55	TBD	0.01
2-Hexanone	591-78-6	Low	2000	NC	1000	5.1	1.7

SAP Worksheet #15-9a — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-9a: Reference Limits and Evaluation Table
Matrix: Surface Water
Analytical Group: VOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Dibromochloromethane	124-48-1	Low	8	5.6	2.8	1	0.26
1,2-Dibromoethane	106-93-4	Low	0.065	NC	0.065	1	0.28
Chlorobenzene	108-90-7	Low	91	680	45.5	1	0.25
Ethylbenzene	100-41-4	Low	15	3100	7.5	1	0.3
o-Xylene	95-47-6	Low	1400	NC	700	1	0.26
m,p-Xylene	m&pXYLENE	Low	NC	NC	2.1	2.1	0.69
Styrene	100-42-5	Low	1600	NC	800	1	0.27
Bromoform	75-25-2	Low	85	43	21.5	1.2	0.37
Isopropylbenzene	98-82-8	Low	680	NC	340	1.1	0.36
1,1,2,2-Tetrachloroethane	79-34-5	SIM	0.67	1.7	0.67	0.05	0.021
1,3-Dichlorobenzene	541-73-1	Low	NC	400	200	1.1	0.34
1,4-Dichlorobenzene	106-46-7	SIM	4.3	400	2.15	0.05	0.0060
1,2-Dichlorobenzene	95-50-1	Low	370	2700	185	1	0.29
1,2-Dibromo-3-chloropropane	96-12-8	Low	0.0032	NC	0.0032	2	0.64
1,2,4-Trichlorobenzene	120-82-1	Low	190	260	95	1.1	0.34
1,2,3-Trichlorobenzene	87-61-6	Low	NC	NC	1	1	0.31

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 VOCs in water will be analyzed by "Low" (SW-846 8260B) and "SIM" (SW-846 8260B-SIM).

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

7 Katahdin may be able to analyze 1,1,2-Trichloroethane via "SIM", however they have not yet established a QL/MDL.

SAP Worksheet #15-10 — Reference Limits and Evaluation Table

SAP Worksheet #15-10: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Benzaldehyde	100-52-7	Low	370	NC	185	10	2.92
Phenol	108-95-2	Low	1100	NC	550	10	1.92
Bis(2-chloroethyl) ether	111-44-4	Low	0.012	NC	0.012	10	1.92
2-Chlorophenol	95-57-8	Low	18	NC	18	11	3.44
2-Methylphenol	95-48-7	Low	180	NC	90	13	4.04
2,2'-Oxybis(1-choloropropane)	108-60-1	Low	0.32	NC	0.32	10	1.78
Acetophenone	98-86-2	Low	370	NC	185	12	3.82
3- and 4-Methylphenol	m&pCRESOL	Low	18	NC	18	10	2.68
N-Nitroso-di-n propylamine	621-64-7	Low	0.0096	NC	0.0096	10	2.09
Hexachloroethane	67-72-1	SIM	3.7	NC	1.85	0.22	0.073
Nitrobenzene	98-95-3	Low	0.34	NC	0.34	10	2.15
Isophorone	78-59-1	Low	71	NC	35.5	10	1.87
2-Nitrophenol	88-75-5	Low	18	NC	18	11	3.62
2,4-Dimethylphenol	105-67-9	Low	73	NC	36.5	12	3.74
Bis(2-chloroethoxy) methane	111-91-1	Low	11	NC	11	10	2.45
2,4-Dichlorophenol	120-83-2	Low	11	NC	11	13	4.01
Naphthalene	91-20-3	SIM	0.62	NC	0.31	0.2	0.064
4-Chloroaniline	106-47-8	Low	15	NC	15	10	1.67
Hexachlorobutadiene	87-68-3	Low	0.86	NC	0.86	10	2.34
Caprolactam	105-60-2	Low	1800	NC	900	10	0.4
4-Chloro-3-methylphenol	59-50-7	Low	18	NC	18	10	2.57
2-Methylnaphthalene	91-57-6	SIM	15	NC	7.5	0.2	0.077
Hexachlorocyclopentadiene	77-47-4	Low	22	50	11	10	1.24
2,4,6-Trichlorophenol	88-06-2	Low	3.7	NC	3.7	10	3.26
2,4,5-Trichlorophenol	95-95-4	Low	370	NC	185	25	4.22
1,1'-Biphenyl	92-52-4	Low	180	NC	90	10	1.75
2-Chloronaphthalene	91-58-7	SIM	290	NC	145	0.2	0.072
2-Nitroaniline	88-74-4	Low	NC	NC	25	25	1.53
Dimethylphthalate	131-11-3	Low	NC	NC	10	10	0.79
2,6-Dinitrotoluene	606-20-2	Low	3.7	NC	3.7	10	1.06
Acenaphthylene	208-96-8	SIM	220	NC	110	0.2	0.054
3-Nitroaniline	99-09-2	Low	NC	NC	25	25	1.39
Acenaphthene	83-32-9	SIM	220	NC	110	0.2	0.064
2,4-Dinitrophenol	51-28-5	Low	7.3	NC	7.3	45	15

SAP Worksheet #15-10 — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-10: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
4-Nitrophenol	100-02-7	Low	NC	NC	25	25	5.7
Dibenzofuran	132-64-9	Low	3.7	NC	3.7	10	1.47
2,4-Dinitrotoluene	121-14-2	Low	7.3	NC	7.3	10	1.41
Diethylphthalate	84-66-2	Low	2900	NC	1450	10	1.1
Fluorene	86-73-7	SIM	150	NC	75	0.2	0.061
4-Chlorophenyl-phenyl ether	7005-72-3	Low	18	NC	18	10	1.39
4-Nitroaniline	100-01-6	Low	NC	NC	25	25	1.74
4,6-Dinitro-2-methylphenol	534-52-1	Low	NC	NC	25	25	5.9
N-Nitrosodiphenylamine	86-30-6	Low	14	NC	14	10	1.86
1,2,4,5-Tetrachlorobenzene	95-94-3	Low	1.1	NC	1.1	10	2
4-Bromophenyl-phenylether	101-55-3	Low	NC	NC	10	10	1.28
Hexachlorobenzene	118-74-1	SIM	0.042	1	0.042	0.2	0.055
Atrazine	1912-24-9	Low	0.29	3	0.29	10	1.65
Pentachlorophenol	87-86-5	SIM	0.56	1	0.56	1	0.333
Phenanthrene	85-01-8	SIM	1100	NC	550	0.2	0.051
Anthracene	120-12-7	SIM	1100	NC	550	0.2	0.044
Carbazole	86-74-8	SIM	3.4	NC	1.7	0.57	0.189
Di-n-butylphthalate	84-74-2	SIM	370	NC	185	2.5	0.832
Fluoranthene	206-44-0	SIM	150	NC	75	0.22	0.073
Pyrene	129-00-0	SIM	110	NC	55	0.2	0.059
Butylbenzylphthalate	85-68-7	Low	730	NC	365	10	1.5
3,3'-dicholorobenzidine	91-94-1	Low	0.15	NC	0.15	10	2.87
Benzo(a)anthracene	56-55-3	SIM	0.029	NC	0.029	0.2	0.046
Chrysene	218-01-9	SIM	2.9	NC	1.45	0.2	0.036
Bis(2-ethylhexyl) phthalate	117-81-7	SIM	4.8	6	2.4	2	0.498
Di-n-octylphthalate	117-84-0	Low	NC	NC	10	10	2.3
Benzo(b) fluoranthene	205-99-2	SIM	0.029	NC	0.029	0.27	0.089
Benzo(k) fluoranthene	207-08-9	SIM	0.29	NC	0.145	0.2	0.049
Benzo(a) pyrene	50-32-8	SIM	0.0029	0.2	0.0029	0.2	0.066
Indeno(1,2,3,-cd) pyrene	193-39-5	SIM	0.029	NC	0.029	0.2	0.052
Dibenzo(a,h) anthracene	53-70-3	SIM	0.0029	NC	0.0029	0.21	0.07

SAP Worksheet #15-10 — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-10: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Benzo(g,h,i) perylene	191-24-2	SIM	110	NC	55	0.2	0.065
2,3,4,6-Tetrachlorophenol	58-90-2	Low	110	NC	55	10	1.43
1,4-Dioxane	123-91-1	SIM	6.1	NC	3.05	1	0.029

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 SVOCs in groundwater analyzed by “low” and “SIM” as noted above under the Concentration Range column. Low refers to full scan.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-10a — Reference Limits and Evaluation Table

SAP Worksheet #15-10a: Reference Limits and Evaluation Table

Matrix: Surface Water

Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Benzaldehyde	100-52-7	Low	3700	NC	1850	10	2.92
Phenol	108-95-2	Low	11000	21000	5500	10	1.92
Bis(2-chloroethyl) ether	111-44-4	Low	0.12	0.31	0.12	10	1.92
2-Chlorophenol	95-57-8	Low	180	120	60	11	3.44
2-Methylphenol	95-48-7	Low	1800	NC	900	13	4.04
2,2'-Oxybis(1-choloropropane)	108-60-1	Low	3.2	NC	3.2	10	1.78
Acetophenone	98-86-2	Low	3700	NC	1850	12	3.82
3- and 4-Methylphenol	m&pCRESOL	Low	180	NC	90	10	2.68
N-Nitroso-di-n propylamine	621-64-7	Low	0.096	0.05	0.05	10	2.09
Hexachloroethane	67-72-1	SIM	37	19	9.5	0.22	0.073
Nitrobenzene	98-95-3	Low	3.4	17	3.4	10	2.15
Isophorone	78-59-1	Low	710	360	180	10	1.87
2-Nitrophenol	88-75-5	Low	180	NC	90	11	3.62
2,4-Dimethylphenol	105-67-9	Low	730	540	270	12	3.74
Bis(2-chloroethoxy) methane	111-91-1	Low	110	NC	55	10	2.45
2,4-Dichlorophenol	120-83-2	Low	110	93	46.5	13	4.01
Naphthalene	91-20-3	SIM	6.2	NC	3.1	0.2	0.064
4-Chloroaniline	106-47-8	Low	150	NC	75	10	1.67
Hexachlorobutadiene	87-68-3	Low	8.6	4.4	4.4	10	2.34
Caprolactam	105-60-2	Low	18000	NC	9000	10	0.4
4-Chloro-3-methylphenol	59-50-7	Low	180	NC	90	10	2.57
2-Methylnaphthalene	91-57-6	SIM	150	NC	75	0.2	0.077
Hexachlorocyclopentadiene	77-47-4	Low	220	240	110	10	1.24
2,4,6-Trichlorophenol	88-06-2	Low	37	21	10.5	10	3.26
2,4,5-Trichlorophenol	95-95-4	Low	3700	NC	1850	25	4.22
1,1'-Biphenyl	92-52-4	Low	1800	NC	900	10	1.75
2-Chloronaphthalene	91-58-7	SIM	2900	1700	850	0.2	0.072
2-Nitroaniline	88-74-4	Low	NC	NC	25	25	1.53
Dimethylphthalate	131-11-3	Low	NC	313000	156500	10	0.79
2,6-Dinitrotoluene	606-20-2	Low	37	NC	18.5	10	1.06
Acenaphthylene	208-96-8	SIM	2200	NC	1100	0.2	0.054
3-Nitroaniline	99-09-2	Low	NC	NC	25	25	1.39
Acenaphthene	83-32-9	SIM	2200	1200	600	0.2	0.064

SAP Worksheet #15-10a — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-10a: Reference Limits and Evaluation Table

Matrix: Surface Water

Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
2,4-Dinitrophenol	51-28-5	Low	73	70	35	45	15
4-Nitrophenol	100-02-7	Low	NC	NC	25	25	5.7
Dibenzofuran	132-64-9	Low	37	NC	18.5	10	1.47
2,4-Dinitrotoluene	121-14-2	Low	73	0.11	0.11	10	1.41
Diethylphthalate	84-66-2	Low	29000	23000	11500	10	1.1
Fluorene	86-73-7	SIM	1500	1300	650	0.2	0.061
4-Chlorophenyl-phenyl ether	7005-72-3	Low	180	NC	90	10	1.39
4-Nitroaniline	100-01-6	Low	NC	NC	25	25	1.74
4,6-Dinitro-2-methylphenol	534-52-1	Low	NC	NC	25	25	5.9
N-Nitrosodiphenylamine	86-30-6	Low	140	50	25	10	1.86
1,2,4,5-Tetrachlorobenzene	95-94-3	Low	11	NC	11	10	2
4-Bromophenyl-phenylether	101-55-3	Low	NC	NC	10	10	1.28
Hexachlorobenzene	118-74-1	SIM	0.42	0.0075	0.0075	0.2	0.055
Atrazine	1912-24-9	Low	2.9	NC	2.9	10	1.65
Pentachlorophenol	87-86-5	SIM	5.6	2.8	1.4	1	0.333
Phenanthrene	85-01-8	SIM	11000	NC	5500	0.2	0.051
Anthracene	120-12-7	SIM	11000	9600	4800	0.2	0.044
Carbazole	86-74-8	SIM	34	NC	17	0.57	0.189
Di-n-butylphthalate	84-74-2	SIM	3700	2700	1350	2.5	0.832
Fluoranthene	206-44-0	SIM	1500	300	150	0.22	0.073
Pyrene	129-00-0	SIM	1100	960	480	0.2	0.059
Butylbenzylphthalate	85-68-7	Low	7300	3000	1500	10	1.5
3,3'-dicholorobenzidine	91-94-1	Low	1.5	0.4	0.4	10	2.87
Benzo(a)anthracene	56-55-3	SIM	0.29	0.044	0.044	0.2	0.046
Chrysene	218-01-9	SIM	29	0.044	0.044	0.2	0.036
Bis(2-ethylhexyl) phthalate	117-81-7	SIM	48	18	9	2	0.498
Di-n-octylphthalate	117-84-0	Low	NC	NC	10	10	2.3
Benzo(b) fluoranthene	205-99-2	SIM	0.29	0.044	0.044	0.27	0.089
Benzo(k) fluoranthene	207-08-9	SIM	2.9	0.044	0.044	0.2	0.049
Benzo(a) pyrene	50-32-8	SIM	0.029	0.044	0.029	0.2	0.066
Indeno(1,2,3,-cd) pyrene	193-39-5	SIM	0.29	0.044	0.044	0.2	0.052
Dibenzo(a,h) anthracene	53-70-3	SIM	0.029	0.044	0.029	0.21	0.07

SAP Worksheet #15-10a — Reference Limits and Evaluation Table (continued)

SAP Worksheet #15-10a: Reference Limits and Evaluation Table

Matrix: Surface Water

Analytical Group: SVOC

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[6]	MDLs (ug/L)
Benzo(g,h,i) perylene	191-24-2	SIM	1100	NC	550	0.2	0.065
2,3,4,6-Tetrachlorophenol	58-90-2	Low	1100	NC	550	10	1.43
1,4-Dioxane	123-91-1	SIM	61	NC	30.5	1	0.029

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 SVOCs in surface water analyzed by "low" and "SIM" as noted above under the Concentration Range column. Low refers to full scan.

6 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-11 — Reference Limits and Evaluation Table

SAP Worksheet #15-11: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: PEST/PCB

Analyte	CAS Number	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
					QLs (ug/L)[5]	MDLs (ug/L)
alpha-BHC	319-84-6	0.011	NC	0.011	0.07	0.023
beta-BHC	319-85-7	0.037	NC	0.037	0.08	0.024
delta-BHC	319-86-8	0.037	NC	0.037	0.1	0.033
gamma-BHC (Lindane)	58-89-9	0.061	0.2	0.061	0.07	0.023
Heptachlor	76-44-8	0.015	0.4	0.015	0.1	0.034
Aldrin	309-00-2	0.004	NC	0.004	0.11	0.037
Heptachlor epoxide	1024-57-3	0.0074	0.2	0.0074	0.09	0.03
Endosulfan I	959-98-8	22	NC	11	0.07	0.024
Dieldrin	60-57-1	0.0042	NC	0.0042	0.1	0.024
4,4'-DDE	72-55-9	0.2	NC	0.1	0.1	0.019
Endrin	72-20-8	1.1	2	0.55	0.1	0.025
Endosulfan II	33213-65-9	22	NC	11	0.1	0.033
4,4'-DDD	72-54-8	0.28	NC	0.14	0.1	0.031
Endosulfan sulfate	1031-07-8	22	NC	11	0.1	0.022
4,4'-DDT	50-29-3	0.2	NC	0.1	0.1	0.02
Methoxychlor	72-43-5	18	40	9	0.5	0.024
Endrin ketone	53494-70-5	1.1	2	0.55	0.1	0.021
Endrin aldehyde	7421-93-4	1.1	2	0.55	0.23	0.078
alpha-Chlordane	5103-71-9	0.19	NC	0.095	0.09	0.029
gamma-Chlordane	5103-74-2	0.19	NC	0.095	0.08	0.025
Toxaphene	8001-35-2	0.061	3	0.061	1	0.21
Aroclor-1016	12674-11-2	0.26	0.5	0.26	0.51	0.17
Aroclor-1221	11104-28-2	0.0068	0.5	0.0068	1.2	0.4
Aroclor-1232	11141-16-5	0.0068	0.5	0.0068	0.5	0.16
Aroclor-1242	53469-21-9	0.034	0.5	0.034	0.75	0.25
Aroclor-1248	12672-29-6	0.034	0.5	0.034	0.75	0.25
Aroclor-1254	11097-69-1	0.034	0.5	0.034	0.84	0.28
Aroclor-1260	11096-82-5	0.034	0.5	0.034	0.78	0.26

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-11a — Reference Limits and Evaluation Table

SAP Worksheet #15-11a: Reference Limits and Evaluation Table

Matrix: Surface Water

Analytical Group: PEST/PCB

Analyte	CAS Number	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
					QLs (ug/L)[5]	MDLs (ug/L)
alpha-BHC	319-84-6	0.11	NC	0.11	0.07	0.023
beta-BHC	319-85-7	0.37	NC	0.185	0.08	0.024
delta-BHC	319-86-8	0.37	NC	0.185	0.1	0.033
gamma-BHC (Lindane)	58-89-9	0.61	0.19	0.095	0.07	0.023
Heptachlor	76-44-8	0.15	0.0021	0.0021	0.1	0.034
Aldrin	309-00-2	0.04	0.0013	0.0013	0.11	0.037
Heptachlor epoxide	1024-57-3	0.074	0.0038	0.0038	0.09	0.03
Endosulfan I	959-98-8	220	0.056	0.056	0.07	0.024
Dieldrin	60-57-1	0.042	0.0014	0.0014	0.1	0.024
4,4'-DDE	72-55-9	2	0.001	0.001	0.1	0.019
Endrin	72-20-8	11	0.036	0.036	0.1	0.025
Endosulfan II	33213-65-9	220	0.056	0.056	0.1	0.033
4,4'-DDD	72-54-8	2.8	0.001	0.001	0.1	0.031
Endosulfan sulfate	1031-07-8	220	NC	110	0.1	0.022
4,4'-DDT	50-29-3	2	0.001	0.001	0.1	0.02
Methoxychlor	72-43-5	180	0.03	0.03	0.5	0.024
Endrin ketone	53494-70-5	11	NC	5.5	0.1	0.021
Endrin aldehyde	7421-93-4	11	NC	5.5	0.23	0.078
alpha-Chlordane	5103-71-9	1.9	0.0043	0.0043	0.09	0.029
gamma-Chlordane	5103-74-2	1.9	0.0043	0.0043	0.08	0.025
Toxaphene	8001-35-2	0.61	0.0002	0.0002	1	0.21
Aroclor-1016	12674-11-2	2.6	0.014	0.014	0.51	0.17
Aroclor-1221	11104-28-2	0.068	0.014	0.014	1.2	0.4
Aroclor-1232	11141-16-5	0.068	0.014	0.014	0.5	0.16
Aroclor-1242	53469-21-9	0.34	0.014	0.014	0.75	0.25
Aroclor-1248	12672-29-6	0.34	0.014	0.014	0.75	0.25
Aroclor-1254	11097-69-1	0.34	0.014	0.014	0.84	0.28
Aroclor-1260	11096-82-5	0.34	0.014	0.014	0.78	0.26

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-12 — Reference Limits and Evaluation Table

SAP Worksheet #15-12: Reference Limits and Evaluation Table

Matrix: Groundwater and Aqueous (Blanks)

Analytical Group: EXPLO

Analyte	CAS Number	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[5]	Laboratory-specific[2,3]	
					QLs (ug/L)	MDLs (ug/L)[4]
Perchlorate	14797-73-0	2.6	NC	1.3	0.2	0.022
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	180	NC	90	0.25	0.016
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	0.61	NC	0.305	0.25	0.079
1,3,5-Trinitrobenzene	99-35-4	110	NC	55	0.25	0.032
1,3-Dinitrobenzene	99-65-0	0.37	NC	0.37	0.25	0.031
Methyl-2,4,6-trinitrophenylnitramine	479-45-8	15	NC	7.5	0.25	0.078
Nitrobenzene	98-95-3	0.34	NC	0.34	0.25	0.076
2,4,6-Trinitrotoluene	118-96-7	1.8	NC	0.9	0.25	0.070
2-Amino-4,6-dinitrotoluene	35572-78-2	7.3	NC	3.65	0.25	0.065
4-Amino-2,6-dinitrotoluene	19406-51-0	7.3	NC	3.65	0.25	0.068
2,4-Dinitrotoluene	121-14-2	7.3	NC	3.65	0.25	0.048
2,6-Dinitrotoluene	606-20-2	3.7	NC	1.85	0.25	0.038
2-Nitrotoluene	88-72-2	37	NC	18.5	0.25	0.054
3-Nitrotoluene	99-08-1	NC	NC	0.25	0.25	0.087
4-Nitrotoluene	99-99-0	4.2	NC	2.1	0.25	0.066

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Perchlorate MDL (Test America - Burlington) is for the 2007-2008 timeframe and the MDL study will likely be performed again before the sampling event.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

SAP Worksheet #15-12a — Reference Limits and Evaluation Table

SAP Worksheet #15-12a: Reference Limits and Evaluation Table
Matrix: Surface Water
Analytical Group: EXPLO

Analyte	CAS Number	Vieques HHRA SW (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[5]	Laboratory-specific[2,3]	
					QLs (ug/L)	MDLs (ug/L)[4]
Perchlorate	14797-73-0	26	NC	13	0.2	0.022
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	1800	NC	900	0.25	0.016
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	6.1	NC	3.05	0.25	0.079
1,3,5-Trinitrobenzene	99-35-4	1100	NC	550	0.25	0.032
1,3-Dinitrobenzene	99-65-0	3.7	NC	1.85	0.25	0.031
Methyl-2,4,6-trinitrophenylnitramine	479-45-8	150	NC	75	0.25	0.078
Nitrobenzene	98-95-3	3.4	17	1.7	0.25	0.076
2,4,6-Trinitrotoluene	118-96-7	18	NC	9	0.25	0.070
2-Amino-4,6-dinitrotoluene	35572-78-2	73	NC	36.5	0.25	0.065
4-Amino-2,6-dinitrotoluene	19406-51-0	73	NC	36.5	0.25	0.068
2,4-Dinitrotoluene	121-14-2	73	0.11	0.11	0.25	0.048
2,6-Dinitrotoluene	606-20-2	37	NC	18.5	0.25	0.038
2-Nitrotoluene	88-72-2	370	NC	185	0.25	0.054
3-Nitrotoluene	99-08-1	NC	NC	0.25	0.25	0.087
4-Nitrotoluene	99-99-0	42	NC	21	0.25	0.066

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Perchlorate MDL (Test America - Burlington) is for the 2007-2008 timeframe and the MDL study will likely be performed again before the sampling event.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

SAP Worksheet #15-13 — Reference Limits and Evaluation Table

SAP Worksheet #15-13: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: TPH

Analyte	CAS Number	PREQB Land Pollution Control Corrective Action Level (ug/L)	Project Quantitation Limit Goal (ug/L)[3]	Laboratory-specific[1,2]	
				QLs (ug/L)	MDLs (ug/L)
TPH-gas range	TPH-GRO	50000	25000	10	6.6
TPH-diesel range	TPH-DRO	50000	25000	50	36

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

2 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

3 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

SAP Worksheet #15-14 — Reference Limits and Evaluation Table

SAP Worksheet #15-14: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: METAL

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[7]	MDLs (ug/L)
Aluminum	7429-90-5	Low	3700	NC	1850	300	7.2
Antimony	7440-36-0	Low	1.5	6	1.5	1	0.12
Arsenic	7440-38-2	Low	0.045	10	0.045	5	1.500
Barium	7440-39-3	Low	730	2000	365	1	0.250
Beryllium	7440-41-7	Low	7.3	4	3.65	1	0.06
Cadmium	7440-43-9	Low	1.8	5	1.8	1	0.0930
Calcium[6]	7440-70-2	Low	NC	NC	100	100	11
Chromium	7440-47-3	Low	11	100	5.5	3	0.570
Cobalt	7440-48-4	Low	73	NC	36.5	1	0.120
Copper	7440-50-8	Low	150	1300	75	1	0.280
Iron	7439-89-6	Low	2600	NC	1300	100	24
Lead	7439-92-1	Low	NC	15	7.5	1	0.110
Magnesium[6]	7439-95-4	Low	NC	NC	100	100	9.5
Manganese	7439-96-5	Low	88	NC	44	1	0.220
Mercury	7439-97-6	Low	1.1	2	0.55	0.2	0.031
Nickel	7440-02-0	Low	73	NC	36.5	1	0.120
Potassium[6]	7440-09-7	Low	NC	NC	1000	1000	32
Selenium	7782-49-2	Low	18	50	9	5	0.9
Silver	7440-22-4	Low	18	NC	9	1	0.065
Sodium[6]	7440-23-5	Low	NC	NC	1000	1000	11.0
Thallium	7440-28-0	Low	0.24	2	0.24	1	0.11
Vanadium	7440-62-2	Low	26	NC	13	5	0.58
Zinc	7440-66-6	Low	1100	NC	550	10	0.900
Cyanide	57-12-5	Low	73	200	36.5	12	4

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Metals/Cyanide in water will be analyzed by "Low" (SW-846 6020/7470A/9012).

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-14a — Reference Limits and Evaluation Table

SAP Worksheet #15-14a: Reference Limits and Evaluation Table
Matrix: Surface Water
Analytical Group: METAL

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[7]	MDLs (ug/L)
Aluminum	7429-90-5	Low	37000	87	87	300	7.2
Antimony	7440-36-0	Low	15	14	14	1	0.12
Arsenic	7440-38-2	Low	0.45	0.018	0.018	5	1.500
Barium	7440-39-3	Low	7300	NC	3650	1	0.250
Beryllium	7440-41-7	Low	73	NC	36.5	1	0.06
Cadmium	7440-43-9	Low	18	0.27	0.27	1	0.0930
Calcium[6]	7440-70-2	Low	NC	NC	100	100	11
Chromium	7440-47-3	Low	110	11.4	55	3	0.570
Cobalt	7440-48-4	Low	730	NC	365	1	0.120
Copper	7440-50-8	Low	1500	9.33	4.665	1	0.280
Iron	7439-89-6	Low	26000	1000	500	100	24
Lead	7439-92-1	Low	NC	3.18	1.59	1	0.110
Magnesium[6]	7439-95-4	Low	NC	NC	100	100	9.5
Manganese	7439-96-5	Low	880	NC	440	1	0.220
Mercury	7439-97-6	Low	11	0.05	0.05	0.2	0.031
Nickel	7440-02-0	Low	730	52.2	26.1	1	0.120
Potassium[6]	7440-09-7	Low	NC	NC	1000	1000	32
Selenium	7782-49-2	Low	180	5	5	5	0.9
Silver	7440-22-4	Low	180	4.1	2.05	1	0.065
Sodium[6]	7440-23-5	Low	NC	NC	1000	1000	11.0
Thallium	7440-28-0	Low	2.4	NC	2.4	1	0.11
Vanadium	7440-62-2	Low	260	NC	130	5	0.58
Zinc	7440-66-6	Low	11000	119.8	59.9	10	0.900
Cyanide	57-12-5	Low	730	5.2	5.2	12	4

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Metals/Cyanide in water will be analyzed by "Low" (SW-846 6020/7470A/9023).

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-15: Reference Limits and Evaluation Table
Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: FMETAL

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap for GW Adjusted (ug/L)[1]	MCL-Groundwater (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[7]	MDLs (ug/L)
Aluminum	7429-90-5	Low	3700	NC	1850	300	7.2
Antimony	7440-36-0	Low	1.5	6	1.5	1	0.12
Arsenic	7440-38-2	Low	0.045	10	0.045	5	1.500
Barium	7440-39-3	Low	730	2000	365	1	0.250
Beryllium	7440-41-7	Low	7.3	4	3.65	1	0.06
Cadmium	7440-43-9	Low	1.8	5	1.8	1	0.0930
Calcium[6]	7440-70-2	Low	NC	NC	100	100	11
Chromium	7440-47-3	Low	11	100	5.5	3	0.570
Cobalt	7440-48-4	Low	73	NC	36.5	1	0.120
Copper	7440-50-8	Low	150	1300	75	1	0.280
Iron	7439-89-6	Low	2600	NC	1300	100	24
Lead	7439-92-1	Low	NC	15	7.5	1	0.110
Magnesium[6]	7439-95-4	Low	NC	NC	100	100	9.5
Manganese	7439-96-5	Low	88	NC	44	1	0.220
Mercury	7439-97-6	Low	1.1	2	0.55	0.2	0.031
Nickel	7440-02-0	Low	73	NC	36.5	1	0.120
Potassium[6]	7440-09-7	Low	NC	NC	1000	1000	32
Selenium	7782-49-2	Low	18	50	9	5	0.9
Silver	7440-22-4	Low	18	NC	9	1	0.065
Sodium[6]	7440-23-5	Low	NC	NC	1000	1000	11.0
Thallium	7440-28-0	Low	0.24	2	0.24	1	0.11
Vanadium	7440-62-2	Low	26	NC	13	5	0.58
Zinc	7440-66-6	Low	1100	NC	550	10	0.900

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Filtered Metals in water will be analyzed by "Low" (SW-846 6020/7470A)

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

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

SAP Worksheet #15-15a: Reference Limits and Evaluation Table
Matrix: Surface Water
Analytical Group: FMETAL

Analyte	CAS Number	Concentration Range[5]	RSLs - Tap X 10 for SW Adjusted (ug/L)[1]	Vieques Eco Freshwater SW (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
						QLs (ug/L)[7]	MDLs (ug/L)
Aluminum	7429-90-5	Low	37000	87	87	300	7.2
Antimony	7440-36-0	Low	15	14	14	1	0.12
Arsenic	7440-38-2	Low	0.45	0.018	0.018	5	1.500
Barium	7440-39-3	Low	7300	NC	3650	1	0.250
Beryllium	7440-41-7	Low	73	NC	36.5	1	0.06
Cadmium	7440-43-9	Low	18	0.27	0.27	1	0.0930
Calcium[6]	7440-70-2	Low	NC	NC	100	100	11
Chromium	7440-47-3	Low	110	11.4	55	3	0.570
Cobalt	7440-48-4	Low	730	NC	365	1	0.120
Copper	7440-50-8	Low	1500	9.33	4.665	1	0.280
Iron	7439-89-6	Low	26000	1000	500	100	24
Lead	7439-92-1	Low	NC	3.18	1.59	1	0.110
Magnesium[6]	7439-95-4	Low	NC	NC	100	100	9.5
Manganese	7439-96-5	Low	880	NC	440	1	0.220
Mercury	7439-97-6	Low	11	0.05	0.05	0.2	0.031
Nickel	7440-02-0	Low	730	52.2	26.1	1	0.120
Potassium[6]	7440-09-7	Low	NC	NC	1000	1000	32
Selenium	7782-49-2	Low	180	5	5	5	0.9
Silver	7440-22-4	Low	180	4.1	2.05	1	0.065
Sodium[6]	7440-23-5	Low	NC	NC	1000	1000	11.0
Thallium	7440-28-0	Low	2.4	NC	1.2	1	0.11
Vanadium	7440-62-2	Low	260	NC	130	5	0.58
Zinc	7440-66-6	Low	11000	119.8	59.9	10	0.900

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 Regional Screening Levels (RSLs) are current as of May 15, 2008. Vieques Eco criteria are derived from various sources, which are summarized in the "Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program" (Final MQAPP, CH2M HILL, May 2007).

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields. MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

5 Filtered Metals in water will be analyzed by "Low" (SW-846 6020/7470A).

6 Calcium, magnesium, potassium, and sodium are essential nutrients and there are no applicable criteria.

7 Some QLs have been elevated such that they are > 3X MDL for strict DOD QSM compliance).

SAP Worksheet #15-16 — Reference Limits and Evaluation Table

SAP Worksheet #15-16: Reference Limits and Evaluation Table
Matrix: Groundwater, Aqueous (Blanks), and Surface Water
Analytical Group: WCHEM

Analyte	CAS Number	Project Quantitation Limit Goal (ug/L)[3]	Laboratory-specific[1,2]	
			QLs (ug/L)	MDLs (ug/L)
Chloride	16887-00-6	2000	2000	990
Total Dissolved Solids (TDS)	TDS	10000	10000	5020
Total Organic Carbon	TOC	1000	1000	263

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

2 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

3 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

SAP Worksheet #15-17 — Reference Limits and Evaluation Table

SAP Worksheet #15-17: Reference Limits and Evaluation Table

Matrix: IDW (Liquid Waste)

Analytical Group: TCLPV

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)
1,1-Dichloroethene	75-35-4	700	350	20	5.2
1,2-Dichloroethane	107-06-2	500	250	20	3.8
2-Butanone	78-93-3	200000	100000	100	26.6
Benzene	71-43-2	500	250	20	5.6
Carbon tetrachloride	56-23-5	500	250	20	7.2
Chlorobenzene	108-90-7	100000	50000	20	5
Chloroform	67-66-3	6000	3000	20	4.4
Tetrachloroethene	127-18-4	700	350	20	8
Trichloroethene	79-01-6	500	250	20	7.4
Vinyl chloride	75-01-4	200	100	40	5.2

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 TCLP limits for disposal.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4 .

SAP Worksheet #15-18 — Reference Limits and Evaluation Table

SAP Worksheet #15-18: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: TCLPS

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)[4]
2-Methylphenol	95-48-7	200000	100000	50	20.2
4-Methylphenol	106-44-5	200000	100000	50	13.4
1,4-Dichlorobenzene	106-46-7	7500	3750	50	9.7
2,4-Dinitrotoluene	121-14-2	130	65	50	75
Hexachlorobenzene	118-74-1	130	65	50	4.75
Hexachlorobutadiene	87-68-3	500	250	50	11.7
Hexachloroethane	67-72-1	3000	1500	50	10.8
Nitrobenzene	98-95-3	2000	1000	50	10.75
Pentachlorophenol	87-86-5	100000	50000	125	38.55
Pyridine	110-86-1	5000	2500	50	16.8
2,4,5-Trichlorophenol	95-95-4	400000	200000	125	21.1
2,4,6-Trichlorophenol	88-06-2	2000	1000	50	16.3

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

[1] TCLP limits for disposal.

[2] Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

[3] If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

[4] Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the CRQL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the CRQL.

SAP Worksheet #15-19 — Reference Limits and Evaluation Table

SAP Worksheet #15-19: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: TCLPP

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)
gamma-BHC (Lindane)	58-89-9	400	200	0.25	0.115
Heptachlor	76-44-8	8	4	0.25	.05.17
Heptachlor epoxide	1024-57-3	8	0.25	0.25	0.15
Endrin	72-20-8	20	10	0.25	0.125
Methoxychlor	72-43-5	10000	5000	0.25	0.12
Toxaphene	8001-35-2	500	250	5	1.05
Chlordane (technical)	12789-03-6	30	15	2.5	1.15

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

[1] TCLP limits for disposal.

[2] Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

[3] If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

[4] Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4 .

SAP Worksheet #15-20 — Reference Limits and Evaluation Table

SAP Worksheet #15-20: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: TCLPH

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)
2,4,5-TP (Silvex)	93-72-1	1000	500	15	0.8
2,4-D	94-75-7	10000	5000	15	1.2

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 TCLP limits for disposal.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4 .

SAP Worksheet #15-21 — Reference Limits and Evaluation Table

SAP Worksheet #15-21: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: TCLPM

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)
Arsenic	7440-38-2	5000	2500	40	8.45
Barium	7440-39-3	100000	50000	25	2.965
Cadmium	7440-43-9	1000	500	5	0.1855
Chromium	7440-47-3	5000	2500	7.5	2.04
Lead	7439-92-1	5000	2500	25	4.83
Selenium	7782-49-2	1000	500	50	4.8
Silver	7440-22-4	5000	2500	75	1.45
Mercury	7439-97-6	200	100	0.2	0.0309

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 TCLP limits for disposal.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4

SAP Worksheet #15-22 — Reference Limits and Evaluation Table

SAP Worksheet #15-22: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: REACT

Analyte	CAS Number	Project Action Limit[1] (ug/L)	Project Quantitation Limit Goal (ug/L)[4]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)
Reactive Cyanide	REACT-CN	NC	1000	1000	828
Reactive Sulfide	REACT-S	NC	27000	27000	20300

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report.

1 There are no regulatory criteria for reactive cyanide and reactive sulfide. However, the disposal facility may require these analyses.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL.

SAP Worksheet #15-23 — Reference Limits and Evaluation Table

SAP Worksheet #15-23: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: CORR

Analyte	CAS Number	40 CFR 261.4 (ug/L)[1]	Project Quantitation Limit Goal (ug/L)[5]	Laboratory-specific[2,3]	
				QLs (ug/L)	MDLs (ug/L)[4]
pH	PH	2<pH<12.5	0<pH<14	0<pH<14	N/A

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Limits for disposal.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

3 f Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 MDLs are not applicable to CORR.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4

SAP Worksheet #15-24 — Reference Limits and Evaluation Table

SAP Worksheet #15-24: Reference Limits and Evaluation Table
Matrix: IDW (Liquid Waste)
Analytical Group: IGN

Analyte	CAS Number	40 CFR 261.4 (F)[1]	Project Quantitation Limit Goal (F)[5]	Laboratory-specific[2,3]	
				QLs (F)	MDLs (F)[4]
Ignitability	FLASHPOINT	140	140	TBD	N/A

Shading represents rows where the laboratory specific QL is greater than the PQL Goal. Refer to Worksheet 11, section 5.

1 Limits for disposal.

2 Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

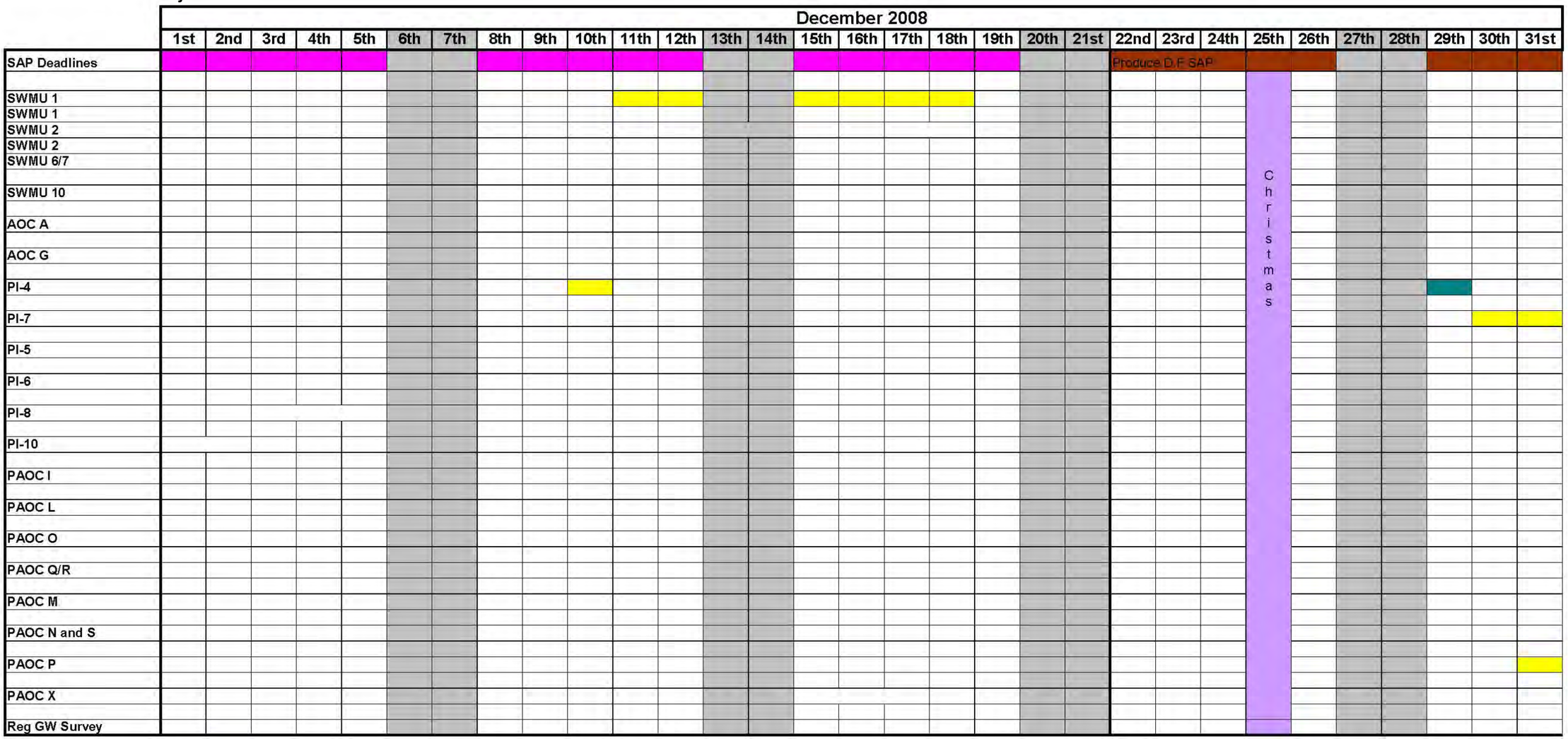
3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, "TBD", as a placeholder in the columns. However, these fields MUST be populated and approved in the final SAP prior to the sampling event.

4 MDLs are not applicable to IGN.

5 Project Quantitation Limit Goal is 1/2X the lower of the applicable criteria. If 1/2X the lower of the applicable criteria is less than the QL, the project quantitation limit goal is the lower of the applicable criteria. If there are no applicable criteria, the project quantitation limit goal is the QL. PAL is 40 CFR 261.4 .

Page Intentionally Left Blank

SAP Worksheet #16 — Project Schedule/Timeline Table

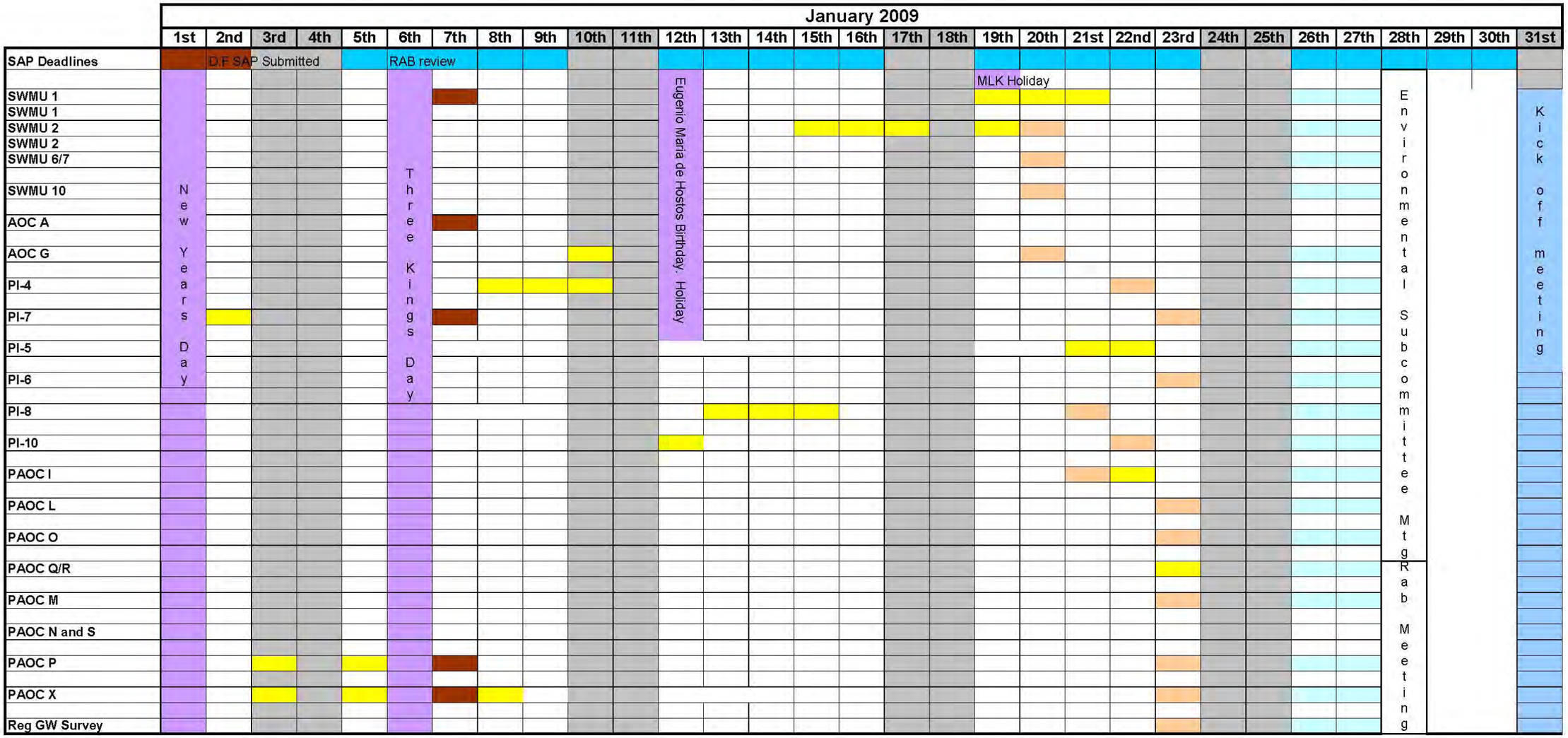


General color representation

- Vegetation clearing
- Groundwater levels taken at on-site wells
- Stake sampling locations
- Site visit with regulators
- Geophysical investigation
- Hand auger or slide hammer sampling
- Direct push sampling (mechanical)
- Monitoring well installation and well development
- Backhoe work which includes test pitting, debris removal, or soil excavating.
- Well development and/or groundwater sampling
- Holiday
- Excavator Site Visits

Page Intentionally Left Blank

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

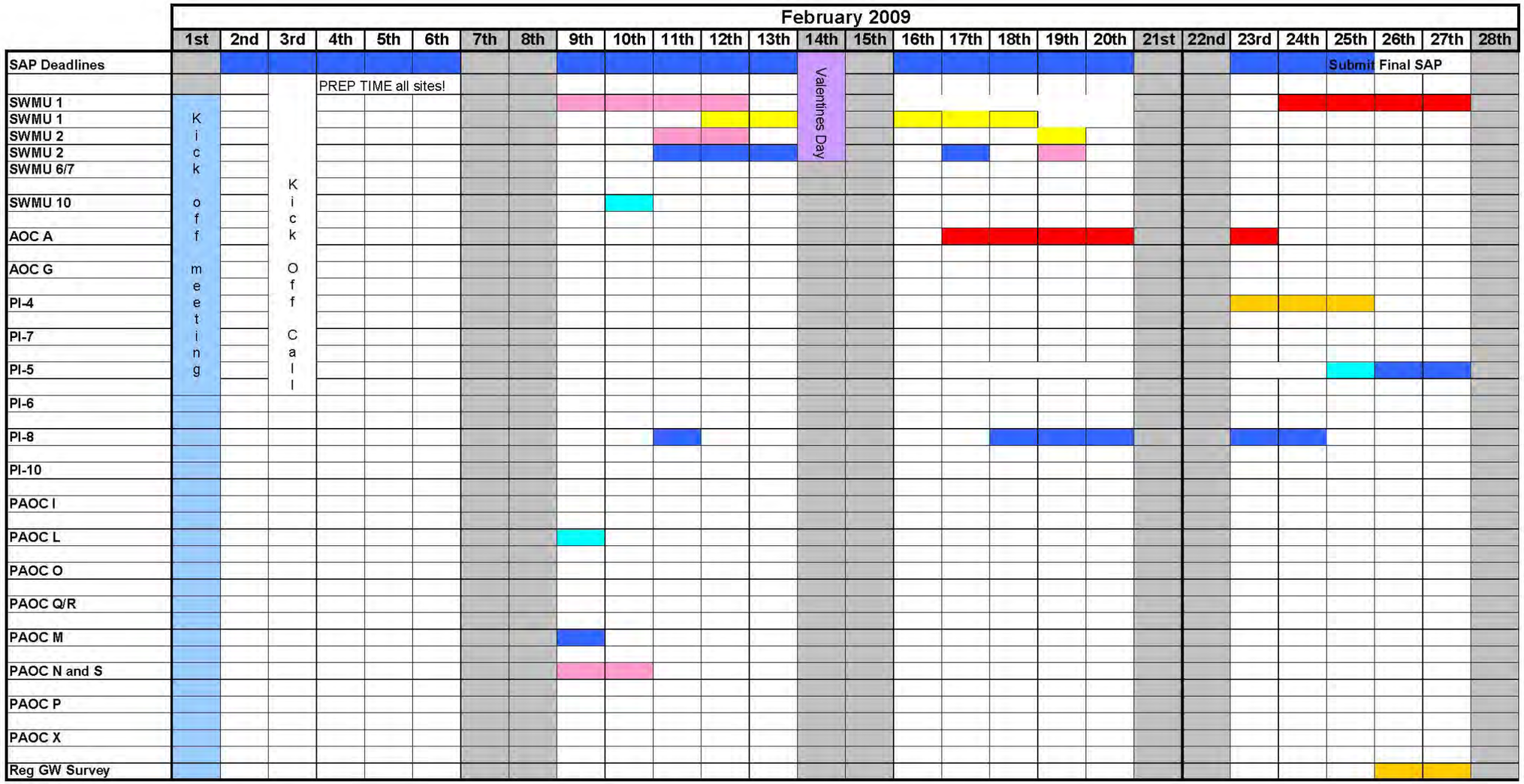


General color representation

- Vegetation clearing
- Groundwater levels taken at on-site wells
- Stake sampling locations
- Site visit with regulators
- Geophysical investigation
- Hand auger or slide hammer sampling
- Direct push sampling (mechanical)
- Monitoring well installation and well development
- Backhoe work which includes test pitting, debris removal, or soil excavating.
- Well development and/or groundwater sampling
- Holiday
- Excavator Site Visits

Page Intentionally Left Blank

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

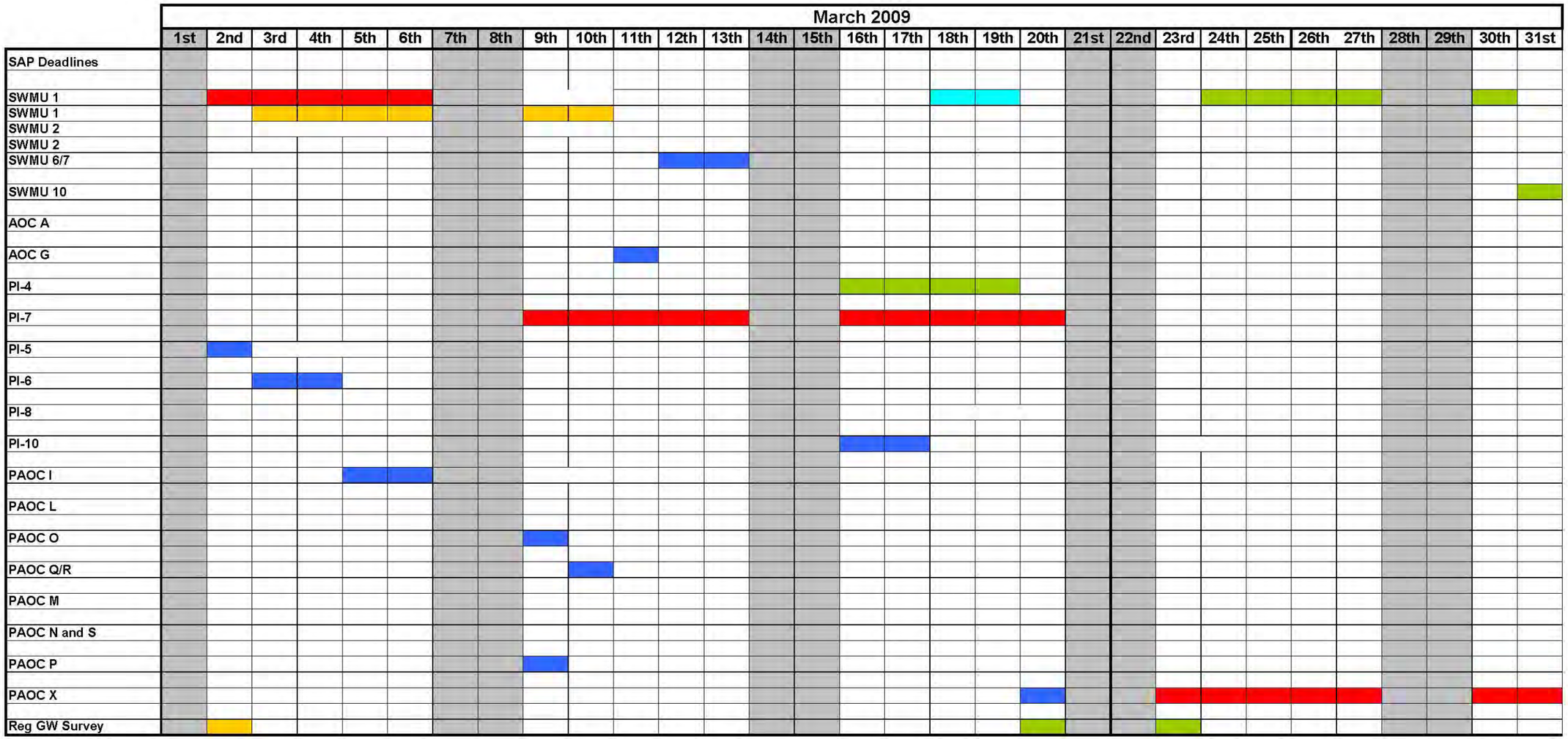


General color representation

- Vegetation clearing
- Groundwater levels taken at on-site wells
- Stake sampling locations
- Site visit with regulators
- Geophysical investigation
- Hand auger or slide hammer sampling
- Direct push sampling (mechanical)
- Monitoring well installation and well development
- Backhoe work which includes test pitting, debris removal, or soil excavating.
- Well development and/or groundwater sampling
- Holiday
- Excavator Site Visits

Page Intentionally Left Blank

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

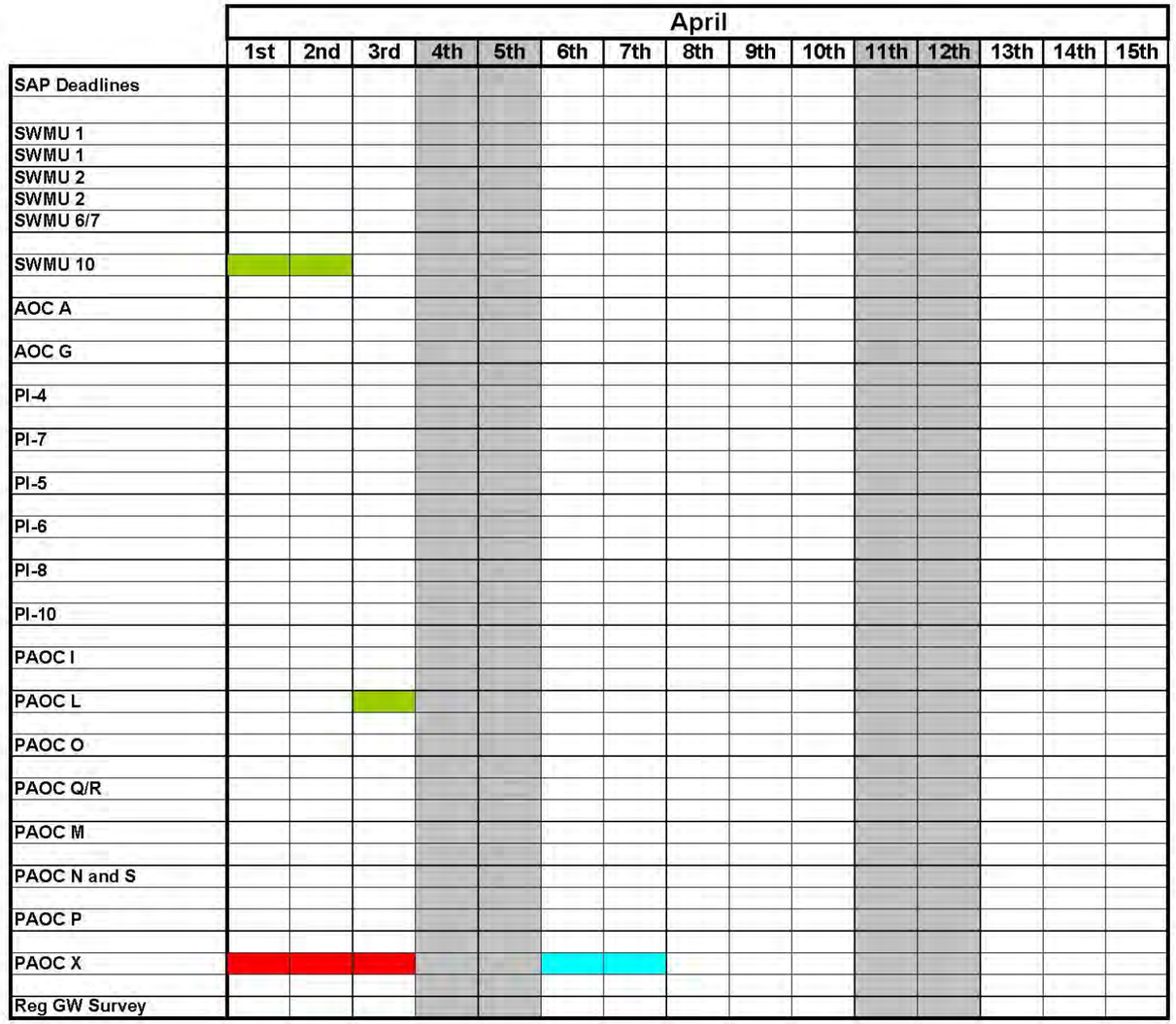


General color representation

- Vegetation clearing
- Groundwater levels taken at on-site wells
- Stake sampling locations
- Site visit with regulators
- Geophysical investigation
- Hand auger or slide hammer sampling
- Direct push sampling (mechanical)
- Monitoring well installation and well development
- Backhoe work which includes test pitting, debris removal, or soil excavating.
- Well development and/or groundwater sampling
- Holiday
- Excavator Site Visits

Page Intentionally Left Blank

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



General color representation

- Vegetation clearing
- Groundwater levels taken at on-site wells
- Stake sampling locations
- Site visit with regulators
- Geophysical investigation
- Hand auger or slide hammer sampling
- Direct push sampling (mechanical)
- Monitoring well installation and well development
- Backhoe work which includes test pitting, debris removal, or soil excavating.
- Well development and/or groundwater sampling
- Holiday
- Excavator Site Visits

Page Intentionally Left Blank

SAP Worksheet #17 — Sampling Design and Rationale

Given that the scope of work under this SAP is SI/Expanded SI, the general sampling rationale and design are based on the objective of determining whether a release has occurred and, if so, whether it warrants further action. Based on this objective, the sampling design is based on a judgmental (i.e., biased) approach.

For sites where there are no relevant historical sample data, sample locations are biased to those areas where, if a release occurred (based on known or suspected site historical information and/or field observations), it would most likely be detected via environmental media samples. This approach is taken for the following sites:

- PI 5 – Former Airfield and Associated Ditches
- PAOC I – Former Power Plant and Mechanics Shop
- PAOC M – Former Fuel Facility
- PAOC O – Former Boiler Room in Heat Plant Building 238
- PAOC P – Former Water Treatment Pumphouse
- PAOC Q/R – Former Boiler Room in Heat Plant Buildings 607, 617

For sites were relevant historical sample data exist, but the data are insufficient spatially to make release determinations conclusively, sample locations are biased to areas that, when considered collectively with the relevant historical sample data, provide sufficient spatial data to make conclusive release determinations (i.e., new samples fill data gaps in historical samples). This approach is taken for the following sites:

- SWMU 1 – Camp Garcia Landfill
- SWMU 2 – Fuels Offloading Site
- AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons
- PI 6 – Former PCB Storage Pad and Vehicle Wash Pad
- PI 8 – Former Motor Pool Maintenance Area
- PI 10 – Former Wastewater Leach Field

For sites where relevant historical sample data exist that suggest a release has not occurred, but debris is present at the site that represent a potential source of contamination, sample locations are biased to areas immediately beneath the debris upon its removal to complete the release determinations for the sites. This approach is taken for the following sites:

- PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area
- PAOC X – Debris Area in Ephemeral Stream

For sites where relevant historical sample data exist that suggest a release occurred, but the data are insufficient for determining whether the release is of a magnitude that warrants further action, sample locations are biased to areas that will help confirm the source area extent and determine whether further action is warranted. This approach is taken at the following sites:

- SWMUs 6/7 – Waste Oil and Paint Accumulation Areas
- PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage
- PAOC L – Former Paint and Transformer Storage Area

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

For AOC A (Diesel Fuel Fill Pipe Area), the presence of a release was confirmed via soil samples collected upon removal of the UST. However, the data suggest the release may have been isolated to a relatively small area along the former fuel fill pipeline. Therefore, some additional soil will be removed from beneath the former pipeline and confirmatory samples will be collected within the area of excavation to ensure adequate removal of contaminated soil.

SWMU 10 (Sewage Treatment Lagoons) is a special case where the historical sample data are sufficient in terms of spatial extent to make release determinations, but the data quality of a particular analyte (i.e., thallium) is suspect. In this case, the sampling rationale and design is that necessary to confirm the suspicion that a release did not occur that warrants further action. As such, the environmental media at the site will be re-sampled for thallium analysis.

Finally, the historical sample data for PAOCs N (Former Fuel Farm and Filling Station) and S (Former Power Plant) suggest a release did not occur at these sites. No additional sampling is proposed unless the results of a geophysical survey suggest a subsurface fuel pipeline exists between the two sites or if a UST is identified at the PAOC S power plant building footprint.

For the above sampling approach, the rationale for the matrices to be sampled, the number of samples per matrix, the analytical groups, and the concentration levels is discussed in Worksheets #10, #11, #14, and #15. Sample location figures are provided in Attachment A. Exact sampling locations will be determined in the field during a site visit conducted by the ERP Technical Subcommittee.

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 1						
VEW01-SO01	VEW01-SO01-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO01	VEW01-SB01-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW02-SO02	VEW02-SO02-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	2 (Duplicate)	See Worksheet 21
VEW02-SO02	VEW02-SB02-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO03	VEW01-SO03-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO03	VEW01-SB03-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO04	VEW01-SO04-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO04	VEW01-SB04-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	2 (Duplicate)	See Worksheet 21
VEW01-SO05	VEW01-SO05-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO05	VEW01-SB05-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO06	VEW01-SO06-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO06	VEW01-SB06-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW01-SO07	VEW01-SO07-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO07	VEW01-SB07-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO08	VEW01-SO08-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	3 (MS/MSD)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 1 (continued)						
VEW01-SO08	VEW01-SB08-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO09	VEW01-SO09-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO09	VEW01-SB09-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO10	VEW01-SO10-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO10	VEW01-SB10-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO11	VEW01-SO11-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO11	VEW01-SB11-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO12	/VEW01-SO12-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO12	VEW01-SB12-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	2 (Duplicate)	See Worksheet 21
VEW01-SO13	VEW01-SO13-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO13	VEW01-SB13-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO14	VEW01-SO14-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO14	VEW01-SB14-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO15	VEW01-SO15-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO15	VEW01-SB15-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO16	VEW01-SO16-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO16	VEW01-SB16-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW01-SO17	VEW01-SO17-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	2 (Duplicate)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 1 (continued)						
VEW01-SO17	VEW01-SB17-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO18	VEW01-SO18-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO18	VEW01-SB18-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO19	VEW01-SO19-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO19	VEW01-SB19-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	3 (MS/MSD)	See Worksheet 21
VEW01-SO20	VEW01-SO20-MMYY	Soil Composite	Composite	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SO20	VEW01-SB20-A-MMYY	Subsurface Soil	6 inches below the waste	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics, EXPLO, Perchlorate	1	See Worksheet 21
VEW01-SW01 VEW01-SD01 or VEW01-SO21	VEW01-SW01-MMYY VEW01-SD01-MMYY or VEW01-SS21-AA-MMYY VEW02-SB21-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	4 (Duplicate) VOC, SVOC, PEST, PCBs, TAL Inorganics, EXPLO only	See Worksheet 21
VEW01-SW02 VEW01-SD02 or VEW01-SO22	VEW01-SW02-MMYY VEW01-SD02-MMYY or VEW01-SS22-AA-MMYY VEW02-SB22-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, bulk density, and grain size	2	See Worksheet 21
VEW01-SW03 VEW01-SD03 or VEW01-SO23	VEW01-SW03-MMYY VEW01-SD03-MMYY or VEW01-SS23-AA-MMYY VEW02-SB23-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	2	See Worksheet 21
VEW01-SW04 VEW01-SD04 or VEW01-SO24	VEW01-SW04-MMYY VEW01-SD04-MMYY or VEW01-SS24-AA-MMYY VEW02-SB24-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	6 (MS/MSD) VOC, SVOC, PEST, PCBs, TAL Inorganics, EXPLO only	See Worksheet 21
VEW01-SW05 VEW01-SD05 or VEW01-SO25	VEW01-SW05-MMYY VEW01-SD05-MMYY or VEW01-SS25-AA-MMYY VEW02-SB25-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	2	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 1 (continued)						
VEW01-SW06 VEW01-SD06 or VEW01-SO26	VEW01-SW06-MMYY VEW01-SD06-MMYY or VEW01-SS26-AA-MMYY VEW02-SB26-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	2	See Worksheet 21
VEW01-SW07 VEW01-SD07 or VEW01-SO27	VEW01-SW07-MMYY VEW01-SD07-MMYY or VEW01-SS27-AA-MMYY VEW02-SB27-AA-MMYY	Surface Water and Sediment or Surface Soil and Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, pH, TOC, and grain size	2	See Worksheet 21
CGW1MW01	VEW01-MW01-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate	2 (Duplicate)	See Worksheet 21
CGW1MW02	VEW01-MW02-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate,	1	See Worksheet 21
CGW1MW03	VEW01-MW03-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate	1	See Worksheet 21
CGW1MW04	VEW01-MW04-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate	1	See Worksheet 21
CGW1MW05	VEW01-MW05-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, TDS and Chloride	1	See Worksheet 21
CGW1MW06	VEW01-MW06-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, TDS and Chloride	3 (MS/MSD) VOC, SVOC, PEST, PCBs, TAL Inorganics, EXLPO, and Perchlorate only	See Worksheet 21
CGW1MW07	VEW01-MW07-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, TDS and Chloride	1	See Worksheet 21
CGW1MW08	VEW01-MW08-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate	1	See Worksheet 21
CGW1MW09	VEW01-MW09-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, TAL Inorganics (total and dissolved), EXPLO, Perchlorate, TDS and Chloride	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 2						
VEW02-SO13	VEW02-SS13-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW02-SO13	VEW02-SB13-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO, grain size analysis, TOC, pH and dry bulk density	1	See Worksheet 21
VEW02-SO14	VEW02-SS14-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	3 (MS/MSD)	See Worksheet 21
VEW02-SO14	VEW02-SB14-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO15	VEW02-SS15-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	2 (Duplicate)	See Worksheet 21
VEW02-SO15	VEW02-SB15-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO16	VEW02-SS16-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO16	VEW02-SB16-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO17	VEW02-SS17-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO17	VEW02-SB17-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO18	VEW02-SS18-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO18	VEW02-SB18-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO19	VEW02-SS19-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	3 (MS/MSD)	See Worksheet 21
VEW02-SO19	VEW02-SB19-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	2 (Duplicate)	See Worksheet 21
VEW02-SO20	VEW02-SS20-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO20	VEW02-SB20-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO21	VEW02-SS21-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 2 (continued)						
VEW02-SO21	VEW02-SB21-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO22	VEW02-SS22-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO22	VEW02-SB22-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO23	VEW02-SS23-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	2 (Duplicate)	See Worksheet 21
VEW02-SO23	VEW02-SB23-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO24	VEW02-SS24-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
VEW02-SO24	VEW02-SB24-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, Lead, TPH-GRO, and TPH-DRO	1	See Worksheet 21
SWMU 6/7						
VEW6/7-SO11	VEW6/7-SS11-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW6/7-SO11	VEW6/7-SB11-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW6/7-SO12	VEW6/7-SS12-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	2 (Duplicate)	See Worksheet 21
VEW6/7-SO12	VEW6/7-SB12-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEW6/7-SO13	VEW6/7-SS13-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEW6/7-SO13	VEW6/7-SB13-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEW6/7-SO14	VEW6/7-SS14-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEW6/7-SO14	VEW6/7-SB14-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEW6/7-SO15	VEW6/7-SS15-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	3 (MS/MSD)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 6/7 (continued)						
VEW6/7-SO15	VEW6/7-SB15-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEW6/7-SO16	VEW6/7-SS16-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEW6/7-SO16	VEW6/7-SB16-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
SWMU 10						
VEW10-SO21	VEW10-SS21-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW10-SO21	VEW10-SB21-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEW10-SO22	VEW10-SS22-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO22	VEW10-SB22-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21
VEW10-SO23	VEW10-SS23-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO23	VEW10-SB23-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21
VEW10-SO24	VEW10-SS24-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	2 (Duplicate)	See Worksheet 21
VEW10-SO24	VEW10-SB24-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21
VEW10-SO25	VEW10-SS25-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO25	VEW10-SB25-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
SWMU 10 (continued)						
VEW10-SO26	VEW10-SS26-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO26	VEW10-SB26-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	3 (MS/MSD)	See Worksheet 21
VEW10-SO27	VEW10-SS27-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO27	VEW10-SB27-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21
VEW10-SO28	VEW10-SS28-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	Thallium	1	See Worksheet 21
VEW10-SO28	VEW10-SB28-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if it can be visually distinguished from the native material	Thallium	1	See Worksheet 21
CGW10MW01	VEW10-MW01-MMYY	Groundwater	N/A	Thallium (total and dissolved), TDS and Chloride	2 (Duplicate) Thallium only	See Worksheet 21
CGW10MW02	VEW10-MW02-MMYY	Groundwater	N/A	Thallium (total and dissolved), TDS and Chloride	1	See Worksheet 21
CGW10MW03	VEW10-MW03-MMYY	Groundwater	N/A	Thallium (total and dissolved)	1	See Worksheet 21
CGW10MW04	VEW10-MW04-MMYY	Groundwater	N/A	Thallium (total and dissolved)	3 (MS/MSD)	See Worksheet 21
CGW10MW05	VEW10-MW05-MMYY	Groundwater	N/A	Thallium (total and dissolved)	1	See Worksheet 21
AOC A						
VEAA-SO11	VEAA-SB11a-A-MMYY	Subsurface Soil (bottom of excavation)	0-6 inches below the bottom of the excavation	TPH-DRO	1	See Worksheet 21
VEAA-SO11	VEAA-SB11b-A-MMYY	Subsurface Soil (side of excavation, north)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO11	VEAA-SB11c-A-MMYY	Subsurface Soil (side of excavation, south)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO12	VEAA-SB12a-A-MMYY	Subsurface Soil (bottom of excavation)	0-6 inches below the bottom of the excavation	TPH-DRO	2 (Duplicate)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
AOC A (continued)						
VEAA-SO12	VEAA-SB12b-A-MMYY	Subsurface Soil (side of excavation, north)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO12	VEAA-SB12c-A-MMYY	Subsurface Soil (side of excavation, south)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO13	VEAA-SB13a-A-MMYY	Subsurface Soil (bottom of excavation)	0-6 inches below the bottom of the excavation	TPH-DRO	1	See Worksheet 21
VEAA-SO13	VEAA-SB13b-A-MMYY	Subsurface Soil (side of excavation, north)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO13	VEAA-SB13c-A-MMYY	Subsurface Soil (side of excavation, south)	0-1 foot below the depth of backfill	TPH-DRO	3 (MS/MSD)	See Worksheet 21
VEAA-SO14	VEAA-SB14a-A-MMYY	Subsurface Soil (bottom of excavation)	0-6 inches below the bottom of the excavation	TPH-DRO	1	See Worksheet 21
VEAA-SO14	VEAA-SB14b-A-MMYY	Subsurface Soil (side of excavation, north)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO14	VEAA-SB14c-A-MMYY	Subsurface Soil (side of excavation, south)	0-1 foot below the depth of backfill	TPH-DRO	2 (Duplicate)	See Worksheet 21
VEAA-SO15	VEAA-SB15a-A-MMYY	Subsurface Soil (bottom of excavation)	0-6 inches below the bottom of the excavation	TPH-DRO	1	See Worksheet 21
VEAA-SO15	VEAA-SB15b-A-MMYY	Subsurface Soil (side of excavation, north)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21
VEAA-SO15	VEAA-SB15c-A-MMYY	Subsurface Soil (side of excavation, south)	0-1 foot below the depth of backfill	TPH-DRO	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
AOC A (continued)						
VEAA-SO16	VEAA-SB16-MMYY	Soil Composite	Composite	TPH-DRO	1	See Worksheet 21
VEAA-SO17	VEAA-SB16-MMYY	Soil Composite	Composite	TPH-DRO	1	See Worksheet 21
VEAA-SO18	VEAA-SB16-MMYY	Soil Composite	Composite	TPH-DRO	1	See Worksheet 21
AOC G						
VEAG-SO06	VEAG-SS06-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEAG-SO06	VEAG-SB06-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEAG-SO07	VEAG-SS07-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEAG-SO07	VEAG-SB07-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
PI-4						
EPI04-MW01	VEP04-GW01-MMYY	Groundwater	N/A	TCL VOCs, TDS and Chloride	2 (Duplicate) VOCs only	See Worksheet 21
EPI04-MW02	VEP04-GW02-MMYY	Groundwater	N/A	TCL VOCs	1	See Worksheet 21
EPI04-MW03	VEP04-GW03-MMYY	Groundwater	N/A	TCL VOCs	1	See Worksheet 21
EPI04-MW04	VEP04-GW04-MMYY	Groundwater	N/A	TCL VOCs	1	See Worksheet 21
EPI04-MW05	VEP04-GW05-MMYY	Groundwater	N/A	TCL VOCs	3 (MS/MSD)	See Worksheet 21
EPI04-MW06	VEP04-GW06-MMYY	Groundwater	N/A	TCL VOCs	1	See Worksheet 21
EPI04-MW07	VEP04-GW07-MMYY	Groundwater	N/A	TCL VOCs, TDS and Chloride	1	See Worksheet 21
PI-7						
VEP7-SO23	VEP7-SS23-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP7-SO36	VEP7-SB23-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO24	VEP7-SS24-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO37	VEP7-SB24-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO25	VEP7-SS25-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO38	VEP7-SB25-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PI-7 (continued)						
VEP7-SO26	VEP7-SS26-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP7-SO39	VEP7-SB26-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO27	VEP7-SS27-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO40	VEP7-SB27-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO28	VEP7-SS28-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO41	VEP7-SB28-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP7-SO29	VEP7-SS29-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO42	VEP7-SB29-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO30	VEP7-SS30-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO43	VEP7-SB30-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO31	VEP7-SS31-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP7-SO44	VEP7-SB31-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO32	VEP7-SS32-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO45	VEP7-SB32-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP7-SO33	VEP7-SS33-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO46	VEP7-SB33-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO34	VEP7-SS34-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP7-SO47	VEP7-SB34-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP7-SO35	VEP7-SS35-06-MMYY	Surface Soil	0 to 6 inches below the removed drums	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP7-SO48	VEP7-SB35-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PAOC-L						
VEPL-SO5	VEPL-SS05-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPL-SO6	VEPL-SS06-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	3 (MS/MSD)	See Worksheet 21
VEPL-SO7	VEPL-SS07-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	1	See Worksheet 21
VEPL-SO8	VEPL-SS08-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	1	See Worksheet 21
VEPL-SO9	VEPL-SS09-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	1	See Worksheet 21
VEPL-SO10	VEPL-SS10-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	1	See Worksheet 21
VEPL-SO11	VEPL-SS11-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	2 (Duplicate)	See Worksheet 21
VEPL-SO12	VEPL-SS12-01-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PEST	1	See Worksheet 21
EPAL-MW01	VEPL-GW01-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, PEST, PCBs, and TAL Inorganics (total and dissolved) TDS and Chloride	5 (Duplicate and MS/MSD) VOCs, SVOCs, PEST, PCBs, TAL Inorganics only	See Worksheet 21
PI-5						
VEP5-SO01	VEP5-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP5-SO01	VEP5-SB01-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP5-SO02	VEP5-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO02	VEP5-SB02-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO03	VEP5-SS03-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP5-SO03	VEP5-SB03-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PI-5 (continued)						
VEP5-SO04	VEP5-SS04-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO04	VEP5-SB04-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO05	VEP5-SS05-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO05	VEP5-SB05-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO06	VEP5-SS06-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO06	VEP5-SB06-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO07	VEP5-SS07-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP5-SO07	VEP5-SB07-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP5-SO08	VEP5-SS08-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP5-SO08	VEP5-SB08-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
PI-6						
VEP6-SO04	VEP6-SS04-AA-MMYY	Surface Soil	0-1 foot	TCL PCBs	1	See Worksheet 21
VEP6-SO04	VEP6-SB04-AA-MMYY	Subsurface Soil	Bottom of accumulated material, measured depth TBD in field.	TCL PCBs	1	See Worksheet 21
VEP6-SO05	VEP6-SS05-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PCBs	3 (MS/MSD)	See Worksheet 21
VEP6-SO05	VEP6-SB05-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL PCBs	2 (Duplicate)	See Worksheet 21
VEP6-SO06	VEP6-SS06-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL PCBs	1	See Worksheet 21
VEP6-SO06	VEP6-SB06-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL PCBs	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PI-6 (continued)						
VEP6-SO07	VEP6-SS07-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	3 (MS/MSD) VOCs, SVOCs, and TAL Inorganics only	See Worksheet 21
VEP6-SO07	VEP6-SB07-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	2 (Duplicate), VOCs, SVOCs, and TAL Inorganics only	See Worksheet 21
PI-8						
VEP8-SO05	VEP8-SS05-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP8-SO05	VEP8-SB05-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP8-SO06	VEP8-SS06-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP8-SO06	VEP8-SB06-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO07	VEP8-SS07-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP8-SO07	VEP8-SB07-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO08	VEP8-SS08-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO08	VEP8-SB08-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO09	VEP8-SS09-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO09	VEP8-SB09-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP8-SO10	VEP8-SS10-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TAL Inorganics	1	See Worksheet 21
VEP8-SO10	VEP8-SB10-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP8-SO11	VEP8-SS11-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TAL Inorganics	1	See Worksheet 21
VEP8-SO11	VEP8-SB11-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TAL Inorganics	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PI-8 (continued)						
VEP8-SO12	VEP8-SS12-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO12	VEP8-SB12-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO13	VEP8-SS13-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO13	VEP8-SB13-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP8-SO14	VEP8-SS14-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP8-SO14	VEP8-SB14-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP8-SO15	VEP8-SS15-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP8-SO15	VEP8-SB15-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL SVOCs, and TAL Inorganics	1	See Worksheet 21
PI-10						
VEP10-SO01	VEP10-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP10-SO01	VEP10-SB01-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if distinguishable from the native material	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEP10-SO02	VEP10-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEP10-SO02	VEP10-SB02-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if distinguishable from the native material	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEP10-SO03	VEP10-SS03-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEP10-SO03	VEP10-SB03-AA-MMYY	Subsurface Soil	Just above the bottom of the lagoon material, if distinguishable from the native material	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PAOC I						
VEPI-SO01	VEPI-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPI-SO01	VEPI-SB01-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPI-SO02	VEPI-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO02	VEPI-SB02-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO03	VEPI-SS03-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEPI-SO03	VEPI-SB03-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO04	VEPI-SS04-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO04	VEPI-SB04-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO05	VEPI-SS05-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	1	See Worksheet 21
VEPI-SO05	VEPI-SB05-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, PCBs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
PAOC M[3]						
VEPM-SO01	VEPM-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	2 (Duplicate)	See Worksheet 21
VEPM-SO01	VEPM-SB01-AA-MMYY	Subsurface Soil	From depth interval of suspected contamination	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
VEPM-SO02	VEPM-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
VEPM-SO02	VEPM-SB01-AA-MMYY	Subsurface Soil	From depth interval of suspected contamination	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
VEPM-SO03	VEPM-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
VEPM-SO03	VEPM-SB02-AA-MMYY	Subsurface Soil	From depth interval of suspected contamination	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	3 (MS/MSD)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PAOC M[3] (continued)						
VEPM-SO04	VEPM-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
VEPM-SO04	VEPM-SB02-AA-MMYY	Subsurface Soil	From depth interval of suspected contamination	BTEX, MTBE, PAHs, lead, TPH-DRO, TPH-GRO	1	See Worksheet 21
PAOC O						
VEPO-SO01	VEPO-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPO-SO01	VEPO-SB01-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPO-SO02	VEPO-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21
VEPO-SO02	VEPO-SB02-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
PAOC P						
VEPP-SO01	VEPP-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-GRO, and TPH-DRO	2 (Duplicate)	See Worksheet 21
VEPP-SO01	VEPP-SB01-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	BTEX, MTBE, PAHs, lead, TPH-GRO, and TPH-DRO	3 (MS/MSD)	See Worksheet 21
PAOC Q/R						
VEPQ/R-SO01	VEPQ-SS01-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPQ/R-SO01	VEPQ-SB01-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPQ/R-SO02	VEPQ-SS02-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEPQ/R-SO02	VEPQ-SB02-AA-MMYY	Subsurface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics	2 (Duplicate)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PAOC X						
VEPX-SO05	VEPX-SB05-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEPX-SO05	VEPX-SB05-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEPX-SO06	VEPX-SS06-AA-MMYY	Surface Soil	As per MQAPP Attachment 7	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEPX-SO06	VEPX-SB06-AA-MMYY	Subsurface Soil	TBD	TCL VOCs, SVOCs, and TAL Inorganics,	1	See Worksheet 21
VEPX-SO07	VEPX-SS07-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1	See Worksheet 21
VEPX-SO07	VEPX-SB07-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics, grain size analysis, TOC, pH, and dry bulk density	1 only if contamination is suspected in surface soil sample	See Worksheet 21
VEPX-SO08	VEPX-SS08-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEPX-SO08	VEPX-SB08-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1 only if contamination is suspected in surface soil sample 2 (Duplicate)	See Worksheet 21
VEPX-SO09	VEPX-SS09-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics	1	See Worksheet 21
VEPX-SO09	VEPX-SB09-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1 only if contamination is suspected in surface soil sample	See Worksheet 21
VEPX-SO10	VEPX-SS10-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21
VEPX-SO10	VEPX-SB10-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1 only if contamination is suspected in surface soil sample	See Worksheet 21
VEPX-SO11	VEPX-SS11-AA-MMYY	Surface Soil	0-6 inches below the bottom of the debris	TCL VOCs, SVOCs, and TAL Inorganics	3 (MS/MSD)	See Worksheet 21

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

Station ID	Sample ID	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1 2]
PAOC X						
VEPX-SO11	VEPX-SB11-AA-MMYY	Subsurface Soil	TBD[3]	TCL VOCs, SVOCs, and TAL Inorganics	1 only if contamination is suspected in surface soil sample	See Worksheet 21
Regional Groundwater Study — Wells South of Camp Garcia						
VECG	VECG-MW01-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, Pesticide/PCBs, TAL total and dissolved Inorganics, TDS and Chloride	2 (Duplicate) VOCs, PESTs, PCBs, TAL Inorganics only	See Worksheet 21
VECG	VECG-MW02-MMYY	Groundwater	N/A	TCL VOCs, SVOCs, Pesticide/PCBs, TAL total and dissolved Inorganics, TDS and Chloride	3 (MS/MSD) VOCs, SVOCs, PEST/PCBs, TAL Inorganics only	See Worksheet 21

[1] SOP or worksheet that describes the sample collection procedures.

[2] All samples are grab samples unless cited as composite in the “Depth” column.

[3] Soil samples will be collected only if visual/PID/odor screening suggests the presence of contamination.

Page Intentionally Left Blank

SAP Worksheet #19 — Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[1]	Containers (number, size, and type)	Sample Volume[2] (units)	Preservation Requirements (chemical, temperature, light-protected)	Maximum Holding Time[3] (preparation / analysis)
SS&SB&SD	VOC	SW846 8260, 8260-SIM / CA-202, CA-220,5035 / CA-214	(4) 5-gram EnCores	(4) 5-gram EnCores	(4 ± 2) °C	48 hours from collection to preservation into three water-preserved vials and one methanol-preserved vial; 48 hours from collection to freezing of low-level preserved vials; 14 days from collection to analysis of water-preserved or methanol-preserved vial.
SS&SB&SD	SVOC[4]	SW846 8270, 8270-SIM, 3540, 3550/ CA-204, CA-213, CA-512, CA-526	(1) 4 oz. soil jar	30 g	(4 ± 2) °C	14 Days / 40 Days
SS&SB&SD	PEST/PCB[4]	SW846 8081, 8082, 3540, 3545, 3550 / CA-302, CA-329, CA-500, CA-524, CA-537	(1) 4 oz. soil jar	30 g	(4 ± 2) °C	14 Days / 40 Days
SS&SB&SD	EXPLO	SW-846 8330 / CA-402	(1) 4 oz. amber glass soil jar	TBD	(4 ± 2) °C, protect from light	14 Days / 40 Days
		SW-846 6850 / BR-LC-004	(1) 4 oz. amber glass soil jar	TBD	(4 ± 2) °C, headspace in jar, protect from light	14 Days
SS&SB&SD	TPH (GRO)	SW846 8015M, 5035 / CA-316, CA-214	(2) 5-gram EnCores	(2) 5-gram EnCores	(4 ± 2) °C	14 Days
	TPH (DRO)[4]	SW846 8015M, 3540, 3545, 3550 / CA-315, CA-527, CA-535	(1) 4 oz. soil jar	30 g	(4 ± 2) °C	14 Days / 40 Days
SS&SB&SD	METAL[7]	SW846 6020, 7471, 9012, 3050 / CA-627, CA-611, CA-773, CA-605	(1) 2 oz. soil jar	1 g	(4 ± 2) °C	28 Days (Hg), 14 Days (CN), 6 Months (all others)
SS&SB&SD	GRAINSIZE	ASTM D422 / BR-GT-006	(1) 500 mL wide mouth glass or poly or (1) 1 gallon Ziploc (double bagged)	500 g	N/A	N/A
SS&SB&SD	WCHEM	SW-846 9045C / CA-709	(1) 4 oz. soil jar	20 g	(4 ± 2) °C	As soon as possible
		Lloyd Kahn / CA-741	(1) 4 oz. soil jar	100 g	(4 ± 2) °C	14 Days
		ASTM D2937 / BR-GT-018	(1) 4 oz. soil jar	TBD	N/A	N/A
GW&AQ&SW	VOC	SW846 8260, 8260-SIM, 5030 / CA-202, CA-220, CA-320	(3) 40 mL VOA vial	40 mL	HCL to pH < 2, (4 ± 2) °C, zero-headspace	14 Days
GW&AQ&SW	SVOC[5]	SW846 8270, 8270-SIM, 3510, 3520 / CA-204, CA-213, CA-502	(2) 1000 mL amber glass	1000 mL	(4 ± 2) °C	7 Days / 40 Days
GW&AQ&SW	PEST/PCB[5]	SW846 8081, 8082, 3510, 3520/ CA-302, CA-329, CA-515	(2) 1000 mL amber glass	1000 mL	(4 ± 2) °C, protect from light	7 Days / 40 Days
GW&AQ&SW	EXPLO[6]	SW-846 8330 / CA-402	(2) 1000 mL amber glass	TBD	(4 ± 2) °C, headspace in jar, protect from light	7 Days / 40 Days

SAP Worksheet #19 — Analytical SOP Requirements Table (continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[1]	Containers (number, size, and type)	Sample Volume[2] (units)	Preservation Requirements (chemical, temperature, light-protected)	Maximum Holding Time[3] (preparation / analysis)
GW&AQ&SW	EXPLO	SW-846 6850 / BR-LC-004	(1) 250 mL plastic	TBD	Field filtering with 0.2 um PTFE membrane filter; (4 ± 2) °C, headspace in jar, protect from light	14 Days
GW&AQ&SW	TPH-DRO	SW-846 8015M, 3510 / CA-315, CA-520	(2) 1000 mL amber	1000 mL	(4 ± 2) °C, protect from light	7 Days / 40 Days
	TPH-GRO	SW-846 8015M, 5030 / CA-316, CA-320	(2) 40 mL VOA vial	40 mL	HCL to pH < 2, (4 ± 2) °C, zero-headspace	14 Days
GW&AQ&SW	METAL[7]	SW-846 6020, 7470, 9012, 3010 / CA-627. CA-615, CA-773, CA-604.	(1) 500 mL plastic	250 mL	HNO_3 to pH <2, (4 ± 2) °C	28 Days (Hg), 6 Months (all others)
			(1) 250 mL plastic	125 mL	NaOH to pH >14, (4 ± 2) °C	14 Days (CN)
GW&AQ&SW	FMETAL	SW-846 6020, 7470, 3010 / CA-627, CA-615, CA-604.	(1) 500 mL plastic	250 mL	HNO_3 to pH <2, (4 ± 2) °C	28 Days (Hg), 6 Months (all others)
GW&AQ&SW	WCHEM	EPA 300.0 / CA-742	(1) 250 mL plastic	2 mL	(4 ± 2) °C	28 Days for Cl
		EPA 160.2 / CA-720	(1) 500 mL plastic	100 mL	(4 ± 2) °C	7 Days
		SW-846 9060 / CA-763	(2) 40 mL VOA vial	(1) VOA Vial	(4 ± 2) °C	28 Days
LIQ	TCLPV	SW-846 1311, 8260 / CA-209, CA-202, CA-320	Share (4) 1 L amber glass	200 mL	(4 ± 2) °C	14 Days from TCLP extraction
LIQ	TCLPS[5]	SW-846 1311, 8270, 3510, 3520 / CA-204, CA-502, CA-510		200 mL	(4 ± 2) °C	7 Days from TCLP extraction / 40 Days
LIQ	TCLPP[5]	SW-846 1311, 8081, 3510, 3520 / CA-302, CA-515		200 mL	(4 ± 2) °C	7 Days from TCLP extraction / 40 Days
LIQ	TCLPH	SW-846 1311, 8151, 3510 / CA-305, CA-516, CA-510		200 mL	(4 ± 2) °C	7 Days from TCLP extraction / 40 Days
LIQ	TCLPM	SW-846 1311, 6010, 3010, 7470 / CA-608, CA-604, CA-615, CA-510		250 mL	(4 ± 2) °C	28 Days (Hg), 6 Months (all others) from TCLP extractions
LIQ	REACT	SW-846 Section 7.3.9014 / CA-733		20 mL	(4 ± 2) °C	14 Days (CN)
		SW-846 Section 7.3 9034 / CA-734		20 mL	(4 ± 2) °C	7 Days (S2-)
LIQ	CORR	SW-846 9045 / CA-709		10 mL	(4 ± 2) °C	As soon as possible
LIQ	IGN	Pensky Martens / CA-736		100mL	(4 ± 2) °C	14 Days

1 Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
2 Provide the minimum sample volume or mass requirement if it differs from the container volume.
3 Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.
4 The laboratory will use 3550 (sonication) unless a difficult matrix necessitations the use of 3540 (soxhlet) or 3545 (pressurized fluid extraction).
5 The laboratory will use 3510 (separatory funnel extraction) unless a difficult matrix necessitates the use of 3520 (continuous liquid extraction)."
6 Section 8.2 of SW-846 6850 suggests that aqueous samples be sterilely filtered using 0.2 um PTFE membrane filters. Because it is easier to do this in a sterile laboratory environment, samples are typically filtered upon receipt at the laboratory.
7 The METAL analysis group includes metals, mercury, and cyanide. The FMETAL analysis group includes metals and mercury.

SAP Worksheet #20 — Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Samples and/or Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks[5]	No. of Equip. Blanks[5]	No. of VOA Trip Blanks[5]	No. of PT Samples[3]	Total No. of Samples to Lab
SWMU 1									
SO/SB	VOC w/EnCore	40	4	2		14	14		74
SO/SB	SVOC (+1,4-Dioxane)	40	4	2		14			60
SO/SB	PEST/PCB	40	4	2		14			60
SO/SB	METAL	40	4	2		14			60
SO/SB	EXPLO (+ Perchlorate)	40	4	2		14			60
SO/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SO/SB	GRAINSIZE	2							2
SS/SB or SD[4]	VOC w/EnCore	14	2	1		2	2		21
SS/SB or SD[4]	SVOC (+1,4-Dioxane)	14	2	1		2			19
SS/SB or SD[4]	PEST/PCB	14	2	1		2			19
SS/SB or SD[4]	METAL	14	2	1		2			19
SS/SB or SD[4]	EXPLO (+Perchlorate)	14	2	1		2			19
SS/SB or SD[4]	WCHEM (pH, TOC)	14							14
SS/SB or SD[4]	Buld Density	1							1
SS/SB or SD[4]	GRAINSIZE	14							14
SW	VOC	7	1	1		2	2		13
SW	SVOC (+1,4-Dioxane)	7	1	1		2			11
SW	PEST/PCB	7	1	1		2			11
SW	METAL	7	1	1		2			11
SW[4]	FMETAL	7	1	1		2			11
SW	EXPLO (+Perchlorate)	7	1	1		2			11
GW	VOC	9	1	1		6	6		23
GW	SVOC (+1,4-Dioxane)	9	1	1		6			17
GW	PEST/PCB	9	1	1		6			17
GW	METAL	9	1	1		6			17
GW	FMETAL	9	1	1		6			17
GW	EXPLO (+Perchlorate)	9	1	1		6			17
GW	WCHEM (Chloride and TDS)	4							4
SWMU 2									
SS/SB	VOC (BTEX and MTBE only) w/EnCore	24	3	2		5	5		39
SS/SB	SVOC (SIM only)	24	3	2		5			34
SS/SB	METAL (Pb only)	24	3	2		5			34
SS/SB	TPH (GRO)	24	3	2		5	5		39
SS/SB	TPH (DRO)	24	3	2		5			34
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	4							4
SS/SB	GRAINSIZE	4							4

SAP Worksheet #20 — Field Quality Control Sample Summary Table (continued)

Matrix	Analytical Group	No. of Samples and/or Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks[5]	No. of Equip. Blanks[5]	No. of VOA Trip Blanks[5]	No. of PT Samples[3]	Total No. of Samples to Lab
Regional Groundwater Study—Wells South of Camp Garcia									
GW	VOC	2	1	1		1	1		6
GW	SVOC (+1,4-Dioxane)	2	1	1		1			5
GW	**PEST/PCB**	2	1	1		1			5
GW	METAL	2	1	1		1			5
GW	FMETAL	2	1	1		1			5
GW	WCHEM (Chloride and TDS)	2							2
SWMUs 6&7									
SS/SB	VOC w/EnCore	12	2	1		2	2		19
SS/SB	SVOC (+1,4-Dioxane)	12	2	1		2			17
SS/SB	METAL	12	2	1		2			17
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
SWMU 10									
SS/SB	METAL (Tl only)	16	2	1		3			22
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
GW	METAL (Tl only)	5	1	1		2			9
GW	FMETAL (Tl only)	5	1	1		2			9
GW	WCHEM (Chloride and TDS)	2							2
AOC A									
SB	TPH (DRO)	15	2	1		3			21
SO/SB	TPH (DRO) (fast TAT)	1							1
AOC G									
SS/SB	VOC w/EnCore	4	1	1		1	1		8
SS/SB	SVOC (+1,4-Dioxane)	4	1	1		1			7
SS/SB	METAL	4	1	1		1			7
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PI-4									
GW	VOC	7	1	1		4	4		17
GW	WCHEM (Chloride and TDS)	2							2
PI-7									
SS/SB	VOC w/EnCore	26	3	2		10	10		51

SAP Worksheet #20 — Field Quality Control Sample Summary Table (continued)

Matrix	Analytical Group	No. of Samples and/or Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks[5]	No. of Equip. Blanks[5]	No. of VOA Trip Blanks[5]	No. of PT Samples[3]	Total No. of Samples to Lab
SS/SB	SVOC (+1,4-Dioxane)	26	3	2		10			41
SS/SB	METAL	26	3	2		10			41
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PAOC L									
SS	PEST	8	1	1		2			12
SS	WCHEM (pH, TOC, and Dry Bulk Density)	1							1
SS	GRAINSIZE	1							1
GW	VOC	1	1	1		1	1		5
GW	SVOC (+1,4-Dioxane)	1	1	1		1			4
GW	PEST/PCB	1	1	1		1			4
GW	METAL	1	1	1		1			4
GW	FMETAL	1	1	1		1			4
GW	WCHEM (Chloride and TDS)	1							1
PI-5									
SS/SB	VOC w/EnCore	16	2	1		4	4		27
SS/SB	SVOC (+1,4-Dioxane)	16	2	1		4			23
SS/SB	METAL	16	2	1		4			23
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PI-6									
SS/SB	VOC w/EnCore	2	1	1		3	3		10
SS/SB	SVOC (+1,4-Dioxane)	2	1	1		3			7
SS/SB	PCB	6	1	1		3			11
SS/SB	METAL	2	1	1		3			7
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PI-8									
SS/SB	VOC w/EnCore	16	2	1		6	6		31
SS/SB	SVOC (+1,4-Dioxane)	18	2	1		6			27
SS/SB	PCB	12	2	1		6			21
SS/SB	METAL	22	3	2		6			33
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	4							4
SS/SB	GRAINSIZE	4							4

SAP Worksheet #20 — Field Quality Control Sample Summary Table (continued)

Matrix	Analytical Group	No. of Samples and/or Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks[5]	No. of Equip. Blanks[5]	No. of VOA Trip Blanks[5]	No. of PT Samples[3]	Total No. of Samples to Lab
PI-10									
SS/SB	VOC w/EnCore	6	1	1		2	2		12
SS/SB	SVOC (+1,4-Dioxane)	6	1	1		2			10
SS/SB	METAL	6	1	1		2			10
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PAOC I									
SS/SB	VOC w/EnCore	10	1	1		2	2		16
SS/SB	SVOC (+1,4-Dioxane)	10	1	1		2			14
SS/SB	PCB	10	1	1		2			14
SS/SB	METAL	10	1	1		2			14
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PAOC M									
SS/SB	VOC w/EnCore (BTEX and MTBE only)	8	1	1		1	1		12
SS/SB	SVOC (SIM only)	8	1	1		1			11
SS/SB	METAL (Pb only)	8	1	1		1			11
SS/SB	TPH (GRO)	8	1	1		1	1		12
SS/SB	TPH (DRO)	8	1	1		1			11
PAOC O									
SS/SB	VOC w/EnCore	4	1	1		1	1		8
SS/SB	SVOC (+1,4-Dioxane)	4	1	1		1			7
SS/SB	METAL	4	1	1		1			7
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PAOC P									
SS/SB	VOC w/EnCore (BTEX and MTBE only)	2	1	1		1	1		6
SS/SB	SVOC (SIM only)	2	1	1		1			5
SS/SB	METAL (Pb only)	2	1	1		1			5
SS/SB	TPH (GRO)	2	1	1		1	1		6
SS/SB	TPH (DRO)	2	1	1		1			5

SAP Worksheet #20 — Field Quality Control Sample Summary Table (continued)

Matrix	Analytical Group	No. of Samples and/or Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks[5]	No. of Equip. Blanks[5]	No. of VOA Trip Blanks[5]	No. of PT Samples[3]	Total No. of Samples to Lab
PAOC Q/R									
SS/SB	VOC w/EnCore	4	1	1		1	1		8
SS/SB	SVOC (+1,4-Dioxane)	4	1	1		1			7
SS/SB	METAL	4	1	1		1			7
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2
PAOC X									
SS/SB	VOC w/EnCore	11	2	1		4	4		22
SS/SB	SVOC (+1,4-Dioxane)	11	2	1		4			18
SS/SB	METAL	11	2	1		4			18
SS/SB	WCHEM (pH, TOC, and Dry Bulk Density)	2							2
SS/SB	GRAINSIZE	2							2

[1] Although the MS/MSD is not typically considered a field QC, it is included here because location determination is often established in the field.
[2] If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.
[3] The number of Batch or Project-specific proficiency testing (PT) samples are optional but highly recommended.
[4] SW/SD samples will be collected instead of SS/SB samples at these locations if the stream is inundated.
[5] Equipment blanks may be collected for VOCs samples because the soil may be obtained using split spoon, direct push acetate liner, hand auger, etc., which may require decontamination.
[5] Field blanks are not planned during this investigation. Instead, equipment blanks will be collected in the field, such that they are subject to field and equipment contamination.

Page Intentionally Left Blank

SAP Worksheet #21 — Project Sampling SOP References Table

MQAPP (CH2M HILL, 2007b) Reference numbers refer to the SOP number in the Final Master QAPP, EPR, Vieques, Puerto Rico.

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
MQAPP, A-1	Shallow Soil Sampling	CH2M HILL	Trowel/hand auger/direct push	Y	Allow the use of global positioning system (GPS) instead of measuring tape
MQAPP, A-2	Soil Sampling	CH2M HILL	Drill rig	Y	Direct push sampling techniques may also be used, once the sample tube is split open, follow the split-spoon sampling SOP.
MQAPP, A-3	Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils	ASTM D 1586-99	Split barrel samples	N	If using split barrel sampler
MQAPP, A-5	Homogenization of Soil and Sediment Samples	CH2M HILL	Sample containers, stainless steel spoons and stainless steel bowls	N	
MQAPP, A-6	Soil Sampling for VOCs Using the EnCore Sampler	CH2M HILL	EnCore Sampler	N	
MQAPP, A-7	Soil Boring Sampling-Split Spoon	CH2M HILL	Split Spoon	N	
MQAPP, A-8	Direct-Push Soil Sample Collection	CH2M HILL	Direct Push	N	
MQAPP, A-9	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)	ASTM D 2488-00	ASTM document	N	
MQAPP, A-10	Soil Boring Drilling and Abandonment	CH2M HILL	Drill rig	N	
MQAPP, B-1	Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling	CH2M HILL	Low Flow pump	N	
MQAPP, B-3	VOC Sampling - Water	CH2M HILL	VOA vials	Y	Use pre-preserved VOA vials.
MQAPP, C-1	Calibration and measurement with Field Instruments	CH2M HILL	Multi-parameter groundwater monitoring instrument	N	
MQAPP, C-3	Explosimeter	CH2M HILL	Explosimeter	N	
MQAPP, C-4	Operation of Drager Gas Detector	CH2M HILL	Drager tubes and pump	N	If needed
MQAPP, C-7	Volatile Monitoring with an OVA	CH2M HILL	FID	N	General SOP for FIDs
MQAPP, C-8	Volatile Monitoring by OVM	CH2M HILL	PID	N	
MQAPP, D-1	General Guidance for Monitoring Well Installation	CH2M HILL	Drill rig, well construction eqp.	N	
MQAPP, D-2	Installation of Shallow Monitoring Well	CH2M HILL	Drill rig, well construction eqp.	N	As necessary, generally wells are bedrock.
MQAPP, D-3	Installation of Surface-Cased Monitoring Wells	CH2M HILL	Drill rig, well construction eqp.	N	As necessary, generally wells do not require surface casing.
MQAPP, D-4	Installation of Bedrock Monitoring Wells	CH2M HILL	Drill rig, well construction eqp.	N	

SAP Worksheet #21 — Project Sampling SOP References Table (continued)

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
MQAPP, D-5	Monitoring Well and Borehole Abandonment	CH2M HILL	Drill rig, well abandonment eqp.	N	
MQAPP, E-1	Decontamination of Personnel and Equipment	CH2M HILL	Decon equipment	N	
MQAPP, E-2	Decontamination of Drilling Rigs and Equipment	CH2M HILL	Pressure washer	N	
MQAPP, G-2	Surface Water Sampling	CH2M HILL	Sample bottles	N	If needed at SWMU 1
MQAPP, G-5	Sediment Sampling	CH2M HILL	Grab sampler	N	If needed at SWMU 1
MQAPP, H-1	Preparing Field Log Books	CH2M HILL	Log book	N	
MQAPP, H-2	Water Level Measurements	CH2M HILL	Electric water level device	N	
MQAPP, H-7	Disposal of Waste Fluids and Solids	CH2M HILL	Water and soil drums	N	
MQAPP, H-8	Chain-of-Custody	CH2M HILL	SOP, tape, custody seals, electronic chain of custody forms	N	
MQAPP, H-9	Packaging and Shipping Procedures for Low-Concentration Samples	CH2M HILL	SOP	N	
MQAPP, H-10	Equipment Blank and Field Blank Preparation	CH2M HILL	Sample containers	N	
MQAPP, H-11	Civil Surveying	CH2M HILL	Professional surveyor	N	
MQAPP, H-14	Downhole Geophysics	CH2M HILL	Downhole camera	N	Video logging of Borehole
Attachment C-1	TPH Analysis using Petro-FLAG Field Assay Kit	Manufacturer (Dexsil)	PetroFLAG field assay kit	N	Manufacturers SOP, manual included as attachment Not included in MQAPP
Attachment C-2	Electromagnetic Induction	CH2M HILL	EM-31 or similar	N	Surface geophysical technique Not included in MQAPP
Attachment C-3	Magnetometry	CH2M HILL	Geometrics 858 Cesium Vapor magnetometer or similar	N	Surface geophysical technique Not included in MQAPP
Attachment C-4	Vegetation clearance SOP for Environmental Investigations	CH2M HILL	Vegetation clearance equipment	N	Not included in MQAPP
Attachment C-5	Slide hammer SOP	CH2M HILL	Slide hammer	N	Not included in MQAPP

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Resp. Person	SOP Reference
YSI pH probe	Calibrate probe using YSI Auto-Calibration Standard Solution			Daily, before use	Std X-0.2<Reading<Std X+0.2	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-1
YSI Specific conductance Probe	Calibrate probe using YSI Calibration Standard Solution			Daily, before use	±3%	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-1
Hach Turbidity Meter	Calibrate probe using Hach-Calibration Standard			Daily, before use	0.1 to 10 NTU standard - ±10%; 11 to 40 NTU standard - ±8%; 41 to 100 NTU standard - ±6.5%; >100 NTU standard - ±5%	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-1
YSI Dissolved oxygen and Temperature Probes	Calibrate probe using YSI-Calibration Standard Solution		During calibration of other probes, check these readings against the day's atmospheric pressure and ambient temperature Check sensor for bubbles and membrane for wrinkles or tear	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	"±3 mg/L DO of what the tabulated DO is for the measured temperature	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly. Follow manufacturer's instructions to remove bubble or replace torn membrane	FTL	MQAPP Attachment 1 C-1
YSI multi-meter	Calibrate probe using multiple Calibration Standard Solutions	Check mechanical and electronic parts, verify system continuity, check battery, and clean probes. Calibration check.	Visual Inspection	Daily before use, at the end of the day, and when unstable readings occur.	Stable readings after 3 minutes pH reads 4.0 +/- 3% conductivity reads 4.49 +/- 3%	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-1

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Resp. Person	SOP Reference
PID	Calibrate using ambient air and isobutylene 100ppm calibration gas	Recharge battery daily	Visual Inspection	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	Ambient air reads 0.0 ppm +/- 3% Isobutylene gas reads 100 ppm +/- 3% ambient air reads 0.0 ppm ±3%: (if possible).	Follow instructions in manual to clean sensor. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-8
FID	Calibrate using ambient air and methane 100ppm calibration gas	Recharge battery daily	Visual Inspection	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	Methane gas reads 100 ppm +/- 3% ambient air reads 0.0 ppm ±3%: (if possible)	Follow instructions in manual to clean sensor. Do not use this instrument if unable to calibrate properly.	FTL	MQAPP Attachment 1 C-7
ORP	Calibrate using ORP standard solution	check batteries and have a replacement set on hand	Visual inspection	Daily, before use, at the end of the day (if practicable), and when unstable readings occur	±10 mV of the theoretical redox standard value at that temperature	Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly	FTL	MQAPP Attachment C-1
Groundwater sampling pumps and tubing	No calibration required	N/A	Inspect pumps, tubing and air/sample line quick-connects	Regularly	Maintained in good working order per manufacturer's recommenda-tions	Replace items	Field Team Lead	MQAPP Attachment 1 B-1
TPH field assay kit	Daily prior to use, after every 10 samples, and if the ambient temperature varies by more than ±10 °C from the original calibration temperature.	Recharge the battery prior to use and keep the instrument out of sunlight when not in use.		Daily	Manufacturers recommendation	Replace items	Field Team Lead	SAP Attachment C-1 I-1

SAP Worksheet #23 — Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (y/n)
BR-GT-006	Particle Size Analysis ASTM D422-63, 01/08, Rev. 5	Definitive	SS, SB, SD / GRAINSIZE	N/A	TestAmerica Laboratories, Burlington, Vermont	N
BR-GT-018	Density of Soil in Place by the Drive Cylinder Method, 01/08, Rev. 4	Definitive	SS, SB, SD / WCHEM	N/A	TestAmerica Laboratories, Burlington, Vermont	N
BR-LC-004	Perchlorate by LC/MS/MS [SW-846 Method 6850], 01/08, Rev. 0	Definitive	GW, SW, AQ, SS, SB, SD / EXPLO (Perch)	LC/MS/MS	TestAmerica Laboratories, Burlington, Vermont	N
CA-202	Analysis of VOAs by Purge and Trap GC/MS: SW-846 Method 8260, 03/08, Rev. 9	Definitive	GW, SW, AQ, IDW, SS, SB, SD / VOC	GC/MS	Katahdin Analytical Services, Inc.	N
CA-204	Analysis of SVOAs by Capillary Column GC/MS: SW-846 Method 8270, 02/08, Rev. 9	Definitive	GW, SW, AQ, IDW, SS, SB, SD / SVOC	GC/MS	Katahdin Analytical Services, Inc.	N
CA-209	Zero Headspace Extraction (ZHE) Of Volatile Samples For Toxicity Characteristic Leaching Procedure (TCLP) Method 1311, 02/07, Rev. 4	Definitive	IDW / TCLP	Rotary Extractor	Katahdin Analytical Services, Inc.	N
CA-213 [2]	Analysis of Semivolatile Organic Compounds By: SW 846 Method 8270 – Modified For Selected Ion Monitoring (SIM), 02/08, Rev. 5	Definitive	GW, SW, AQ, IDW, SS, SB, SD / SVOC	GC/MS	Katahdin Analytical Services, Inc.	Y
CA-214	Closed-System Purge-And-Trap And Extraction For Volatile Organics In Soil And Waste Samples Using SW-846 Method 5035, 04/06, Rev. 4	Definitive	SS, SB / VOC, TPH (GRO)	Tekmar, Arcon, Encon	Katahdin Analytical Services, Inc.	N
CA-220	Analysis Of Volatile Organic Compounds By Purge And Trap GC/MS SW-846 Method 8260 – Modified For Selected Ion Monitoring (SIM), 06/07, Rev. 5.	Definitive	GW, SW, AQ, IDW, SS, SB, SD / VOC	GC/MS	Katahdin Analytical Services, Inc.	N
CA-302	Analysis of Pesticides By Gas Chromatography/Electron Capture Detector (GC/ECD): SW-846 Method 8081, 01/08, Rev. 8	Definitive	GW, SW, AQ, IDW, SS, SB, SD / PEST	GC/ECD	Katahdin Analytical Services, Inc.	N
CA-305	Analysis of Chlorinated Herbicides By GC Using Methylation Derivatization: SW-846 Method 8151, 01/08, Rev. 6	Definitive	IDW / HERB	GC/ECD	Katahdin Analytical Services, Inc.	N
CA-315	Determination of Extractable Petroleum Hydrocarbons or Diesel Range Organics (DRO) By Modified Methods 8015 And 8100, 01/08, Rev. 7	Definitive	SS, SB, GW, AQ / TPH (DRO)	GC/FID	Katahdin Analytical Services, Inc.	N
CA-316	Method For Determining Volatile Petroleum Hydrocarbons Or Gasoline Range Organics (GRO) By Modified Method 8015, 02/08, Rev. 7	Definitive	SS, SB, GW, AQ / TPH (GRO)	GC/FID	Katahdin Analytical Services, Inc.	N
CA-320	Purge and Trap Extraction of Volatiles for GC Analysis - Method 5030, 03/06, Rev. 3	Definitive	GW, AQ / VOC, TPH (GRO)	Tekmar, Arcon, Encon	Katahdin Analytical Services, Inc.	N

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

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (y/n)
CA-329	Analysis Of PCBs As Total Arochlors By Gas Chromatography/Electron Capture Detector (GC/ECD): SW-846 Method 8082, 01/08, Rev. 7	Definitive	GW, SW, AQ, SS, SB, SD / PCB	GC/ECD	Katahdin Analytical Services, Inc.	N
CA-402	Determination Of Nitroaromatics And Nitramines By HPLC Method 8330, 07/08, Rev. 3.	Definitive	GW, SW, AQ, SS, SB, SD / EXPLO	HPLC	Katahdin Analytical Services, Inc.	N
CA-500	Preparation Of Sediment/Soil Samples By Sonication Using Method 3550 For Subsequent Pesticides/PCBs Analysis, 09/07, Rev. 4.	Definitive	SS, SB, SD / PEST, PCB	Sonication	Katahdin Analytical Services, Inc.	N
CA-502	Preparation Of Aqueous Samples For Extractable Semivolatile Analysis, 09/07, Rev. 4	Definitive	GW, AQ / SVOC	Separtory Funnel / CLLE	Katahdin Analytical Services, Inc.	N
CA-510	Toxicity Characteristic Leaching Procedure (TCLP) For Inorganic And Non-Volatile Organic Analytes, 03/08, Rev. 4	Definitive	IDW / TCLP	Rotary Extractor	Katahdin Analytical Services, Inc.	N
CA-512	Preparation Of Sediment/Soil Samples By Sonication Using Method 3550 For Subsequent Extractable Semi-Volatiles Analysis, 09/07, Rev. 5.	Definitive	SS, SB, SD / SVOC	Sonication	Katahdin Analytical Services, Inc.	N
CA-515	Preparation of Aqueous Samples for Pesticides/PCBs Analysis, 09/07, Rev.4	Definitive	GW, SW, AQ, IDW/PEST.	Separtory Funnel / CLLE	Katahdin Analytical Services, Inc.	N
CA-516	Preparation of Aqueous Samples for Herbicides by Method 8151, 03/08, Rev. 4	Definitive	IDW / HERB	Separtory Funnel	Katahdin Analytical Services, Inc.	N
CA-520	Preparation Of Aqueous Samples For Analysis of Extractable Petroleum Hydrocarbons Or Diesel Range Organics (DRO), 09/07, Rev. 4	Definitive	GW, AQ / TPH (DRO)	Separatory Funnel / CLLE	Katahdin Analytical Services, Inc.	N
CA-524	Preparation Of Sediment/Soil Samples By Soxhlet Extraction Using Method 3540 For Pesticide/PCB Analysis, 09/07, Rev. 4	Definitive	SS, SB, SD / PEST, PCB	Soxhlet	Katahdin Analytical Services, Inc.	N
CA-526	Preparation Of Sediment/Soil Samples By Soxhlet Extraction Using Method 3540 For Subsequent Extractable Semivolatile Analysis, 09/07, Rev. 4.	Definitive	SS, SB, SD / SVOA	Soxhlet	Katahdin Analytical Services, Inc.	N
CA-527	Preparation Of Sediment/Soil Samples By Soxhlet Extraction Using Method 3540 For Subsequent Extractable Total Petroleum Hydrocarbon (TPH) Or Diesel Range Organic (DRO) Analysis, 09/07, Rev. 3	Definitive	SS, SB / TPH (DRO)	Soxhlet	Katahdin Analytical Services, Inc.	N
CA-535	Preparation of Sediment/Soil Samples By Sonication Using Method 3550 For Subsequent Diesel Range Organics (DRO) or Total Petroleum Hydrocarbons (TPH) Analysis, 09/07, Rev. 3	Definitive	SS, SB / TPH (DRO)	Sonication	Katahdin Analytical Services, Inc.	N
CA-537	Preparation of Sediment/Soil and Tissue Samples by Accelerated Solvent Extraction Using Method 3545 for Subsequent Extractable Pesticide and PCB Analysis, 04/06, Rev. 0.	Definitive	SS, SB, SD / PEST, PCB	ASE	Katahdin Analytical Services, Inc.	N

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

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (y/n)
CA-604	Acid Digestion of Aqueous Samples By EPA Method 3010 for ICP Analysis of Total or Dissolved Metals, 01/08, Rev. 3	Definitive	GW, SW, AQ / METAL	Digestion Block	Katahdin Analytical Services, Inc.	N
CA-605	Acid Digestion of Solid Samples by USEPA Method 3050 for Metals Analysis by ICP-AES and ICP-MS	Definitive	SS, SB, SD / METAL	Digestion Block	Katahdin Analytical Services, Inc.	N
CA-608	Trace Metals Analysis By ICP-AES Using EPA Method 6010, 09/07, Rev. 6	Definitive	IDW / METAL	ICP	Katahdin Analytical Services, Inc.	N
CA-611	Digestion And Analysis Of Solid Samples For Mercury By USEPA Method 7471, 03/08, Rev. 4.	Definitive	SS, SB, SD / METAL (Hg)	Mercury Analyzer	Katahdin Analytical Services, Inc.	N
CA-615	Digestion And Analysis Of Aqueous Samples For Mercury By USEPA Method 7470, 04/08, Rev. 2	Definitive	IDW / METAL (Hg)	Mercury Analyzer	Katahdin Analytical Services, Inc.	N
CA-627	Trace Metals Analysis By ICP-MS Using USEPA Method 6020, 04/08,Rev. 4.	Definitive	SS, SB, SD, GW, SW, AQ/METAL	ICPMS	Katahdin Analytical Services, Inc.	N
CA-629	Operation and Maintenance of CETAC M-6100 Automated Mercury Analyzer, 04/06, Rev. 0	Definitive		Mercury Analyzer	Katahdin Analytical Services, Inc.	N
CA-632	Operation and Maintenance of the Thermo ICAP 6500 ICP Spectrometer, 05/08, Rev. 0	Definitive		ICP	Katahdin Analytical Services, Inc.	N
CA-709	pH Concentration Measurements In Soil Matrices - SW 846 Method 9045, 02/07, Rev. 6	Definitive	SS, SB, SD, IDW/CORR, WCHEM	pH Meter	Katahdin Analytical Services, Inc.	N
CA-720	Total Dissolved Solids (Non-Filterable Residue) by EPA Method 160.2 and Standard Methods 2540 D, 02/08, Rev. 3	Definitive	GW, SW, AQ / WCHEM (TDS)	Gravimetric	Katahdin Analytical Services, Inc.	N
CA-733	Reactive Cyanide SW-846 Chapter Seven, 7.3.3.2, 02/08, Rev. 3	Definitive	IDW / REACT (CN)	Konelab	Katahdin Analytical Services, Inc.	N
CA-734	Reactive Sulfide SW-846 Chapter Seven, 7.3.4.2, 01/08, Rev. 3	Definitive	IDW / REACT (S2)	Titrimetric	Katahdin Analytical Services, Inc.	N
CA-736	Test Method for Flash Point by Pensky-Martens Closed-Cup Tester, 06/08, Rev. 3	Definitive	IDW / IGN	Flash Point Apparatus	Katahdin Analytical Services, Inc.	N
CA-741	Determination of Total Organic Carbon in Solids Using the EPA Region II Lloyd Kahn Method, 06/08, Rev. 2	Definitive	SS, SB, SD / WCHEM (TOC)	TOC Analyzer	Katahdin Analytical Services, Inc.	N
CA-742	Anions by Ion Chromatography (IC) – Method 300.0, 06/08, Rev. 5	Definitive	GW, SW, AQ / WCHEM (Anions)	IC	Katahdin Analytical Services, Inc.	N
CA-763	Analysis of TOC, DOC, and TIC in Aqueous Samples using the Shimadzu Carbon Analyzer: EPA Method 415.1, SW-846 9060 and SM5310B, 06/08, Rev. 3	Definitive	GW, SW, AQ / WCHEM (TOC)	TOC Analyzer	Katahdin Analytical Services, Inc.	N
CA-769	Operation And Maintenance Of The Automated Konelab Multiwavelength Photometric Analyzer, 03/08, Rev. 0	Definitive		Konelab	Katahdin Analytical Services, Inc.	N
CA-773	Colorimetric Analysis Of Total And Ammenable Cyanide Using The Automated Konelab Multiwavelength Photometric Analyzer, 03/08, Rev. 0	Definitive	SS, SB, SD, GW, SW, AQ / METAL (CN)	Konelab	Katahdin Analytical Services, Inc.	N
SD-902	Sample Receipt and Internal Control, 02/08, Rev. 7	N/A		N/A	Katahdin Analytical Services, Inc.	N

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

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (y/n)
SD-903	Sample Disposal, 02/08, Rev. 3	N/A		N/A	Katahdin Analytical Services, Inc.	N

[1] If yes, then specify the modification that has been made. Note that any analytical SOP modification made relative to project specific needs must be reviewed and approved by the Navy QAO.

[2] SOP-CA-213 has been modified to include 1,4-Dioxane

SAP Worksheet #24 — Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
GC/FID (TPH-DRO)	Initial Calibration	IC-instrument receipt, major instrument change, when CC does not meet criteria	5 point calibration using Diesel component mix - coefficient of determination $\geq$ 0.990.	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Supervisor	CA-315
	Continuing Calibration	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	Opening CV - % D $\leq$ 20%, Closing CV - % D $\leq$ 25%	Evaluate the samples: If the %D >+20% and sample results are <PQL, narrate. If %D >±25% for closing CV, and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last acceptable CV.	Analyst, Supervisor	
GC/FID (TPH-GRO)	Initial Calibration	IC-instrument receipt, major instrument change, when CC does not meet criteria	6-point calibration using gasoline component mixture - coefficient of determination $\geq$ 0.990.	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Supervisor	CA-316
	Continuing Calibration	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	% D $\leq$ 20%	Evaluate the samples: If the %D >+20% and sample results are <PQL, narrate. If %D >±20% for closing CV, and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last accept	Analyst, Supervisor	
ICP-AES (SW-846 6010 and TCLP Metals)	Initial calibration	At the beginning of each day or if QC is out of criteria.	IC – According to instrument manufacturer.	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards.	Analyst, Supervisor	CA-608
	Initial calibration verification and continuing calibration verification	At the beginning and end of each run sequence after every 10 samples and at end of run.	CV – 90-110% Acceptance criteria	Check problem, recalibrate and reanalyze any samples not bracketed by passing CCVs. If the CCV fails high, consult with client and report samples that are <PQL.	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
ICP/MS (SW-846 6020)	Tune	Daily prior to calibration	Mass calibration within 0.1 amu of true value, Resolution < 0.9 amu at 10% peak height	Perform necessary equipment maintenance	Analyst, Supervisor	CA-627
	Initial calibration	Daily prior to sample analysis.	4 point calibration plus blank – correlation coefficient ≥ 0.995.	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards	Analyst, Supervisor	
	Calibration Verification (CV)	At the beginning and end of each run sequence and every 10 samples	90-110% of True Values	Check problem, recalibrate and reanalyze any samples not bracketed by passing CCVs.	Analyst, Supervisor	
Mercury Analyzer (SW846 7470, 7471 Hg and TCLP Hg)	Initial calibration	At the start of each run	Correlation coefficient >/=0.995.	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards	Analyst, Supervisor	CA-611, CA-615
	Initial calibration verification	ICV-Analyzed after the initial calibration	Includes analysis of a calibration blank and five calibration standards. Must fall within 90-110% of the expected value.	Results may not be reported from the run until the problem is corrected and a passing ICV has been analyzed.	Analyst, Supervisor	
	Continuing calibration verification	CCV-After the Initial Calibration, after every 10 samples, and at the end of the analytical run.	80-120% of True Value	Check problem, recalibrate and reanalyze any samples not bracketed by passing CCVs. If the CCV fails high, consult with client and report samples that are <PQL.	Analyst, Supervisor	
TOC analyzer	Initial calibration	Initial Calibration- initially, when the daily CCV does not pass, but, no longer than every 3 months.	Correlation coefficient >/= 0.995	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards	Analyst, Supervisor	CA-741, CA-763
	Continuing calibration	CCV-every 10 samples and at the end of the run	A six-point calibration will be run. 80-120% of true value for 415.1 75-125% of true value for Lloyd Kahn	If the CCV fails high, report samples that are <PQL. Recalibrate and/or reanalyze samples back to last acceptable CCV recovery.	Analyst, Supervisor	
Konelab – SW846 9012 (Cyanide)	Initial calibration	Daily prior to sample analysis.	7 point calibration; Correlation coefficient >/= 0.995	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards	Analyst, Supervisor	CA-773
	Calibration Verification (CV)	CV -at beginning and end of each run sequence and every 10 samples	+/- 15% of True Value	If the CCV fails high, report samples that are <PQL. Recalibrate and/or reanalyze samples back to last acceptable CCV recovery.	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
GC/MS SW846 8260,	Initial Calibration	ICAL – Instrument receipt, instrument change (new column, source cleaning, etc.), when CCV is out of criteria.	Six-point initial calibration for all analytes	Repeat calibration if criterion is not met	Analyst, Supervisor	CA-202
			RSD ≤30 for CCC's; SPCC's RFs ≥ 0.10 or 0.30. %RSD ≤ 15% for all other compounds.			
	Calibration Verification (CV)	CCV – at the beginning of each 12 hour shift	RSD ≤20 for CCC's ; SPCC's RFs ≥ 0.10 or 0.30.	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification. Notify client for corrective action if there are sporadic failures.	Analyst, Supervisor	
	BFB Tune	Every 12 hours	Mass - Criteria	Retune and/or clean source	Analyst, Supervisor	
			50 - 15.0-40.0% of mass 95			
			75 - 30.0-60% of mass 95			
			95 - base peak, 100% relative abundance			
			96 - 5.0-9.0% of mass 95			
			173 - less than 2.0% of mass 174			
			174 - greater than 50.0% of mass 95			
			175 - 5.0-9.0% of mass 174			
			176 - 95.0 - 101% of mass 174			
			177 - 5.0-9.0% of mass 176			
8260-SIM	Initial Calibration (six point)	Prior to sample analysis	VOC RSD < 15%	Repeat Initial Calibration	Analyst, Supervisor	CA-220
	Calibration Verification	Once per each 12 hours, prior to sample analysis	RF for VOCs within 15% of average initial multi-point RF	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification.	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
GC/MS(SW846 8270	Initial Calibration	ICAL – Instrument receipt, instrument change (new column, source cleaning, etc.), when CCV is out of criteria.	Six-point initial calibration for all analytes	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification	Analyst, Supervisor	CA-204
			RSD ≤30 for CCC's; SPCC's RFs ≥ 0.050. %RSD ≤ 15% for all other compounds.			
	Calibration Verification (CV)	CCV – at the beginning of each 12 hour shift	RSD ≤20 for CCC's ; SPCC's RFs ≥ 0.050.	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification. Notify client for corrective action if there are sporadic failures.	Analyst, Supervisor	
	BFB Tune	Every 12 hours	Mass - Criteria	Retune and/or clean source	Analyst, Supervisor	
			51 30.0 to 60.0 % of mass 198			
			68 less than 2.0 % of mass 69			
			69 present			
			70 less than 2.0 % of mass 69			
			127 40.0-60.0 % of mass 198			
			197 less than 1.0 % of mass 198			
			198 base peak, 100 % relative abundance			
			199 5.0-9.0 % of mass 198			
			275 10.0-30.0 % of mass 198			
			365 greater than 1.0 % of mass 198			
			441 present, but less than mass 443			
			442 greater than 40% of mass 198			
			443 17.0-23.0 % of mass 442			
8270-SIM	Initial Calibration	Initial calibration prior to sample analysis	RSD ≤30 for RFs of the CCCs, Average %RSD <15% for all compounds.	Repeat calibration if criteria are not met.	Analyst, Supervisor	CA-213
	Calibration Verification	Once per each 12 hours, prior to sample analysis.	CCCs ≤20%D	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
GC/ECD (SW846 8081)	Initial Calibration	IC-instrument receipt, major instrument change, when CC does not meet criteria	6-point calibration of all pesticides except for toxaphene and chlordane - Coefficient of determination $\geq$ 0.990. Mid point calibration standard for toxaphene and chlordane.	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Supervisor	CA-302
	Continuing Calibration	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	% D $\leq$ 15%	Evaluate the samples: If the %D >+15% and sample results are <PQL, narrate. If %D >±15% only on one channel, narrate. If %D >±15% for closing CV, and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last accept	Analyst, Supervisor	
GC/ECD (SW846 8082)	Initial Calibration	IC-instrument receipt, major instrument change, when CC does not meet criteria.	6 pt calibration – coefficient of determination (r^2) ≥ 0.990	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data. If single pt cal Aroclor is identified in analysis of sample, 6-pt calibration run of identified compound with reanalysis of sample.	Analyst, Supervisor	CA-329
	Continuing Calibration	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	%D ≤ 15 for both the quantitation and confirmation columns	Evaluate the samples: If the %D >+15% and sample results are <PQL, narrate. If %D >±15% only on one channel, narrate. If %D >±15% for closing CV, and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last acceptable CV.	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
GC/ECD-TCLP Herbicides	Initial Calibration	IC-instrument receipt, major instrument change, when CC does not meet criteria	6-point calibration of all herbicides - Coefficient of determination ≥ 0.990.	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Supervisor	CA-305
	Continuing Calibration	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	% D ≤ 15%	Evaluate the samples: If the %D >+15% and sample results are <PQL, narrate. If %D >±15% only on one channel, narrate. If %D >±15% for closing CV, and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last accept	Analyst, Supervisor	
HPLC- Explosives	Initial Calibration	IC-instrument receipt, major instrument change, when CV does not meet criteria	5 pt calibration – coefficient of determination ≥ 0.990	Repeat Initial calibration and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Supervisor	CA-402
	Calibration Verification (CV)	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	15% D	(1) Evaluate the samples: If the %D > +15% and sample results are < PQL, narrate. If %D > ± 15% only on one channel, narrate. If %D > ± 15% and is likely a result of matrix interference, narrate. Otherwise, reanalyze all samples back to last acceptable CV.	Analyst, Supervisor	

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[2]	SOP Reference[1]
LC/MS/MS (Perchlorate)	Weighted Linear Regression Correlation Coefficient	Initially prior to sample analysis, when calibration verification standards indicate calibration relationship is no longer valid, whenever significant instrument maintenance is performed.	R^2 < or = 0.995	Perform Maintenance and re-calibrate	Analyst, Supervisor	BR-LC-004
	Initial Calibration	Whenever a new column is installed and when the CCV does not meet acceptance criteria.	6-points plus blank; r > 0.995	Correct the problem and repeat the calibration.	Analyst, Supervisor	
	ICV	Immediately after each initial calibration.	±15%	Correct the problem and reanalyze the ICV.	Analyst, Supervisor	
	CCV	Each day before sample analysis, after every 10 injections, and at the end of each analytical batch.	±50% for low-range standard and ±15% for mid-range standard	Samples before and after failing CCVs must be reanalyzed.	Analyst, Supervisor	
Ion Chromatograph	ICV	One per prep batch	90-110%R	If a high bias is indicated, report samples that are <MDL. Recalibrate and or reanalyze other samples	Analyst, Supervisor	CA - 742
	CCV	One after every 10 samples.	±10%	If a high bias is indicated, report samples that are <QL. Recalibrate and/or reanalyze samples back to last acceptable CCV recovery	Analyst, Supervisor	
TDS Balance	Initial demonstration of performance: precision and accuracy study using 4 replicate analyses LCS	Initially once per analyst, then annually per analyst	All recoveries within method QC acceptance limits.	Investigate source of problem, then rerun P&A Study	Analyst, Supervisor	CA-720
pH probe	2-point calibration with pH buffers with a midrange cal. Check	Once per day	±0.05pH units for every buffer	If calibration is not achieved, check meter, buffer solutions, and probe; replace if necessary, repeat calibration	Analyst, Supervisor	CA-709

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

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

Page Intentionally Left Blank

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

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[2]	SOP Reference[1]
ICP (METAL)	Clean torch assembly and spray chamber when discolored or when degradation in data quality is observed. Clean nebulizer, check argon, replace peristaltic pump tubing as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Torch, nebulizer chamber, pump, pump tubing	Prior to initial calibration and as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-608
TOC Combustion Analyzer (WCHEM)	Check level of dilution water, drain vessel water, humidifier water, auto sampler rinse water and phosphoric acid vessel and fill as needed. Replace oxygen cylinder.	QC standards	Tubing, sample boat, syringe, humidifier, rinse Reservoir, phosphoric acid vessel, oxygen pressure	Prior to initial calibration and as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-741, CA-763
GC/ECD (PEST/PCB)	Check pressure and gas supply daily. Change septa and/or liner as needed, replace or cut column as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Injector liner, septa, column, column flow.	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-302 and CA-329
GC/ECD (HERB)	Check pressure and gas supply daily. Change septa and/or liner as needed, replace or cut column as needed. Other maintenance specified in lab Equipment Maintenance SOP	QC standards	Injector liner, septa, column, column flow.	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-305
GC/FID (TPH (DRO))	Check pressure and gas supply daily. Change septa and/or GC injector glass liner as needed. Replace or cut GC column as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Injector liner, septa, column, column flow.	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-315
GC/FID (TPH (GRO))	Check pressure and gas supply daily. Bake out trap and column. Change trap as needed. Replace or cut GC column as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Column, column flow, purge lines, purge flow, trap	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-316
Konelab (METAL (CN only))	Check and clean segments weekly, clean reagent tubes monthly. Change lamp, change diluent and wash tubes, change mixing paddles and syringes, change dispensing needle, all as needed.	QC standards	Reagent tubes, lamp, wash tubes, paddles, syringes, dispensing needles.	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-773, CA-769
GC/MS (VOA)	Check pressure and gas supply daily. Bake out trap and column, manual tune if BFB not in criteria, change septa as needed, cut column as needed, change trap as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Ion source, injector liner, column, column flow, purge lines, purge flow, trap	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-202, CA-214, CA-220 and CA-320
GC/MS(SVOA)	Check pressure and gas supply daily. Manual tune if DFTPP not in criteria, change septa as needed, change liner as needed, cut column as needed. Other maintenance specified in lab Equipment Maintenance SOP	QC standards	Ion source, injector liner, column, column flow, purge lines, purge flow, trap	Prior to initial calibration and/or as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-204, CA-213

Page Intentionally Left Blank

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

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[2]	SOP Reference[1]
Mercury Analyzer (METAL (Hg))	Replace peristaltic pump tubing, replace mercury lamp, replace drying tube, clean optical cell and/or clean liquid/gas separator as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Tubing, sample probe, optical cell	Prior to initial calibration and as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-611, CA-615 and CA-629
ICP/MS (METAL)	Clean torch assembly and spray chamber when discolored or when degradation in data quality is observed. Clean nebulizer, check argon, replace peristaltic pump tubing as needed. Other maintenance specified in lab Equipment Maintenance SOP.	QC standards	Torch, nebulizer, spray chamber, pump tubing	Prior to initial calibration and as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-627
pH meter (WCHEM (pH))	Clean probe	QC standards	Probe	As necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-709
HPLC/MS/MS – (EXPLO (Perch))	Check and sonicate pump valves as needed. Backflush column as needed. Replace analytical column or guard column as needed. Sonicate and replace solvent with every use. Replace the UV lamp as needed. Check and replace seal-pak as needed. Check valves and change seals. Replace column.	QC standards. Acquire check standard, observe retention time stability, check for air in system expressed by cavitation of baseline. Observe chromatography and peak shape.	Column flow, pressure. Passing calibration and check standard.	Prior to initial calibration and/or as necessary.	Acceptable calibration or CV, stable calibration check standards	Correct the problem and repeat calibration or CV, Perform instrument maintenance	Analyst, Department Manager	CA-402 BR-LC-004
Ion Chromatograph (WCHEM (chloride))	Check regenerate pump tubing and replace as needed. Clean or regenerate column as needed. Replace analytical column or guard column as needed. Change suppressor as needed.	QC standards	Column flow, pressure	Prior to initial calibration and/or as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-742
Analytical Balance (WCHEM (TDS))	Clean and calibrate balances annually (minimum). Check balance calibration each day of use. Clean balance pan prior to each use.	Weights	Cleanliness	Prior to sample weighing	Acceptable daily calibration	Correct the problem and repeat calibration	Analyst, Department Manager	CA-720

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

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

Page Intentionally Left Blank

SAP Worksheet #26 — Sample Handling System

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/Katahdin Analytical Services, Inc.
Sample Custody and Storage (Personnel/Organization): Sample Receipt Personnel/Katahdin Analytical Services, Inc.
Sample Preparation (Personnel/Organization): Extractions Personnel/Katahdin Analytical Services, Inc.
Sample Determinative Analysis (Personnel/Organization): Analytical Personnel/Katahdin Analytical Services, Inc.

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.
Biological Sample Storage (No. of days from sample collection): N/A

SAMPLE DISPOSAL
Personnel/Organization: Environmental Health and Safety Office/Katahdin Analytical Services, Inc.
Number of Days from Analysis: Samples may be disposed of 90 days after report mail date

Page Intentionally Left Blank

SAP Worksheet #27 — Sample Custody Requirements Table

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 they do not separate.

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):

See the laboratory sample handling SOP: SD-902 "Sample Receipt and Internal Control" and SD-903 "Sample Disposal" for details on sample handling.

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 (with the exception of VOC 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 EIS to check sample IDs and parameters are correct.

SAP Worksheet #27 — Sample Custody Requirements Table (continued)

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.

SAP Worksheet #28-1 — Laboratory QC Samples Table

Matrix: SS&SB&SD
Analytical Group: VOC
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"Low"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reanalyze blank and samples >QL and < 10X the blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same 12 hour clock and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate Otherwise reprep and reanalyze the LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits, See Worksheet 28-1a, RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	RPD ≤ 30%

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

Matrix: SS&SB&SD
Analytical Group: VOC
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window + 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window + 0.5 minutes compared to CV RT
Surrogates	4 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a	Re-extract and re-analyze if sufficient sample volume is available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-1a

SAP Worksheet #28-1a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: SS&SB&SD
Analytical Group: VOC
Concentration Level: "Low" (SW-846 8260B)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Soil Accuracy % Recovery	Soil Precision RPD (1)
Volatile Organic Compounds			
Dichlorodifluoromethane	8260B	72-196	0-30 (nominal)
Chloromethane	8260B	78-146	0-30 (nominal)
Vinyl chloride	8260B	80-142	0-30 (nominal)
Bromomethane	8260B	70-165	0-30 (nominal)
Chloroethane	8260B	76-132	0-30 (nominal)
Trichlorofluoromethane	8260B	73-200	0-30 (nominal)
1,1-Dichloroethene	8260B	84-128	0-30 (nominal)
1,1,2-Trichloro-1,2,2-trifluoroethane	8260B	83-137	0-30 (nominal)
Acetone	8260B	74-200	0-30 (nominal)
Carbon disulfide	8260B	78-146	0-30 (nominal)
Methyl acetate	8260B	85-129	0-30 (nominal)
Methylene chloride	8260B	58-141	0-30 (nominal)
trans-1,2-Dichloroethene	8260B	83-121	0-30 (nominal)
Methyl tert-butyl ether	8260B	58-157	0-30 (nominal)
1,1-Dichloroethane	8260B	89-122	0-30 (nominal)
cis-1,2-Dichloroethene	8260B	80-111	0-30 (nominal)
2-Butanone	8260B	76-137	0-30 (nominal)
Bromochloromethane	8260B	90-134	0-30 (nominal)
Chloroform	8260B	90-126	0-30 (nominal)
1,1,1-Trichloroethane	8260B	87-133	0-30 (nominal)
Cyclohexane	8260B	87-133	0-30 (nominal)
Carbon tetrachloride	8260B	81-147	0-30 (nominal)
Benzene	8260B	80-119	0-30 (nominal)
1,2-Dichloroethane	8260B	85-136	0-30 (nominal)
Trichloroethene	8260B	86-116	0-30 (nominal)
Methylcyclohexane	8260B	80-123	0-30 (nominal)
1,2-Dichloropropane	8260B	86-114	0-30 (nominal)
Bromodichloromethane	8260B	83-126	0-30 (nominal)
cis-1,3-Dichloropropene	8260B	89-122	0-30 (nominal)
4-Methyl-2-pentanone	8260B	84-122	0-30 (nominal)
Toluene	8260B	86-119	0-30 (nominal)
trans-1,3-Dichloropropene	8260B	90-143	0-30 (nominal)
1,1,2-Trichloroethane	8260B	88-115	0-30 (nominal)
Tetrachloroethene	8260B	71-144	0-30 (nominal)
2-Hexanone	8260B	83-128	0-30 (nominal)
Dibromochloromethane	8260B	86-127	0-30 (nominal)
1,2-Dibromoethane	8260B	85-122	0-30 (nominal)
Chlorobenzene	8260B	88-115	0-30 (nominal)
Ethylbenzene	8260B	88-117	0-30 (nominal)
o-Xylene	8260B	90-119	0-30 (nominal)
m,p-Xylene	8260B	89-119	0-30 (nominal)
Styrene	8260B	90-121	0-30 (nominal)
Bromoform	8260B	87-134	0-30 (nominal)

SAP Worksheet #28-1a — LCS, MS/MSD and Surrogate Recovery Limits (continued)

Matrix: SS&SB&SD			
Analytical Group: VOC			
Concentration Level: "Low" (SW-846 8260B)			
Measurement Performance Criteria Table – Field QC Samples			
Target List	**EPA Method**	**Soil Accuracy % Recovery**	**Soil Precision RPD [(1)]**
Isopropylbenzene	8260B	90-137	0-30 (nominal)
1,1,2,2-Tetrachloroethane	8260B	74-128	0-30 (nominal)
1,3-Dichlorobenzene	8260B	81-118	0-30 (nominal)
1,4-Dichlorobenzene	8260B	86-121	0-30 (nominal)
1,2-Dichlorobenzene	8260B	86-117	0-30 (nominal)
1,2-Dibromo-3-chloropropane	8260B	78-137	0-30 (nominal)
1,2,4-Trichlorobenzene	8260B	79-129	0-30 (nominal)
1,2,3-Trichlorobenzene	8260B	82-124	0-30 (nominal)
Surrogates			
DBFM	8260B	67-118	--
1,2-DCA-d4	8260B	55-148	--
Toluene-d8	8260B	71-102	--
BFB	8260B	53-122	--

[(1)] Represented as Relative Percent Difference

SAP Worksheet #28-2 — Laboratory QC Samples Table

Matrix: SS&SB&SD						
Analytical Group: SVOC						
Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
"Low"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analytes detected > QL; up to 5 times QL for phthalate esters	Investigate source of contamination. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reprep and analyze method blank and all samples processed with the contaminated blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analytes detected > QL; up to 5 times QL for phthalate esters
Surrogates	6 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a	Re-extract and re-analyze if sufficient sample volume is available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT

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

Matrix: SS&SB&SD

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a	Evaluate and reanalyze if possible. If an MS/MSD was extracted in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all affected samples	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a. RPD ≤ 50%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a. RPD ≤ 50%

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

Matrix: SS&SB&SD

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"SIM"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analytes detected > QL; up to 5 times QL for phthalate esters	Investigate source of contamination. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reprep and analyze method blank and all samples processed with the contaminated blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analytes detected > QL; up to 5 times QL for phthalate esters
Surrogates	Up to 4 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.	Re-extract and re-analyze if sufficient sample volume is available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT

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

Matrix: SS&SB&SD

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.	Evaluate and reanalyze if possible. If an MS/MSD was extracted in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all affected samples	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a.
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a. RPD ≤ 50%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-2a. RPD ≤ 50%

SAP Worksheet #28-2a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: SS&SB&SD

Analytical Group: SVOC

Concentration Level: "Low" (SW-846 8270C) and "SIM" (SW-846 8270C-SIM)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Soil Accuracy % Recovery	Soil Precision RPD (1)
Semivolatile Organic Compounds			
Benzaldehyde	8270C	30-150 (nominal)	0-50 (nominal)
Phenol	8270C	56-108	0-50 (nominal)
Bis (2-Chloroethyl) Ether	8270C	50-104	0-50 (nominal)
2-Chlorophenol	8270C	57-102	0-50 (nominal)
2-Methylphenol	8270C	60-99	0-50 (nominal)
2,2'-Oxybis(1-chloropropane	8270C	61-98	0-50 (nominal)
Acetophenone	8270C	59-102	0-50 (nominal)
3&4-Methylphenol	8270C	58-105	0-50 (nominal)
n-Nitroso-di-n-propylamine	8270C	52-93	0-50 (nominal)
Hexachloroethane	8270C	59-90	0-50 (nominal)
Nitrobenzene	8270C	59-103	0-50 (nominal)
Isophorone	8270C	45-110 (DOD QSM)	0-50 (nominal)
2-Nitrophenol	8270C	61-110	0-50 (nominal)
2,4-Dimethylphenol	8270C	52-99	0-50 (nominal)
Bis(2-chloroethoxy)methane	8270C	63-99	0-50 (nominal)
2,4-Dichlorophenol	8270C	63-102	0-50 (nominal)
4-Chloroaniline	8270C	10-95 (DOD QSM)	0-50 (nominal)
Hexachlorobutadiene	8270C	59-90	0-50 (nominal)
Caprolactam	8270C	30-140	0-50 (nominal)
4-Chloro-3-methylyphenol	8270C	62-109	0-50 (nominal)
Hexachlorocyclopentadiene	8270C	23-107	0-50 (nominal)
2,4,6-Trichlorophenol	8270C	61-105	0-50 (nominal)
2,4,5-trichlorophenol	8270C	64-107	0-50 (nominal)
1,1'-Biphenyl	8270C	50-113	0-50 (nominal)
2-Chloronaphthalene	8270C	68-102	0-50 (nominal)
2-Nitroaniline	8270C	58-120	0-50 (nominal)
Dimethyl phthalate	8270C	66-121	0-50 (nominal)
2,6-Dinitrotoluene	8270C	64-109	0-50 (nominal)
3-Nitroaniline	8270C	25-110 (DOD QSM)	0-50 (nominal)
2,4-Dinitrophenol	8270C	20-81	0-50 (nominal)
4-Nitrophenol	8270C	45-139	0-50 (nominal)
Dibenzofuran	8270C	60-108	0-50 (nominal)
2,4-Dinitrotoluene	8270C	64-111	0-50 (nominal)
Diethylphthalate	8270C	59-113	0-50 (nominal)
4-Chlorophenyl-phenylether	8270C	67-110	0-50 (nominal)
4-Nitroaniline	8270C	40-142	0-50 (nominal)
4,6-Dinitro-2-methyphenol	8270C	40-111	0-50 (nominal)
n-Nitrosodiphenylamine	8270C	50-115 (DOD QSM)	0-50 (nominal)
1,2,4,5-Tetrachlorobenzene	8270C	30-150 (nominal)	0-50 (nominal)
4-Bromophenyl-phenylether	8270C	67-119	0-50 (nominal)
Hexachlorobenzene	8270C	65-112	0-50 (nominal)
Atrazine	8270C	55-135	0-50 (nominal)
Carbazole	8270C	49-168	0-50 (nominal)
Di-n-butylphthalate	8270C	56-129	0-50 (nominal)
Butylbenzylphthalate	8270C	50-131	0-50 (nominal)
3,3'-Dichlorobenzidine	8270C	40-130 (DOD QSM)	0-50 (nominal)
Bis(2-ethylhexyl)phthalate	8270C	39-130	0-50 (nominal)

SAP Worksheet #28-2a — LCS, MS/MSD and Surrogate Recovery Limits (continued)

Matrix: SS&SB&SD

Analytical Group: SVOC

Concentration Level: "Low" (SW-846 8270C) and "SIM" (SW-846 8270C-SIM)

Measurement Performance Criteria Table – Field QC Samples

Target List	EPA Method	Soil Accuracy % Recovery	Soil Precision RPD [1]
Di-n-octylphthalate	8270C	40-130 (DOD QSM)	0-50 (nominal)
2,3,4,6-Tetrachlorophenol	8270C	58-93	0-50 (nominal)
Surrogates			
2-Fluorophenol	8270C	43-99	---
Phenol-d6	8270C	53-98	---
Nitrobenzene-d5	8270C	47-110	---
2-Fluorobiphenyl	8270C	49-114	---
2,4,6-Tribromophenol	8270C	44-111	---
Terphenyl-d14	8270C	58-140	---
Semivolatile Organic SIM Compounds			
Naphthalene	8270C-SIM	54-94	0-50 (nominal)
2-Methylnaphthalene	8270C-SIM	75-132	0-50 (nominal)
Acenaphthylene	8270C-SIM	51-103	0-50 (nominal)
Acenaphthene	8270C-SIM	56-97	0-50 (nominal)
Fluorene	8270C-SIM	61-103	0-50 (nominal)
Pentachlorophenol	8270C-SIM	30-150 (nominal)	0-50 (nominal)
Phenanthrene	8270C-SIM	58-122	0-50 (nominal)
Anthracene	8270C-SIM	55-113	0-50 (nominal)
Fluoranthene	8270C-SIM	68-126	0-50 (nominal)
Pyrene	8270C-SIM	33-133	0-50 (nominal)
Benzo(a)anthracene	8270C-SIM	50-138	0-50 (nominal)
Chysene	8270C-SIM	44-132	0-50 (nominal)
Benzo(b)fluoranthene	8270C-SIM	44-119	0-50 (nominal)
Benzo(k)fluoranthene	8270C-SIM	40-120	0-50 (nominal)
Benzo(a)pyrene	8270C-SIM	52-113	0-50 (nominal)
Indeno(1,2,3-cd)pyrene	8270C-SIM	32-134	0-50 (nominal)
Dibenzo(a,h)anthracene	8270C-SIM	30-134	0-50 (nominal)
Hexachloroethane	8270C-SIM	30-150 (nominal)	0-50 (nominal)
2-chloronaphthalene	8270C-SIM	30-150 (nominal)	0-50 (nominal)
Hexachlorobenzene	8270C-SIM	30-150 (nominal)	0-50 (nominal)
Carbazole	8270C-SIM	30-150 (nominal)	0-50 (nominal)
di-n-butylphthalate	8270C-SIM	30-150 (nominal)	0-50 (nominal)
bis(2-ethylhexyl)phthalate	8270C-SIM	30-150 (nominal)	0-50 (nominal)
Benzo(g,h,i)perylene	8270C-SIM	43-121	0-50 (nominal)
1,4-Dioxane	8270C-SIM	30-150 (nominal)	0-50 (nominal)
Surrogates			
2-Methylnaphthalene-D10	8270C-SIM	33-125	---
Fluorene-D10	8270C-SIM	53-136	---
Pyrene-D10	8270C-SIM	16-162	---
2,4-Dibromophenol	8270C-SIM	30-150 (nominal)	---

[1] Represented as Relative Percent Difference

SAP Worksheet #28-3 — Laboratory QC Samples Table

Matrix: SS&SB&SD
Analytical Group: PEST/PCB
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA329

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Pesticides						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >QL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10XQL.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
Breakdown Evaluation Check	Before samples are analyzed and at the beginning of each 12-hour shift	Breakdown of endrin or DDT should be ≤ 15%	Perform instrument maintenance and reanalyze all samples analyzed after the failing breakdown check.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	Breakdown of endrin or DDT should be ≤ 15%
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-extract LCS and affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a

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

Matrix: SS&SB&SD
Analytical Group: PEST/PCB
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA329

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a, RPD ≤ 50%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a, RPD ≤ 50%
Surrogates	2 per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. (3) If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a
PCB						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >QL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10XQL.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-extract blank and affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a

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

Matrix: SS&SB&SD
Analytical Group: PEST/PCB
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA329

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a, RPD ≤ 50%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a, RPD ≤ 50%
Surrogates	2 per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a	No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. (3) If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-3a

Page Intentionally Left Blank

SAP Worksheet #28-3a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: SS&SB&SD

Analytical Group: Pest / PCB

Concentration Level: "Low" (SW-846 8081A, 8082)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Soil Accuracy % Recovery	Soil Precision RPD [1]
Pesticides			
Alpha-BHC	8081A	61-108	0-50 (nominal)
Beta-BHC	8081A	68-124	0-50 (nominal)
Delta-BHC	8081A	53-145	0-50 (nominal)
Gamma-BHC(Lindane)	8081A	67-116	0-50 (nominal)
Heptachlor	8081A	59-118	0-50 (nominal)
Aldrin	8081A	61-117	0-50 (nominal)
Heptachlor Epoxide	8081A	64-119	0-50 (nominal)
Endosulfan I	8081A	58-108	0-50 (nominal)
Dieldrin	8081A	66-122	0-50 (nominal)
4,4'-DDE	8081A	69-120	0-50 (nominal)
Endrin	8081A	63-118	0-50 (nominal)
Endosulfan II	8081A	63-116	0-50 (nominal)
4,4'-DDD	8081A	61-127	0-50 (nominal)
Endosulfan Sulfate	8081A	58-144	0-50 (nominal)
4,4'-DDT	8081A	64-133	0-50 (nominal)
Methoxychlor	8081A	68-129	0-50 (nominal)
Endrin Ketone	8081A	71-132	0-50 (nominal)
Endrin Aldehyde	8081A	54-105	0-50 (nominal)
Alpha-Chlordane	8081A	64-121	0-50 (nominal)
Gamma-Chlordane	8081A	68-121	0-50 (nominal)
Toxaphene	8081A	---	0-50 (nominal)
Surrogates			
Tetrachloro-m-xylene	8081A	42-104	---
Decachlorobiphenyl	8081A	51-119	---
Polychorinated Biphenyls			
Aroclor 1016	8082	75-122	0-50 (nominal)
Aroclor 1221	8082	---	---
Aroclor 1232	8082	---	---
Aroclor 1242	8082	---	---
Aroclor 1248	8082	---	---
Aroclor 1254	8082	---	---
Aroclor 1260	8082	78-132	0-50 (nominal)
Aroclor 1262	8082	---	---
Aroclor 1268	8082	---	---
Surrogates			
Tetrachloro-m-xylene	8082	56-115	---
Decachlorobiphenyl	8082	59-124	---

[1] Represented as Relative Percent Difference

Page Intentionally Left Blank

SAP Worksheet #28-4 — Laboratory QC Samples Table

Matrix: SS&SB&SD						
Analytical Group: EXPLO						
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-004						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Nitroaromatics/Nitroamines						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >PQL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. the blank results are above the PQL, report sample results which are <PQL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected >PQL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R	Evaluate the samples and associated QC: i.e. If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the surrogate recoveries in the LCS are also low but are acceptable in the blank and samples, narrate. If the LCS recovery is high but the sample results are < PQL, narrate. Otherwise, reprep and reanalyze the LCS and all affected samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R

SAP Worksheet #28-4 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD						
Analytical Group: EXPLO						
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-003						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R; 50% RPD	See above	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R; 50% RPD
Surrogates	One per sample	1,2-Dinitrobenzene: 30-150	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	1,2-Dinitrobenzene: 30-150
Perchlorate						
Method Blank	With each preparation batch of 20 or less samples	Less than 1/2 the QL	Correct problem, re-prep and re-analyze along with associated samples. If re-analysis is not possible, apply "B" flag to samples associated with the contaminated MB.	Lab Analyst	Accuracy/Bias, Contamination	Less than 1/2 the QL

SAP Worksheet #28-4 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD
Analytical Group: EXPLO
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-003

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	With each preparation batch of 20 or less samples	LCS Spike concentration must be equal to the QL. %R:80-120%.	Correct problem, re-prep and re-analyze along with associated samples.	Lab Analyst	Accuracy/Bias	LCS Spike concentration must be equal to the QL. %R:80-120%.
Matrix Spike (MS)	One with each preparation batch of 20 or less samples	MS spike conc. must be equal to the QL. 80-120%R	If LCS is acceptable, apply "J" flag to the results of the parent sample. If LCS is also outside limits, reprep the samples and QC.	Lab Analyst	Accuracy/Bias	MS spike conc. must be equal to the QL. 80-120%R
Matrix Spike Duplicate (MSD)	One with each preparation batch of 20 or less samples	MSD spike concentration must be equal to the QL. 80-120%R; RPD < 15%	If LCS is acceptable, apply "J" flag to the results of the parent sample. If LCS is also outside limits, reprep the samples and QC.	Lab Analyst	Accuracy/Bias, Precision	MSD spike concentration must be equal to the QL. 80-120%R; RPD < 15%
Conductivity Limit Standard	With each preparation batch of 20 or less samples	70-130%R for perchlorate spiked at QL with chloride, sulfate, and carbonate ions spiked at 1000ppm. Internal standards must meet 50-150 criteria.	Changing analytical conditions or instrument column may be required.	Lab Analyst	Accuracy	70-130%R for perchlorate spiked at QL with chloride, sulfate, and carbonate ions spiked at 1000ppm. Internal standards must meet 50-150 criteria.
Internal Standards	Added to each sample and QC sample	must be within 50-150% of the mean responses detected in the initial calibration	Reanalyze sample	Lab Analyst	Accuracy/Bias	must be within 50-150% of the mean responses detected in the initial calibration

SAP Worksheet #28-4 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD						
Analytical Group: EXPLO						
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-003						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Laboratory Duplicate (LD)	One with each preparation batch of 20 or less samples	RPD < 15%	Apply "J" flag to the results of the parent sample.	Lab Analyst	Precision	RPD < 15%

SAP Worksheet #28-5 — Laboratory QC Samples Table

Matrix: SS&SB
Analytical Group: TPH
Analytical Method / SOP Reference: SW-846 8015M / CA-315

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
TPH-GRO						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 76-131	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate Otherwise reprep and reanalyze the LCS and affected samples	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Statistically derived limits: 76-131
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 76-131	(1) Evaluate the samples and associated QC If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits: 76-131
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 76-131, 50% RPD	Same as MS	Analyst, Supervisor, QA Manager	Accuracy/Bias and Precision	Statistically derived limits: 76-131, 50% RPD

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

Matrix: SS&SB
Analytical Group: TPH
Analytical Method / SOP Reference: SW-846 8015M / CA-315

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	One per sample	4-Bromofluorobenzene: 65-129	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	4-Bromofluorobenzene: 65-129
TPH-DRO						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 60-127	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate Otherwise reprep and reanalyze the LCS and affected samples	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Statistically derived limits: 60-127
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 60-127	(1) Evaluate the samples and associated QC If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits:
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits :60-127, 50% RPD	See above	Analyst, Supervisor, QA Manager	Accuracy/Bias and Precision	Statistically derived limits:
Surrogates	One per sample	o-Terphenyl: 32-121	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	o-Terphenyl: 32-121

SAP Worksheet #28-6 — Laboratory QC Samples Table

Matrix: SS&SB&SD
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7471, 9012 / CA-627, CA-611, CA-773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Metals (6020)						
Preparation Blank (PBS)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCS)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within reference limits supplied by SRM vendor.	If the LCS recoveries are > the vendor upper limit but the sample results are <QL, narrate. Otherwise, redigest and reanalyze the LCS and all associated samples for the affected analyte.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Recovery within reference limits supplied by SRM vendor.
Interference Check Solution A	Before analyzing samples and every 12 hours during a run	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified	Do not use sample results for failing elements unless ICSA > QL and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified
Interference Check Solution AB	Before analyzing samples and every 12 hours during a run	80-120%R	Do not use sample results for failing elements unless ICSAB > 120% and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120%R

SAP Worksheet #28-6 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7471, 9012 / CA-627, CA-611, CA-773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration Blank	Immediately after the initial calibration verification	Absolute value of ICB < QL	Do not use results if sample > QL and less than 10X that in the ICB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of ICB < QL
Continuing Calibration Blank	After every 10 samples and at the end of the run	Absolute value of CCB < QL	Do not use sample results if ≥ QL and less than 10X that in the CCB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of CCB < QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value; RPD ≤ 20%	See Above. Flag results for affected analytes for all associated samples with"*". Perform postdigestion spike for all failing elements, except Ag, at 2x the indigenous level or 2x the PQL, whichever is greater.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	(1) Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.

SAP Worksheet #28-6 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7471, 9012 / CA-627, CA-611, CA-773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	Internal Standard (IS), Appropriate IS required for all analytes in all samples. Mass of IS must be <50 amu different from that of analyte	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.	Reanalyze affected samples	Analyst, Supervisor, QA Manager	Accuracy	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.
Mercury						
Preparation Blank (PBS)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCS)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within reference limits supplied by SRM vendor.	If the LCS recoveries are > the vendor upper limit but the sample results are <QL, narrate. Otherwise, redigest and reanalyze the LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Recovery within reference limits supplied by SRM vendor.
Initial Calibration Blank	Before beginning a sample run	< QL	Correct problem and repeat calibration	Analyst, Supervisor, QA Manager	Contamination	< QL

SAP Worksheet #28-6 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7471, 9012 / CA-627, CA-611, CA-773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Mercury (continued)						
Continuing Calibration Blank	At beginning of run, after every 10 samples, and at end of run	< QL	Repeat calibration and repeat all samples analyzed after the last successful CCB	Analyst, Supervisor, QA Manager	Contamination	< QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	RPD ≤ 20%	See Above. Flag results for affected analytes for all associated samples with"*". Perform postdigestion spike.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.
Method Blank	One per batch of 20 samples or fewer	Abs. value < PQL	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise reprep the blank and the associated samples	Analyst, Supervisor, QA Manager	Accuracy / Bias / Contamination	Abs. value < PQL

SAP Worksheet #28-6 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7471, 9012 / CA-627, CA-611, CA-773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per digestion batch of 20 samples or fewer	80-120 %R	If the LCS fails high, report samples that are <PQL. Otherwise, recalibrate and/or reanalyze the LCS and other samples.	Analyst, Supervisor, QA Manager	Accuracy / Bias	80-120 %R
Sample Duplicate	One sample duplicate per 20 samples	RPD ≤ 20 % for samples > 3X the PQL and <100% for samples < 3X the PQL.	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Accuracy / Bias / Precision	RPD ≤ 20 % for samples <3X the PQL and <100% for samples >3X the PQL.
Matrix Spike (MS)	One for every set of 10 samples	75-125 % Recovery if sample conc. is < 4 X spike	Evaluate samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep and reanalyze the samples and QC. May analyze unspiked sample digestate to confirm matrix interference. Notate sample result in raw data if matrix is confirmed	Analyst, Supervisor, QA Manager	Accuracy / Bias	75-125% Recovery

SAP Worksheet #28-7 — Laboratory QC Samples Table

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

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
N/A						

SAP Worksheet #28-8 — Laboratory QC Samples Table

Matrix: SS&SB&SD
Analytical Group: WCHEM
Analytical Method / SOP Reference: SW-846 9045C, Lloyd Kahn, ASTM D2937 / CA-709, CA-741, BR-GT-018

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
pH						
Laboratory Control Sample(LCS)	One per 20 samples	90-110% recovery	Correct problem, recalibrate	Analyst, Supervisor, QA Manager	Accuracy/Bias	90-110% recovery
Sample duplicate	One sample duplicate per every 10 field samples.	RPD < 20	1) Investigate problem and reanalyze sample in duplicate (2) If RPD is still unacceptable, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Precision	RPD < 20
TOC						
Method Blank	One per 20 samples	No analyte > PQL	Investigate source of contamination. Report all sample results > 10 x the blank result and flag results with "B". Reprep and analyze method blank and all other samples processed with the contaminated blank.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	No analyte > PQL
Instrument Blank	After each ICV and CCV	No analyte >PQL	Samples analyzed before or after an unacceptable blank will be reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	No analyte > PQL
Laboratory Quadruplicate	One sample quadruplicate per 20 samples.	RSD < 30%	If lab QC in criteria and matrix interference suspected, flag data. Else, reanalyze.	Analyst, Supervisor, QA Manager	Precision	RSD < 30%
Matrix Spike (MS)	If deemed necessary by the laboratory.	75-125 % recovery	If LCS in criteria and matrix interference suspected, flag data. Else, reanalyze.	Analyst, Supervisor, QA Manager	Accuracy/Bias	75-125 % recovery
Laboratory Control Sample(LCS)	One per 20 samples	80-120%	Investigate source of problem. If the LCS fails high, report samples that are < PQL. Otherwise, reprep an LCS and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120%

SAP Worksheet #28-8 — Laboratory QC Samples Table (continued)

Matrix: SS&SB&SD						
Analytical Group: WCHEM						
Analytical Method / SOP Reference: SW-846 9045C, Lloyd Kahn, ASTM D2937 / CA-709, CA-741, BR-GT-018						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Low-level standard in the Initial calibration	With each initial calibration	Low-level calibration standard in the initial calibration is spiked at or below the QL. Initial calibration acceptance criteria is a correlation coefficient of > 0.995.	Reanalyze sample	Analyst, Supervisor, QA Manager	Accuracy/Bias	Low-level calibration standard in the initial calibration is spiked at or below the QL. Initial calibration acceptance criteria is a correlation coefficient of > 0.995.
Dry Bulk Density						
N/A						

SAP Worksheet #28-9 — Laboratory QC Samples Table

Matrix: GW&AQ						
Analytical Group: VOC						
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
"Low"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reanalyze blank and samples >QL and < 10X the blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected > QL, except for common lab contaminants methylene chloride, acetone and 2-Butanone - 2X.
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same 12 hour clock and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a

SAP Worksheet #28-9 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ
Analytical Group: VOC
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits, See Worksheet 28-9a, RPD ≤ 20%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits, See Worksheet 28-9a, RPD ≤ 20%
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT
Surrogates	4 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a	Reanalyze if sufficient sample volume is available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-9a

SAP Worksheet #28-9 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ
Analytical Group: VOC
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"SIM"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination. Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reanalyze blank and samples >QL and < 10X the blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits:70-130 %R	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same 12 hour clock and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate Otherwise reprep and reanalyze the LCS and all associated samples	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits:70-130 %R
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 70-130 %R	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 70-130 %R

SAP Worksheet #28-9 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ
Analytical Group: VOC
Analytical Method / SOP Reference: 8260B, 8260B-SIM / CA-202, CA-220

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 70-130 %R; RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	RPD ≤ 30%
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window + 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window + 0.5 minutes compared to CV RT
Surrogates	2 Per Sample	Nominal Limits: 70-130 %R	Reanalyze if sufficient sample volume is available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 70-130 %R

SAP Worksheet #28-9a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: GW & AQ
Analytical Group: VOC
Concentration Level: "Low" (SW-846 8260B) and "SIM" (SW-846 8260B-SIM)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Aqueous Accuracy % Recovery	Aqueous Accuracy RPD (1)
Volatile Organic Compounds			
Dichlorodifluoromethane	8260B	40-192	0-20 (nominal)
Chloromethane	8260B	47-151	0-20 (nominal)
Vinyl Chloride	8260B	63-141	0-20 (nominal)
Bromomethane	8260B	41-169	0-20 (nominal)
Chloroethane	8260B	57-145	0-20 (nominal)
Trichlorofluoromethane	8260B	85-164	0-20 (nominal)
1,1-Dichloroethene	8260B	79-162	0-20 (nominal)
1,1,2-Trichloro-1,2,2-triflurorethane (Freon-113)	8260B	78-132	0-20 (nominal)
Acetone	8260B	54-134	0-20 (nominal)
Carbon Disulfide	8260B	72-127	0-20 (nominal)
Methyl Acetate	8260B	62-137	0-20 (nominal)
Methylene Chloride	8260B	70-120	0-20 (nominal)
trans-1,2-Dichloroethene	8260B	76-127	0-20 (nominal)
Methyl tert-butyl ether	8260B	78-136	0-20 (nominal)
1,1-Dichloroethane	8260B	80-126	0-20 (nominal)
cis-1,2-Dichloroethene	8260B	80-116	0-20 (nominal)
2-Butanone (MEK)	8260B	59-125	0-20 (nominal)
Bromochloromethane	8260B	90-131	0-20 (nominal)
Chloroform	8260B	86-124	0-20 (nominal)
1,1,1-Trichloroethane	8260B	88-125	0-20 (nominal)
Cyclohexane	8260B	60-150	0-20 (nominal)
Carbon Tetrachloride	8260B	73-146	0-20 (nominal)
Benzene	8260B	88-115	0-20 (nominal)
1,2-Dichloroethane	8260B	82-125	0-20 (nominal)
Trichloroethene	8260B	84-115	0-20 (nominal)
Methylcyclohexane	8260B	74-128	0-20 (nominal)
1,2-Dichloropropane	8260B	82-125	0-20 (nominal)
Bromodichloromethane	8260B	89-113	0-20 (nominal)
cis-1,3-Dichloropropene	8260B	87-118	0-20 (nominal)
4-methyl-2-pentanone(MiBK)	8260B	70-123	0-20 (nominal)
Toluene	8260B	87-119	0-20 (nominal)
trans-1,3-Dichloropropene	8260B	90-137	0-20 (nominal)
1,1,2-Trichloroethane	8260B	80-115	0-20 (nominal)
Tetrachloroethene	8260B	58-147	0-20 (nominal)
2-Hexanone	8260B	66-121	0-20 (nominal)
Dibromochloromethane	8260B	84-122	0-20 (nominal)
1,2-Dibromoethane (EDB)	8260B	83-116	0-20 (nominal)
Chlorobenzene	8260B	88-112	0-20 (nominal)
Ethylbenzene	8260B	86-116	0-20 (nominal)
o-Xylene	8260B	82-119	0-20 (nominal)
m+p-Xylene	8260B	83-122	0-20 (nominal)
Styrene	8260B	85-116	0-20 (nominal)
Bromoform	8260B	78-127	0-20 (nominal)

SAP Worksheet #28-9a — LCS, MS/MSD and Surrogate Recovery Limits (continued)

Matrix: GW&AQ			
Analytical Group: VOC			
Concentration Level: "Low" (SW-846 8260B) and "SIM" (SW-846 8260B-SIM)			
Measurement Performance Criteria Table – Field QC Samples			
Target List	**EPA Method**	**Aqueous Accuracy % Recovery**	**Aqueous Accuracy RPD (1)**
Isopropylbenzene	8260B	90-132	0-20 (nominal)
1,1,2,2-Tetrachloroethane	8260B	83-118	0-20 (nominal)
1,3-Dichlorobenzene	8260B	82-118	0-20 (nominal)
1,4-Dichlorobenzene	8260B	83-113	0-20 (nominal)
1,2-Dichlorobenzene	8260B	83-116	0-20 (nominal)
1,2-Dibromo-3-Chloropropane	8260B	69-121	0-20 (nominal)
1,2,4-Trichlorobenzene	8260B	71-127	0-20 (nominal)
1,2,3-Trichlorobenzene	8260B	62-124	0-20 (nominal)
Surrogates			
DBFM	8260B	78-116	--
1,2-DCA-d4	8260B	70-124	--
Toluene-d8	8260B	70-123	--
BFB	8260B	69-119	--
Volatile Organic SIM Compounds			
Vinyl Chloride	8260B-SIM	70-130	0-20 (nominal)
1,1-Dichloroethene	8260B-SIM	70-130	0-20 (nominal)
1,2-Dichloroethane	8260B-SIM	70-130	0-20 (nominal)
Carbon Tetrachloride	8260B-SIM	70-130	0-20 (nominal)
Tetrachloroethene	8260B-SIM	70-130	0-20 (nominal)
Surrogates			
DBFM	8260B-SIM	70-130	--
BFB	8260B-SIM	70-130	--

(1) Represented as Relative Percent Difference

SAP Worksheet #28-10 — Laboratory QC Samples Table

Matrix: GW&AQ&SW						
Analytical Group: SVOC						
Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
"Low"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte > QL; Up to 5X QL for phthalate esters	Investigate source of contamination. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reprep and analyze method blank and all samples processed with the contaminated blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte > QL; Up to 5X QL for phthalate esters
Surrogates	6 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	Re-extract and reanalyze if sufficient sample volume available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT

SAP Worksheet #28-10 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"Low"						
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	Evaluate and reanalyze if possible. If an MS/MSD was extracted in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all associated samples	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a

SAP Worksheet #28-10 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"Low" (continued)						
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a. RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a. RPD ≤ 30%
"SIM"						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Reprep and analyze method blank and all samples processed with the contaminated blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected > QL
Surrogates	Up to 4 Per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	Re-extract and reanalyze if sufficient sample volume available.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a

SAP Worksheet #28-10 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"SIM" (continued)						
Internal Standards (IS)	Each field and QC sample	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT	Reanalyze affected samples	Analyst	Accuracy	IS area -50% to +100% compared to IS from CV; IS RT window ± 0.5 minutes compared to CV RT
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	Evaluate and reanalyze if possible. If an MS/MSD was extracted in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all affected samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a

SAP Worksheet #28-10 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW

Analytical Group: SVOC

Analytical Method / SOP Reference: 8270C, 8270C-SIM / CA-204, CA-213

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
"SIM" (continued)						
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. If both the LCS and MS/MSD are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a. RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-10a. RPD ≤ 30%

Page Intentionally Left Blank

SAP Worksheet #28-10a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: GW&AQ&SW
Analytical Group: SVOC
Concentration Level: "Low" (SW-846 8270C)" and "SIM" (SW-846 8270C-SIM)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Aqueous Accuracy % Recovery	Aqueous Accuracy RPD (1)
Semivolatile Organic Compounds			
Benzaldehyde	8270C	30-150 (nominal)	0-30 (nominal)
Phenol	8270C	10-115 (DOD QSM)	0-30 (nominal)
Bis (2-Chloroethyl) Ether	8270C	42-101	0-30 (nominal)
2-Chlorophenol	8270C	47-99	0-30 (nominal)
2-Methylphenol	8270C	45-88	0-30 (nominal)
2,2'-Oxybis(1-chloropropane	8270C	58-96	0-30 (nominal)
Acetophenone	8270C	54-103	0-30 (nominal)
3&4-Methylphenol	8270C	41-80	0-30 (nominal)
n-Nitroso-di-n-propylamine	8270C	44-98	0-30 (nominal)
Hexachloroethane	8270C	31-98	0-30 (nominal)
Nitrobenzene	8270C	56-105	0-30 (nominal)
Isophorone	8270C	50-110 (DOD QSM)	0-30 (nominal)
2-Nitrophenol	8270C	56-105	0-30 (nominal)
2,4-Dimethylphenol	8270C	51-93	0-30 (nominal)
Bis(2-chloroethoxy)methane	8270C	55-103	0-30 (nominal)
2,4-Dichlorophenol	8270C	53-103	0-30 (nominal)
4-Chloroaniline	8270C	30-115	0-30 (nominal)
Hexachlorobutadiene	8270C	39-194	0-30 (nominal)
Caprolactam	8270C	30-150 (nominal)	0-30 (nominal)
4-Chloro-3-methylyphenol	8270C	62-108	0-30 (nominal)
Hexachlorocyclopentadiene	8270C	30-150 (nominal)	0-30 (nominal)
2,4,6-Trichlorophenol	8270C	59-108	0-30 (nominal)
2,4,5-trichlorophenol	8270C	64-111	0-30 (nominal)
1,1'-Biphenyl	8270C	49-112	0-30 (nominal)
2-Chloronaphthalene	8270C	57-108	0-30 (nominal)
2-Nitroaniline	8270C	69-117	0-30 (nominal)
Dimethyl phthalate	8270C	25-125 (DOD QSM)	0-30 (nominal)
2,6-Dinitrotoluene	8270C	66-111	0-30 (nominal)
3-Nitroaniline	8270C	51-139	0-30 (nominal)
2,4-Dinitrophenol	8270C	15-140 (DOD QSM)	0-30 (nominal)
4-Nitrophenol	8270C	10-125 (DOD QSM)	0-30 (nominal)
Dibenzofuran	8270C	57-108	0-30 (nominal)
2,4-Dinitrotoluene	8270C	63-122	0-30 (nominal)
Diethylphthalate	8270C	50-101	0-30 (nominal)
4-Chlorophenyl-phenylether	8270C	60-118	0-30 (nominal)
4-Nitroaniline	8270C	30-154	0-30 (nominal)
4,6-Dinitro-2-methyphenol	8270C	57-126	0-30 (nominal)
n-Nitrosodiphenylamine	8270C	42-104	0-30 (nominal)
1,2,4,5-Tetrachlorobenzene	8270C	30-150 (nominal)	0-30 (nominal)
4-Bromophenyl-phenylether	8270C	76-114	0-30 (nominal)
Hexachlorobenzene	8270C	75-109	0-30 (nominal)
Atrazine	8270C	57-126	0-30 (nominal)
Carbazole	8270C	45-173	0-30 (nominal)

SAP Worksheet #28-10a — LCS, MS/MSD and Surrogate Recovery Limits (continued)

Matrix: GW&AQ&SW

Analytical Group: SVOC

Concentration Level: "Low" (SW-846 8270C)" and "SIM" (SW-846 8270C-SIM)

Measurement Performance Criteria Table – Field QC Samples

Target List	EPA Method	Aqueous Accuracy % Recovery	Aqueous Accuracy RPD [1]
Di-n-butylphthalate	8270C	58-112	0-30 (nominal)
Butylbenzylphthalate	8270C	36-134	0-30 (nominal)
3,3'-Dichlorobenzidine	8270C	32-174	0-30 (nominal)
Bis(2-ethylhexyl)phthalate	8270C	33-120	0-30 (nominal)
Di-n-octylphthalate	8270C	35-135 (DOD QSM)	0-30 (nominal)
2,3,4,6-Tetrachlorophenol	8270C	50-109	0-30 (nominal)
Surrogates			
2-Fluorophenol	8270C	20-110 (DOD QSM)	---
Phenol-d6	8270C	10-115 (DOD QSM)	---
Nitrobenzene-d5	8270C	50-88	---
2-Fluorobiphenyl	8270C	44-109	---
2,4,6-Tribromophenol	8270C	32-109	---
Terphenyl-d14	8270C	61-116	---
Semivolatile Organic SIM Compounds			
Naphthalene	8270C-SIM	42-91	0-30 (nominal)
2-Methylnaphthalene	8270C-SIM	51-125	0-30 (nominal)
Acenaphthylene	8270C-SIM	43-99	0-30 (nominal)
Acenaphthene	8270C-SIM	44-93	0-30 (nominal)
Fluorene	8270C-SIM	49-100	0-30 (nominal)
Pentachlorophenol	8270C-SIM	30-150 (nominal)	0-30 (nominal)
Phenanthrene	8270C-SIM	57-119	0-30 (nominal)
Anthracene	8270C-SIM	50-113	0-30 (nominal)
Fluoranthene	8270C-SIM	60-122	0-30 (nominal)
Pyrene	8270C-SIM	64-121	0-30 (nominal)
Benzo(a)anthracene	8270C-SIM	48-120	0-30 (nominal)
Chysene	8270C-SIM	53-147	0-30 (nominal)
Benzo(b)fluoranthene	8270C-SIM	49-104	0-30 (nominal)
Benzo(k)fluoranthene	8270C-SIM	57-145	0-30 (nominal)
Benzo(a)pyrene	8270C-SIM	63-113	0-30 (nominal)
Indeno(1,2,3-cd)pyrene	8270C-SIM	30-140	0-30 (nominal)
Dibenzo(a,h)anthracene	8270C-SIM	30-136	0-30 (nominal)
Hexachloroethane	8270C-SIM	30-150 (nominal)	0-30 (nominal)
2-chloronaphthalene	8270C-SIM	30-150 (nominal)	0-30 (nominal)
Hexachlorobenzene	8270C-SIM	30-150 (nominal)	0-30 (nominal)
Carbazole	8270C-SIM	30-150 (nominal)	0-30 (nominal)
di-n-butylphthalate	8270C-SIM	30-150 (nominal)	0-30 (nominal)
bis(2-ethylhexyl)phthalate	8270C-SIM	30-150 (nominal)	0-30 (nominal)
Benzo(g,h,i)perylene	8270C-SIM	48-126	0-30 (nominal)
1,4-Dioxane	8270C-SIM	30-150 (nominal)	0-30 (nominal)
Surrogates			
2-Methylnaphthalene-D10	8270C-SIM	34-110	---
Fluorene-D10	8270C-SIM	46-122	---
Pyrene-D10	8270C-SIM	36-134	---
2,4-Dibromophenol	8270C-SIM	30-150 (nominal)	

[1] Represented as Relative Percent Difference

SAP Worksheet #28-11 — Laboratory QC Samples Table

Matrix: GW&AQ&SW						
Analytical Group: PEST/PCB						
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA-329						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Pesticides						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >QL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10XQL.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
Breakdown Evaluation Check	Before samples are analyzed and at the beginning of each 12-hour shift	Breakdown of endrin or DDT should be ≤ 15%	Perform instrument maintenance and reanalyze all samples analyzed after the failing breakdown check.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	Breakdown of endrin or DDT should be ≤ 15%
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-extract LCS and affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a

SAP Worksheet #28-11 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: PEST/PCB
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA-329

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Pesticides (continued)						
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a, RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a, RPD ≤ 30%
Surrogates	2 per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. (3) If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a
PCB						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >QL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10XQL.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL

SAP Worksheet #28-11 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: PEST/PCB
Analytical Method / SOP Reference: 8081A, 8082 / CA-302, CA-329

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
PCB (continued)						
LCS	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-extract LCS and affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a, RPD ≤ 30%	See above	Analyst, Supervisor, QA Manager	Accuracy/bias & Precision	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a, RPD ≤ 30%
Surrogates	2 per Sample	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a	No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. (3) If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	Katahdin Analytical Services statistically derived limits; See Worksheet 28-11a

Page Intentionally Left Blank

SAP Worksheet #28-11a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: GW&AQ&SW
Analytical Group: Pest / PCB
Concentration Level: "Low" (SW-846 8081A/8082)

Measurement Performance Criteria Table – Lab and Field QC Samples

Target List	EPA Method	Aqueous Accuracy % Recovery	Aqueous Precision RPD [1]
Pesticides			
Alpha-BHC	8081A	62-116	0-30 (nominal)
Beta-BHC	8081A	75-122	0-30 (nominal)
Delta-BHC	8081A	66-142	0-30 (nominal)
Gamma-BHC(Lindane)	8081A	65-124	0-30 (nominal)
Heptachlor	8081A	60-114	0-30 (nominal)
Aldrin	8081A	59-116	0-30 (nominal)
Heptachlor Epoxide	8081A	64-123	0-30 (nominal)
Endosulfan I	8081A	56-118	0-30 (nominal)
Dieldrin	8081A	66-126	0-30 (nominal)
4,4'-DDE	8081A	63-124	0-30 (nominal)
Endrin	8081A	67-119	0-30 (nominal)
Endosulfan II	8081A	64-118	0-30 (nominal)
4,4'-DDD	8081A	60-120	0-30 (nominal)
Endosulfan Sulfate	8081A	65-138	0-30 (nominal)
4,4'-DDT	8081A	68-127	0-30 (nominal)
Methoxychlor	8081A	64-129	0-30 (nominal)
Endrin Ketone	8081A	71-131	0-30 (nominal)
Endrin Aldehyde	8081A	68-120	0-30 (nominal)
Alpha-Chlordane	8081A	66-124	0-30 (nominal)
Gamma-Chlordane	8081A	68-126	0-30 (nominal)
Toxaphene	8081A	---	0-30 (nominal)
Surrogates			
Tetrachloro-m-xylene	8081A	48-112	---
Decachlorobiphenyl	8081A	41-131	---
Polychorinated Biphenyls			
Aroclor 1016	8082	82-117	0-30 (nominal)
Aroclor 1221	8082	---	---
Aroclor 1232	8082	---	---
Aroclor 1242	8082	---	---
Aroclor 1248	8082	---	---
Aroclor 1254	8082	---	---
Aroclor 1260	8082	75-125	0-30 (nominal)
Aroclor 1262	8082	---	---
Aroclor 1268	8082	---	---
Surrogates			
Tetrachloro-m-xylene	8082	57-111	---
Decachlorobiphenyl	8082	15-93	---

[1] Represented as Relative Percent Difference

Page Intentionally Left Blank

SAP Worksheet #28-12 — Laboratory QC Samples Table

Matrix: GW&AQ&SW
Analytical Group: EXPLO
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-004

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Nitroaromatics/Nitroamines						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >PQL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. the blank results are above the PQL, report sample results which are <PQL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected >PQL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R	Evaluate the samples and associated QC: i.e. If an MS/MSD was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the surrogate recoveries in the LCS are also low but are acceptable in the blank and samples, narrate. If the LCS recovery is high but the sample results are < PQL, narrate. Otherwise, reprep and reanalyze the LCS and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R

SAP Worksheet #28-12 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: EXPLO
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-004

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Nominal Limits: 30-150 %R; 30% RPD	See above	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal Limits: 30-150 %R; 30% RPD
Surrogates	One per sample	1,2-Dinitrobenzene: 30-150	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	1,2-Dinitrobenzene: 30-150
Perchlorate						
Method Blank	With each preparation batch of 20 or less samples	Less than 1/2 the QL	Correct problem, re-prep and re-analyze along with associated samples. If re-analysis is not possible, apply "B" flag to samples associated with the contaminated MB.	Lab Analyst	Accuracy/Bias, Contamination	Less than 1/2 the QL
Laboratory Control Sample (LCS)	With each preparation batch of 20 or less samples	LCS Spike concentration must be equal to the QL. %R:80-120%.	Correct problem, re-prep and re-analyze along with associated samples.	Lab Analyst	Accuracy/Bias	LCS Spike concentration must be equal to the QL. %R:80-120%.

SAP Worksheet #28-12 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: EXPLO
Analytical Method / SOP Reference: SW-846 8330, 6850 / CA-402, BR-LC-004

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Conductivity Limit Standard	With each preparation batch of 20 or less samples	70-130%R for perchlorate spiked at QL with chloride, sulfate, and carbonate ions spiked at 1000ppm. Internal standards must meet 50-150 criteria.	Changing analytical conditions or instrument column may be required.	Lab Analyst	Accuracy	70-130%R for perchlorate spiked at QL with chloride, sulfate, and carbonate ions spiked at 1000ppm. Internal standards must meet 50-150 criteria.
Internal Standards	Added to each sample and QC sample	must be within 50-150% of the mean responses detected in the initial calibration	Reanalyze sample	Lab Analyst	Accuracy/Bias	must be within 50-150% of the mean responses detected in the initial calibration
Matrix Spike (MS)	One with each preparation batch of 20 or less samples	MS spike conc. must be equal to the QL. 80-120%R	If LCS is acceptable, apply "J" flag to the results of the parent sample. If LCS is also outside limits, reprep the samples and QC.	Lab Analyst	Accuracy/Bias	MS spike conc. must be equal to the QL. 80-120%R
Matrix Spike Duplicate (MSD)	One with each preparation batch of 20 or less samples	MSD spike concentration must be equal to the QL. 80-120%R. RPD < 15%	If LCS is acceptable, apply "J" flag to the results of the parent sample. If LCS is also outside limits, reprep the samples and QC.	Lab Analyst	Accuracy/Bias, Precision	MSD spike concentration must be equal to the QL. 80-120%R
Laboratory Duplicate (LD)	One with each preparation batch of 20 or less samples	RPD < 15%	DoD: Apply "J" flag to the results of the parent sample.	Lab Analyst	Precision	RPD < 15%

SAP Worksheet #28-13 — Laboratory QC Samples Table

Matrix: GW&AQ&SW
Analytical Group: TPH
Analytical Method / SOP Reference: SW-846 8015M / CA-316, CA-315

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
TPH-GRO						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 48-162	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate. Otherwise reprep and reanalyze the LCS and all affected samples	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Statistically derived limits:70-154
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 48-162	Evaluate the samples and associated QC If the LCS results are acceptable, narrate If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits: 70-154
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 48-162, 30% RPD	Same as MS	Analyst, Supervisor, QA Manager	Accuracy/Bias and Precision	Statistically derived limits: 70-154 30% RPD

SAP Worksheet #28-13 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: TPH
Analytical Method / SOP Reference: SW-846 8015M / CA-316, CA-315

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	One per sample	4-Bromofluorobenzene: 60-131	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	4-Bromofluorobenzene: 60-131
TPH-DRO						
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected > QL	Investigate source of contamination Rerun method blank prior to analysis of samples if possible. Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
LCS	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 33-135	Evaluate and reanalyze if possible. If an MS/MSD was performed in the same extraction batch and acceptable narrate. If the LCS recoveries are high but the sample results are <QL narrate Otherwise reprep and reanalyze the LCS and all affected samples	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Statistically derived limits: 34-111
Matrix Spike	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 33-135	Evaluate the samples and associated QC If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits:34-111

SAP Worksheet #28-13 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: TPH
Analytical Method / SOP Reference: SW-846 8015M / CA-316, CA-315

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived limits: 33-135, 30% RPD	Same as MS	Analyst, Supervisor, QA Manager	Accuracy/Bias and Precision	Statistically derived limits:
Surrogates	One per sample	o-Terphenyl: 46-116	If surrogate is outside high and sample is <QL no CA taken. If surrogate is outside low the affected samples are re-extracted and reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/bias	o-Terphenyl: 46-116

SAP Worksheet #28-14 — Laboratory QC Samples Table

Matrix: GW&AQ&SW						
Analytical Group: METAL						
Analytical Method / SOP Reference: 6020, 7470, 9012 / CA-627, CA-615, CA773						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Metals						
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	If the LCS recoveries are > 120 % but the sample results are <QL narrate. Otherwise, redigest and reanalyze the LCS and all associated samples for affected analyte.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Interference Check Solution A	Before analyzing samples and every 12 hours during a run	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified	Do not use sample results for failing elements unless ICSA > QL and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified
Interference Check Solution AB	Before analyzing samples and every 12 hours during a run	80-120%R	Do not use sample results for failing elements unless ICSAB > 120% and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120%R

SAP Worksheet #28-14 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7470, 9012 / CA-627, CA-615, CA773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration Blank	Immediately after the initial calibration verification	Absolute value of ICB < QL	Do not use results if sample > QL and less than 10X that in the ICB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of ICB < QL
Continuing Calibration Blank	After every 10 samples and at the end of the run	Absolute value of CCB < QL	Do not use sample results if ≥ QL and less than 10X that in the CCB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of CCB < QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with “N”.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	See Above. Flag results for affected analytes for all associated samples with”*”. Perform postdigestion spike for all failing elements, except Ag, at 2x the indigenous level or 2x the PQL, whichever is greater.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with “E”.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.

SAP Worksheet #28-14 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7470, 9012 / CA-627, CA-615, CA773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	Internal Standard (IS); Appropriate IS required for all analytes in all samples. Mass of IS must be <50 amu different from that of analyte	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.	Reanalyze affected samples	Analyst, Supervisor, QA Manager	Accuracy	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.
Mercury						
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	If the LCS recoveries are > 120 % but the sample results are <QL narrate. Otherwise, redigest and reanalyze the LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Initial Calibration Blank	Before beginning a sample run	< QL	Correct problem and repeat calibration	Analyst, Supervisor, QA Manager	Contamination	< QL
Continuing Calibration Blank	At beginning of run, after every 10 samples, and at end of run	< QL	Repeat calibration and repeat all samples analyzed after the last successful CCB	Analyst, Supervisor, QA Manager	Contamination	< QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value

SAP Worksheet #28-14 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: METAL
Analytical Method / SOP Reference: 6020, 7470, 9012 / CA-627, CA-615, CA773

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	See above. Flag results for affected analytes for all associated samples with"*". Perform postdigestion spike.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.
Cyanide						
Method Blank	One per batch of 20 samples or fewer	Abs. value < PQL	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise reprep the blank and the associated samples.	Analyst, Supervisor, QA Manager	Accuracy / Bias / Contamination	Abs. value < PQL
Laboratory Control Sample (LCS)	One per digestion batch of 20 samples or fewer	80-120 %R	If the LCS fails high, report samples that are <PQL. Otherwise, recalibrate and/or reanalyze the LCS and other samples.	Analyst, Supervisor, QA Manager	Accuracy / Bias	80-120 %R
Sample Duplicate	One sample duplicate per 20 samples	RPD ≤ 20 % for samples > 3X the PQL and <100% for samples < 3X the PQL.	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Accuracy / Bias / Precision	RPD ≤ 20 % for samples <3X the PQL and <100% for samples >3X the PQL.

SAP Worksheet #28-14 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW						
Analytical Group: METAL						
Analytical Method / SOP Reference: 6020, 7470, 9012 / CA-627, CA-615, CA773						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Matrix Spike (MS)	One for every set of 10 samples	75-125% Recovery if sample conc. < 4 X spike	Evaluate samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep and reanalyze the samples and QC. May analyze unspiked sample digestate to confirm matrix interference. Notate sample result in raw data if matrix is confirmed	Analyst, Supervisor, QA Manager	Accuracy / Bias	75-125 % Recovery

SAP Worksheet #28-15 — Laboratory QC Samples Table

Matrix: GW&AQ&SW						
Analytical Group: FMETAL						
Analytical Method / SOP Reference: 6020, 7470 / CA-615, CA-627						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Metals						
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and all associated samples..	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	If the LCS recoveries are > 120 % but the sample results are <QL narrate. Redigest and reanalyze the LCS and all associated samples for affected analyte.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Interference Check Solution A	Before analyzing samples and every 12 hours during a run	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified	Do not use sample results for failing elements unless ICSA > QL and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified
Interference Check Solution AB	Before analyzing samples and every 12 hours during a run	80-120%R	Do not use sample results for failing elements unless ICSAB > 120% and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120%R
Initial Calibration Blank	Immediately after the initial calibration verification	Absolute value of ICB < QL	Do not use results if sample > QL and less than 10X that in the ICB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of ICB < QL

SAP Worksheet #28-15 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: FMETAL
Analytical Method / SOP Reference: 6020, 7470 / CA-615, CA-627

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Continuing Calibration Blank	After every 10 samples and at the end of the run	Absolute value of CCB < QL	Do not use sample results if ≥ QL and less than 10X that in the CCB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of CCB < QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	See Above. Flag results for affected analytes for all associated samples with"*". Perform postdigestion spike for all failing elements, except Ag, at 2x the indigenous level or 2x the PQL, whichever is greater.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.

SAP Worksheet #28-15 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW						
Analytical Group: FMETAL						
Analytical Method / SOP Reference: 6020, 7470 / CA-615, CA-627						
QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Internal Standards	Internal Standard (IS); Appropriate IS required for all analytes in all samples. Mass of IS must be <50 amu different from that of analyte	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.	Reanalyze affected samples	Analyst, Supervisor, QA Manager	Accuracy	For each sample, IS intensity within 30%-120% of that of initial calib. standard. For ICV, ICB, CCV, and CCB, IS intensity within 80%-120% of that in initial calib. standard.
Mercury						
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	Investigate source of contamination. If blank value > PQL report sample results if < PQL or > 10 x the blank value. Otherwise redigest the blank and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL.
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	If the LCS recoveries are > 120 % but the sample results are <QL narrate. Otherwise, redigest and reanalyze the LCS all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Initial Calibration Blank	Before beginning a sample run	< QL	Correct problem and repeat calibration	Analyst, Supervisor, QA Manager	Contamination	< QL

SAP Worksheet #28-15 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: FMETAL
Analytical Method / SOP Reference: 6020, 7470 / CA-615, CA-627

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Continuing Calibration Blank	At beginning of run, after every 10 samples, and at end of run	< QL	Repeat calibration and repeat all samples analyzed after the last successful CCB	Analyst, Supervisor, QA Manager	Contamination	< QL
Matrix Spike Sample	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	One per prep batch of twenty or fewer samples of similar matrix	Recovery ± 25 % of true value if sample < 4x spike value. RPD ≤ 20%	See above. Flag results for affected analytes for all associated samples with"*". Perform postdigestion spike.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.

SAP Worksheet #28-16 — Laboratory QC Samples Table

Matrix: GW&AQ&SW
Analytical Group: WCHEM
Analytical Method / SOP Reference: EPA 300.0, 160.2, SW-846 9060 / CA-742, CA-720, CA-763

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Chloride						
Method Blank	One per prep batch of 20 samples or less.	No analyte detected >PQL	Investigate source of contamination. Report all sample results <PQL. Report sample results >10X the blank result and flag results with a "B". Reanalyze all other samples associated with the failing blank.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	No analyte detected >PQL
Instrument Blank	After each ICV and CCV	No analyte detected >PQL	Associated samples may be reanalyzed	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	No analyte detected >PQL
Laboratory Duplicate	One sample duplicate per twenty samples	RPD $\leq$ 20	Investigate problem and reanalyze sample in duplicate. If RPD still out, report original result with notation or narration	Analyst, Supervisor, QA Manager	Precision	RPD $\leq$20
Matrix Spike (MS)	If deemed necessary by the laboratory	80-120 %R	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep and reanalyze the samples and QC. Notate sample result in raw data if matrix interference suspected.	Analyst, Supervisor, QA Manager	Accuracy/Bias	75-125% recovery
Laboratory Control Sample (LCS)	One per prep batch of 20 samples or less.	90-110 %R	If the LCS fails high, report samples that are <PQL.. Recalibrate and/or reanalyze other samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	90-110 %R

SAP Worksheet #28-16 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: WCHEM
Analytical Method / SOP Reference: EPA 300.0, 160.2, SW-846 9060 / CA-742, CA-720, CA-763

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
TDS						
Method Blank	One per prep batch of 20 or fewer samples	Measured TDS <PQL	Investigate source of contamination. Evaluate sample results. Report results <PQL. Report results >10x blank contamination with narration. Reprep a blank and all remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	Measured TSS <PQL
Laboratory Duplicate	One duplicate every ten samples	RPD ≤20	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation.	Analyst, Supervisor, QA Manager	Precision	RPD ≤20
Laboratory Control Sample (LCS)	One per prep batch of 20 or fewer samples	60-140%	Investigate source of problem. If the LCS recovery is high report sample results <PQL with narration. Reprep an LCS and all remaining samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	60-140%
TOC						
Method Blank	One per prep batch of 20 or fewer samples	No TOC detected ≥ QL	Investigate source of contamination. Re-analyze all affected samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No TOC > QL
Laboratory Quadruplicate.	One per prep batch of 20 or fewer samples	RSD ≤ 30%	Narrate any results that are outside control limits	Analyst, Supervisor, QA Manager	Precision	RSD ≤ 30%
Matrix Spike	If deemed necessary by the laboratory	75-125 %	No CA will be taken for Samples where recoveries are outside limits and LCS criteria are met. Narrate outages	Analyst, Supervisor, QA Manager	Accuracy/bias	75-125 %

SAP Worksheet #28-16 — Laboratory QC Samples Table (continued)

Matrix: GW&AQ&SW
Analytical Group: WCHEM
Analytical Method / SOP Reference: EPA 300.0, 160.2, SW-846 9060 / CA-742, CA-720, CA-763

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per prep batch of 20 or fewer samples	80-120%	Re-analyze associated samples. If sample is within holding time, re-analyze affected sample batch. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-prep LCS and affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/bias	80-120%

SAP Worksheet #28-17 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: TCLPV
Analytical Method / SOP Reference: SW-846 1311, 8260B / CA-510, CA-202

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per prep batch	No analytes greater than or equal to the QL, except for common lab contaminant 2-butanone.	(1) Investigate source of contamination(2) Rerun method blank prior to analysis of samples if possible(3) Evaluate the samples and associated QC: if blank results are above QL, report sample results which are < QL or > 10X the blank concentration (4) Reanalyze blank and samples >QL and < 10X the blank	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	No analytes greater than or equal to the QL, except for common lab contaminant 2-butanone.
Matrix Spike (MS)	If deemed necessary by the laboratory	See Worksheet 28-17a	(1) CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. (2) If both the LCS and MS are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias and Precision	See Worksheet 28-17a
Laboratory Control Sample (LCS)	One LCS per every 20 samples.	See Worksheet 28-17a	(1) Evaluate and reanalyze if possible (2) If an MS was performed in the same 12 hour clock and acceptable narrate. (3) If the surrogate recoveries in the LCS are also low but are acceptable in the blank and samples narrate.(4) If the LCS recoveries are high but the sample results are <QL narrate otherwise reprep an LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	See Worksheet 28-17a

SAP Worksheet #28-17 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPV
Analytical Method / SOP Reference: SW-846 1311, 8260B / CA-510, CA-202

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	Every sample, control, standard, and method blank	See Worksheet 28-17a	Reanalyze sample	Analyst, Supervisor, QA Manager	Accuracy/Bias	See Worksheet 28-17a
Internal Standards (IS)	Every sample, control, standard, and method blank	IS area -50% to +100% compared to IS from CV; IS RT window + 0.5 minutes compared to CV RT	Inspect mass spectrometer or GC for malfunctions;	Analyst, Supervisor, QA Manager	Accuracy/Bias	NA

SAP Worksheet #28-17a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: Liquid IDW			
Analytical Group: TCLPV			
Concentration Level: Medium			
Measurement Performance Criteria Table – Lab and Field QC Samples			
Target List	**EPA Method**	**Aqueous Accuracy % Recovery**	**Aqueous Precision RPD (1)**
Volatile Organic Compounds			
1,1-Dichloroethene	1311-8260B	79-126	0-20 (nominal)
1,2-Dichloroethane	1311-8260B	82-125	0-20 (nominal)
2-Butanone (MEK)	1311-8260B	59-125	0-20 (nominal)
Benzene	1311-8260B	88-115	0-20 (nominal)
Carbon Tetrachloride	1311-8260B	73-146	0-20 (nominal)
Chlorobenzene	1311-8260B	88-112	0-20 (nominal)
Chloroform	1311-8260B	86-124	0-20 (nominal)
Tetrachloroethene	1311-8260B	58-147	0-20 (nominal)
Trichloroethene	1311-8260B	84-115	0-20 (nominal)
Vinyl Chloride	1311-8260B	63-141	0-20 (nominal)
Surrogates			
DBFM	1311-8260B	78-116	--
1,2-DCA-d4	1311-8260B	70-124	--
Toluene-d8	1311-8260B	70-123	--
BFB	1311-8260B	69-119	--

(1) Represented as Relative Percent Difference

Page Intentionally Left Blank

SAP Worksheet #28-18 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: TCLPS
Analytical Method / SOP Reference: SW-846 1311, 8270C / CA-510, CA-204

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per prep batch	Less than or equal to the QL of target analytes	(1) Investigate source of contamination, Evaluate the samples and the associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or >10X the blank concentration for that analyte. If sample >QL and <10X the blank concentration for that analyte, reextract and reanalyze the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Contamination	Less than or equal to the QL of target analytes
Matrix Spike (MS)	If deemed necessary by the laboratory	Statistically derived limits	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met. 2) If both the LCS and MS are unacceptable reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits
Laboratory Control Sample (LCS)	One LCS per every 20 samples.	Statistically derived limits	If an MS was performed and acceptable narrate. If the surrogate recoveries in the LCS are also low but are acceptable in the blank and samples narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise reextract affected sample batch.	Analyst, Supervisor, QA Manager	Accuracy/Bias	Statistically derived limits

SAP Worksheet #28-18 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPS
Analytical Method / SOP Reference: SW-846 1311, 8270C / CA-510, CA-204

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	Every sample, control, standard, and method blank	% Rec. Water / Soil listed in Worksheet 28-18a	(1) If the surrogates are outside high and sample is <QL no CA taken. If surrogates are low outside limits, the affected sample is reextracted and reanalyzed to confirm matrix interference.	Analyst, Supervisor, QA Manager	Accuracy/Bias	NA
Internal Standards (IS)	Every sample, control, standard, and method blank	Response must be within -50 % to +100 % of daily continuing calibration standard. Retention time must be within specified RT window	Re-analysis of sample.	Analyst, Supervisor, QA Manager	Accuracy/Bias	NA

SAP Worksheet #28-18a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: Liquid IDW			
Analytical Group: TCLPS			
Concentration Level: Medium			
Measurement Performance Criteria Table – Lab and Field QC Samples			
Target List	**EPA Method**	**Aqueous Accuracy % Recovery**	**Aqueous Precision RPD (1)**
2-Methylphenol	1311-8270C	45-88	0-30 (nominal)
3&4-Methylphenol	1311-8270C	41-80	0-30 (nominal)
1,4-Dichlorobenzene	1311-8270C	83-113	0-30 (nominal)
2,4-Dinitrotoluene	1311-8270C	63-122	0-30 (nominal)
Hexachlorobenzene	1311-8270C	75-109	0-30 (nominal)
Hexachlorobutadiene	1311-8270C	61-124	0-30 (nominal)
Hexachloroethane	1311-8270C	31-98	0-30 (nominal)
Nitrobenzene	1311-8270C	56-105	0-30 (nominal)
Pentachlorophenol	1311-8270C	39-156	0-30 (nominal)
Pyridine	1311-8270C	30-150 (nominal)	0-30 (nominal)
2,4,5-trichlorophenol	1311-8270C	64-111	0-30 (nominal)
2,4,6-Trichlorophenol	1311-8270C	59-108	0-30 (nominal)
Surrogates			
2-Fluorophenol	1311-8270C	20-110 (DOD QSM)	---
Phenol-d6	1311-8270C	10-115 (DOD QSM)	---
Nitrobenzene-d5	1311-8270C	50-88	---
2-Fluorobiphenyl	1311-8270C	44-109	---
2,4,6-Tribromophenol	1311-8270C	32-109	---
Terphenyl-d14	1311-8270C	61-116	---

(1) Represented as Relative Percent Difference

Page Intentionally Left Blank

SAP Worksheet #28-19 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: TCLPP
Analytical Method / SOP Reference: SW-846 1311, 8081A / CA-510, CA-302

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per prep batch of twenty or fewer samples of similar matrix	No analyte detected >QL	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10XQL.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No analyte detected >QL
Matrix Spike	If deemed necessary by the laboratory	Statistically derived limits	(1) Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Statistically derived limits
Breakdown Evaluation Check	Before samples are analyzed and at the beginning of each 12-hour shift	Breakdown of endrin or DDT should be ≤ 15%	Perform instrument maintenance and reanalyze all samples analyzed after the failing breakdown check.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	Breakdown of endrin or DDT should be ≤ 15%
LCS	One per prep batch of twenty or fewer samples of similar matrix	Statistically derived acceptance limits.	If an MS was performed and acceptable, narrate. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, re-extract an LCS and all the associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Statistically derived acceptance limits.

SAP Worksheet #28-19 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPP
Analytical Method / SOP Reference: SW-846 1311, 8081A / CA-510, CA-302

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	2 per Sample	Statistically derived, Tetrachloro-m-xylene: 48-112 Decachlorobiphenyl: 41-131	(1) No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	Statistically derived, Tetrachloro-m-xylene: 48-112 Decachlorobiphenyl: 41-131

SAP Worksheet #28-19a — LCS, MS/MSD and Surrogate Recovery Limits

Matrix: Liquid IDW
Analytical Group: TCLPP
Concentration Level: Medium
Measurement Performance Criteria Table - Field QC Samples

Target List	EPA Method	Aqueous Accuracy % Recovery	Aqueous Precision RPD [1]
gamma-BHC (Lindane)	1311-8081A	65-124	0-30 (nominal)
Heptachlor	1311-8081A	60-114	0-30 (nominal)
Heptachlor epoxide	1311-8081A	64-123	0-30 (nominal)
Endrin	1311-8081A	67-119	0-30 (nominal)
Methoxychlor	1311-8081A	64-129	0-30 (nominal)
Toxaphene	1311-8081A	---	---
Chlordane (technical)	1311-8081A	---	---
Surrogates			
Tetrachloro-m-xylene	1311-8081A	48-112	---
Decachlorobiphenyl	1311-8081A	41-131	---

[1] Represented as Relative Percent Difference

SAP Worksheet #28-20 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: TCLPH
Analytical Method / SOP Reference: SW-846 1311, 8151A / CA-510, CA-305

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per prep batch; no greater than 1/20	No analyte detected > QL	Investigate source of contamination Evaluate the samples and associated QC: i.e. If the blank results are above the QL, report sample results which are <QL or > 10X the blank concentration. Otherwise, reprep a blank and samples >QL and <10X the blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-Contamination	No target > QL
Matrix Spike	If deemed necessary by the laboratory	Nominal limits: 30-120	Evaluate the samples and associated QC. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable, reprep the samples and QC.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal limits: 30-120
LCS	One per prep batch; no greater than 1/20	Nominal limits: 30-120	If an MS was performed and acceptable, narrate. If the surrogate recoveries in the LCS are also low but are acceptable in the blank and samples, narrate. If the LCS recovery is high but the sample results are <QL, narrate. Otherwise, reprep an LCS and all associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias	Nominal limits: 30-120

SAP Worksheet #28-20 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPH
Analytical Method / SOP Reference: SW-846 1311, 8151A / CA-510, CA-305

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	1 per Sample	2,4-Dichlorophenylacetic acid: 26-117%	No CA will be taken when one surrogate is within criteria. If surrogates are outside high and sample is <QL no CA taken. If surrogates are outside low the affected samples are re-extracted and reanalyzed.	Analyst, Supervisor, QA Manager	Accuracy/bias	2,4-Dichlorophenylacetic acid: 26-117%

SAP Worksheet #28-21 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: TCLPM
Analytical Method / SOP Reference: SW-846 1311, 6010B, 7470A / CA-510, CA-608, CA-615

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Metals						
Independent Calibration Verification (ICV)	Immediately after calibration	± 10 %	Correct problem, recalibrate and reanalyze ICV	Analyst, Supervisor, QA Manager	Accuracy/bias	± 10 %
Initial Calibration Blank (ICB)	Immediately after the ICV	≤ PQL	Correct problem, recalibrate and reanalyze ICV and ICB	Analyst, Supervisor, QA Manager	Accuracy/bias, Contamination	≤ PQL
PQL Standard for ICP (PQL)	At the beginning of a sample run, after every 20 samples and at the end of the run	80-120 % recovery.	(1) Reanalyze immediately for failing elements only. (2) Terminate analysis, correct problem, recalibrate and reanalyze all analytical samples analyzed since last good PQL Std.	Analyst, Supervisor, QA Manager	Sensitivity	80-120 % recovery.
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	(1) If blank value > PQL report sample results if < PQL or > 10 x the blank value; otherwise redigest. (2) If blank value is less than negative PQL, report sample results if > 10x the absolute value of the blank result, otherwise redigest the blank and associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-contamination	Absolute value < PQL. sample results if > 10x the absolute value of the blank result, otherwise redigest.
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with “E”.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.

SAP Worksheet #28-21 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPM
Analytical Method / SOP Reference: SW-846 1311, 6010B, 7470A / CA-510, CA-608, CA-615

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	Redigest and reanalyze the LCS and all associated samples for affected analyte.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Interference Check Solution A	Before analyzing samples and every 12 hours during a run	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified	Do not use sample results for failing elements unless ICSA > QL and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	Interferents: 80-120%R. Analytes: ±QL unless otherwise specified
Interference Check Solution AB	Before analyzing samples and every 12 hours during a run	80-120%R	Do not use sample results for failing elements unless ICSAB > 120% and sample result < QL	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120%R
Initial Calibration Blank	Immediately after the initial calibration verification	Absolute value of ICB < QL	Do not use results if sample > QL and less than 10X that in the ICB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of ICB < QL
Continuing Calibration Blank	After every 10 samples and at the end of the run	Absolute value of CCB < QL	Do not use sample results if ≥ QL and less than 10X that in the CCB	Analyst, Supervisor, QA Manager	Contamination	Absolute value of CCB < QL
Matrix Spike Sample	If deemed necessary by the laboratory	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	Initial Calibration Blank	Before beginning a sample run	< QL	Correct problem and repeat calibration	Analyst, Supervisor, QA Manager	Contamination
Mercury						
Independent Calibration Verification (ICV)	Immediately after calibration	± 10 %	Correct problem, recalibrate and reanalyze ICV	Analyst, Supervisor, QA Manager	Accuracy/bias	± 10 %
Initial Calibration Blank (ICB)	Immediately after the ICV	≤ PQL	Correct problem, recalibrate and reanalyze ICV and ICB	Analyst, Supervisor, QA Manager	Accuracy/bias, Contamination	≤ PQL

SAP Worksheet #28-21 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPM
Analytical Method / SOP Reference: SW-846 1311, 6010B, 7470A / CA-510, CA-608, CA-615

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
PQL Standard for CVAA (PQL)	At the beginning of a sample run, after every 20 samples and at the end of the run	80-120 % recovery.	(1) Reanalyze immediately for failing elements only. (2) Terminate analysis, correct problem, recalibrate and reanalyze all analytical samples analyzed since last good PQL Std.	Analyst, Supervisor, QA Manager	Sensitivity	80-120 % recovery.
Preparation Blank (PBW)	One per prep batch of twenty or fewer samples of similar matrix	Absolute value < PQL.	(1) If blank value > PQL report sample results if < PQL or > 10 x the blank value; otherwise redigest. (2) If blank value is less than negative PQL, report sample results if > 10x the absolute value of the blank result, otherwise redigest the blank and associated samples.	Analyst, Supervisor, QA Manager	Accuracy/bias-	Absolute value < PQL. sample results if > 10x the absolute value of the blank result, otherwise redigest.
Serial Dilution (L)	One per prep batch of twenty or fewer samples of similar matrix	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	If original sample result is at least 50x IDL, 5-fold dilution must agree within ± 10% of the original result.
Laboratory Control Sample (LCSW)	One per prep batch of twenty or fewer samples of similar matrix	Recovery within ± 20% of true value.	Redigest and reanalyze the LCS and all associated samples for affected analyte.	Analyst, Supervisor, QA Manager	Accuracy/Bias	80-120 % recovery.
Initial Calibration Blank	Before beginning a sample run	< QL	Correct problem and repeat calibration	Analyst, Supervisor, QA Manager	Contamination	< QL
Continuing Calibration Blank	At beginning of run, after every 10 samples, and at end of run	< QL	Repeat calibration and repeat all samples analyzed after the last successful CCB	Analyst, Supervisor, QA Manager	Contamination	< QL

SAP Worksheet #28-21 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: TCLPM
Analytical Method / SOP Reference: SW-846 1311, 6010B, 7470A / CA-510, CA-608, CA-615

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Sample	If deemed necessary by the laboratory	Recovery ± 25 % of true value if sample < 4x spike value	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	Recovery ± 25 % of true value if sample < 4x spike value
Matrix Spike Duplicate	If deemed necessary by the laboratory	RPD ≤ 20%	Flag results for affected analytes for all associated samples with"*", Perform postdigestion spike for all failing elements, except Ag, at 2x the indigenous level or 2x the PQL, whichever is greater.	Analyst, Supervisor, QA Manager	Accuracy/bias	RPD ≤ 20%

SAP Worksheet #28-22 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: REACT
Analytical Method / SOP Reference: Section 7.3; 9014, 9034 / CA733, CA-734

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Reactivity to Cyanide						
Method blank	One per prep batch	CN not detected >PQL	Investigate source of contamination. Report all sample results <PQL. Report sample results >10X the blank result and flag results with a "B". Reanalyze all other samples associated with the failing blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-contamination	HCN not detected >PQL
LCS	One per prep batch	0 – 100% nominal; statistically derived after sufficient historical	If the LCS fails high, report samples that are <PQL. Reanalyze /or recalibrate and reanalyze Redistill, recalibrate and/or reanalyze other samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	0 – 100% nominal; statistically derived after sufficient historical
Matrix Spike	If deemed necessary by the laboratory	0-100 %R	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep and reanalyze the samples and QC. Analyze unspiked sample scrubber solution with post-scrub spike to confirm matrix interference present in the scrubber. It should be anticipated that 0% to very low recoveries may be evidenced in high metals content samples. Notate sample result in raw data if matrix interference confirmed	Analyst, Supervisor, QA Manager	Accuracy/Bias	0-100 %R

SAP Worksheet #28-22 — Laboratory QC Samples Table (continued)

Matrix: Liquid IDW
Analytical Group: REACT
Analytical Method / SOP Reference: Section 7.3; 9014, 9034 / CA733, CA-734

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Sample Duplicate	One every ten samples	RPD ≤ 20%	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	RPD ≤ 20%
Reactivity to Sulfide						
Method blank	One per prep batch	No analyte detected >PQL	Investigate source of contamination. Report all sample results <PQL. Report sample results >10X the blank result and flag results with a "B". Reanalyze all other samples associated with the failing blank.	Analyst, Supervisor, QA Manager	Accuracy/bias-contamination	No analyte detected >PQL
LCS	One per prep batch	50 – 150% nominal; statistically derived after sufficient historical	If the LCS fails high, report samples that are <PQL. Reanalyze /or recalibrate and reanalyze Redistill, recalibrate and/or reanalyze other samples.	Analyst, Supervisor, QA Manager	Accuracy/Bias	50 – 150% nominal; statistically derived after sufficient historical
Matrix Spike	If deemed necessary by the laboratory	50-150 %R	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep and reanalyze the samples and QC. Analyze unspiked sample scrubber solution with post-scrub spike to confirm matrix interference present in the scrubber. It should be anticipated that 0% to very low recoveries may be evidenced in high metals content samples. Notate sample result in raw data if matrix interference confirmed	Analyst, Supervisor, QA Manager	Accuracy/Bias	50-150 %R
Sample Duplicate	One every ten samples	RPD ≤ 20%	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Accuracy/Bias, Precision	RPD ≤ 20%

SAP Worksheet #28-23 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: CORR
Analytical Method / SOP Reference: SW-846 9045 / CA-709

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample(LCS)	One per 20 samples	90-110% recovery	Correct problem, recalibrate	Analyst, Supervisor, QA Manager	Accuracy/Bias	90-110% recovery
Sample duplicate	One sample duplicate per every 10 field samples.	RPD < 20	1) Investigate problem and reanalyze sample in duplicate (2) If RPD is still unacceptable, report original result with notation or narration.	Analyst, Supervisor, QA Manager	Precision	RPD < 20

SAP Worksheet #28-24 — Laboratory QC Samples Table

Matrix: Liquid IDW
Analytical Group: IGN
Analytical Method / SOP Reference: Pensky Martens / CA-736

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per prep batch	No flash	Investigate source of contamination. Reprep and analyze method blank and all samples processed with the contaminated blank	Analyst, Supervisor, QA Manager	Accuracy/bias-contamination	No flash
Sample Duplicate	One sample duplicate per ten samples	Results of sample and sample duplicate agree within ±2 °C – Report the lowest value.	If lab QC in criteria and duplicates do not agree within ±2 °C , report the lowest value and narrate the other values. Else, reanalyze	Analyst, Supervisor, QA Manager	Accuracy/bias	Results of sample and sample duplicate agree within ±2 °C – Report the lowest value.
LCS (p-xylene)	In duplicate per batch of twenty samples or less	Flash point 27°C + 2°C	Repeat analysis of reference standard and associated samples	Analyst, Supervisor, QA Manager	Accuracy/bias	Flash point 27°C + 2°C

Page Intentionally Left Blank

SAP Worksheet #29 — Project Documents and Records Table

Document	Where Maintained
Field Notebooks	Electronic .pdf copies in the project file. Hardcopy (bound 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.
PID/FID readings	Recorded in Field Notebook. Stored in EnDat.
Water quality parameters collected during groundwater sampling	Recorded in Field Notebook. Stored in EnDat.
OVM/OVA readings	Recorded in Field Notebook. Stored in EnDat.
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. Archived at project closeout.
Sample Prep Logs	Hardcopy in the full data package. Archived at project closeout.
Run Logs	Hardcopy in the full data package. Archived at project closeout.
Reported Field Sample Results	Electronic .pdf copies in the project file. Hardcopy in the data package. Archived at project closeout.
Reported Results for Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Clean-up Records	Hardcopy in the full data package.
Raw Data	Hardcopy in the full data package. 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.
SI/Expanded SI Report	Electronic .pdf copies in the project file. Hardcopy (bound notebook) in the project file. Archived at project closeout*.

* Data archiving will be done in accordance with Navy requirements. CH2M HILL will provide the Navy (currently Bonnie Capito) all data and reports for archiving.

SAP Worksheet #29-a — Project Documents and Records Table

Katahdin Analytical Services, Inc.

Hardcopy Data Deliverables

DELIVERABLE	Data Reporting Level				
	I	H(+)	HI	IV	CLP
Report of Analysis (Form 1 or equiv -- TICs optional)	✓	✓	✓	✓	1
External chains of custody	✓	✓	✓	✓	1
Blank Results (Org Form 1/Ino Form 3 or equiv)	✓*	✓	✓	✓	1
Surrogate Recoverics (Org Form 2 or equiv)		✓	✓	✓	1
Laboratory Control Sample Recovery (Org Form 3/Ino Forril 7 or equiv)		✓	✓	✓	1
Dup/MS/MSD if performed on client sample (Org Form 3/1no Form 5A&6 or equiv)		✓(+)	✓	✓	1
Blank Summary (Org Form 4 or equiv)		✓			1
Tune Summary (Org Form 5 or equiv)		✓	✓	✓	1
Initial Calibration (Org Form 6/1no Form 2A&3 or equiv)		✓	✓	✓	1
Continuing Calibration (Org Foml 7/Ino Form 2A&3 or equiv)		✓	✓	✓	1
Internal Standard Area Summary (Org Form 8 or equiv)		✓	✓	✓	1
Run Logs			\1	✓	1
Sample Preparation logs			✓	✓	1
Raw data				✓	1
Florisil cartridge check (Org Form 9A or equiv) - (CLP only)					1
GPC calibration if performed (Org Form 98 or equiv) - (CLP only)					1
Dual column 10 summary (Pesticide Form 10 or equiv) - (if requested)			✓	✓	1
Instrument Sensitivity Check (Ino Form 28 or equiv)			✓	✓	1
Interference Check Sample (Ino Foml 4 or equiv)			✓	✓	1
Post Digest Spike Sample -- if performed (Ino Form 58)			✓	✓	1
Standard Addition Results Summary -- if performed (Ino Form 8 or equiv)			✓	✓	1
ICP Serial Dilutions -- if performed (Ino Form 9 or equiv)			✓	✓	1
JDLs (Ino Form 10 or equiv)			✓	✓	1
Interelement Correction Factors (Ino Form 11A&8 or equiv)			✓	✓	1
ICP Linear Ranges (Ino Form 12 or equiv)			✓	✓	1
Standard Preparation logs - (if requested)				✓	1
Internal chains of custody - (if requested)				✓	1

Data included in reporting level.
* Blank results provided for organics data.
1 CLP is performed and reported according to the appropriate protocol.
○ Data not included in reporting level.
\+ Dup/MS/MSD provided if requested on client sample.

SAP Worksheet #30 — Analytical Services Tables

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person, and telephone number)	Backup Laboratory / Organization (name and address, contact person, and telephone number)
GW or SW	EXPLO	13	Explosives by SW-846 8330	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	EXPLO	13	Perchlorate by SW-846 6850	Standard 28 Calendar-day TAT	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990	TBD
GW or SW	METAL	21	Metals by SW-846 6020, 7470A, 9012M	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	FMETAL	21	Filtered Metals by SW-846 6020, 7470A	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	PEST/PCB	16	Pesticides by SW-846 8081A PCBs by SW-846 8082	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	SVOA	16	Semivolatiles by SW-846 8270C SIM Semivolatiles (+ 1,4-Dioxane) by SW-846 8270C-SIM	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	VOA	23	Volatiles by SW-846 8260B SIM Volatiles by SW-846 8260B-SIM	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
GW or SW	WCHEM	11	Chloride by EPA 300.0 Total Dissolved Solids (TDS) by EPA 160.2	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990

Page Intentionally Left Blank

SAP Worksheet #30 — Analytical Services Tables (continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person, and telephone number)	Backup Laboratory / Organization (name and address, contact person, and telephone number)
SS or SB or SD	EXPLO	48	Explosives by SW-846 8330	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	EXPLO	48	Perchlorate by SW-846 6850	Standard 28 Calendar-day TAT	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990	TBD
SS or SB or SD	GRAINSIZE	41	Grain Size by ASTM D422	Standard 28 Calendar-day TAT	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990	TBD
SS or SB or SD	METAL	224	Metals by SW-846 6020, 7471, 9012	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	PEST/PCB	84	Pesticides by SW-846 8081A PCBs by SW-846 8082	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	SVOA	194	Semivolatiles by SW-846 8270C SIM Semivolatiles (+ 1,4-Dioxane) by SW-846 8270C-SIM	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	TPH	54	TPH-DRO by SW-846 8015M	Standard 28 Calendar-day TAT 1 fast TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	TPH	38	TPH-GRO by SW-846 8015M	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
SS or SB or SD	VOA	204	Volatiles by SW-846 8260B	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990

Page Intentionally Left Blank

SAP Worksheet #30 — Analytical Services Tables (continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person, and telephone number)	Backup Laboratory / Organization (name and address, contact person, and telephone number)
SS or SB or SD	WCHEM	41	pH by SW-846 9045C Total Organic Carbon (TOC) by Lloyd Kahn	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
			Dry Bulk Density by ASTM D2937	Standard 28 Calendar-day TAT	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990	TBD
IDW	TCLPV	1	SW-846 1311, 8260B	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	TCLPS	1	SW-846 1311, 8270C	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	TCLPP	1	SW-846 1311, 8081A	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	TCLPH	1	SW-846 1311, 8151A	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	TCLPM	1	SW-846 1311, 6010B, 7470A	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	REACT	1	Section 7.3; 9014, 9034	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990

Page Intentionally Left Blank

SAP Worksheet #30 — Analytical Services Tables (continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person, and telephone number)	Backup Laboratory / Organization (name and address, contact person, and telephone number)
IDW	CORR	1	SW-846 9045	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990
IDW	IGN	1	Pensky Martens	Standard 28 Calendar-day TAT	Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 POC: Andrea Colby (207) 874-2400	TestAmerica-Burlington 30 Community Drive Burlington, VT 05403 POC: Chris Anderson (802) 660-1990

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

Page Intentionally Left Blank

SAP Worksheet #31 — Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Field Performance Audit	One during sampling activities	Internal	CH2M HILL	Stephen Brand FTL CH2M HILL	Project Field Team CH2M HILL	John Swenfurth PM CH2M HILL	Brett Doerr Environmental Manager CH2M HILL
Safe Work Observation	One per week during field activities	Internal	CH2M HILL	Stephen Brand SSC CH2M HILL	Project Field Team CH2M HILL	Steve Beck H & S Officer CH2M HILL	Stephen Brand SSC CH2M HILL

Page Intentionally Left Blank

SAP Worksheet #32 — Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action (CA) Response Documentation	Individual(s) Receiving CA 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 CA _____ **Date** _____

Description of problem and when identified: _____

_____

_____

_____

_____

Cause of problem, if known or suspected: _____

_____

_____

_____

<u>Sequence of CA:</u> (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:

_____

_____

_____

_____

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 in 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…			

Page Intentionally Left Blank

SAP Worksheet #33 — QA 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	One during sampling activities	Submitted with report in which data is analyzed and presented	Stephen Brand PM CH2M HILL	CH2M HILL Regional Health, Safety, Environment, and Quality Manager, Included in project files.
Data Validation Reports	Once, after analysis by laboratory, for all laboratory analytical data except pH, TOC, grain size, dry bulk density, and One during sampling activities	Submitted by the validators no later than 21 days following their receipt of the analytical data from the laboratory.	Contracted Data Validation company.	Project Chemist, EIS, Project Manager.
Data Usability Assessments	Once in SI/ESI Report	With SI/ESI Report, to be submitted draft in August 2009	Project Chemist, CH2M HILL.	USEPA, PREQB, USFWS.

Page Intentionally Left Blank

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

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	Internal	Project Manager: John Swenfurth/CH2M HILL
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.	Internal	Field Team Leader (TBD)/CH2M HILL Project EIS: Chelsea Bennet/CH2M HILL
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project EIS in the form of laboratory logins.	Internal	Project EIS: Chelsea Bennet/CH2M HILL
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.	External	Data Validation Subcontractor (TBD)
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.	Internal	Project Chemist: Michael Zamboni/CH2M HILL
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check).	Internal	Project EIS: Chelsea Bennet/CH2M HILL
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process.	External	Data Validation Subcontractor (TBD)
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally by the third party validator. Also, the data will be verified for completeness by an Environmental Information System (EIS) specialist. A chemist will perform a data quality evaluation.	Internal and External	Respective Laboratory QA Officer Data Validation Contractor (TBD) Project EIS: Chelsea Bennet/CH2M HILL Project Chemist: Michael Zamboni/CH2M HILL

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

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If corrective actions are required, a copy of the documented corrective action 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 corrective action forms will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the site manager will be notified to ensure action is taken.	Internal	Project Manager: John Swenfurth/CH2M HILL Project Chemist: Michael Zamboni/CH2M HILL
Corrective Action Reports	Corrective action reports will be reviewed by the project chemist or project manager and placed into the project file for archival at project closeout.	Internal	Project Chemist: Michael Zamboni/CH2M HILL Project Manager: John Swenfurth/CH2M HILL

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

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods.	Project Chemist: Michael Zamboni/CH2M HILL
IIa	Target Compound List and Target Analyte List	Ensure the laboratory reported all analytes from each analysis group unless a site-specific requirement dictates a different list.	Project Chemist: Michael Zamboni/CH2M HILL
IIa / IIb	Reporting Limits	Ensure the laboratory met the CRQLs, CRDLs, and otherwise project-designated quantitation limits. If quantitation limits were not met, the reason will be determined and documented.	Project Chemist: Michael Zamboni/CH2M HILL
IIa	Field SOPs	Ensure that all field SOPs were followed.	Field Team Leader (TBD)
IIa	Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed.	Respective Laboratory Quality Assurance Officer
IIa	Raw Data	10 percent review of raw data to confirm laboratory calculations.	Data Validation Subcontractor (TBD)
IIb	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 (TBD)
IIa	Documentation of Method QC Results	Establish that all required QC samples were run and met required limits.	Data Validation Subcontractor (TBD)
IIb	Documentation of field QC Sample Results	Establish that all required QAPP QC samples were run and met required limits	Project Chemist: Michael Zamboni/CH2M HILL Data Validation Subcontractor (TBD)
IIb	NFESC Evaluation	Ensure that each laboratory is NFESC-Evaluated for the analyses they are to perform. Ensure evaluation timeframe does not expire.	Project Chemist: Michael Zamboni/CH2M HILL

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]

Page Intentionally Left Blank

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

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa and IIb	GW or SW	EXPLO	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Region II Checklists as outlined in SOP HW-16, Nitroaromatics and Nitroamines by HPLC, Rev. 2, September 2006.	Data Validation Subcontractor (DataQual Environmental Services, LLC)
	SS or SB or SD			
	GW or SW	METAL or FMETAL	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA, Rev. Final, October, 2004). Guidance and qualifiers from "Validation of Metals for the Contract Laboratory Program (CLP) based on SOW ILM05.3" (EPA Region II, Rev. 13, September, 2006) may also be applicable.	
	GW or SW			
	SS or SB or SD	METAL		
	GW or SW	PEST/PCB	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Region II Checklists as outlined in SOP No. HW-44 Data Validation SOP of Organochlorine Pesticides by Gas Chromatography SW-846 Method 8081B (EPA Region II, Rev. 1, October, 2006) and HW-45 Data Validation SOP of PCBs by Gas Chromatography SW-846 Method 8082A (EPA Region II, Rev. 1, October, 2006) Additional guidance taken from USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, Rev. Final, October, 1999)	
	SS or SB or SD			
	GW or SW	SVOA	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Region II Checklists as outlined in SOP No. HW-22 Validating Semivolatile Compounds by SW-846 Method 8270 (EPA Region II, Rev. 3, October 2006) Additional guidance taken from USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, Rev. Final, October, 1999)	
	SS or SB or SD			
	SS or SB or SD	TPH	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if a QA/QC exceedances has occurred. Data qualifiers will be those presented in USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, Rev. Final, October, 1999).	
	GW or SW	VOA	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. Data may be qualified if QA/QC exceedances have occurred. Region II Checklists as outlined in SOP No. HW-24 Standard Operating Procedure for the Validation of Organic Data Acquired using SW-846 Method 8260B (EPA Region II, Rev. 2, October, 2006) Additional guidance taken from USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, Rev. Final, October, 1999)	
	SS or SB or SD			

Page Intentionally Left Blank

SAP Worksheet #37 — Usability Assessment

The DQE assesses the effect of the overall analytical process on the "availability" of the analytical data. "Availability" in this context refers to whether results can be used by the project team based on their analytical soundness. If a result is analytically sound, it is available for use for evaluating potential releases and whether further action is warranted. However, a particular result or group of results may not be "usable" for these purposes if other conditions apply. For example, if there was a hypothetical site where a TCE spill had occurred and the TCE data for many or all of the samples were rejected, the data may not be usable for making site-specific determinations even if all the non-TCE data were analytically sound and available for use by the project team. In order to avoid confusion of terms, the DQE differentiates the "availability" of results from "usability" of results. "Available" results are analytically sound and available for use by the project team to make decisions, even if they are not usable for a particular purpose.

The three major categories of data availability evaluation are laboratory performance, field collection performance (i.e. blank contamination), and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements; in other words, a check of whether the laboratory analyzed the samples within the limits of the analytical method. Additionally, an independent, third-party validator conducted a review of the laboratory data to assess whether the analytical methods were within required control limits at the time of analysis. Evaluation of potential matrix interferences involves the review of several areas of results, including surrogate spike recoveries, MS recoveries, and duplicate sample results. Evaluation of field collection performance, such as blank contamination and field duplicates, involves the review of field QC and the determination of their effect on the sample results.

The data evaluation and validation is a multi-tiered approach. The process begins with an internal laboratory review, continues with an independent review by a third-party validator, and ends with an overall review by the Navy contractor project chemistry team. While only the data validator is allowed to apply qualifiers to the data, the process provides a medium for essential communication between the laboratory, validator, and project team, and allows for data quality to be thoroughly evaluated.

Data usability evaluation comprises critical assessment of the data with respect to the project objective. Given that the primary objective of the SI/Expanded SI is to determine if there has been a release and, if so, whether the release warrants further action, the comprehensive dataset will be reviewed to determine if it is spatially adequate (in Step 7 of the SI/Expanded SI decision analysis process) for making the project-specific determinations (i.e., was the suspected source area sufficiently characterized). Another aspect of the data usability evaluation is whether PALs were met (for non-detect results) and, if not, what the effects are on the project-specific determinations. Not achieving PALs does not necessarily mean project-specific determinations cannot be made; it may lend some uncertainty to those decisions and may mean additional lines of evidence are necessary to make the decisions conclusively, which will be discussed in the data usability evaluation.

Some specific examples of data availability and usability protocol are:

- The third-party data validator is the only party that may apply 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. The affect 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. The project team may choose to use "rejected" data in a qualitative manner under some circumstances, if the direction of bias and proximity to a project action limit are known. For example, if there were a hypothetical location where a TCE detection was rejected because of an extremely low bias, yet the result was still greater than the project action limit, this rejected result would still be usable for demonstrating that an exceedance has occurred.
- 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 QL is greater than the associated project action limit. In these cases, the project team will determine whether or not the laboratory would likely have detected the contaminant if present at or above the PAL (i.e., evaluation of the PAL versus the MDL).
- Ten percent of hardcopy analytical data will be checked against the electronic data to identify discrepancies. This check will be performed manually. The check will verify results and data validation 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.
- 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 examined. Field duplicates are expected to exhibit greater deviation than laboratory duplicates. Field duplicate and laboratory duplicate reproducibility is outlined in Worksheets 12 and 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 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 considered 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.
- 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.

Notes:

1. Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. The objective of the overall completeness goal for this project is set at 95% valid 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.

References

A. T. Kearney, Inc. and K. W. Brown and Associates, Inc. 1988. *Phase II RCRA Facility Assessment of the Atlantic Fleet Weapons Training Facility (LANT) Including The Eastern Maneuver Area Camp Garcia and Inner Range, Vieques, Puerto Rico.* October.

CH2M HILL. 2008. *Final Preliminary Assessment/Site Investigation 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico.* June.

CH2M HILL. 2007a. *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.

CH2M HILL. 2007b. *Master Quality Assurance Project Plan, Former Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico.*

CH2M HILL. 2007. *Final East Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.

CH2M HILL. 2004. *Draft Phase I RCRA Facility Investigation Report, Former Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico.*

CH2M HILL. 2001. *Description of Current Conditions Report Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico.* February.

Environmental Research, Inc. 2000. Vieques East GIS Draft.

GeoMarine., Inc. 2002. *Mangrove Forest Health and Status: Vieques Island, Naval Station Roosevelt Roads, Puerto Rico.* March.

National Oceanic and Atmospheric Administration (NOAA). 2006. *Study of Land and Fiddler Crabs on Vieques.*

Naval Facilities Engineering Command (NAVFACENGCOM). 2003. *Environmental Baseline Survey (Draft Final), Vieques Naval Training Range, Vieques Island, Puerto Rico.* Atlantic Division. April 1.

Puerto Rico Environmental Quality Board (PREQB). 1995. *Land Pollution Control Area, Hazardous Waste Bureau, Revised RCRA Facility Assessment Report Atlantic Fleet Weapons Training Facility, Vieques, Puerto Rico.* September.

United States Environmental Protection Agency (USEPA). 2006a. *SOP No. HW-37 Aroclor Rev. 0.* Region II. April.

USEPA. 2006b. *SOP No. HW-22 Validating Semivolatile Compounds by SW-846 Method 8270 Rev. 3.* Region II. October.

USEPA. 2006c. *SOP No. HW-34 Trace VOA Rev. 0.* Region II. April.

USEPA. 2006d. *SOP No. HW-24 SOP for the Validation of Organic Data Acquired using SW-846 Method 8260B Rev. 2.* Region II. October.

USEPA. 2006e. *Validation of Metals for the CLP Program based on SOW ILM05.3, Rev. 13.* Region II. September.

USEPA. 2006f. *SOP No. HW-44 Data Validation SOP of Organochlorine Pesticides by Gas Chromatography SW-846 Method 8081B Rev. 1*. Region II, October

USEPA. 2006g *SOP No. HW-45 Data Validation SOP of PCBs by Gas Chromatography SW-846 Method 8082A Rev. 1*. Region II, October

USEPA. 2005. *Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)*. March.

USEPA. 2004. *CLP National Functional Guidelines for Inorganic Data Review*. October.

USEPA. 2002. *Guidance for QAPPs, USEPA QA/G-5, Quality Assurance Management Section (QAMS).* EPA QA/G-5

USEPA. 1999. *CLP National Functional Guidelines for Organic Data Review*. October.

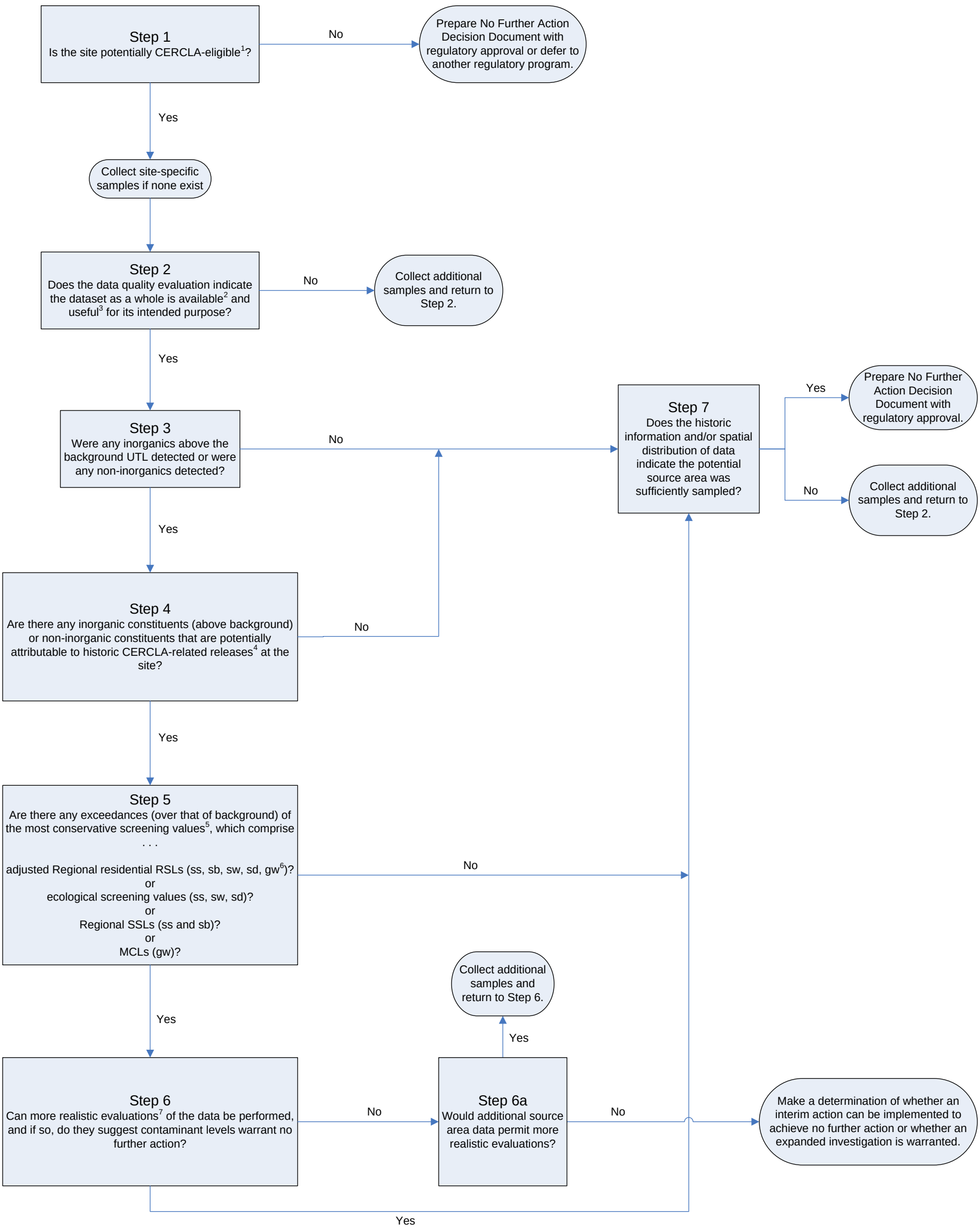
USEPA. 1999a. *Improving Site Assessment: Abbreviated Preliminary Assessments.* Office of Solid Waste and Emergency Response, EPA-540-F-98-037. OSWER DIRECTIVE 9375.2-09FS. October.

USEPA. 1999b. *Improving Site Assessment: Pre-CERCLIS Screening Assessments.* Office of Solid Waste and Emergency Response, EPA-540-F-98-037. OSWER 9375.2-11FS. October.

USEPA. *2006. SOP No. HW-16 Nitroaromatics and Nitroamines by HPLC, Rev. 2.* Region II. September.

USEPA. 1991. *Guidance for Performing Preliminary Assessments Under CERCLA*. Office of Solid Waste and Emergency Response. EPA/540/G-91/013. OSWER 9345.0-01A. September

Attachment A
Figures



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

[1] Determination of CERCLA eligibility is described in Worksheet #11 and in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

[2] "Available" data are described in Worksheet #37

[3] "Useful" data are described in Worksheet #37

[4] CERCLA-related releases are defined in Worksheet #11 and in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

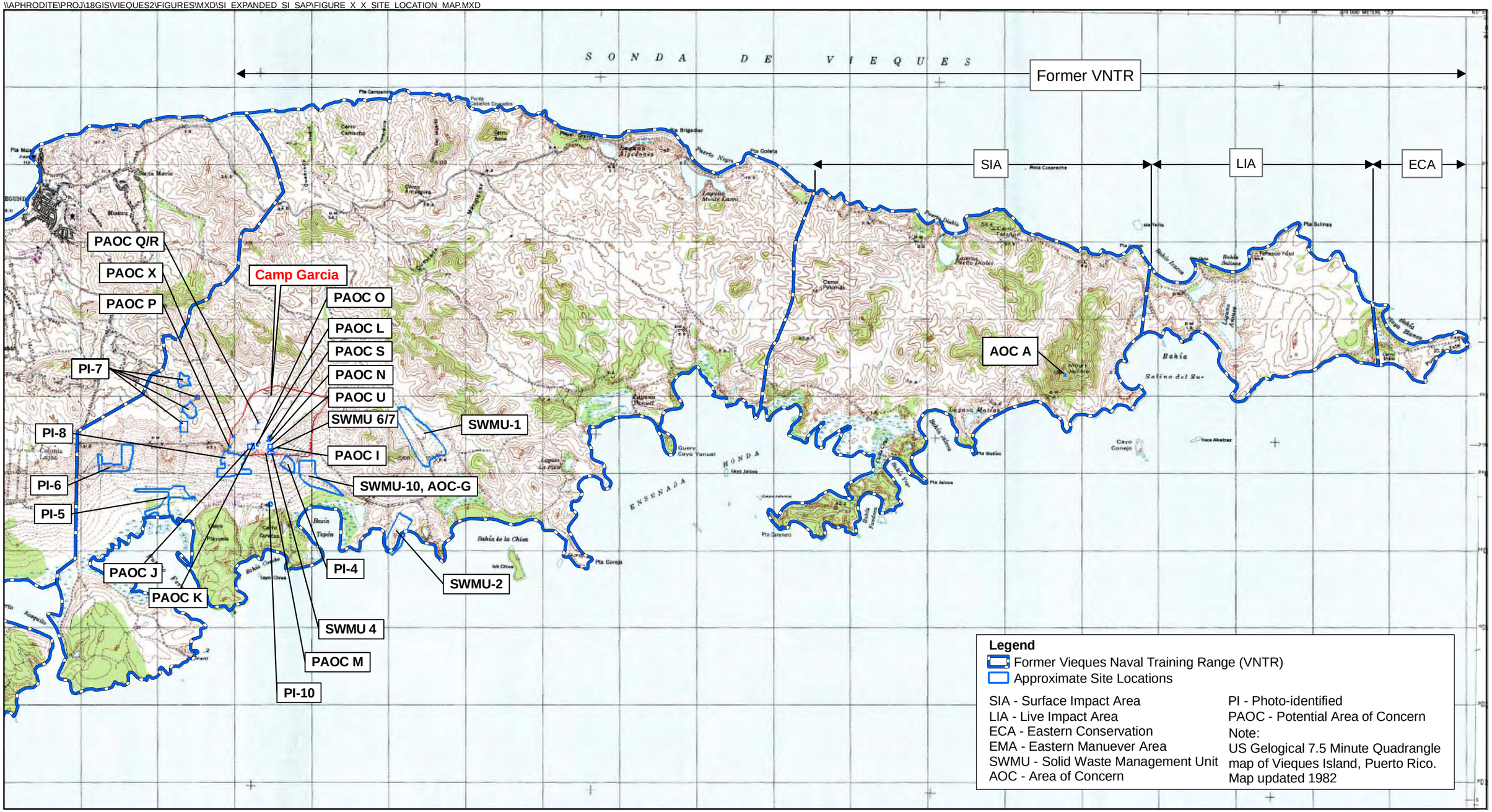
[5] For UST sites, PREQB UST Corrective Action Criteria are also included in the evaluation

[6] ss = surface soil; sb = subsurface soil; sw = surface water; sd = sediment; gw = groundwater

[7] Examples of the types of more realistic evaluations that may be performed are described in Section 1.1 of the Final PA/SI Report (CH2M HILL, June 2008)

FIGURE 1
SI/Expanded SI Evaluation Decision Tree
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

\\APHRODITE\PROJ\18GIS\VIEQUES2\FIGURES\MXD\SI_EXPANDED_SI_SAP\FIGURE_X_X_SITE_LOCATION_MAP.MXD



North

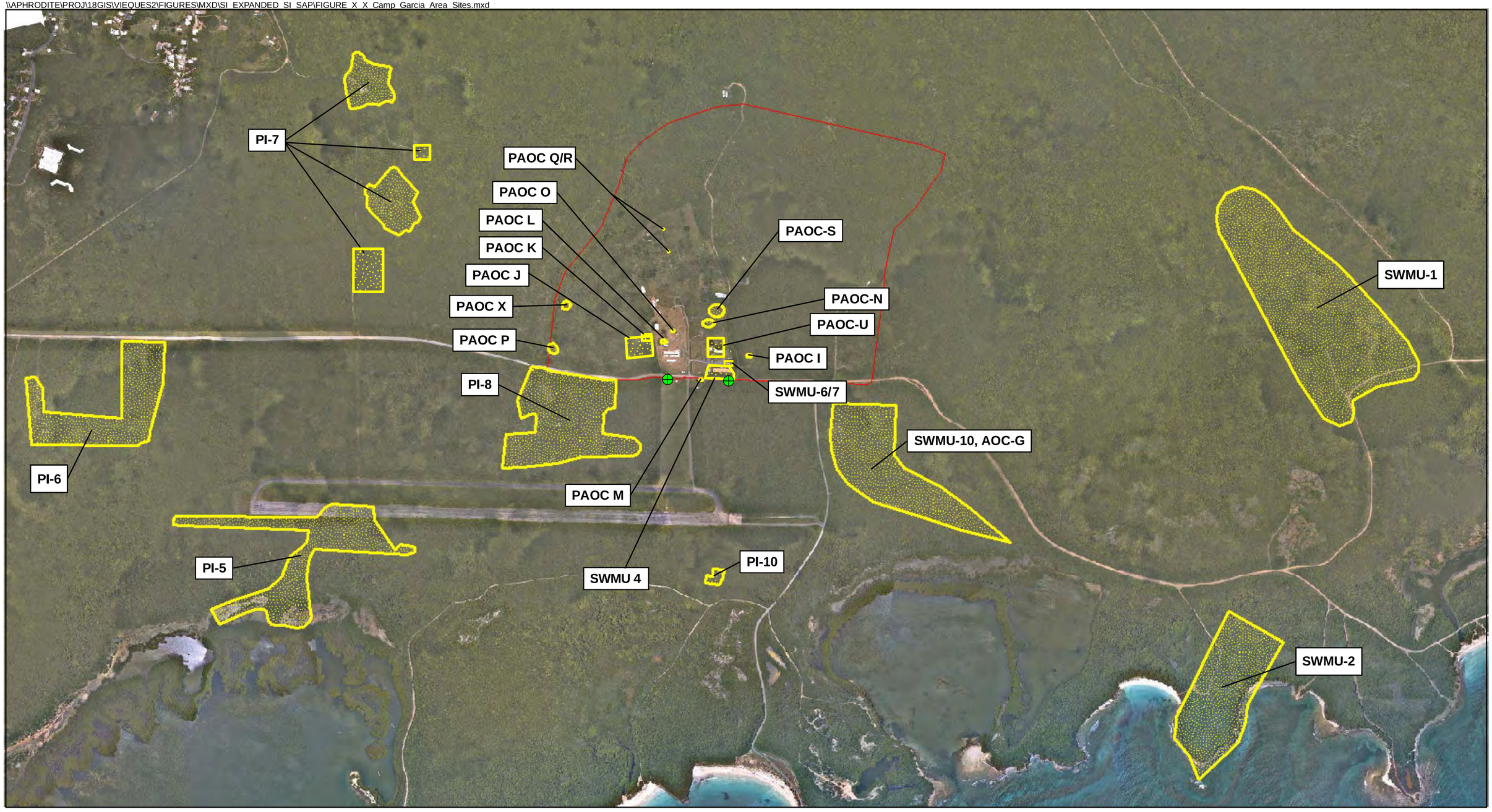
0 2,000 4,000 8,000 Feet

FIGURE 2
Site Location Map
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

\\APHRODITE\PROJ\18GIS\VIEQUES2\FIGURES\MXD\SI_EXPANDED_SI_SAP\FIGURE_X_X_Camp_Garcia_Area_Sites.mxd



Legend

- Proposed Monitoring Well Location
- Approximate Site Locations
- Camp Garcia

North

0 500 1,000 2,000 Feet

FIGURE 3
Camp Garcia Area Sites
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

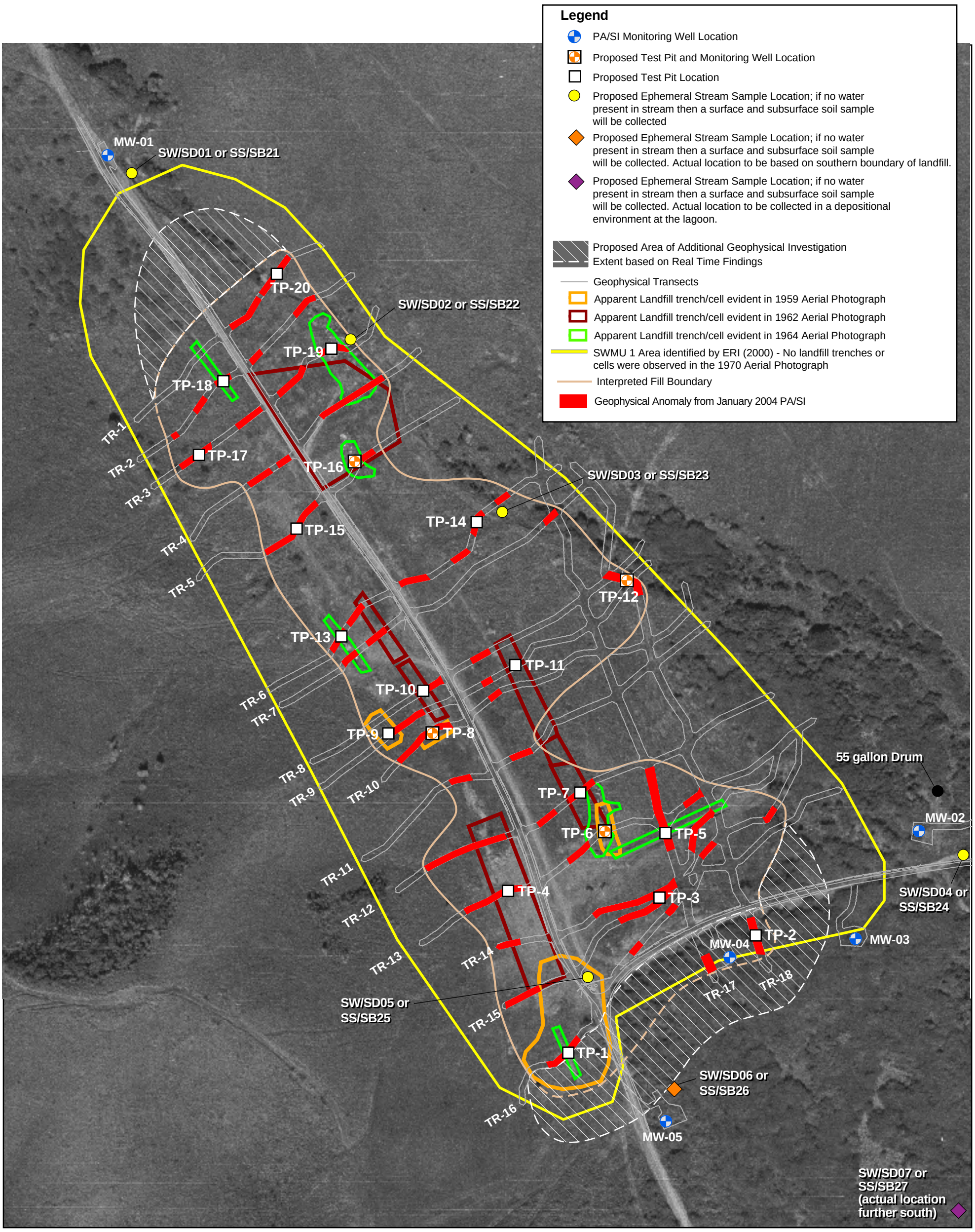
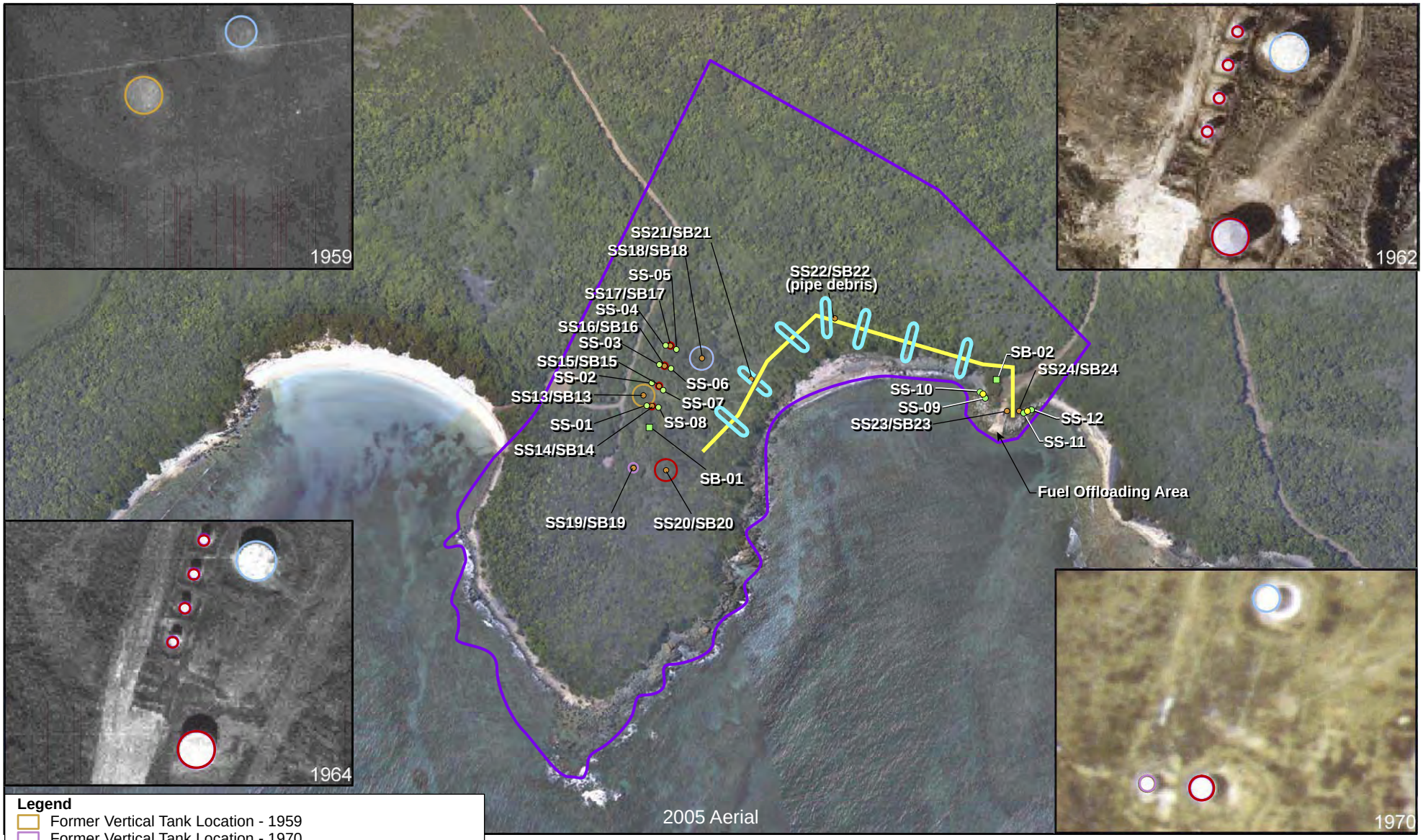


FIGURE 4
Proposed Additional Investigation (SWMU 1)
Preliminary Assessment/Site Inspection Report
12 Consent Order Sites and 8 PI/PAOC Sites
Vieques, Puerto Rico

CH2MHILL
ES052008002TPA



Legend

- Former Vertical Tank Location - 1959
- Former Vertical Tank Location - 1970
- Former Vertical Tank Location - 1959, 1962, 1964, and 1970
- Former Vertical Tank Location - 1962, 1964, and1970
- SWMU, AOC Sites
- Estimated Location of Buried Pipeline
- Proposed Surface and Subsurface Soil Sample Location
- Proposed Limits of Geophysical Surveys
- PA/SI Subsurface Soil Sample Locatioon
- PA/SI Surface Soil Sample Location
- Steel Pipe Supports

N W E S

0 175 350 700 Feet

FIGURE 5
Composite Figure of Historical Tank Locations and Proposed Sampling Locations, SWMU 2
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES072008004TPA

\\APHRODITE\PROJECTS\18GIS\VIEQUES2\FIGURES\MXD\SWMU_AOC_figures\SWMU_4_6_7_2005.mxd

Legend

- Phase I Environmental Assessment Surface Soil Sample Location
- PA/SI Subsurface Soil Sample Location
- Proposed Surface Soil and Subsurface Soil Sample Location

Surface soil sample designations are preceded by "CGSWMU4" (e.g. SS-01 = CGWMU4SS001)

Subsurface soil sample designations are preceded by "CGW4" (e.g. SB-01 = CGW4SB01)

- Proposed Monitoring Well Location

2005 Aerial

N W E S

0 25 50 100 Feet

FIGURE 6

Proposed Surface Soil and Subsurface Soil Sampling Locations at SWMU 6 and 7

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

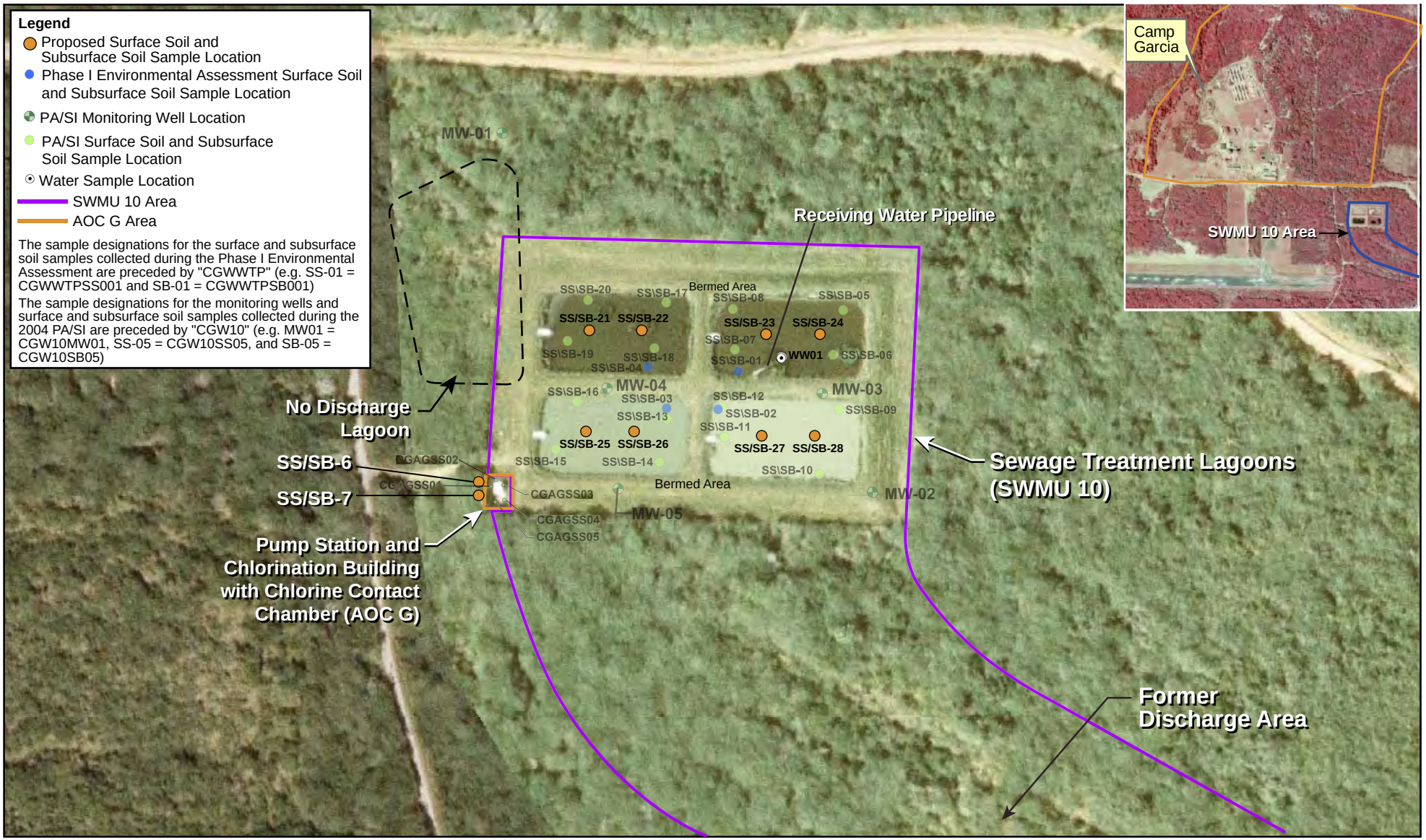


FIGURE 7
SWMU 10 and AOC G Sample Locations, 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA 183719.PP.DR.RI

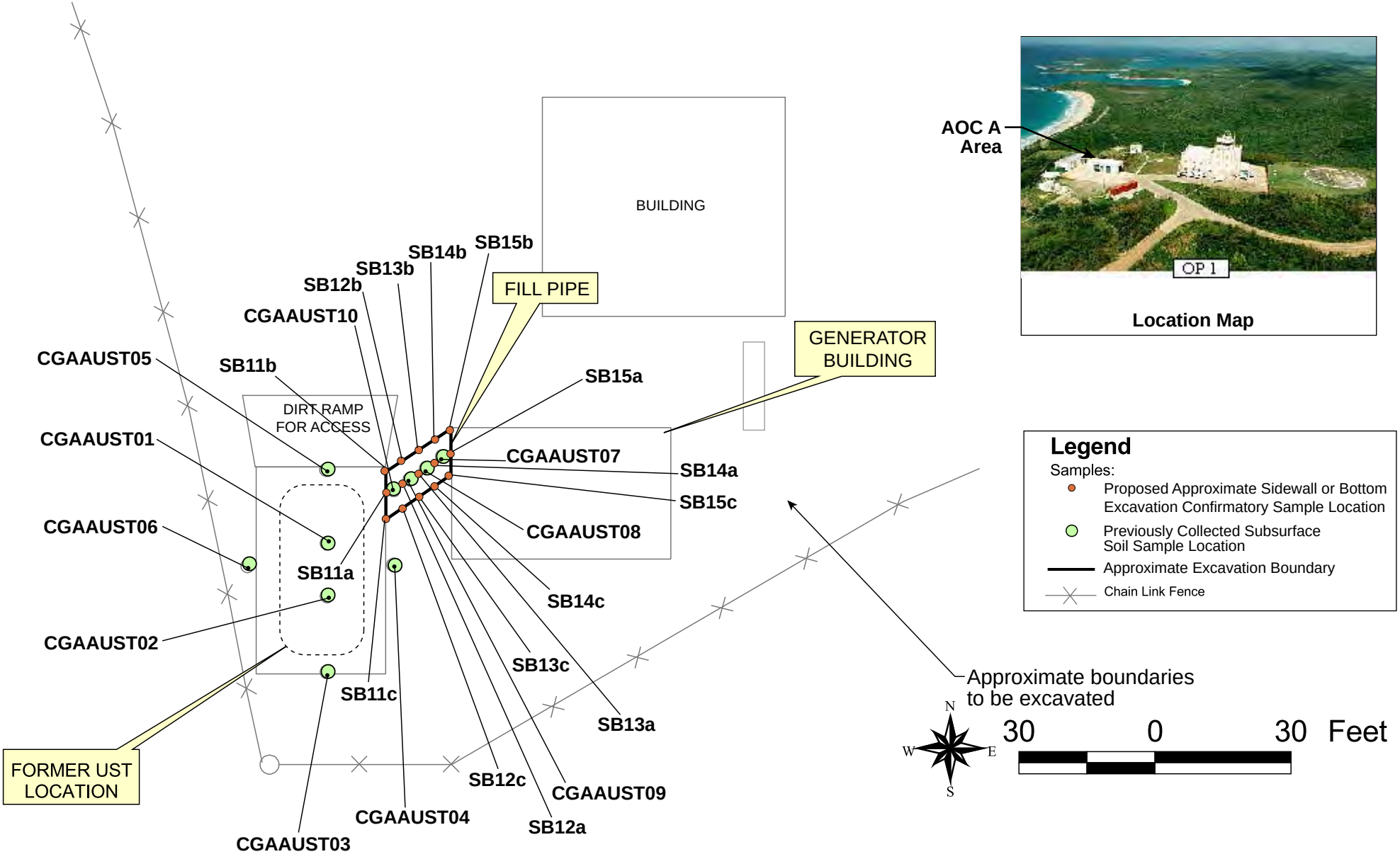
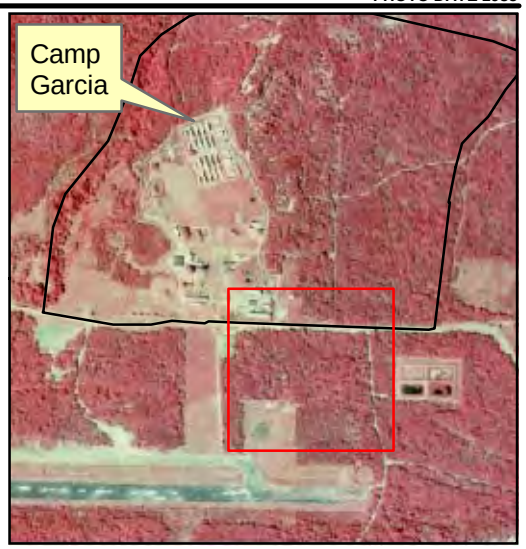


FIGURE 8
AOC A Approximate Excavation Boundaries and Confirmation Sample Locations
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

PHOTO DATE 1962

PHOTO DATE 1985



LEGEND

- PA/SI Monitoring Well Location With Water Elevation, Feet Above Mean Sea Level
- Proposed Monitoring Well Location
- PA/SI Surface and Subsurface Soil Sample Location
- PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location With Water Elevation, Feet Above Mean Sea Level
- PA/SI Surface and Subsurface Soil Sample Location Co-located with EBS Surface Soil Sample Location
- PA/SI Surface Water Sample Location
- Concrete Pipes/Foundation Slab/Vault Box
- Estimated Peizometric Contours from water levels taken on 12-29-08 (dashed where inferred). Contour intervals 0.04 feet.
- Feature visible in 1964 Aerial Photograph

Note: Each sampling location shown is preceded by "EPI04" (e.g. SS02/SB02=EPI04-SS02 and EPI04-SB02, and MW-1=EPI04-MW01)

N

0 100 200 Feet

FIGURE 9

Potentiometric Surface Elevation 12-29-08

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

PHOTO DATE 2005

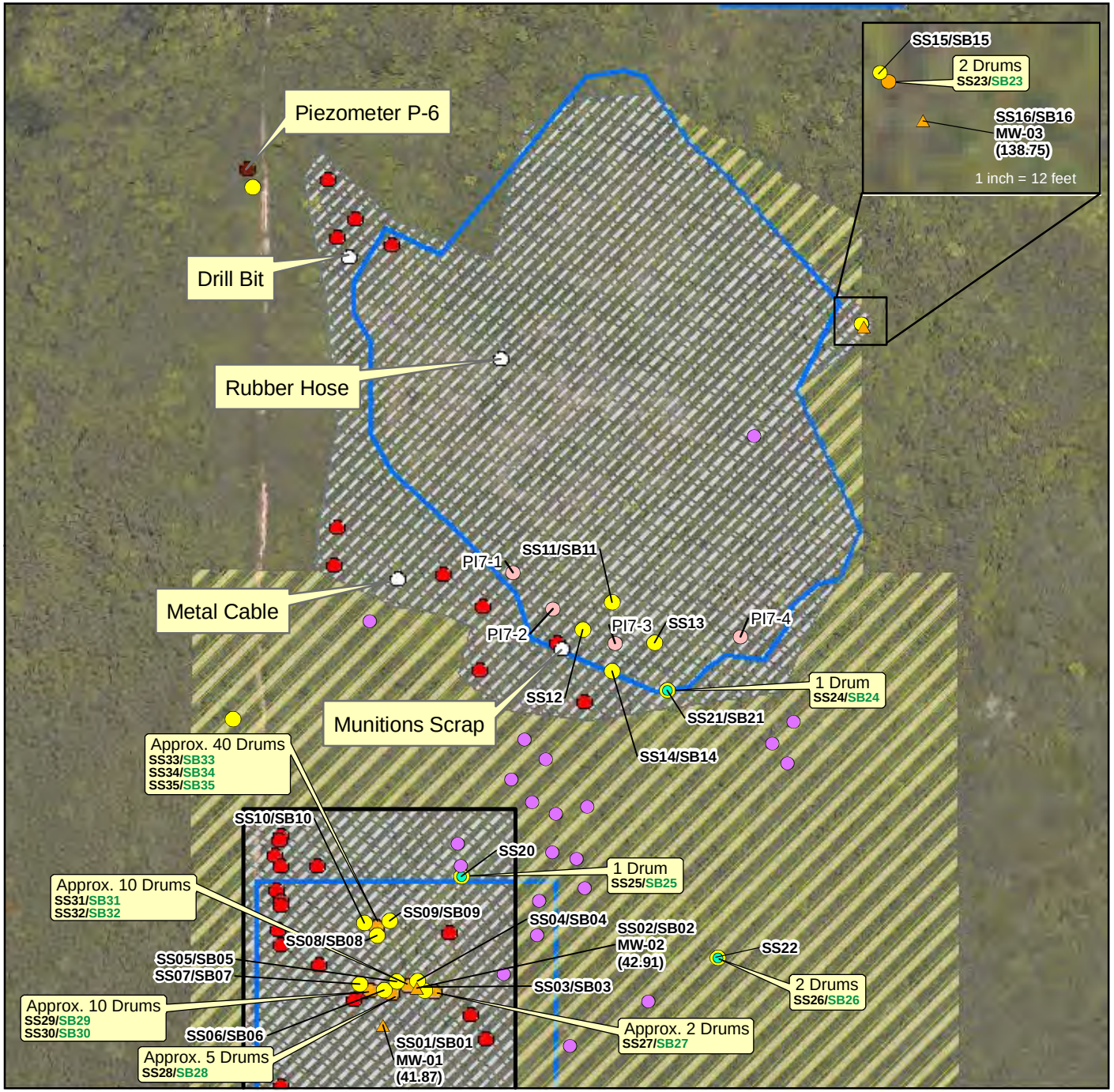
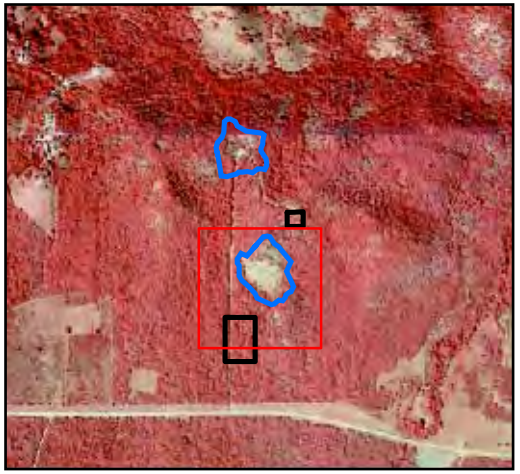


PHOTO DATE 1985



LEGEND

- PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location With Water Elevation, Feet Above Mean Sea Level
- PA/SI Subsurface and/or Surface Soil Sample Location
- Previously Installed Piezometer
- EBS Surface Soil Sample Location
- Drums Identified During 2005 Reconnaissance
- Drums Identified During 2006 Reconnaissance
- Metallic Sub-surface Anomalies Identified During 2005 Reconnaissance
- Surface Debris Identified During 2005 Reconnaissance
- Surface Debris Identified During 2006 Reconnaissance
- Area of August 2005 PA/SI Reconnaissance
- Area of March 2006 PA/SI Reconnaissance
- ERI Aerial Photo Analysis Area

Note:
Each sampling location shown is preceded by "EPI07" (e.g. SS02/SB02 = EPI07-SS02 and EPI07-SB02, and MW-1 = EPI07-MW01)

Subsurface soil samples will only be collected if visual/PID/odor screening suggests the presence of contamination

0 100 200 Feet

N W E S

FIGURE 10
PI 7 Central Subsection - Former Quarry

Preliminary Assessment/Site Inspection Report
12 Consent Order Sites and 8 PI/PAOC Sites
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

PHOTO DATE 2005

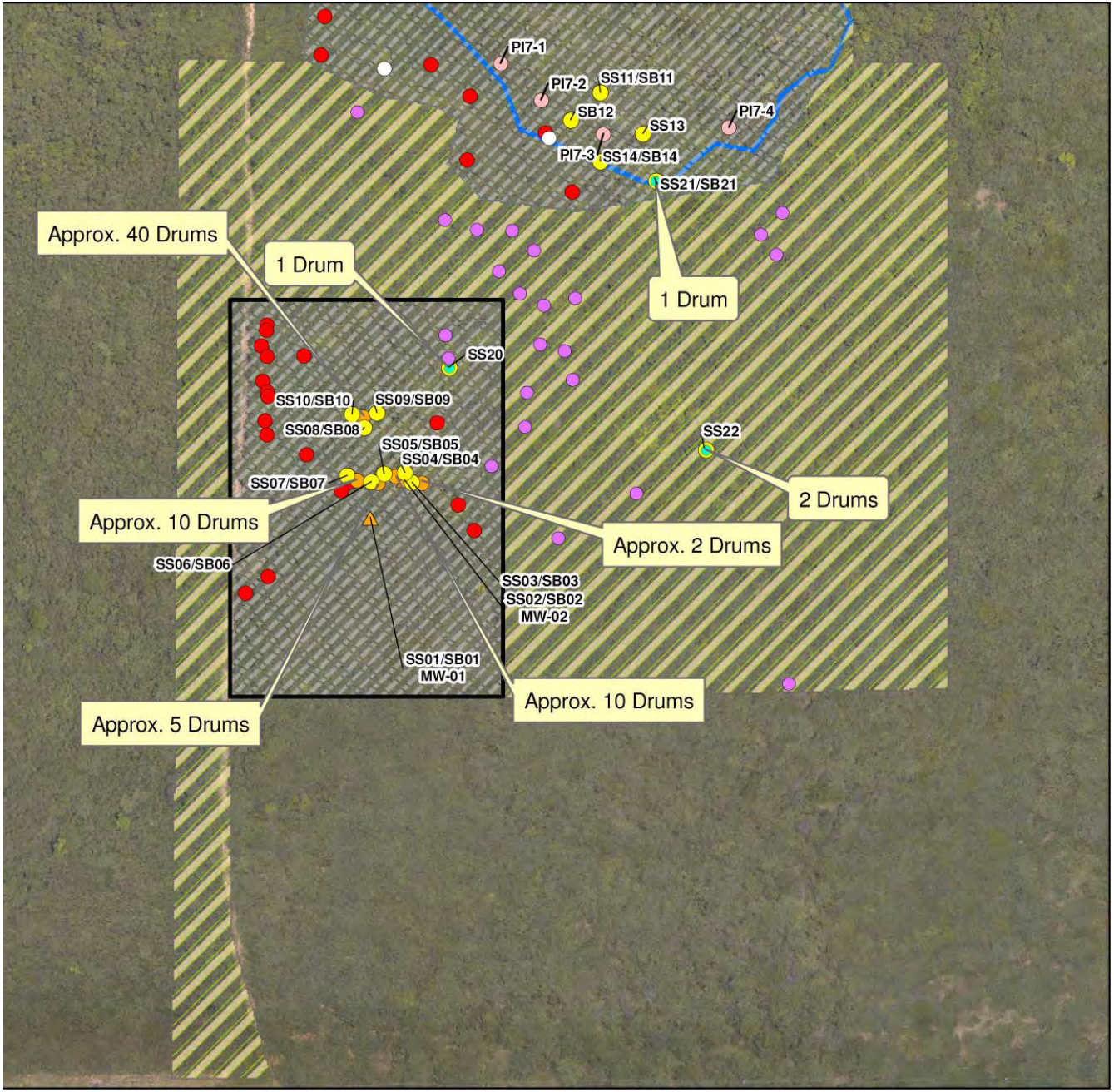
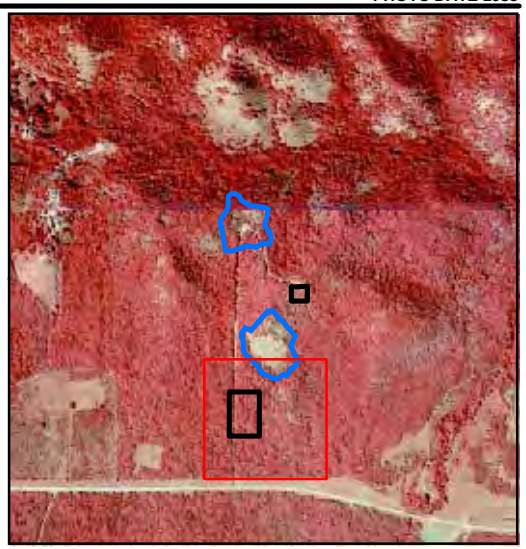


PHOTO DATE 1985



LEGEND

- PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location
- PA/SI Subsurface and/ or Surface Soil Sample Location
- Drums Identified During 2005 Reconnaissance
- Drums Identified During 2006 Reconnaissance
- Metallic Sub-surface Anomalies Identified During 2005 Reconnaissance
- Surface Debris Identified During 2005 Reconnaissance
- Surface Debris Identified During 2006 Reconnaissance
- ERI Aerial Photo Analysis Area
- Area of August 2005 PA/SI Reconnaissance
- Area of March 2006 PA/SI Reconnaissance

Note:
Each sampling location shown is preceded by "EPI07" (e.g. SS02/SB02 = EPI07-SS02 and EPI07-SB02, and MW-1 = EPI07-MW01)

0 50 100 Feet

N W E S

FIGURE 11

Former Tar Drum Disposal Area

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

PHOTO DATE 2005

PHOTO DATE 1983

LEGEND

- PA/SI Surface and Subsurface Soil Sample Location
- PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location
- Proposed Surface Soil Sample Location

Note:
Each PA/SI sampling location is preceded by "EPAL" (e.g. SS02/SB02 = EPAL-SS02 and EPAL-SB02, MW-01 = EPAL-MW01)

N
W E
S

0 30 60 Feet

FIGURE 12
Proposed Additional Surface Soil Sample Locations at PAOC L
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

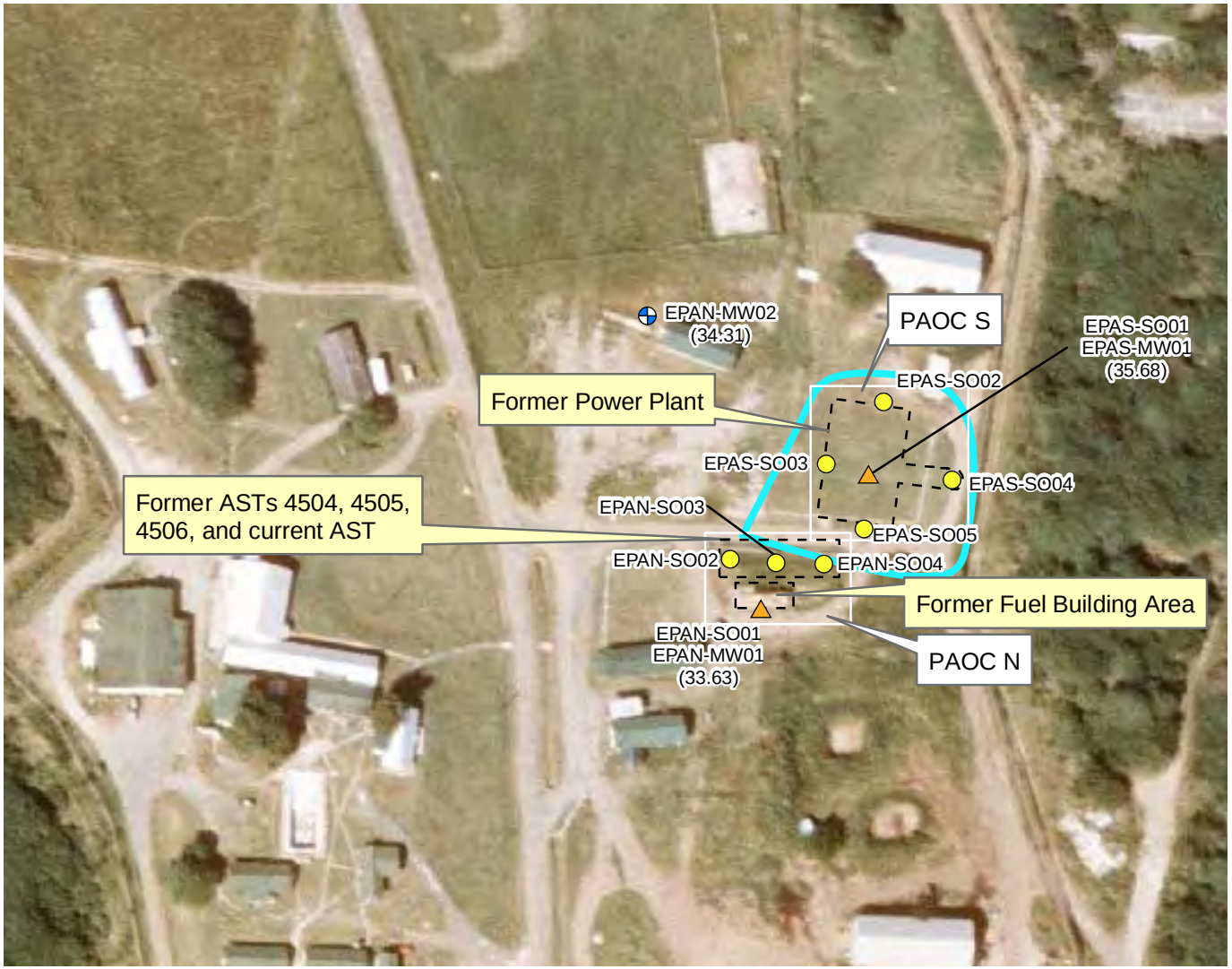


PHOTO DATE 1983

LEGEND

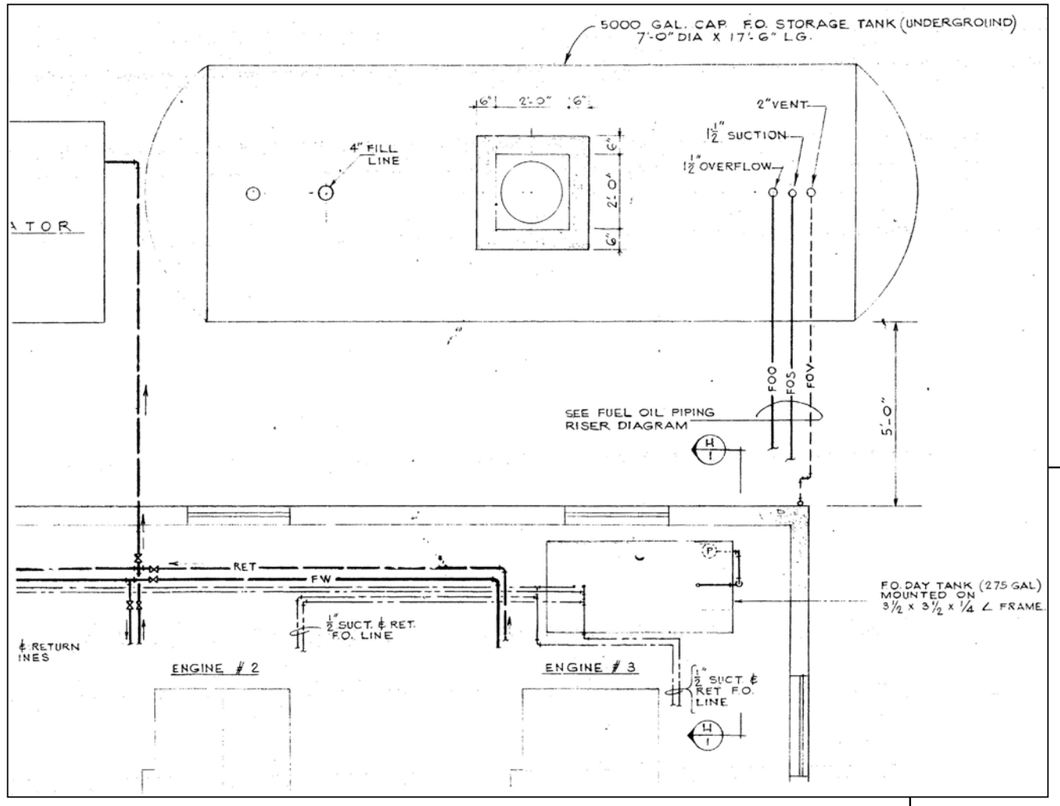
- PA/SI Monitoring Well Location with Water Level Elevation, Feet Above Mean Sea Level
- PA/SI Surface and Subsurface Soil Sample Location
- PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location with Water Level Elevation, Feet Above Mean Sea Level
- Propsed Area of Geophysical Investigation

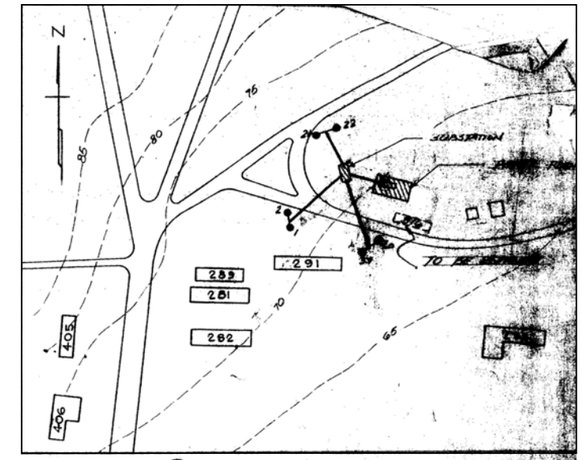
Note: Water Level Elevations collected 4/3/06-4/4/06

North

0 100 200 Feet

FIGURE 13
PAOCs N and S Geophysical Investigation, 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico





(A) PLOT PLAN

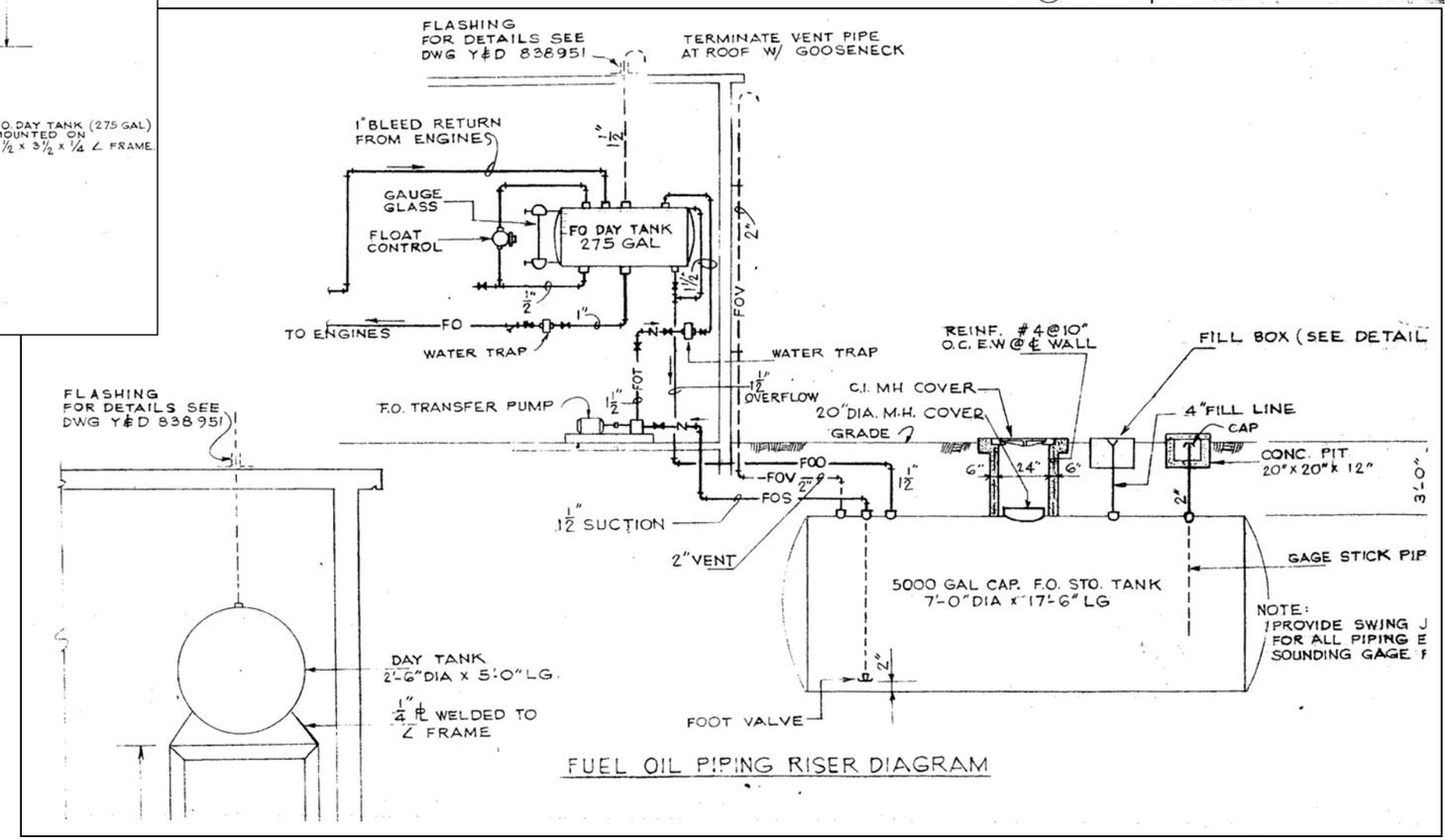
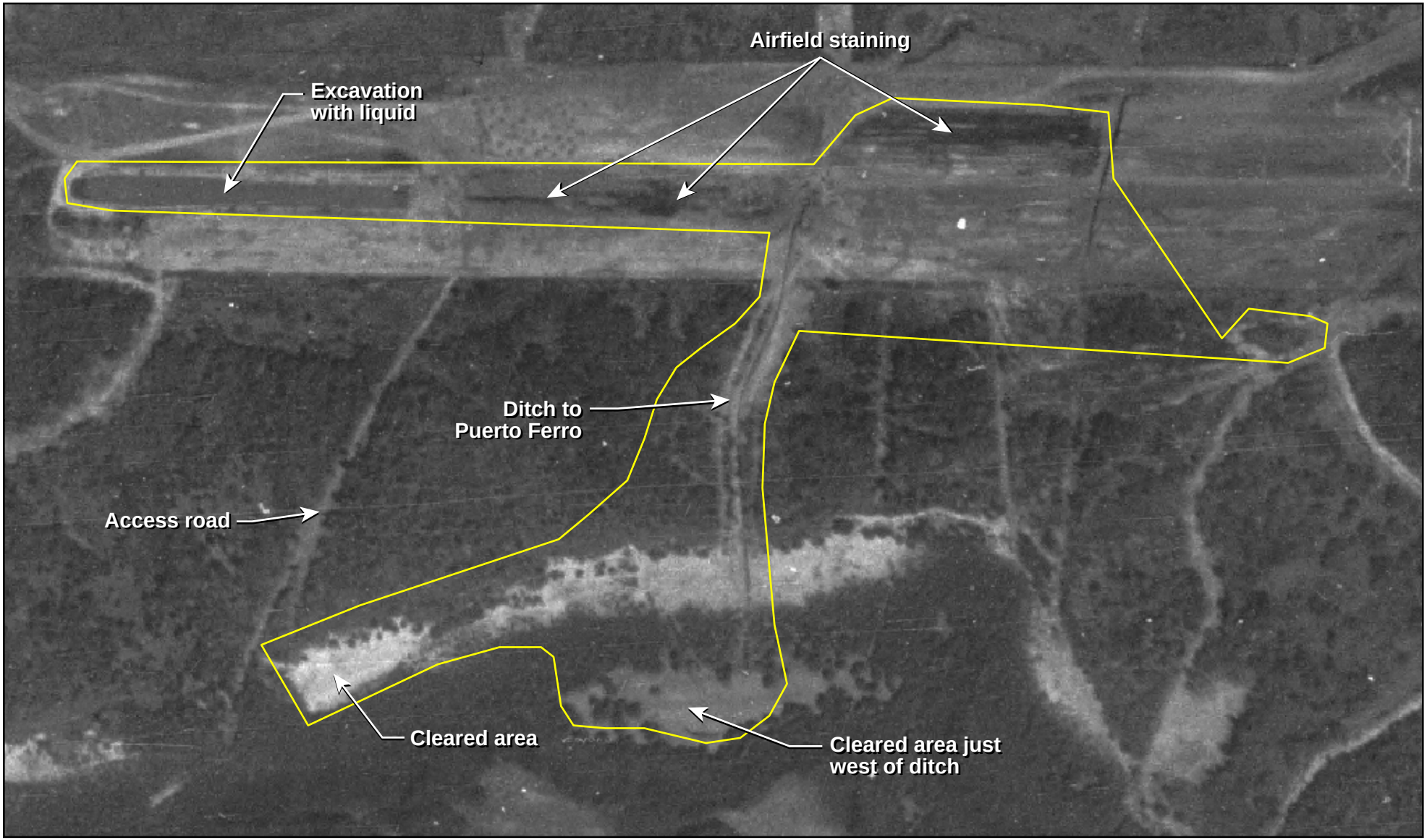


FIGURE 13-A
PAOC S UST Diagram
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

PI-5

North

0 100 200 400 600 Feet

FIGURE 14
PI-5 1959 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-5 and PI-8

North

0 250 500 1,000 Feet

CH2MHILL

ES052008002TPA

FIGURE 15
PI-5 and PI-8 1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

\\APHRODITE\PROJECTS\18GIS\VIEQUES2\FIGURES\MXD\PI_PAOC_FIGURES_SWENFURTH\PI_5_1962.mxd

Legend

PI-5

Proposed Surface and Subsurface Sampling Locations

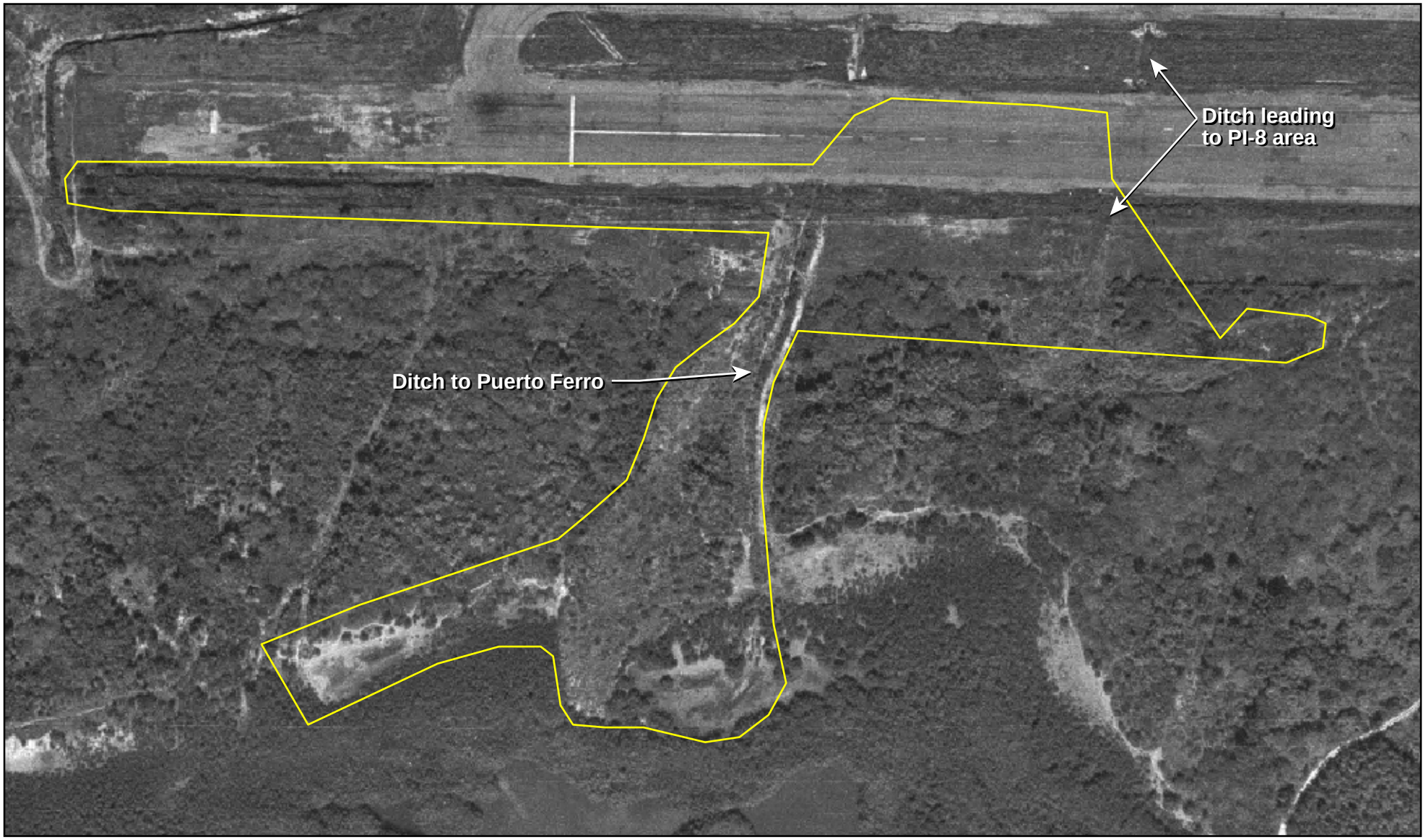
North

0 100 200 400 600 Feet

FIGURE 16
PI-5 Sample Locations, 1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PI-5

North

0 100 200 400 600 Feet

FIGURE 17
PI-5 1964 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-5

North

0 100 200 400 600 Feet

FIGURE 18
PI-5 2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-6

ERI Notes:

- Probable treatment plant
- One of buildings in southeast area may be a pump house

North

0 100 200 400 Feet

FIGURE 19

PI-6 1959 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-6

North

0 100 200 400 Feet

FIGURE 20
PI-6 1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-6

Proposed Surface and Subsurface Sampling Locations

North

0 100 200 400 Feet

CH2MHILL

ES052008002TPA

FIGURE 21

PI-6 1964 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

Legend

- PI-6
- Proposed Surface and Subsurface Sampling Locations
- EBS Surface Soil Sample Locations (PI6-1, 2, 3)
- EBS PCB Wipe Sample Locations (PBC1-6)

Note: Approximate location of former wash pad, actual site to be identified during pre-sampling reconnaissance

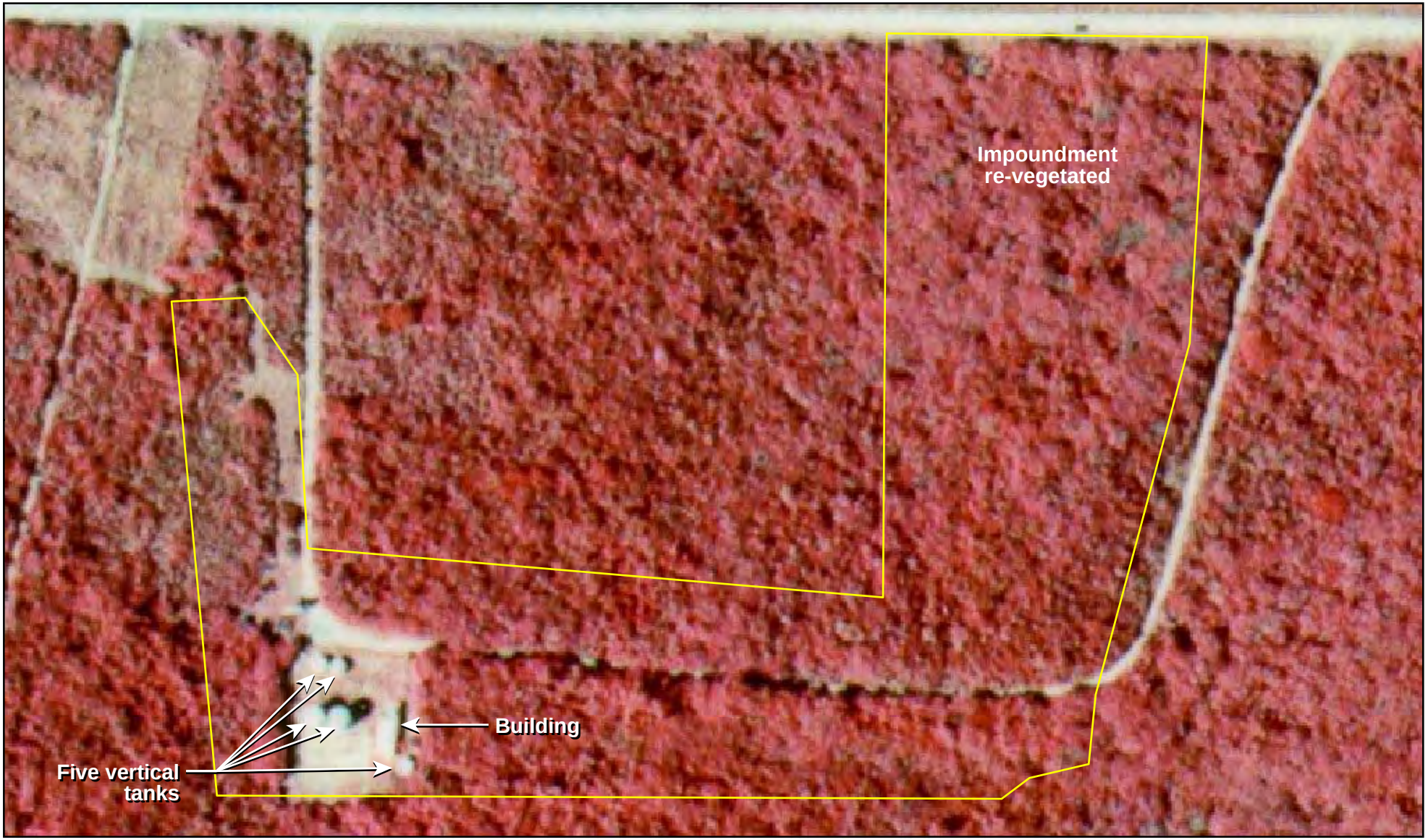
North

0 100 200 400 Feet

FIGURE 22
PI-6 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PI-6

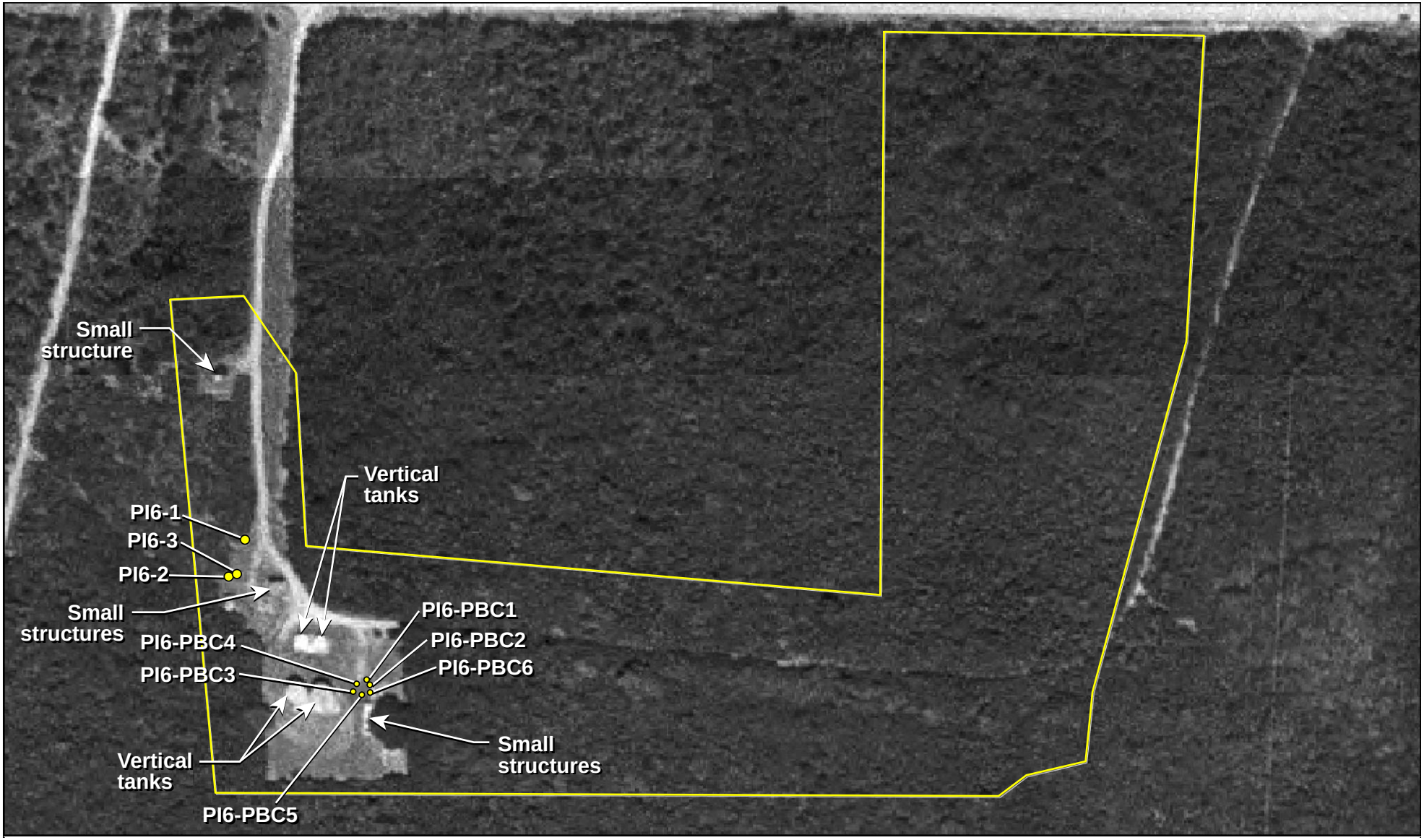
North

0 100 200 400 Feet

FIGURE 23
PI-6 1985 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

- PI-6
- EBS Surface Soil Sample Locations (PI6-1, 2, 3)
- EBS PCB Wipe Sample Locations (PBC1-6)

North

0 100 200 400 Feet

CH2MHILL

ES052008002TPA

FIGURE 24
PI-6 1994 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Legend

PI-6

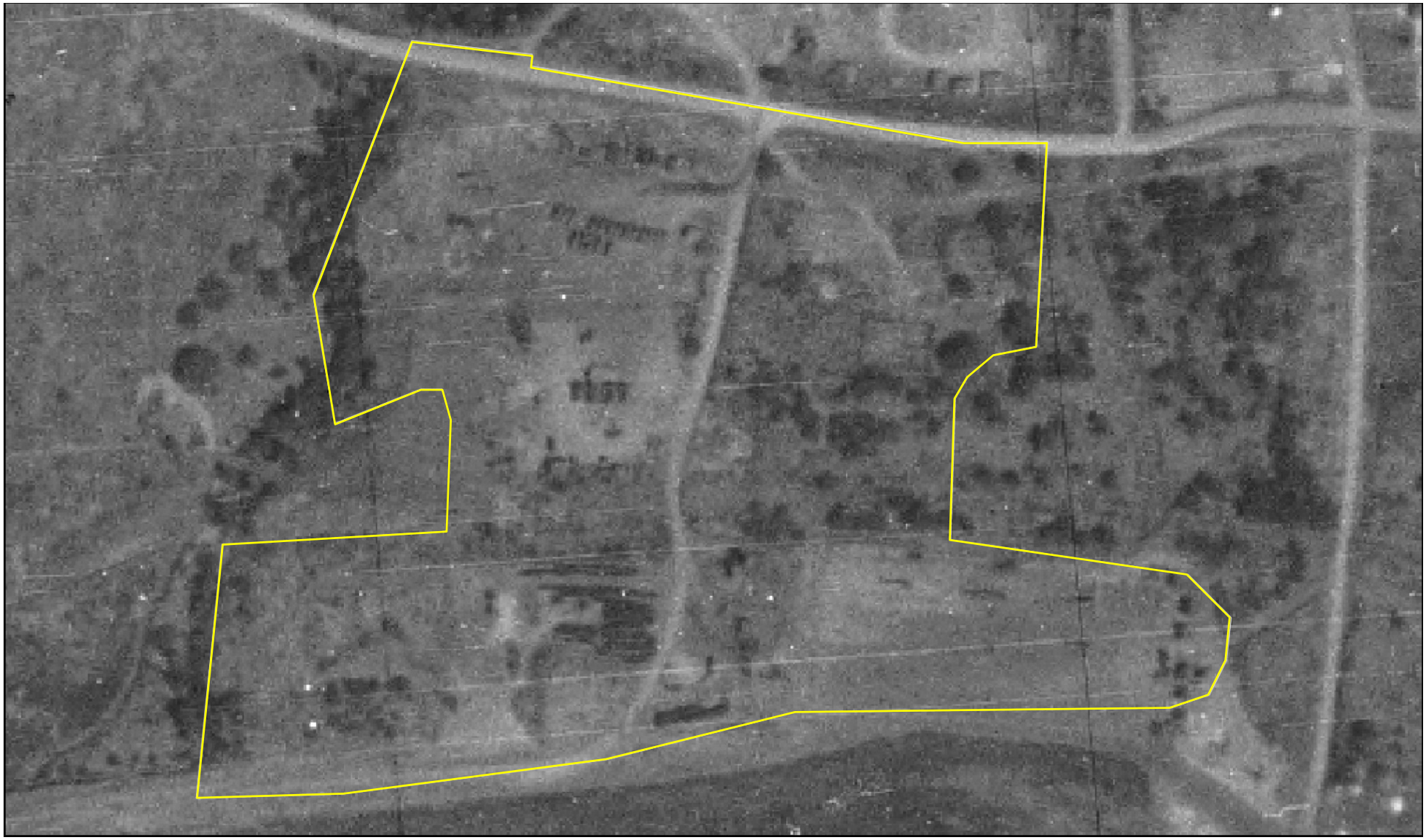
North

0 100 200 400 Feet

FIGURE 25
PI-6 2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PI-8

ERI Notes:

Vehicle and equipment storage, maintenance area, and staining

North

0 100 200 400 Feet

CH2MHILL

ES052008002TPA

FIGURE 26

PI-8 1959 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

Legend

- PI-8
- EBS Surface Soil Sample Locations
- Proposed Surface and Subsurface Sampling Locations

ERI Notes:

- Open storage of vehicles
- Equipment and multi-colored materials (some probably metallic)
- Heavy staining noted south of probable maintenance buildings

North

0 100 200 400 Feet

FIGURE 27
PI-8 Sample Locations, 1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-8

EBS Surface Soil Sample Locations

ERI Notes:

• Vehicle and equipment storage remains

North

0 100 200 400 Feet

CH2MHILL

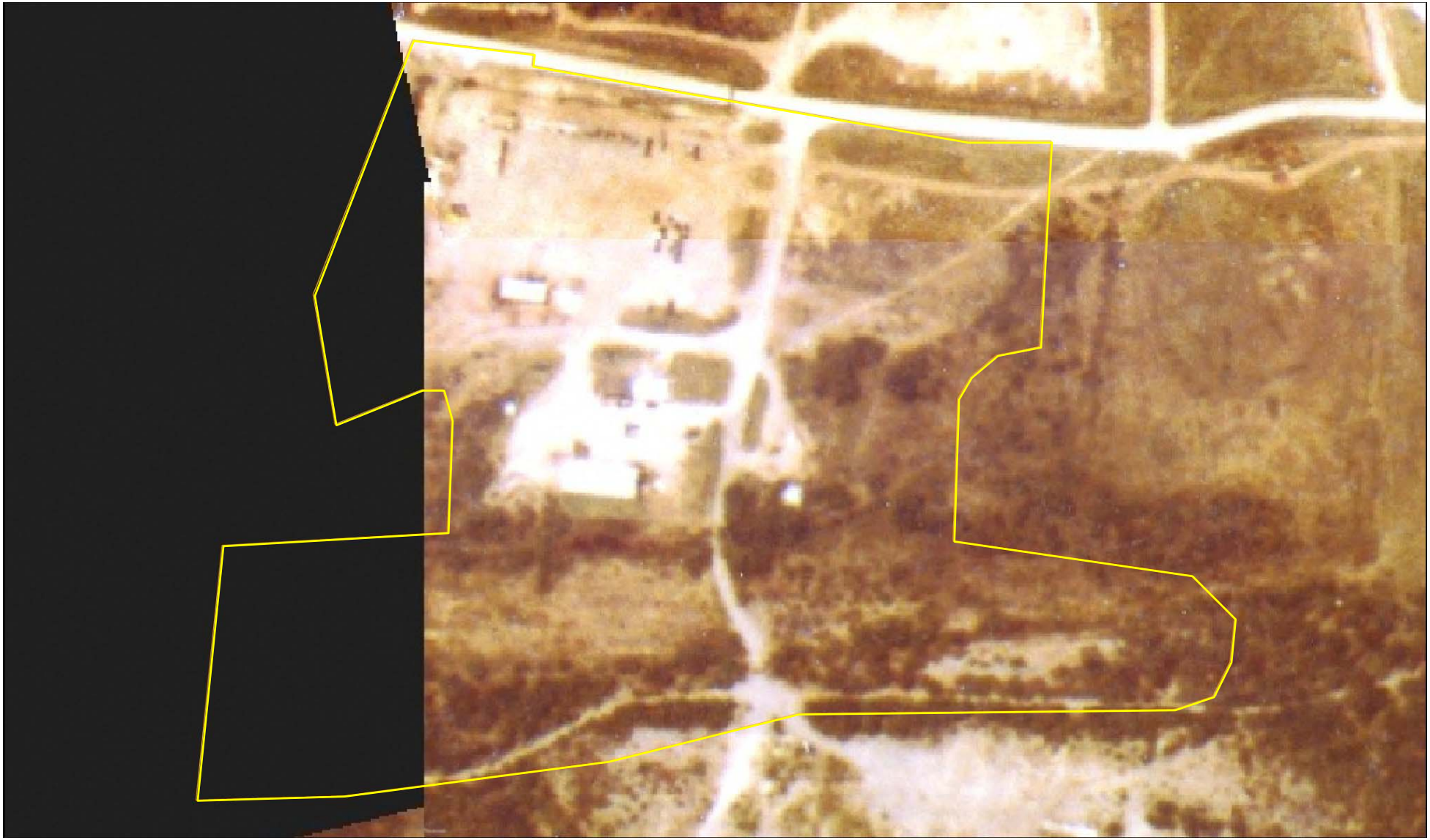
ES052008002TPA

FIGURE 28

PI-8 1964 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico



Legend

PI-8

ERI Notes:

- Probable staining is noted on the north side of a probable maintenance building.
- The southern portion of the site appears inactive.

North

0 100 200 400 Feet

FIGURE 29

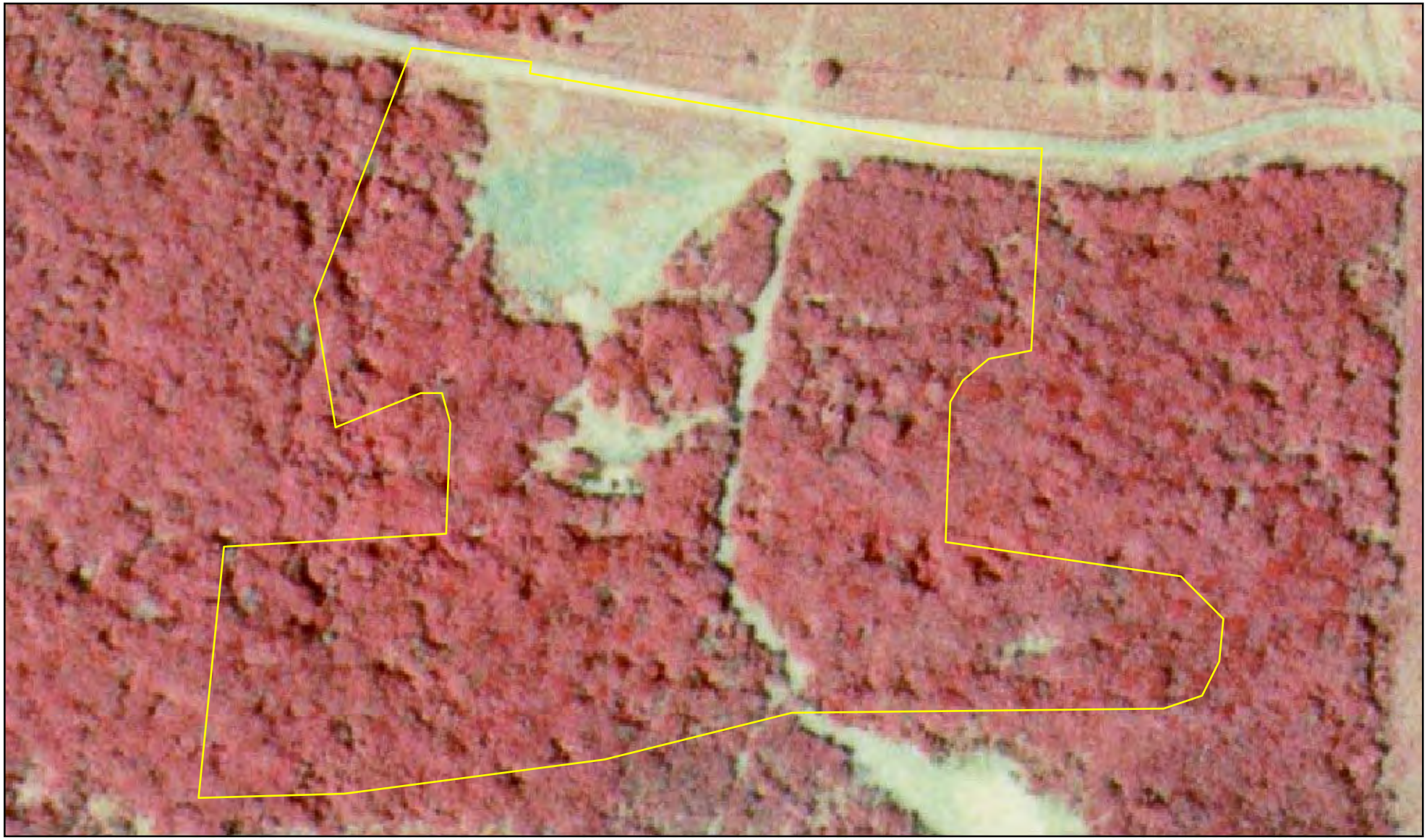
PI-8 1970 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PI-8

ERI Notes:

- Inactive

North

0 100 200 400 Feet

CH2MHILL

ES052008002TPA

FIGURE 30

PI-8 1985 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

Legend

PI-8

North

0 100 200 400 Feet

FIGURE 31
PI-8 2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

- PI-10
- EBS Surface Soil Sample Locations
- Proposed Surface and Subsurface Soil Sample Locations

North

0 100 200 400 Feet

FIGURE 32
PI-10 Sample Locations,
1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PI-10

ERI Notes:

- Lagoons inactive - revegetating
- Site not completely re-vegetated by 1985
- Site completely re-vegetated by 1994

North

0 100 200 400 Feet

CH2MHILL

ES052008002TPA

FIGURE 33

PI-10 1964 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

Legend

PI-10

North

0 100 200 400 Feet

FIGURE 34

PI-10 2005 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

Black area indicates no aerial photography

Camp Garcia Area

North

0 250 500 1,000 Feet

CH2MHILL

ES052008002TPA

FIGURE 35
PAOCs I, O 1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Legend

- Camp Garcia Area
- EBS Surface Soil Sample Location
- Proposed Surface and Subsurface Sampling Locations
- Monitoring Wells installed during the PA/SI
- Proposed Monitoring Well
- PAOC U Surface and Subsurface Sample Locations (PA/SI)

CH2MHILL

ES052008002TPA

FIGURE 36
PAOCs I, M, O and Q Sample Locations, 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Legend

Camp Garcia Area

North

0 125 250 500 Feet

FIGURE 37
PAOC I 1994 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

North

0 50 100 200 Feet

FIGURE 38
PAOC M 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

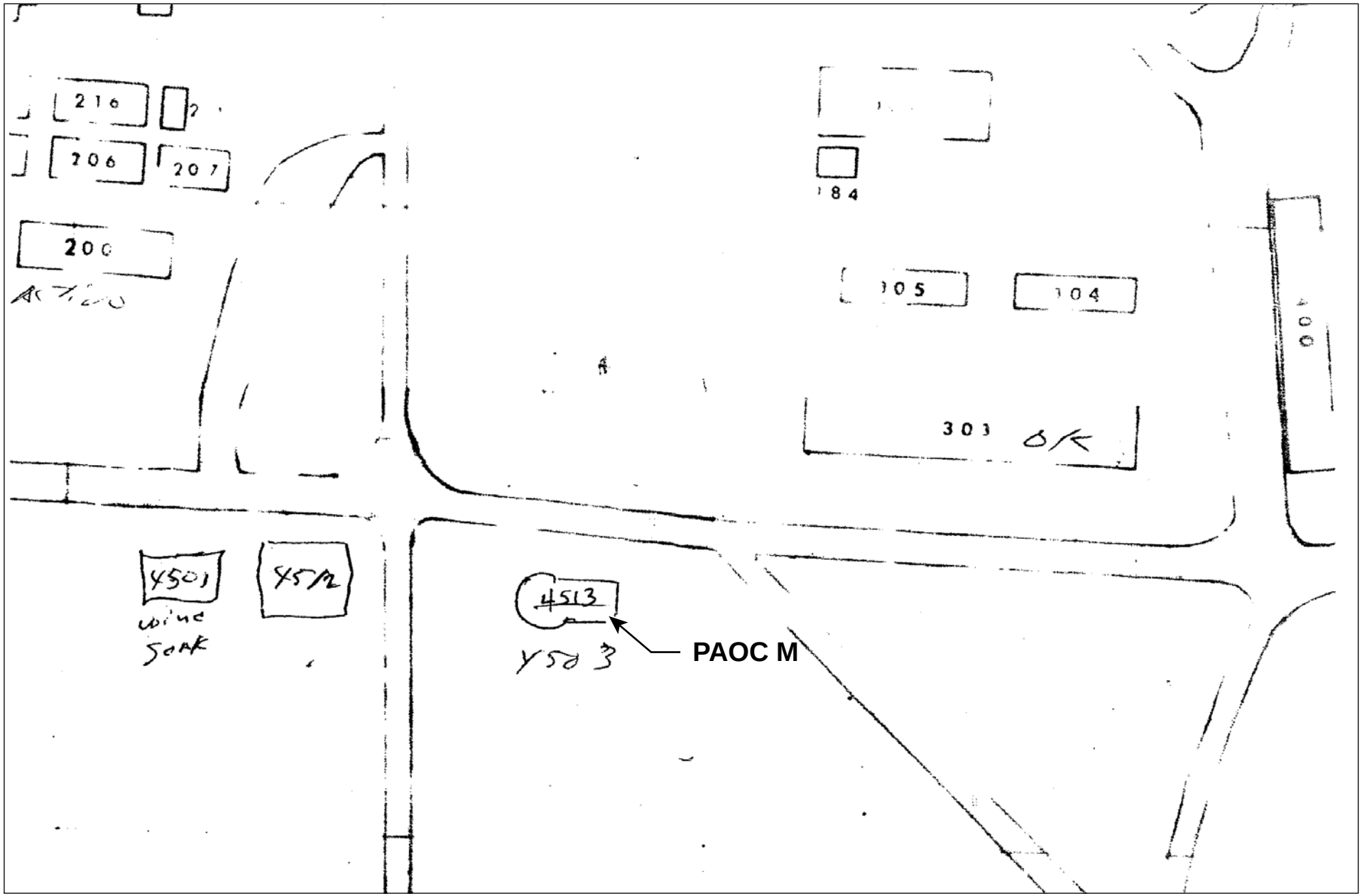
North

0 50 100 200 Feet

FIGURE 39
PAOC M 2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

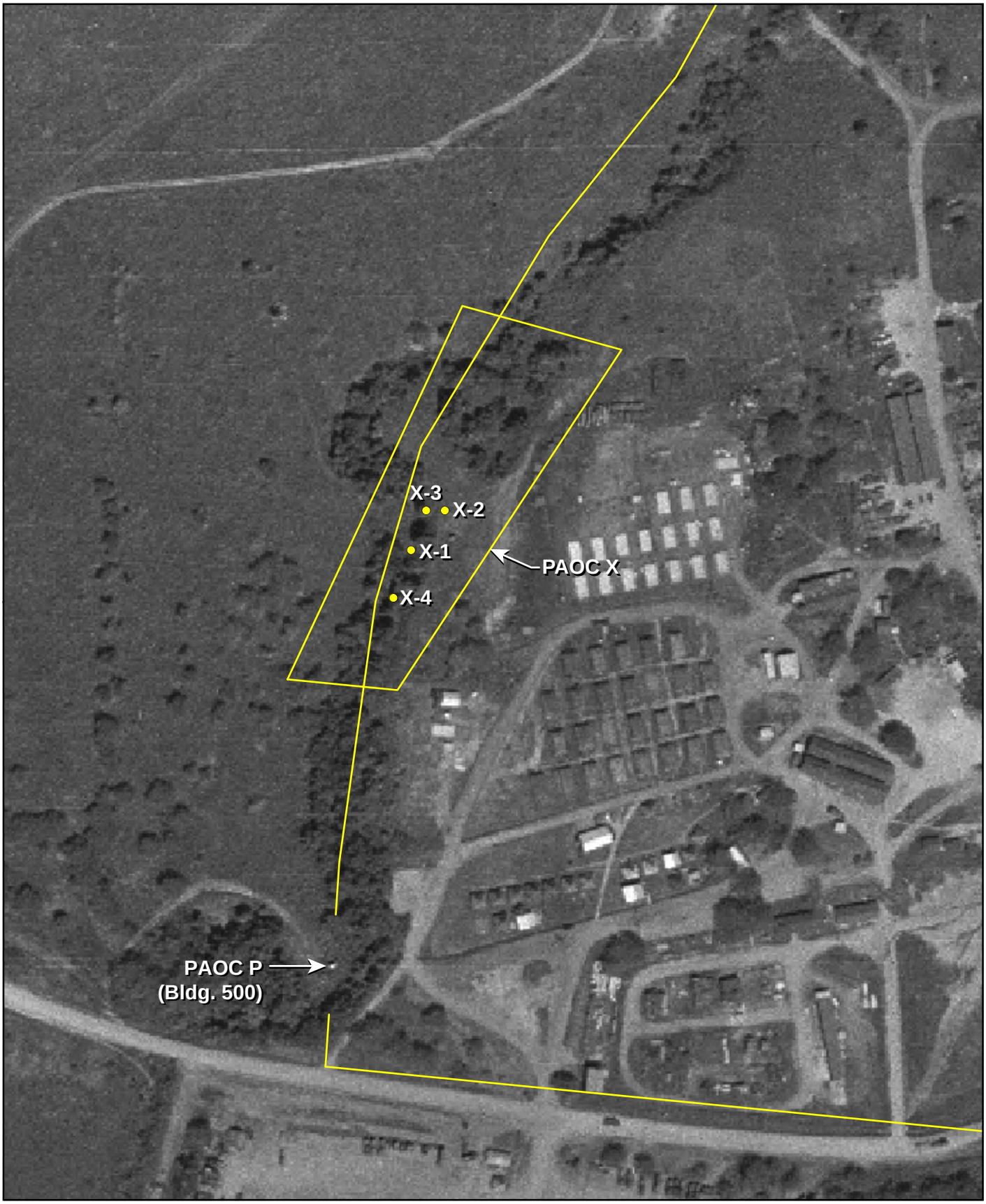


North

FIGURE 40
PAOC M Schematic Map Showing Potential Location of Building
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

- PAOC P and X and Camp Garcia Boundary
- EBS Surface Soil Sample Location

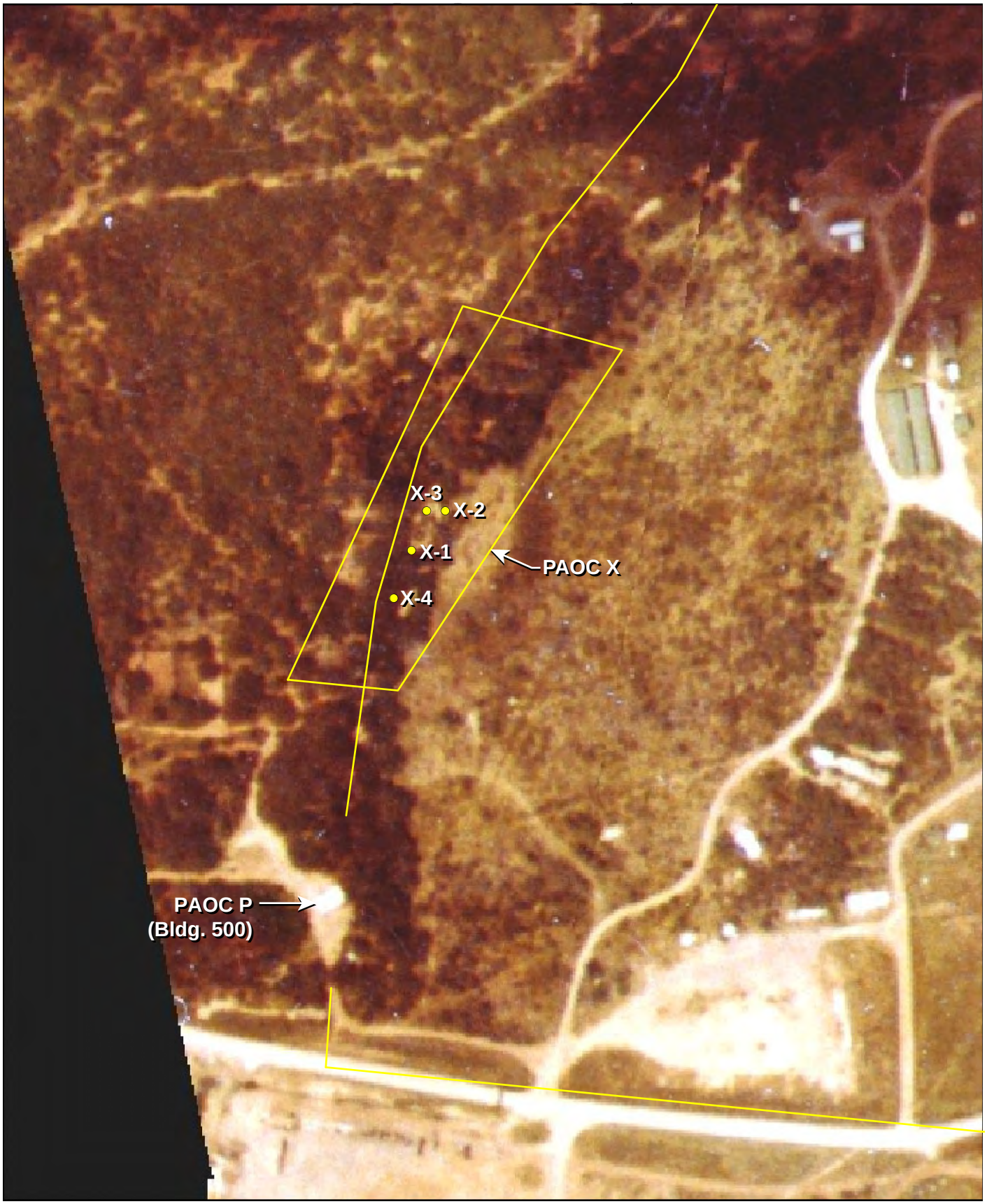
North

0 100 200 400 Feet

FIGURE 41
PAOC P and X 1964 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 42

PAOC P and X 1970 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 43

PAOC P and X 1983 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 44

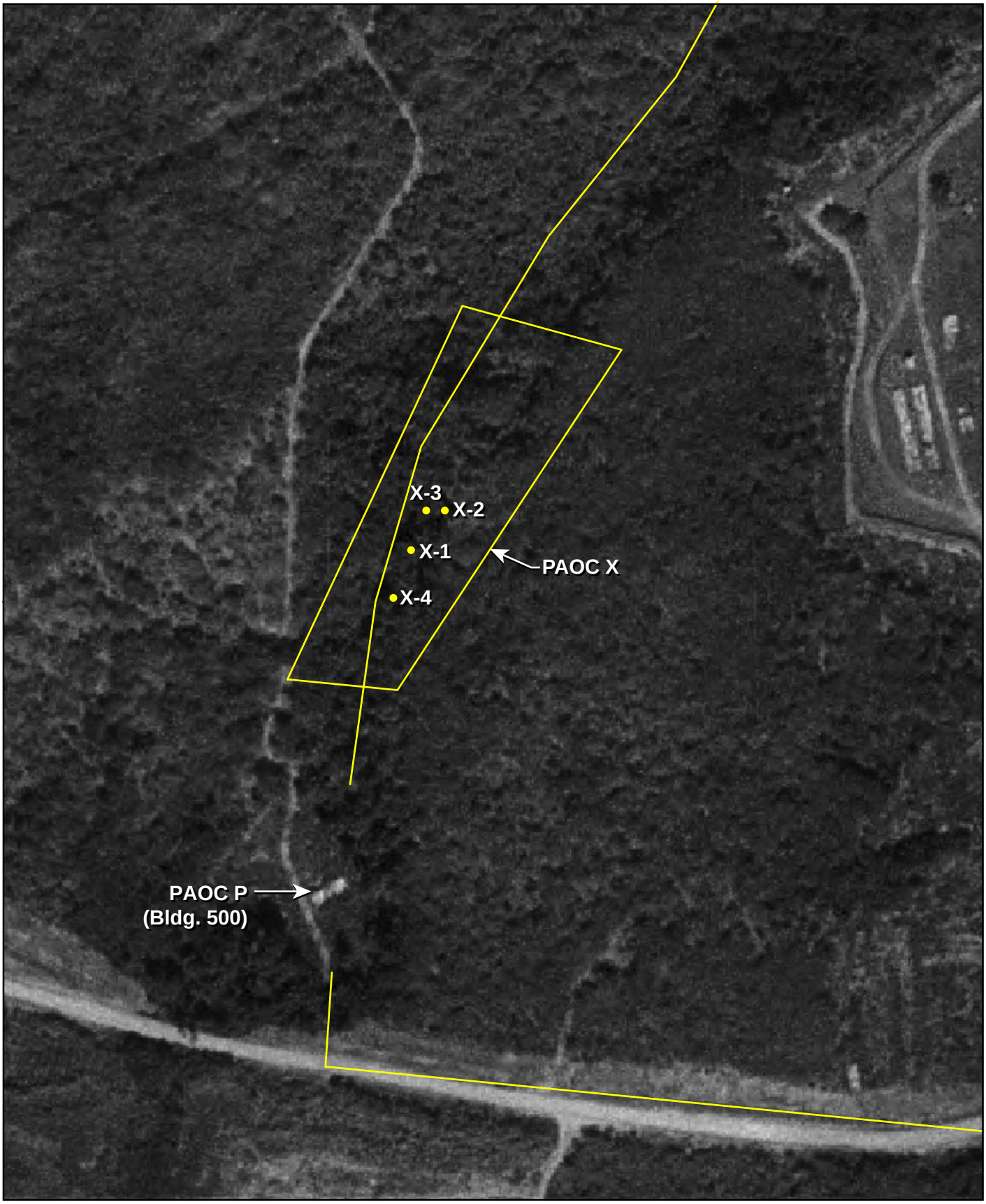
PAOC P and X 1985 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 45

PAOC P and X 1994 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 46

PAOC P and X 2000 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

PAOC P and X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

FIGURE 47

PAOC P and X 2004 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico

CH2MHILL

ES052008002TPA

Legend

- PAOC P and X and Camp Garcia Boundary
- EBS Surface Soil Sample Location
- Proposed Surface and Subsurface Soil Sampling Location

Note: Location of PAOC P generator site approximate. Actual site to be located in the field.

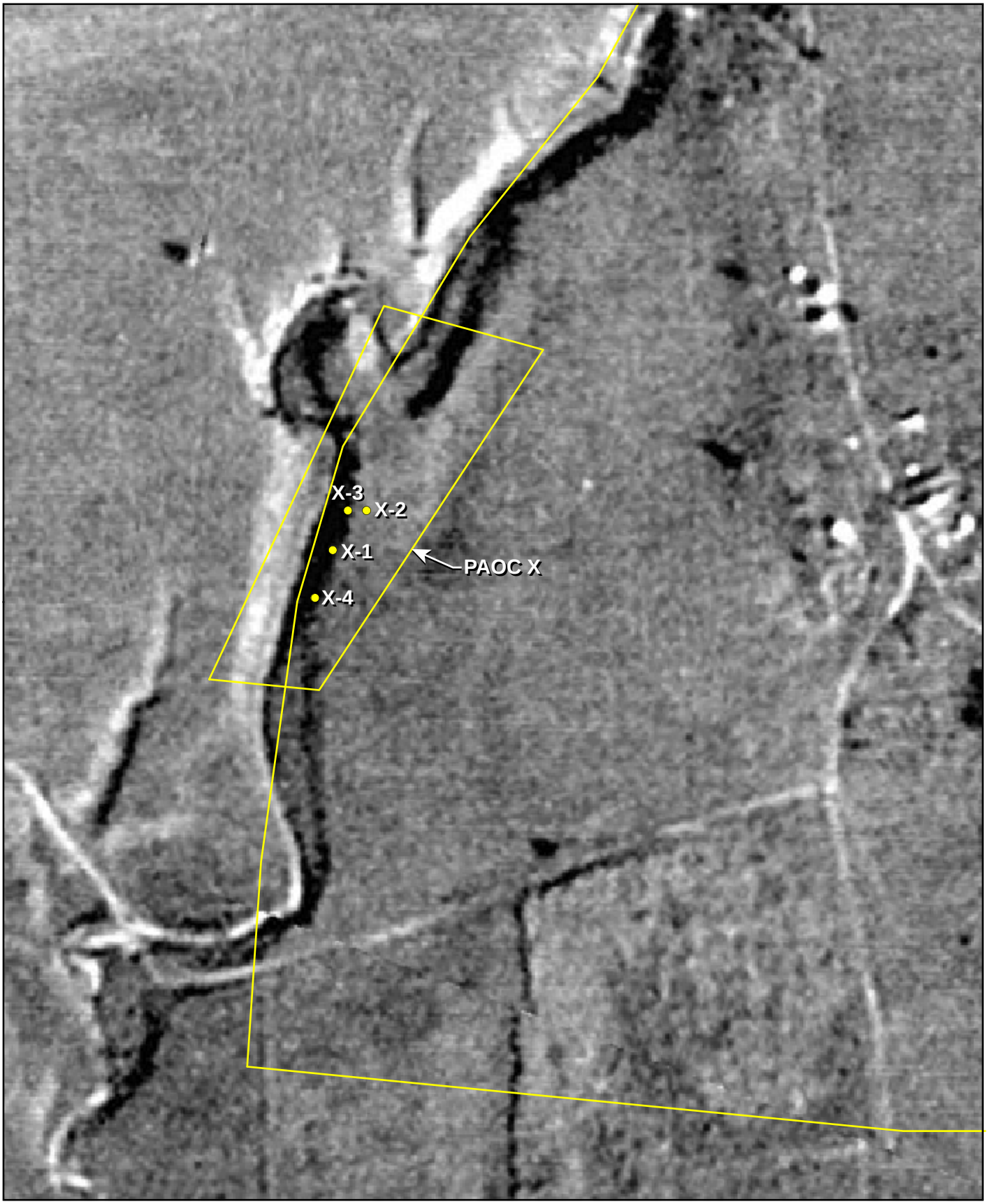
North

0 100 200 400 Feet

FIGURE 48
PAOCs P and X Sample Locations, 2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

CH2MHILL

ES052008002TPA



Legend

PAOC X and Camp Garcia Boundary

EBS Surface Soil Sample Location

North

0 100 200 400 Feet

CH2MHILL

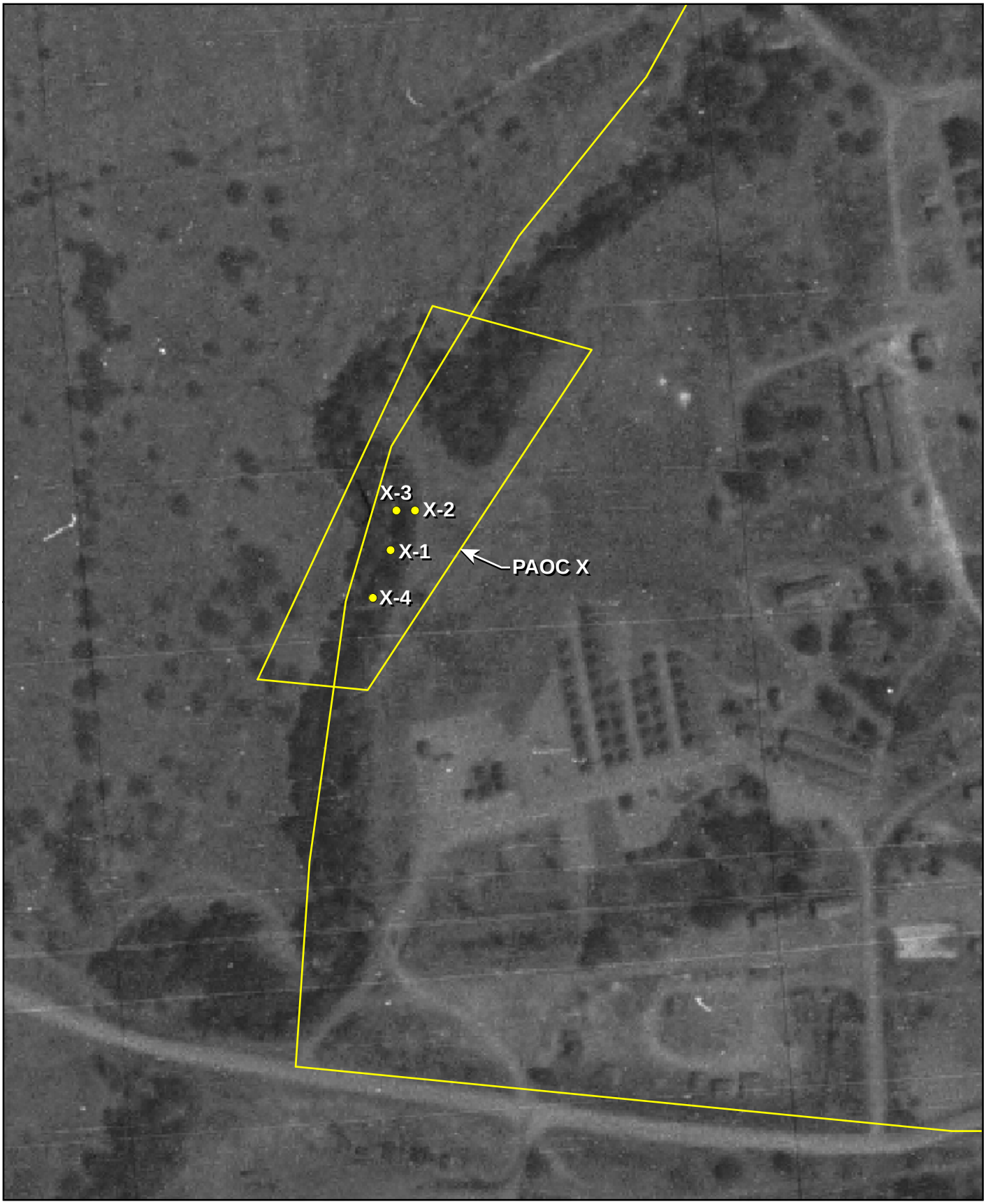
ES052008002TPA

FIGURE 49

PAOC X 1936-37 Aerial Photograph

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico



Legend

- PAOC X and Camp Garcia Boundary
- EBS Surface Soil Sample Location

North

0 100 200 400 Feet

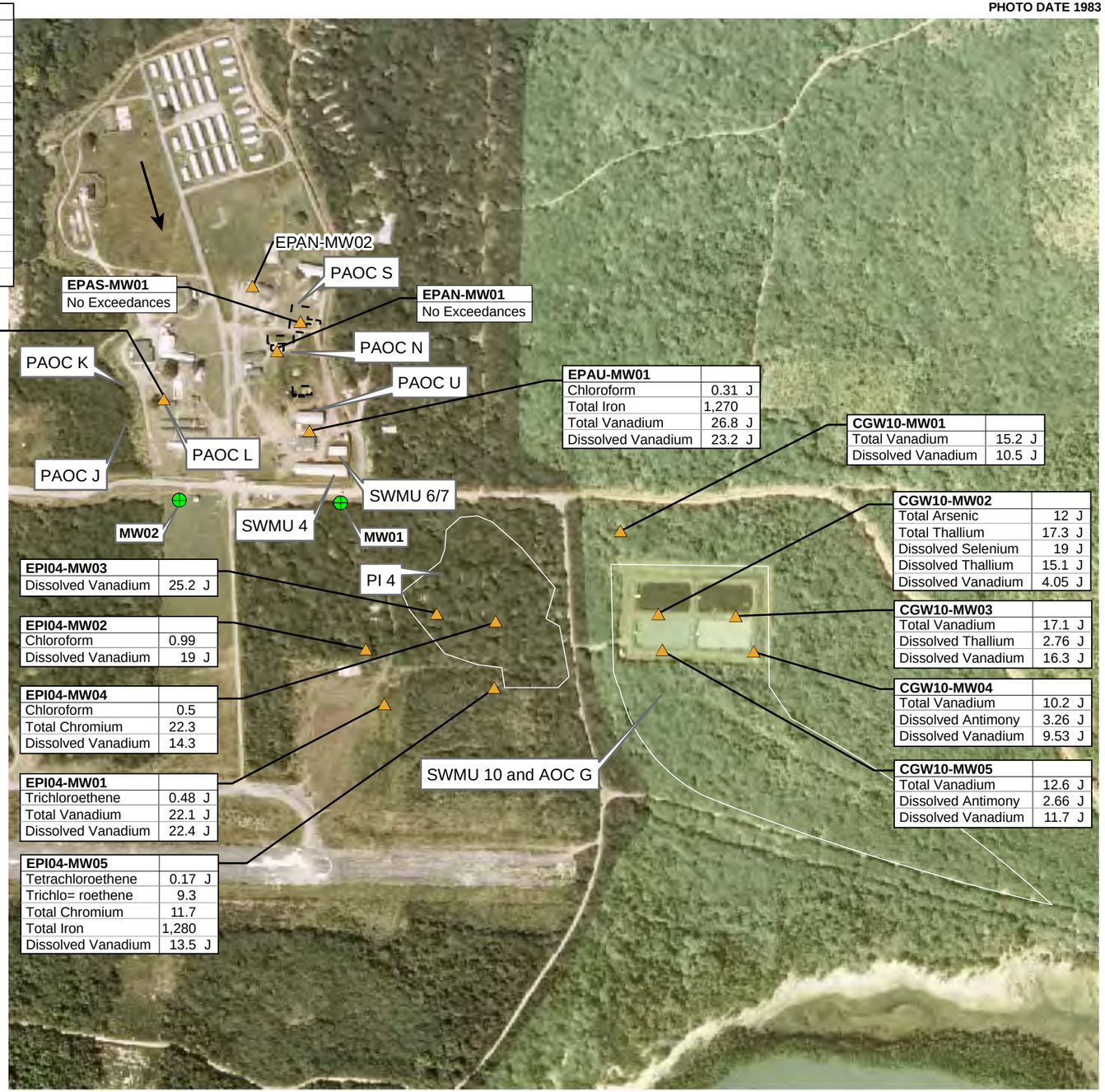
CH2MHILL

ES052008002TPA

FIGURE 50
PAOC X 1959 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Screening Criteria	HHRA	MCL
VOCs		
Chloroform	0.17	
Trichloroethene	0.028	
Tetrachloroethene	0.1	5
Inorganics		
Dissolved Selenium	18	
Dissolved Vanadium	3.6	
Dissolved Thallium	0.24	
Dissolved Antimony	1.5	2
Total Chromium	11	
Total Iron	1,100	
Total Vanadium	3.6	
Total Selenium	18	
Total Chromium	11	
Total Arsenic	0.045	
Total Thallium	0.24	10

PHOTO DATE 1983



EPAL-MW01	
Chloroform	0.49 J
Trichloroethene	0.11 J
Total Selenium	22.4 J
Dissolved Selenium	22.5 J
Dissolved Vanadium	7 J

EPAU-MW01	
Chloroform	0.31 J
Total Iron	1,270
Total Vanadium	26.8 J
Dissolved Vanadium	23.2 J

CGW10-MW01	
Total Vanadium	15.2 J
Dissolved Vanadium	10.5 J

CGW10-MW02	
Total Arsenic	12 J
Total Thallium	17.3 J
Dissolved Selenium	19 J
Dissolved Thallium	15.1 J
Dissolved Vanadium	4.05 J

CGW10-MW03	
Total Vanadium	17.1 J
Dissolved Thallium	2.76 J
Dissolved Vanadium	16.3 J

CGW10-MW04	
Total Vanadium	10.2 J
Dissolved Antimony	3.26 J
Dissolved Vanadium	9.53 J

CGW10-MW05	
Total Vanadium	12.6 J
Dissolved Antimony	2.66 J
Dissolved Vanadium	11.7 J

EPI04-MW03	
Dissolved Vanadium	25.2 J

EPI04-MW02	
Chloroform	0.99
Dissolved Vanadium	19 J

EPI04-MW04	
Chloroform	0.5
Total Chromium	22.3
Dissolved Vanadium	14.3

EPI04-MW01	
Trichloroethene	0.48 J
Total Vanadium	22.1 J
Dissolved Vanadium	22.4 J

EPI04-MW05	
Tetrachloroethene	0.17 J
Trichlo= roethene	9.3
Total Chromium	11.7
Total Iron	1,280
Dissolved Vanadium	13.5 J

PHOTO DATE 1983

LEGEND

- PA/SI Monitoring Well Location
- J Estimated result
- All constituent concentrations in µg/L
- Approximate regional groundwater flow direction
- Proposed Monitoring Well Location

North

0 600 1,200 Feet

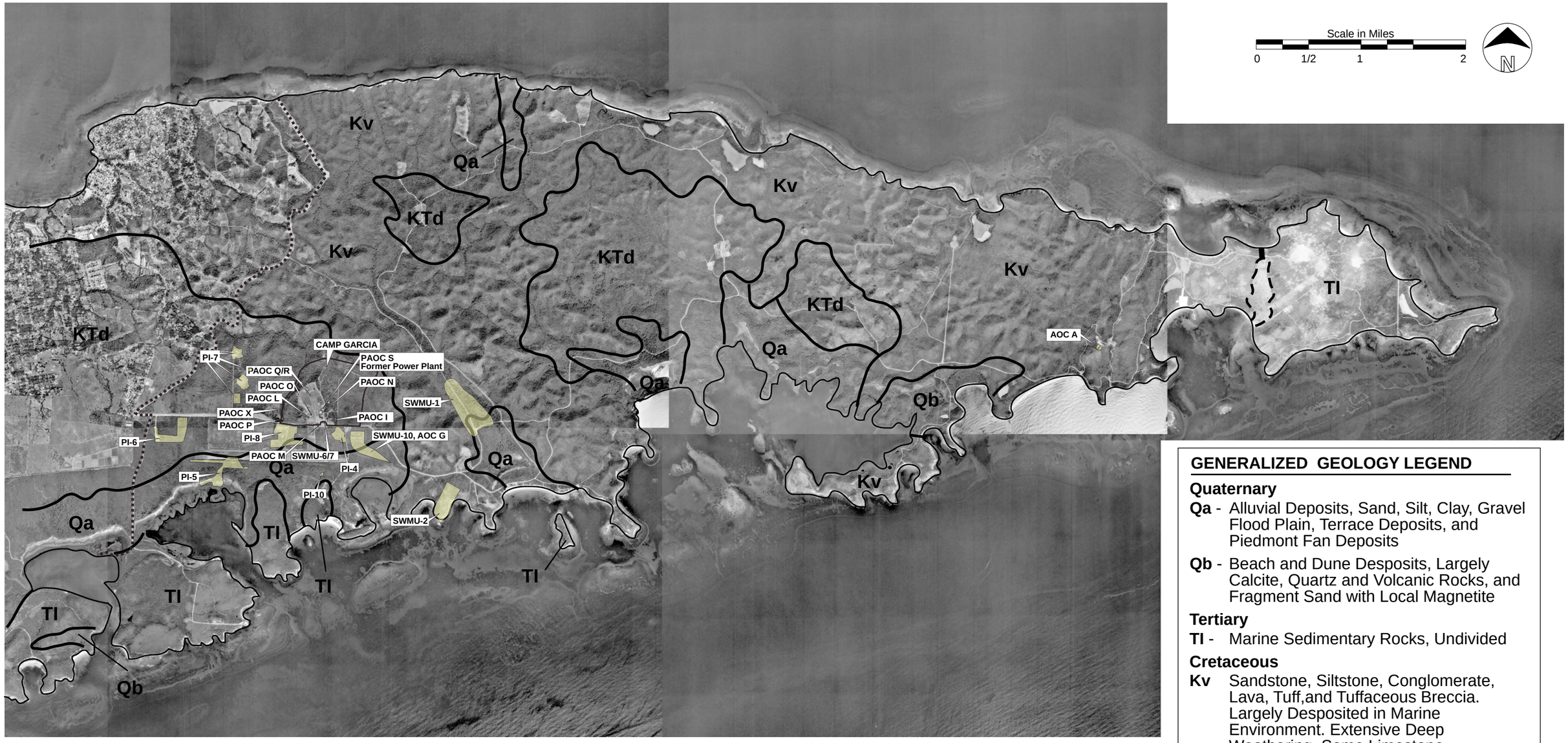
CH2MHILL

FIGURE 51

VOC Detections and Exceedances and Inorganic Exceedances in Groundwater

SI/Expanded SI Sampling and Analysis Plan

Vieques, Puerto Rico



Base imagery is comprised of 1994 1-meter USGS Digital Ortho-imagery quarter quadrangles (DOQQs).

GENERALIZED GEOLOGY LEGEND

Quaternary

Qa - Alluvial Deposits, Sand, Silt, Clay, Gravel Flood Plain, Terrace Deposits, and Piedmont Fan Deposits

Qb - Beach and Dune Desposits, Largely Calcite, Quartz and Volcanic Rocks, and Fragment Sand with Local Magnetite

Tertiary

Tl - Marine Sedimentary Rocks, Undivided

Cretaceous

Kv Sandstone, Siltstone, Conglomerate, Lava, Tuff,and Tuffaceous Breccia. Largely Desposited in Marine Environment. Extensive Deep Weathering. Some Limestone.

KTd- Plutonic Rocks, Largely Grandiorite,and Quartz Diorite, Locally Deeply Weathered (from Torres-Gonzalez, 1989)

LEGEND

AOC = Area of Concern

PAOC = Potential Area of Concern

PI = Photo Identified Site

SWMU = Solid Waste Management Unit

FIGURE 52
Generalized Geology of Former VNTR
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Attachment B
Additional Tables

This page intentionally left blank

Table 1
PI-6 Surface Soil Detection and Exceedance Results
16 PI/PAOC Sites on East Vieques
Vieques, Puerto Rico

Chemical Constituent	Units	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques ECO SO	Vieques (East) Background Zone KTd SS	PI6-1	PI6-2	PI6-3	PI6-3Dup
Volatile Organic Compounds									
No Detections									
Semivolatile Organic Compounds									
No Detections									
Pesticides/Polychlorinated Biphenyls									
4,4'-DDE	mg/kg	3	1.7	0.01		0.0033 U	0.0059	0.0069	0.0073
Herbicides									
2,4,5-T	mg/kg	--	61	--		0.00010 U	0.0133	0.0266	0.0266
2,4,5-TP (Silvex)	mg/kg	--	48.9	--		0.00010 U	0.0599	0.0866	0.00010 U
Total Metals									
Arsenic	mg/kg	1	0.39	18	1.6	2.1	0.893 U	0.82 U	0.714 U
Barium	mg/kg	82	1600	330	147	62	68.1	56.2	48
Chromium	mg/kg	2	210	0.4	72	4.8	3.2	4.9	3.4
Cobalt	mg/kg	33	140	13	16	4.8	4.46 U	4.5	3.57 U
Copper	mg/kg	46	310	50	66	37.4	31.3	45.1	37.1
Lead	mg/kg	14	400	120	5.4	4.1	2.6	23.3	15.6
Mercury	mg/kg	0.1	2.3	0.1	0.057	0.0392 U	0.31	0.069 U	0.1 U
Nickel	mg/kg	7	160	30	22	6.7	5.4	3.28 U	2.86 U
Selenium	mg/kg	0.3	39	1	0.51	0.909 U	1.3	1.2	0.714 U
Thallium	mg/kg	0.04	0.52	1	0.13	0.909 U	0.98	1.1	0.84
Vanadium	mg/kg	300	7.8	2	144	31.3	32.9	31	25.1
Zinc	mg/kg	620	2300	50	32	104	13.2	131	90.7
Wet Chemistry (cyanide, sulfide)									
No Detections									

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria

U - Analyte not detected

Table 2
PI-8 Surface Soil Detection and Exceedance Results
16 PI/PAOC Sites on East Vieques
Vieques, Puerto Rico

Chemical Constituent	**Units**	**Region IX SSLs - DAF 1**	**Vieques HHRA SO**	**Vieques ECO SO**	**Vieques (East) Background Zone KTd SS**	**PI8-1**	**PI8-2**	**PI8-3**	**PI8-3Dup**	**PI8-4**
Volatile Organic Compounds										
Toulene	mg/kg	0.6	66	200		0.0069	0.005 U	0.0219	0.0134	0.0071
Methylene Chloride	mg/kg	0.001	9.1	--		0.005 U	0.005 U	0.005 U	0.005 U	0.0053
Semivolatile Organic Compounds										
No Detections										
Pesticides/Polychlorinated Biphenyls										
Endrin	mg/kg	0.05	1.8	0.00004		0.066 U	0.112	0.01655 U	0.01655 U	0.01655 U
4,4'-DDE	mg/kg	3	1.7	0.01		0.363	0.772	0.159	0.0624	0.147
4,4'-DDT	mg/kg	2	1.7	0.01		0.411	0.634	0.0586	0.0585	0.057
Herbicides										
2,4,5-T	mg/kg	--	61	--		0.0233	0.010 U	0.010 U	0.0566	0.010 U
2,4,5-TP (Silvex)	mg/kg	--	48.9	--		0.0733	0.010 U	0.010 U	0.010 U	0.010 U
Total Metals										
Arsenic	mg/kg	1	0.39	18	1.6	1.7	0.961 U	0.758 U	0.746 U	0.877 U
Barium	mg/kg	82	1600	330	147	43.8	61.3	67.1	62.8	58.9
Chromium	mg/kg	2	210	0.4	72	11.2	15.8	14.6	15	12.1
Cobalt	mg/kg	33	140	13	16	7.6	9.2	10	8.1	7.6
Copper	mg/kg	46	310	50	66	48.9	52.5	51.3	46.8	43
Lead	mg/kg	14	400	120	5.4	9.9	18.2	9.1	3.9	3.6
Nickel	mg/kg	7	160	30	22	7	7.4	6	6	5.1
Selenium	mg/kg	0.3	39	1	0.51	0.99	1.3	1.2	1	1.1
Thallium	mg/kg	0.04	0.52	1	0.13	1	1.3	1.2	1	0.99
Vanadium	mg/kg	300	7.8	2	144	68.1	77.8	82.5	80.5	71.2
Zinc	mg/kg	620	2300	50	32	30.9	41.3	28	22.8	21.5
Wet Chemisty (cyanide, sulfide)										
No Detections										

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria

U - Analyte not detected

Table 3
PI-10 Surface Soil Detection and Exceedance Results
16 PI/PAOC Sites on East Vieques
Vieques, Puerto Rico

Chemical Constituent	**Units**	**Region IX SSLs - DAF 1**	**Vieques HHRA SO**	**Vieques ECO SO**	**Vieques (East) Background Zone Qa SS**	**PI10-1**	**PI10-2**	**PI10-2DUP**	**PI10-3**
Volatile Organic Compounds									
No Detections									
Semivolatile Organic Compounds									
No Detections									
Pesticides/Polychlorinated Biphenyls									
No Detections									
Herbicides									
No Detections									
Total Metals									
Barium	mg/kg	82	1600	330	212	47	33.5	39	50.8
Chromium	mg/kg	2	210	0.4	72	12.6	10.1	12.5	13.7
Cobalt	mg/kg	33	140	13	16	8.2	5.9	7.1	9
Copper	mg/kg	46	310	50	53	32.4	25.1	28.4	39.8
Lead	mg/kg	14	400	120	5.4	3	3.2	4.4	3
Nickel	mg/kg	7	160	30	22	7.1	3.5	4	6.6
Thallium	mg/kg	0.04	0.52	1	0.13	0.94	0.9	1	1.2
Vanadium	mg/kg	300	7.8	2	144	69.3	53.1	64.4	80.4
Zinc	mg/kg	620	2300	50	32	14.5	14.6	18.1	18.7
Wet Chemistry (cyanide, sulfide)									
No Detections									

Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria

U - Analyte not detected

Table 4
PAOC X Surface Soil Detection and Exceedance Results
16 PI/PAOC Sites on East Vieques
Vieques, Puerto Rico

Chemical Constituent	**Units**	**Region IX SSLs - DAF 1**	**Vieques HHRA SO**	**Vieques ECO SO**	**Vieques (East) Background Zone KTd SS**	**X-1**	**X-2**	**X-3**	**X-4**
Volatile Organic Compounds									
No Detections									
Semivolatile Organic Compounds									
Di-n-butylphthalate	mg/kg	270	610	200		0.0986	0.333 U	0.333 U	0.333 U
Pesticides/Polychlorinated Biphenyls									
4,4'-DDD	mg/kg	0.8	2.4	0.01		0.0144	0.0033 U	0.033 U	0.0055
4,4'-DDE	mg/kg	3	1.7	0.01		0.0186	0.0083	0.31	0.045
4,4'-DDT	mg/kg	2	1.7	0.01		0.0376	0.0033 U	0.076	0.008
Herbicides									
No Detections									
Total Metals									
Barium	mg/kg	82	1600	330	147	21.7	23.5	58.7	28.4
Chromium	mg/kg	2	210	0.4	72	5.1	7.4	14.7	9.4
Cobalt	mg/kg	33	140	13	16	3.97 U	4.7	8.5	6
Copper	mg/kg	46	310	50	66	17.6	20.9	46.2	30.9
Lead	mg/kg	14	400	120	5.4	1.2	1.2	7.7	1.6
Nickel	mg/kg	7	160	30	22	3.17 U	3.33 U	8.7	11
Thallium	mg/kg	0.04	0.52	1	0.13	0.794 U	0.833 U	1.4	0.73
Vanadium	mg/kg	300	7.8	2	144	30.9	43.9	74.2	52.4
Zinc	mg/kg	620	2300	50	32	9.9	11.2	38.7	16.2
Wet Chemistry									
No Detections									

Exceeds Background and Eco Criteria
Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria

U - Analyte not detected

Attachment C
SOPs

This page intentionally left blank

Table of Contents

Introduction to the PetroFLAG Hydrocarbon Analysis System 3

Using the PetroFLAG System 5

- Choosing the Correct Response Factor 5
- Analyzing High Concentration Samples 6
- Converting Response Factors for Data Already Collected 6
- Temperature Effects on Measurements 6
- Effects of Soil Water Content on PetroFLAG Result 7
- Sample Preparation 8
- Calibration 8
- Preparing Blanks and Standards 8
- QA/QC 8

The PetroFLAG Test Procedure 10

Analyzer Operation 11

- Selecting a Calibration Curve 11
- Reading the Blank and Standard 12
- Taking a Reading 12
- Power Requirement 12

Analyzer Operation Examples 13

- Standard Operation 13
- Standard Operation - Changing Response Factor Without Recalibrating 13
- Standard Operation With Recalibration 14
- Special Operating Conditions 15
  - Replacing Battery 15
  - Operation of the Meter After the Battery Has Been Disconnected 15
  - Meter Left to Turn Off in Other Mode 15

Helpful Suggestions and Safety Precautions 16

Appendix A: PetroFLAG Response Curves 18

Appendix B: Comparison with Laboratory Methods 19

Appendix C: Determining the Response Factor for Hydrocarbons Not Listed in Table 1 20

Appendix D: Error Conditions 21

Appendix E: Meter Specifications 22

Meter Warranty 23

PetroFLAG is a registered trademark of Dexsil Corporation, US Patents 5,756,357 & 5,928,950 and 6,117,682

Ver. ESA Rev.6 0805

Introduction to the PetroFLAG® Hydrocarbon Analysis System

NOTE: PLEASE READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO RUN THIS TEST

The PetroFLAG hydrocarbon analysis system is a broad spectrum field analytical tool suitable for any type of hydrocarbon contamination regardless of the source or state of degradation[1]. Unlike other field screening methods, the PetroFLAG system does not target specific compounds such as BTEX (Benzene, Toluene, Methylbenzene and Xylene) or PNAs (Poly-Nuclear Aromatics) that may be part of some hydrocarbon mixture. This makes the PetroFLAG system a very versatile analytical method that can be used on most hydrocarbon spills without prior knowledge of the BTEX or PNA content of the contaminant. The PetroFLAG system uses patented chemistry to respond to the broadest range of hydrocarbons possible. The PetroFLAG system is most sensitive to heavier hydrocarbons such as oils and greases and less sensitive to the lighter more volatile hydrocarbon fuels. The specially designed PetroFLAG analyzer allows the user to select, in the field, the response factor that is appropriate for the suspected contaminant at each site. The response factors for a number of contaminants are listed in Table 1. Using the selected response factor, the analyzer compensates for the relative response of each analyte and displays the correct concentration in ppm. The response curves for some typical hydrocarbon contaminants are plotted in Appendix A.

All chemical methods for hydrocarbon analysis in soil that are currently in use, whether they be field screening or laboratory methods, depend on solvent extraction to remove the hydrocarbons from the soil sample. The extraction efficiency for each method is a function of the solvent used and the extraction procedure. This efficiency is also dependent on many other factors such as the soil type, water content, pH, etc. Many EPA SW-846 methods use chlorinated solvents or Freon as extraction solvents. These solvents were originally chosen for their extraction efficiency of polar organic compounds and may not be appropriate for hydrocarbons. Furthermore, special measures need to be taken with these lab methods when the soil is wet.[2] The extraction efficiencies may be as low as 1%[3] in some cases.

The extraction solvent used in the PetroFLAG system has been carefully developed to give consistent extraction efficiencies over the range of soil types and conditions most commonly encountered in the field. The PetroFLAG solvent system contains no chlorofluorocarbons or chlorinated solvents. The extraction efficiency is unaffected by soil moisture and, in most cases, is up to 15%(w/w).[4]

Because the PetroFLAG system has such a broad response spectrum, there are situations where it will indicate a higher hydrocarbon concentration than other methods. This can be due to the higher extraction efficiency of the PetroFLAG extraction solution or the broader response range of the detection system. SW-846 method 8015B, for example, targets only a very narrow range of

[1] Brake fluid, phosphate ester based hydraulic oil, and other soluble fluids, will not be detected by the PetroFLAG system.

[2] USEPA SW846 Method 3550A Ultrasonic Extraction Rev 1, November 1992.

[3] Lee, W.E. III, Houchin, C.A. and Albergo, N., "TRPH Discrimination of Petroleum and Non-petroleum Organic Materials", *American Environmental Lab*, December 1993.

[4] The presence of water will cause a dilution effect resulting in a lower response. This effect can be corrected for, if the water content is known. (For a more complete discussion see "Using the PetroFLAG System: Effects of Soil Water Content on PetroFLAG Result")

hydrocarbons typically in the "Diesel" or "Gasoline" range (DRO or GRO). This method does not detect oils or greases unless the analyst changes the method and specifically looks for the heavier compounds. Requesting 8015B for diesel range hydrocarbons may result in under reporting of the actual total hydrocarbon contamination when oils or greases are present. Method 418.1 is a more general method and detects any Freon extractable compounds that contain a C-H bond. This method has relatively poor extraction efficiencies with many soil types. For a more complete discussion of the comparability of hydrocarbon methods see Appendix B.

Since the PetroFLAG system responds to the full range of hydrocarbons it will also detect some naturally occurring hydrocarbon-like compounds. (Method 418.1 uses a silica column to remove some of these compounds, but will still detect naturally occurring terpenes and creosotes, etc.) Therefore, in situations where high organic content is suspected, background levels outside the spill site should be determined. This will help to identify any naturally occurring sources of hydrocarbons that may cause a positive interference with the test. In cases where there exists a high natural organic background, a "Soil Calibration" can, in limited circumstances, be used to correct readings for this positive interference. Note: Because of the broad spectrum screening nature of the test, naturally occurring waxes and oils can cause high readings; however, false negatives or under-reported levels are very unlikely.

The PetroFLAG system is a valuable field analytical tool when used as part of a systematic sampling plan. As part of any site work, always have the hydrocarbon contamination characterized at some point during the project by sending confirmation samples for closure to a certified laboratory. Since each laboratory method for petroleum hydrocarbons has a different target analyte and different response characteristics, use only appropriate methods for comparison. Furthermore, since the proficiency of laboratory methods for petroleum hydrocarbons varies from one laboratory to another, it is important to verify that the lab you use is proficient with the method you request. Always ask for QA/QC data and verify that the blanks, duplicates and spikes are within specification for the method. When using a lab that is new to you, send them proficiency samples of known concentrations and varying water content.

Lab results often contain one or more samples that are designated "ND" (none detected) without a qualifier. This type of reporting is misleading because information on the limit of quantification is not included. The designation "ND" never means zero ppm and should be followed by an indication of the detection limits of the method used to obtain the result, e.g., ND<40 ppm. In many cases the detection limits for a method will vary with sample size, dilution factors or extraction procedures and may not be the same for all samples in the sample batch. The detection limits for some of the common lab TPH methods are on the order of 40-50 ppm. Therefore, when comparing laboratory data is is important to know the realized detection limits implied in any "ND" results.

The PetroFLAG analyzer has been specifically designed to be used with the unique patented chemistry of the PetroFLAG system. The meter is shipped fully calibrated, preset with response factor 5. This calibration is sufficient to begin screening measurements; however, in order to achieve optimum performance we recommend that the analyzer be calibrated with each batch of samples, or at least daily. The PetroFLAG analyzer is easy to calibrate and a calibration standard is included with every refill pack.

The PetroFLAG analyzer stores two independent calibration equations in separate memory locations. Each calibration has a unique designation, "rC" or "Sc". One way to effectively use this feature is to use one for a "low temp." calibration and one for a "high temp." calibration. This practice is very useful when working at field locations where the ambient temperature varies by more than 10°C over the course of the day. One calibration, run at the lower temperature in the morning, could be stored under "Sc" and later as the temperature rises, triggering a temperature warning, a new calibration can be run and stored under "rC". (See below under "Temperature Effects") This feature can also be used to store both a site-specific "soil" calibration as "Sc" and a "reagent" calibration as "rC". However, due to previously mentioned difficulties associated with a soil calibration, this practice is not recommended and should only be used if very good data is available documenting the uniform presence of background organic material.

Table 1: Response Factors and Method Detection Limits for Common Hydrocarbons

Hydrocarbon Type	Method Detection Limit (ppm)	Response Setting
Transformer Oil	15	10
Grease	15	9
Hydraulic Fluid	10	8
Transmission Fluid	19	8
Motor Oil	19	7
#2 Fuel Oil	25	7
#6 Fuel Oil	18	6
Diesel Fuel	13	5
Gear Oil	22	5
Low Aromatic Diesel	27	4
Pennsylvania Crude Oil	20	4
Kerosene	28	4
Jet A	27	4
Weathered Gasoline	200+*	2

*See Appendix A

+Due to the non-linear response curve of Gasoline, quantification below 1,000 ppm may underestimate the true contamination

Choosing the Correct Response Factor

The microprocessor in the PetroFLAG analyzer uses the calibration data to convert the optical reading into a preliminary concentration. The selected response factor is then used to calculate the correct concentration for the analyte of interest. Therefore, it is important to choose the response factor that is appropriate for the particular hydrocarbon or class of hydrocarbons present at the site. The response factor can be changed at any time without affecting the stored calibrations. (See "Analyzer Operation Examples: Standard Operation-Changing Response Factor Without Recalibrating")

If the contaminant is known or suspected, choose the appropriate response factor from Table 1 and set that response factor on the analyzer. (See "Analyzer Operation" below.) If there is a mixture of hydrocarbons, use the most conservative response factor (i.e. the lowest) for the contaminants known to be present. If the contaminants are unknown, choose a conservative response factor based on those hydrocarbons that are likely to be on the site. Examination of Table 1, indicates that the majority of typical contaminants are in response category 5 or above.

Analyzing High Concentration Samples

The PetroFLAG Hydrocarbon Analyzer is pre-programmed to warn the user of an over-range condition. If the over-range reading is outside of the linear range (±10 precision), but still within the quantifiable range (±20% precision), the reading will be displayed blinking. This reading can be used as an indication that the concentration in the sample is not less than the displayed value. Since the response curve for most analytes is non-linear at high concentrations, the concentration in the sample may be higher than the displayed value. If the over-range condition is outside of the quantifiable range of the meter, the display will show a blinking "EEEE". Either error indication can be cleared by simply inserting the next vial and pressing the <READ/ON> key.

Accurate results can be difficult to obtain when 10 gram soil samples with high contaminant concentrations are used since they may cause a over-range condition on the PetroFLAG analyzer. To quantify these high contaminant samples, extract fresh soil samples of 1 gram size and reanalyze. Then multiply the result by 10 to obtain the concentration in the sample. Using this procedure, it is possible to measure oils containing up to 50,000 ppm of light hydrocarbon contamination or 10,000 ppm of a heavier hydrocarbon. For readings at higher concentrations, a "high range kit" is available.

NOTE: The use of either smaller samples or "high range kits" will affect the precision and accuracy of the method as well as raise the MDL (Minimum Detection Limit) in proportion to the dilution factor.

Converting Response Factors for Data Already Collected

Collected data can be easily converted to the correct reading when it has been determined that the wrong response factor has been used. To make this conversion, multiply the measured value by the response factor initially used to make the measurement and divide by the new response factor.

Temperature Effects on Measurements

The PetroFLAG analyzer is equipped with an onboard temperature sensor to measure the ambient temperature while measurements are being made. The software uses the temperature readings to correct the optical readings for drift caused by the temperature fluctuations. The corrections have been determined for their effects on the turbidity development and the temperature drift of the electronics.

The PetroFLAG analyzer can be used at temperatures from 4°C to 45°C. The temperature corrections are valid for temperatures within 10°C of the calibration temperature. If a calibration is run with each batch of samples, the temperature correction is not significant and measurements can be made at any temperature within the usable range of the instrument. However, if no calibration is run and the ambient temperature deviates from the calibration temperature by more than 10°C, an error condition will result. The analyzer will display "Err4" which can only be cleared by pressing the <NEXT> key. Pressing of the <NEXT> key will clear the error and display the current reading. This reading can be recorded but it should be noted that the ambient temperature was outside of the acceptable 10°C window. Any other samples remaining in the series can be read, however, the same error condition will most likely occur. The meter must be recalibrated to eliminate this error condition.

The ambient temperature should be checked before starting to avoid a temperature error when a calibration is not run with the samples.. This can be

done by taking a reading without inserting a vial into the meter. If a reading is displayed, the temperature is within range and additional readings can proceed. If an error is displayed, the meter must be recalibrated before proceeding.

As previously mentioned, the storage of two calibrations, each at a different temperature, will reduce the number of recalibrations necessary as the temperature changes. If the two calibrations are stored under "Sc" and "rC" and are run at temperatures levels 20°C apart, the effective temperature range for measurements now becomes 40°C.

Effects of Soil Water Content on PetroFLAG Result

The presence of water in a soil sample will have a definite effect on the reporting value in the final PetroFLAG result. As with all field measurements, the PetroFLAG system result is calculated based on the sample weight "as received". If there is water present in the sample, this will produce a "wet weight" result causing an apparent under reporting by the PetroFLAG technique when compared to a laboratory reporting on a "dry weight" basis.

To correct for the difference between "wet weight" vs. "dry weight" results, simply divide the PetroFLAG value by the "fraction solids" (FS), where fraction solids is:

FS = Dry Weight/Wet Weight

or

FS = (100 * %water)/100

Furthermore, when reporting the wet weight vs. dry weight results, the presence of water in a soil sample will cause a "dilution effect". Since the PetroFLAG solvent system is miscible with water, the water in the soil will be extracted into the solvent phase. The aliquot filtered into the developer vial will, therefore, be diluted by the presence of the water. To a first approximation, the correction for this "dilution effect" is made by multiplying the PetroFLAG result by one plus the "fraction water" in the sample; R'=R(1+FW), where fraction water (FW) is:

FW=(Wet Weight * Dry Weight)/Wet Weight

or

FW = %water/100

The equation below can be used to achieve an overall correction that includes both the conversion of the PetroFLAG result to a "dry weight" value and the correction for the dilution effect:

R'=R((2/FS) * 1)

where:

R' = "Dry Weight" Corrected Result

R = Result displayed by PetroFLAG unit

FS = Fraction Solids

where:

FS = (100 * %water)/100

The above correction is applicable for typical soil types containing up to approximately 15% water by weight. For heavy clays or samples with higher water content, the effect of water content will vary with the analyte and should be determined specifically for each site.

In many cases, the effects of water content can be overcome by using a smaller sample size. This approach is the simplest and can be used effectively when a reduction in precision resulting from a smaller sample size still satisfies the overall data quality objective.

In some soils with high water content, the PetroFLAG response will be reduced both by the poor extraction efficiency of the analyte and a sample dilution. In these soils, the effect of water content on the extraction efficiency can sometimes be reduced by the addition of anhydrous sodium sulfate.

To treat such soils with sodium sulfate, weigh out the appropriate amount of soil sample (10 grams for a standard analysis) followed by the addition of up to 10 grams of anhydrous sodium sulfate. Mix the system thoroughly by stirring and/or shaking the sample until a free-flowing mixture is formed. Add the extraction solvent from a break-top ampule and then, follow the standard analysis procedure.

Treatment with sodium sulfate can improve the extraction efficiency, but will not correct for either the dilution effect or the wet weight/dry weight reporting error. The actual water content in the sample should be determined at some point so that the above corrections for wet weight and the dilution effect can be applied to the final result.

Sample Preparation

Each 10-pack of soil reagents contains reagents and supplies for 10 tests. In addition, one blank and one calibration standard are included. Samples can be run individually or by batch. For optimum performance and throughput, samples should be run in groups of 10 samples, once the meter has been calibrated with a blank and a standard. The meter does not need to be recalibrated, provided that the operating conditions and reaction times are maintained. Total time to analyze 10-15 samples is approximately 20-25 minutes.

Calibration

To insure accurate quantification and repeatable results, it is recommended that the PetroFLAG meter be recalibrated with each batch of 10 samples or, at least, daily. The meter is easily calibrated using an extraction solvent ampule as a blank and the calibration standard (supplied with each ten-pack of reagents). The blank and calibration standard can be used as a "reagent calibration", or together with a clean soil sample to generate a site-specific "soil calibration" spike. If there is no verifiably clean soil available, *do not* use a soil calibration; use a reagent calibration. Only when a clean soil has been identified should it be used to prepare site specific standards to calibrate the PetroFLAG meter.

NOTE: The soil calibration method should be used with extreme caution due to the high likelihood of introducing a bias, of unknown magnitude, into the data.

After exiting the calibration mode, all additional readings made by the PetroFLAG analyzer will automatically incorporate the selected response factor. Therefore, rereading of the calibration standard will result in an incorrect reading unless the response factor being used is 10 and within the correct development time of the sample.

NOTE: Once the *blank* and *calibration standard* have been read, discard them. They will fade with time and cannot be reused; DO NOT USE THEM TO RECALIBRATE THE METER OR TO CHECK THE EXISTING CALIBRATION.

Preparing Blanks and Standards

The following description summarizes the procedure for preparing the blank and calibration standard. Read the step-by-step instructions below completely before beginning the calibration process.

To prepare a reagent *blank* and a *calibration standard*, first label two soil tubes, one as the "blank" and the other as the "standard". Add to the *blank* tube the contents of a break-top ampule labeled "Extraction Solvent". Add the contents of the break-top ampule labeled "Calibration Standard" to the *standard* soil tube. Process the blank and standard exactly as soil samples as described below. (See "The PetroFLAG Test Procedure")

A soil calibration is prepared in the same way, with the additional step of adding 10 grams of uncontaminated native soil to each of the labeled calibration tubes (blank and standard). After the soil has been added, proceed as above and process the standards along with the unknown samples.

QA/QC

Performing periodic calibrations of the PetroFLAG meter is one of the most important quality control checks that can be made. In addition to calibrating the PetroFLAG meter, performance of periodic calibration also serves as a quality control check of the entire analysis system. Each time a calibration is performed the individual operator needs to prepare a fresh set standards following the entire analysis procedure. To complete a valid calibration, the resulting test standards must meet the QC acceptance criteria stored in the meter. Each time a calibration is carried out, the meter verifies if the operator is performing the test correctly, e.g.,

following the correct order of steps in sample preparation, holding to the timing requirements, operating the meter correctly, etc. while the meter checks its basic operation. As each calibration is made, the intensity of the test solution is compared to the stored values for acceptance. If the optics have degraded or the electronics are out of specification the calibration will be flagged as an error.

The most important factor affecting the accuracy of PetroFLAGmeasurements is operator error followed by the ambient temperature determination. If the temperature varies by more than 10°C from the calibration temperature, the accuracy of the resulting measurement will be affected. Therefore, during each measurement made by the meter, the current ambient temperature is compared to the temperature determined at calibration. If the difference is more than 10°C, a warning is flashed alerting the operator of the temperature drift. This QC check is transparent to the user unless an error condition exists.

The internal check of the optical system is also transparent to the user. The PetroFLAG meter is designed with two independent optical channels. If, during a measurement, both channels do not agree, an error condition will be generated.

Along with these QC checks, which are performed automatically by the PetroFLAG meter, additional QA/QC procedures should be developed to provide assurances that the data quality objectives for each project are met. The most important part of any SOP (Standard Operating Procedure) should include provisions for ensuring that confirmatory samples are sent to a qualified lab for verification as to the type of hydrocarbon contamination present. This will also serve as a check of the response factor being used. When PetroFLAG meter results are determined to be either high or low when correlated to laboratory data, then a new response factor should be calculated and used. If the PetroFLAG results are not well correlated with the lab, then the field techniques should be examined to determine possible sources of error. A lack of correlation may be the result of inhomogeneous samples or may be due to splitting technique, etc.

A program of field QA/QC should be developed that is compatible with the competing requirements of each user. It should include, a minimum of periodic soil blanks, equipment blanks, soil spikes, and dupes. Other procedures should be implemented depending on the specific requirements of each site.

The PetroFLAG Test Procedure

1) Label the soil extraction tubes (plastic tubes with colored caps) and developer vials (small glass vials with black caps) with the appropriate sample ID. Use the self-adhesive labels to label the screw cap of the developer vial. Do not write in the center 1/3 of the developer vial as this may obscure the optical path when the readings are made.

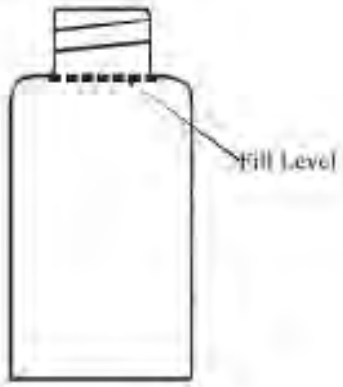
2) Weigh 10 grams (± 0.1 gram) samples of all unknown soils into each of the labeled color-capped polypropylene tubes.

3) Set timer for 5 minutes. Add one break-top ampule of extraction solvent (blue polypropylene top) to the first tube. Start 5 minute timer and shake for 15 seconds. A separate ampule of extraction solvent is added to each of the remaining sample tubes when additional samples are being analyzed. Shake each tube for 15 seconds ensuring that the soil samples are fully wet. Shake each tube intermittently for a total of 4 minutes, then allow each tube to stand for the remaining 1 minute.

4) Verify that the filter disk is firmly attached to the syringe barrel. Remove the cap from the first labeled developer vial. Carefully decant the liquid from the polypropylene soil tube into the syringe barrel minimizing the transfer of soil particles, as this may plug the filter. Insert the plunger into the syringe barrel. Discard the first few drops from the filter into a waste container by pressing the plunger. Next, add the soil extract drop-wise to the developer solution until the meniscus just enters the neck of the vial (see figure). Shake the vial for 10 seconds, start the 10 minute timer and proceed to the next sample. Do not let the developer vials stands longer than 20 minutes before reading, as this may result in lower than actual values.

5) If meter is off, turn on the meter by pressing <READ/ON> key and calibrate (optional, see Analyzer Operation).

6) To read, wipe the vial, place into the meter and press the <READ/ON> key. Be sure that the outside of the vial is clean before reading. Record result on work sheet. Read vials in the same order as they were prepared.



6 mL Developer Vial

Analyzer Operation

The PetroFLAG analyzer is controlled by a low-power consumption micro-computer with a pre-loaded operating program which is stored in EEPROM memory. The program cannot be lost regardless of battery condition. The meter stores two calibration curves in separate memory locations. These calibration curves can be independently updated and the response factors can be changed without losing the calibrations.

The PetroFLAG meter is configured to allow easy access to the program modes. The currently active mode is indicated on the LCD display while a reading is in progress. The response factor and the active calibration can be changed from the MAIN MENU using the four keys on the keypad. The four keys are:

SCROLL	Scrolls through menu choices.
NEXT	Exits the read mode or skips a menu option without changing or executing. (Also used to clear error conditions.)
READ ON	Turns the meter on and starts a reading.
SELECT OFF	Selects a menu choice. Manually turns meter off (only in the *read* mode).

When the PetroFLAG analyzer is turned on, the unit will return to the last mode it was in prior to being shut down. Under normal operating conditions, the analyzer will power up in the *read* mode. When the analyzer powers up in the *read* mode, the screen will display the last measured value for two seconds, and then, display the currently selected calibration curve ("rC" or "Sc") and response factor (1-15). The meter is now ready to resume measurement. Simply insert a new sample vial into the meter and push the <READ/ON> key. The display will initially indicate the calibration curve (either "rC" or "Sc") and the response factor (1-15) that is currently selected. Next, the term "CALC" will flash on the screen and after 5 seconds, the measured concentration in ppm will be displayed.

NOTE: If the battery is disconnected and then reconnected, the meter will automatically return to the MAIN MENU. If the calibration curve and response factor displayed are the desired parameters, the MAIN MENU can be exited while retaining the calibration data by pushing the <NEXT> key. To return to the *read* mode, continue pressing the <NEXT> key until the display shows the calibration curve and the response factor continuously without blinking.

If you wish to exit the *read* mode, push the <NEXT> key and the operation is returned to the MAIN MENU. The <NEXT> key is also used to skip a step where a menu selection is required. To change a flashing menu option, push the <SCROLL> key while the option is flashing. To store the currently flashing menu choice, push the <SELECT> key. This stores the current choice and moves the flashing cursor to the next program mode.

Selecting a Calibration Curve

Either of the two calibration curves, identified as "rC" and "Sc", can be selected from the MAIN MENU. From either calibration curve any response factor can be selected. To change the response factor or to re-calibrate the unit, use the <NEXT> key to enter the MAIN MENU screen. Immediately upon entering this menu three decimal points and the response factor are displayed. Next, the first two characters on the screen indicates the calibration curve that is currently selected ("rC" or "Sc") is displayed. They will blink, indicating that

a new curve may be selected. Use the <SCROLL> key to scroll to the next calibration curve. Push the <SELECT/OFF> key to select the curve.

The response factor will then blink. Use the <SCROLL> key to scroll to the desired response factor for the target analyte and press the <SELECT/OFF> key.

Reading the Blank and Standard

After the response factor has been selected, the screen will read "CALC" for five seconds and then display the calibration temperature. This temperature will remain on the screen until either the <NEXT> key or the <READ/ON> key is pressed. The screen will then prompt you for the "blank" vial by displaying "-bL-". Insert the blank vial in the meter and press the <READ/ON> key (See "Preparing Blanks and Standards" under "Using the PetroFLAG Hydrocarbon Analysis System). After 5 seconds the screen display should read "0" for 2 seconds. The screen will then prompt for the calibration standard, "-CSd". Insert the calibration standard in the meter, press the <READ/ON> key and after 5 seconds, the calibration is complete. The meter will then re-read the calibration standard to verify a valid calibration and display "1000". If the concentration of the calibration standard is not correct using the newly calculated equation, an error message will flash until the <NEXT> key is pushed. If an error condition exists, the previously stored calibration constants will be retained until a valid calibration is completed (See Appendix C, Table 1: Error Conditions).

Taking a Reading

After calibration, the meter will then display the calibration curve in use ("rC" or "Sc") and the current response factor selected. The meter is ready to read the first sample by inserting the sample vial into the meter and pressing the <READ/ON> key. After reading the sample, the meter will display the concentration in parts per million (ppm) until either the <READ/ON> key or the <NEXT> key is pushed. If no key is pushed for a period of five minutes, the meter will turn off automatically. If the meter turns off automatically, the meter can be reactivated by pressing the <READ/ON> key and the unit will return to the operation mode last used. The meter can be turned off manually by using the <SELECT/OFF> key, while in the *read* mode only.

The optical system on the PetroFLAG analyzer is covered with a screw cap to keep out stray light. To remove this screw cap from the vial holder, simply unscrew it 1/4 of a turn counter-clockwise. To make a measurement, insert the developer vial into the unit, place the screw cap over the vial, and while pressing down on the cap (depressing the spring in the bottom of the vial holder), rotate the cap clockwise. Turn the cap until it is snug, but do not over-tighten.

Power Requirement

The PetroFLAG analyzer is powered by one 9V alkaline battery (included). This battery should last for several thousand readings. If a low battery condition exists "LP" will appear on the display.

Analyzer Operation Examples

Outlined below are step-by-step examples of how to use the PetroFLAG analyzer. Under normal operating conditions the meter will power up in the *read* mode. The examples given here categorized as "standard operation" assume that the meter was last operated in the *read* mode. If the meter was left in another mode for longer than five minutes or the batteries were removed, see below for special cases.

Standard Operation:

(Whenever the last operation mode was *read*, the calibration data is current and the last-used response factor is valid.)

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Remove the screw cap, insert developer vial to be read and retighten cap.

3) To begin reading press:

READ ON	The display will show the calibration curve and response factor currently selected (blinking), the display will read "CALC" for 3 seconds, and the final result will be displayed.

4) The result will be displayed until the next reading is taken. To make the next reading remove the vial and repeat steps 2 and 3 above.

Standard Operation/Changing Response Factor Without Recalibrating:

(Whenever the last operation mode was *read* and a different response factor is desired.)

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Return the operation to the MAIN MENU by pressing:

NEXT	Three decimal points will be displayed along with the current response factor. The calibration curve designation will begin blinking.

3) The response factor entry mode is activated by pressing:

NEXT	The response factor will begin to blink, indicating that it may be changed.

4) Scroll to the desired response factor by pressing:

SCROLL	The next response factor will be displayed. Continue pressing the <SCROLL> key until the desired response factor is displayed. (Response factors scroll in descending order, i.e., 15-1)

5) When the desired response factor is reached, select it by pressing:

SELECT OFF	The new response factor has been selected. The meter will calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT	The meter will prompt for the blank to be entered and the calibration procedure to begin by displaying "-bL-".

7) Skip this calibration procedure and move directly to the *read* mode, saving the new response factor but not recalibrating, by pressing (This exits the calibration mode without affecting the current calibration data):

NEXT	The meter will display the current calibration curve and the selected response factor and is ready to read a sample using the new response factor.

8) Proceed with the reading of a sample by following the above procedure for "Standard Operation" beginning at step 2.

Standard Operation With Recalibration:

(Where the last operational mode was the *read* mode and the meter is to be recalibrated.)

Prior to performing this calibration procedure, prepare the *blank* and *standard* as described in the manual under "Using the PetroFLAG Hydrocarbon Analysis System - Preparing Blanks and Standards". The calibration solutions can be prepared by using clean soil for a "soil calibration" or the reagents alone for a "reagent calibration". They may also be prepared along with the unknown samples in order to save time.

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Return the operation to the MAIN MENU by pressing:

NEXT	Three decimal points will be displayed along with the current response factor. The calibration curve designation will begin blinking, indicating that it may be changed.

(If the displayed calibration curve is the one to be redetermined, skip directly to the response factor input by pressing the < NEXT> key.)

OTHERWISE

3) Scroll to the calibration curve that is to be redetermined by pressing:

SCROLL	The display will show the next calibration curve designation.

4) When the desired calibration curve is determined, select it by pressing:

SELECT OFF	The calibration curve is selected and the meter will prompt for the input of the response factor.

5) If the response factor displayed is not the desired one, use the <SCROLL> key as described the previous section above under "Standard Operation - Changing Response Factor Without Recalibrating". If the response factor is correct, skip this step by pressing:

NEXT	The meter will calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT

The meter will prompt for the blank to be entered and the calibration procedure to begin by displaying "-bL-"

7) Remove the screw cap and insert the prepared blank vial, replace the cap and begin calibration by pressing:

READ ON

The display will blink showing the selected calibration curve and response factor. The meter will display "0" for three seconds and prompt for the calibration standard by displaying "-C5d".

8) Remove the screw cap and blank vial and insert the calibration standard vial. Read the calibration standard by pressing:

READ ON

The display will blink showing the selected calibration curve and response factor. The display will read "1000" for three seconds and display the currently selected calibration curve and response factor continuously. The meter is now in the read mode.

9) Proceed with reading the unknown samples by following the procedure for "Standard Operation" above, beginning with step 2.

Special Operating Conditions:

Replacement of Battery:

NOTE: **Use ONLY 9V Alkaline or 9V Lithium battery. Use of carbon/zinc battery will cause the PetroFLAG meter to malfunction.**

Open the battery compartment by sliding the compartment door back (indicated by the arrow on the back of the unit). Lift out the old battery from the compartment and carefully unsnap the battery from the wire harness/connector. Replace with a fresh alkaline battery by snapping the wire harness/connector onto the new battery making sure the polarity is correct (The snaps will only go on one way). Reinsert the battery and connector into the compartment being careful not to twist/ damage the connector wires. Replace compartment door by sliding the door forward until the latch clicks.

Operation of the Meter After the Battery has been Disconnected:

When the battery has been disconnected the micro-processor will automatically return to the MAIN MENU once the battery has been reconnected. The meter, however, will not be in a *read* mode but is calibrated for use, unless other factors warrant recalibration. The operations to be performed will determine the exact steps to be followed. The steps to follow are described above in the various sections of "Analyzer Operation Examples."

Meter Left to Turn Off in Other Mode:

When the meter is left in any "screen" for five minutes the meter will shut off automatically. The meter will return to last active screen when the <READ/ON> key is pressed.

Helpful Suggestions and Safety Precautions

When PetroFLAG test results indicate no hydrocarbons are present, the sample can be sent in for certified laboratory confirmatory analysis. All environmental soil sampling used for final closure should be performed using methods that are approved by the local regulating agency.

Personal protection should be worn during soil sampling and testing. A minimum of latex gloves and goggles should be worn.

Decontamination stations should be set up using appropriate cleaners and rinsing solutions. Soil sampling equipment not supplied with the reagent pack should be decontaminated between sampling locations to prevent the possibility of cross contamination.

All reagents and sampling scoops supplied with the kit are single-use disposable items. Therefore, *do not* reuse spoons, tubes, filters, or vials. The electronic balance is *NOT* disposable.

Check ambient temperature BEFORE extracting soils, when a calibration procedure is not planned for the current batch of test samples.

Make sure the filter disks are screwed on tightly before adding the soil extract to a filter syringe.

Do not leave the PetroFLAG analyzer in direct sunlight when not in use. Store the instrument in the protective carrying case with the lid closed.

Make sure that the contamination at the site is characterized at some time during the investigation.

Avoid sampling organic matter. Scrape away organic material (leaves, sticks, etc.) before sampling.

Avoid sampling directly under pine, cedar, and fir trees unless the sample is collected below the organic layer. Do not collect samples from areas where tree roots have been encountered.

Avoid sampling directly beneath creosote bushes, sage brush and other oil bearing plants.

Commonly Asked Questions

What are the response factors?

A response factor (RF) is the relationship between the analyte of interest and the calibration standard. The turbidity formed in the development solution by the sample is compared to the calibration standard followed by a calculation which determines the correct concentration for your contaminant. For Example: Equal concentrations of diesel and mineral oil do not produce the same level of turbidity. A RF value of 10 for mineral oil divided by the RF value of 5 for diesel produces a result of 2. This means that mineral oil forms twice the turbidity of diesel at the same concentration. Stated another way, 250ppm mineral oil forms the same turbidity as 500 ppm diesel. For more information please see Appendix A in the Manual.

Why doesn't my calibration standard read 1000ppm when I re-read it after calibrating?

This is directly related to the first question. The calibration standard is 1000 ppm mineral oil, therefore, if you read it on any RF other than 10 you will get a different number.

How long are my samples good for after they develop for 10 minutes?

The PetroFLAG development process is a temporary reaction, so readings should be taken right at the end of the 10 minute development period. The turbidity will continue to develop for period of time, after which it begin to fade, therefore no measurements should be taken after 20 minutes. This means you must record your data as it is generated because you cannot save your sample vials for future analysis.

After I prepare a set of calibration solutions how long are they good for?

Since the PetroFLAG development chemistry fades over time they are only good for a single use and the 10 minute time window should be adhered to.

The screen is displaying an error code, what does it mean?

See the reference table in Appendix D for a list of "Error Conditions".

What can I do if my reading is over-range?

Process a new sample using a 1 gram soil sample and multiply the end result by 10. This sample dilution will allow you to read up to 10,000-15,000 ppm on most samples (1-1.5%).

The meter is "stuck" in the calibration program mode with the "rC" or "Sc" characters flashing?

The meter will not allow normal calibration procedure or sample measurement when the <READ/ON> key is pressed, but returns to a flashing "rC" or "Sc" screen. This is usually caused by use of a non-alkaline battery. Replacement with a fresh 9V Alkaline battery should eliminate the problem and the meter should return to normal operation.

Caution

When opening the break-top ampules *DO NOT* remove the plastic sleeve from the top. It is there for your protection. Removing it may result in personal injury.

The Extraction Solvent and Calibration Standards contain methanol and are Flammable and Poisonous.

Wear rubber gloves and safety glasses while performing tests.

Dispose of all used reagents and soil properly.

Read the Material Safety Data Sheet before performing test.

Manufacturer's Warranty

The reagents and supplies used in the PetroFLAG test are warranted to be free of defects in material and workmanship until the expiration date stamped on the box. Manufacturer's sole and exclusive liability under this warranty shall be limited to replacement of any materials that are proved to be defective. Manufacturer shall not be liable for any incidental or consequential damages.

Reliable test results are highly dependent upon the care with which the directions are followed and, consequently, cannot be guaranteed.

Appendix A: PetroFLAG Response Curves

Most fuels, lubes and greases are complex mixtures of various hydrocarbons having a broad range of physical and chemical properties. The PetroFLAG system will detect a majority of the ecologically important hydrocarbon mixtures. The PetroFLAG responses to some typical hydrocarbon contaminants are plotted in figure 1[5].

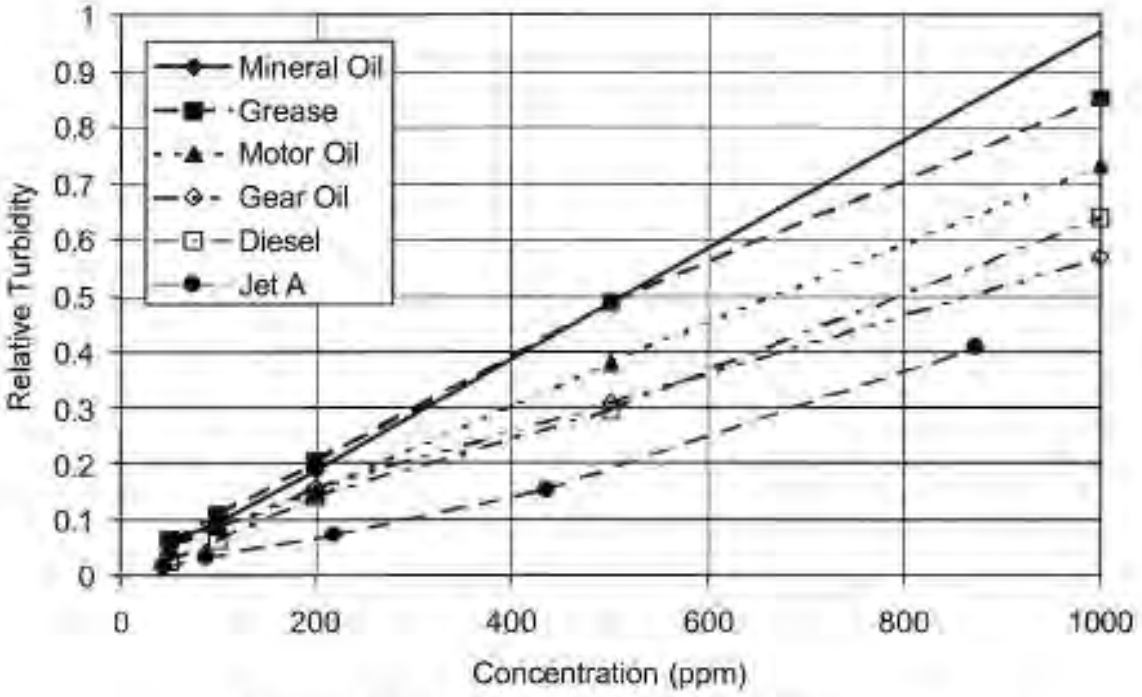


Figure 1: Relative Intensity Data for Common Analytes

[5]The lower limit of quantification, using a 10 gram sample size, is 1000 ppm for gasoline (linear range from 1000 ppm to 5,000 ppm). Brake fluid, phosphate ester based hydraulic oil, or other water soluble compounds will not be detected by the PetroFLAG system.

Appendix B: Comparison with Laboratory Methods

In field trials, the PetroFLAG system was used at sites contaminated with diesel fuel or with oil and grease. In both cases the PetroFLAG results correlated very well with EPA laboratory methods. Both EPA methods 8015B and 418.1 were used to analyze the samples from the diesel site. The resulting correlations were 89% and 92% respectively[6]. The samples from the oil and grease site were analyzed using EPA method 418.1 for soil. The lab results confirmed the PetroFLAG results with no false negatives and only 2 false positives (10%). When comparing the field results and the lab results for the field split samples, the correlation between the PetroFLAG data and EPA method 418.1 for the laboratory split samples was 90%[7].

When comparing the PetroFLAG field results with laboratory results using EPA methods it is important to keep in mind that EPA laboratory methods for TPH are known to have variable extraction efficiency. The extraction efficiency achieved using EPA laboratory methods varies with soil type and moisture content. In addition, the degree to which moisture affects the extraction is dependent on how the individual laboratory is implementing the method. It is, therefore, important to verify that the lab used for comparison is performing the method properly and that the recovery is known.

Another important factor affecting laboratory confirmation analysis is the inhomogeneous nature of soil samples. Whenever possible, homogenize samples using standard methods[8] before taking "splits" to send to the lab for confirmation.

---

[6]Wright, Keith A., "Evaluation of a New Field Test Kit for Determining Total Petroleum Hydrocarbon Concentrations in Soil at a Site Contaminated by Diesel Fuel", Presented at the AEHS Conference on "Hydrocarbon Contaminated Soils", January 11-13, 1995, New Orleans, LA.

[7]Wright, Keith A. and Jermstad, David B., "Evaluation of a Rapid Field Analytical Test Kit for Assessing Hydrocarbon Soil Contamination", Presented at the "Third International Conference On-Site Analysis", January 22-25, 1995 Houston, TX.

[8]See for example: Pitard, Francis F., Pierre Gy's Sampling Theory and Sampling Practice, Volumes 1 and 2, CRC Press, Inc., Boca Raton, FL, 1992)

Appendix C: Determining the Response Factor for Hydrocarbons Not Listed in Table 1

The response factors listed in Table 1 are calculated from response curves similar to those in Figure 1 in Appendix A. The response factor is equal to the slope of the response curve multiplied by 10. The slope of the response curve for the analyte is calculated from the response of the specific analyte relative to the response of the calibration standard. The calibration standard has a slope of one and a response factor of 10 on the PetroFLAG meter. Multiplying the slope of a specific analyte's response curve by 10 yields the appropriate response factor for that analyte.

When a suspected contaminant is not listed in Table 1, there are a few methods that may be used to determine the response factor. The method used is determined by the information and facilities available. The most accurate method would be to replicate the data in Figure 1 for the specific analyte, and then calculate the response factor from the slope of the response curve.

Initially, prepare soil standards from a single homogeneous batch of clean soil spiked at a minimum of 5 different concentrations between 100 and 1000 ppm. (For light hydrocarbons, a higher concentration range can be used.) Next, analyze the soil standards in triplicate using a calibrated PetroFLAG meterset to a response factor of 10. Plot the results with the true spiked concentrations on the "X" axis and the meter readings on the "Y" axis. The slope of the regression line (least squares line) through the data points multiplied by 10 is the response factor that should be used for this analyte. To avoid a low bias and false negatives, round the resulting number down to the nearest whole number when selecting the response factor for the meter. This method can be used if either the contaminant is known or a sample of the neat product is available.

NOTE: When the soil used to prepare the spiked soil standards is not actually clean but contains some hydrocarbons, the curve will have a positive intercept. This result should not affect the calculated response factor provided that the highest spiked standard does not read higher than 1000 ppm on the PetroFLAG meter.

When the contaminant is unknown and a sample of the pure product is not available, then an alternative method can be used. The PetroFLAG results, with the meter set to response factor 10, can be compared with laboratory results from split samples analyzed in triplicate. This method requires extreme care in the homogenizing of the bulk material and also, the preparation of the split samples. Improper sample preparation can result in errors of 100 to 200% or greater. To minimize the effects of this sample variation, as many samples as possible should be analyzed (greater than 20) and the concentrations used should be evenly distributed over the range of 100 to 1000 ppm. Once the data has been collected, plot the data as described above using the laboratory reference method results as the known concentration. The slope of the regression line multiplied by 10 is then the response factor.

NOTE: This method is not as precise as the spike method and any bias in the laboratory method will result in an error in determining this response factor. It is important to check both the laboratory method and the lab performing the analysis thoroughly before using it as the reference method. (See Appendix B)

If the facilities are not available to perform these tests contact Dexsil for advice.

Appendix D: Error Conditions

Table 2: Error Conditions

Message	Cause	Solution
Flashing Concentration Reading [Applies to Unknown Measurements]	Over range condition. Sample concentration outside of linear range.	Use smaller sample (1 gram recommended) and rerun.
Flashing "EEEE" [Applies to Unknown Measurements]	Sensor over range condition. Sample concentration too high.	Use smaller sample (1 gram recommended) and rerun.
"Err0" [Applies to Calibration Mode]	Blank and Calibration Standard vials mixed up. Blank or Calibration Standard outside of QC window (bL too high or CSd too low).	Check calibration vials. Rerun and/or make up new ones.
"Err1" [Applies to All Modes]	Readings from the two optical channels do not agree.	Check vial and reread. If error remains, rerun using another vial.
"Err2" [Applies to Unknown Measurements]	Sample is reading lower than the blank, e.g., Calibration Blank soil unusually high background or not zero.	Recalibrate using true Blank soil.
"Err3" [Applies to Calibration Mode]	Blank or Calibration Standard outside of QC window (bL too low or CSd too high).	Recalibrate using fresh calibration solutions.
"Err4" [Applies to Unknown Measurements]	Absolute temperature difference between calibration and reading exceeds 10°C.	Recalibrate at current temperature.
"Err5" [Applies to All Modes]	Ambient temperature outside of operating range. (4°C - 45°C)	Remove meter and reagents to climate controlled environment to recalibrate/rerun.
"LP"	Low Power	Replace battery

Appendix E: Meter Specifications

A/D Resolution:	0.5 ppm
Display Resolution:	1 ppm
Precision:	Analyte Dependent From MDL to Max Linear Range (MLR) ±10% +5 ppm From Max Linear Range to Max Quantifiable Range (MQR) ± 20%
Measurement Range:	10-10,000 ppm (linear range analyte dependent)
Operating Temperature:	4°C to 45°C

Quantification Limit:

Analyte Dependent Response Factor	Approx. MLR (ppm)*	Approx. MQR (ppm)*
15	730	1,460
10	1,000	2,000
5	2,000	4,000
2	5,000	10,000

*Actual limits realized in the field are temperature and device dependent. PetroFLAG meter automatically warns user when each limit has been reached.

Program Storage:	EEPROM
Calibration Storage:	EEPROM
Display:	4 digit ½ inch seven segment LCD
Batteries:	One 9V Alkaline (included) [Use only Alkaline or Lithium type]
Battery Life:	Approx. 4000 measurements or 1 year (using a 550 mAh alkaline battery)
Dimensions:	length=5.75" width=3.5" height=2"
Weight:	9.85 oz (280 g)

STANDARD OPERATING PROCEDURE C-1

TPH Analysis Using Petro-FLAG Field Assay Kit

I. Purpose

Real-time analysis of potentially TPH-contaminated soil is necessary when removing petroleum contaminated soils from an excavation in order to minimized equipment stand-by charges.

II. Scope

Standard techniques for field assay kits are found in field kit operators manual.

III. Equipment and Materials

Field assay kit with calibration standard and individually packaged TPH analysis kits.

IV. Procedures and Guidelines

Follow directions in operations manual, attached.

V. Attachments

Petro-FLAG operators manual

VI. Key Checks and Items

- Calibrate daily, and again after each batch of 10 samples. Recalibrate if temperature changes more than 10°C.

STANDARD OPERATING PROCEDURE C-2

Electromagnetic Induction

I. Purpose

The purpose of this SOP is to provide general reference information for using electromagnetic induction (EM) methods.

II. Scope

This SOP provides a description of field procedures, equipment, and interpretation methods necessary to fully utilize this procedure.

III. Definitions

Conductivity - Ability of a material to transmit an electrical current. Inverse of resistivity.

Horizontal dipole mode - Transmitter and receiver coils oriented vertically.

Vertical dipole mode - Transmitter and receiver coils oriented horizontally.

Vertical sounding - Multiple EM measurements centered at a point with varying coil spacings.

Vertical profiling - EM measurements along a traverse with a fixed coil spacing and coil orientation.

IV. Responsibilities

Project Manager - The Project Manager is responsible for ensuring that the project-specific plans are in accordance with these procedures, where applicable, or that other approved procedures are developed. The Project Manager is responsible for ensuring that the personnel operating and interpreting the geophysical data are trained, skilled in that endeavor, so far as to receiving documentation on the training and experience of the operating personnel.

Field Team Leader - The Field Team Leader is responsible for selecting and detailing the geophysical technique and equipment to be used. It is the responsibility of the Field Team Leader to ensure that these procedures are implemented in the field and to ensure that the field investigation personnel performing the activities have been briefed and trained to execute these procedures.

Field team - It is the responsibility of the field team to follow these procedures, or to follow documented, project-specific procedures as directed by the Field Team Leader and the Project Manager. Field personnel are responsible for the proper acquisition of geophysical data.

V. Procedures

A. Overview

Electromagnetic Induction (EM) methods are non-intrusive geophysical techniques of measuring the apparent conductivity of the subsurface materials. Electrical conductivity values of subsurface materials are determined by transmitting a high frequency electromagnetic (primary) field into the earth and measuring the secondary electromagnetic field produced by the eddy current. The transmitter and receiver coils do not require direct ground contact thus permitting continuous profiling and rapid data acquisition.

The strength of the secondary field is a function of the inter coil spacing, operating frequency and ground conductivity. The ratio of the secondary to the primary magnetic field is directly proportional to the terrain conductivity which enables direct instrument readout of apparent conductivity values (measured conductivity values are the bulk average conductivity for the area or volume of earth sampled). EM conductivity values are usually expressed in units of milliohms per meter. Conductivity values are converted to resistivity values in ohm-meters by use of the following relationship:

$$\text{resistivity (ohm - meters)} \quad \frac{1{,}000}{\text{EM instrument readout (milliohms per meter)}}$$

The apparent conductivity of the subsurface materials is dependent upon subsurface conditions such as:

- Lithology
- Porosity
- Permeability
- Conductivity of subsurface pore fluids

Changes in these parameters causing measurable variations in electromagnetic conductivity can result from:

- Conductive contaminant plumes
- Abandoned trenches and lagoons
- Lateral changes such as backfill or landfill materials
- Bedrock fracture zones
- Lithological variations
- Buried metallic objects

The sampling depth or depth of investigation is related to the coil spacing and coil mode. The two coil modes used are the vertical dipole mode (coils horizontal) and the horizontal dipole mode (coils vertical).

Two common terrain conductivity meter are EM-31 and the EM-34-3. The EM-31 has a fixed intercoil spacing of 3.7 meters and an effective depth of penetration of approximately 6 meters. The EM-34-3 has two coils which can be separated by 10, 20, or 40 meters and can be oriented in either the horizontal or vertical dipole modes, Intercoil separations increase the effective depth-of investigation as shown below.

Intercoil Spacing (meters)	Depth of Investigation (meters)	
	Horizontal Dipoles	Vertical Dipoles
10	7.5	15
20	15	30
40	30	60

The coil orientation (horizontal or vertical) allows the EM-34-3 to respond to materials of different depths.

Vertical sounding and horizontal profiling are the two EM survey techniques. Vertical profiling is accomplished by multiple measurements about a point with varying coil spacing. Horizontal profiling is performed by making measurements along traverses with a fixed coil spacing. General discussions of electromagnetic induction methods are presented in texts by Grant and West (1965), Telford and others (1976), and Griffiths and King (1981).

B. Applications and Uses

The measurement of subsurface conductivity at a hazardous waste site provides a valuable contribution to site characterization. The conductivity (resistivity) of the hydrogeologic section is predominantly influenced by the pore fluids. Consequently, conductivity measurements provide indirect information on the porosity and permeability of subsurface materials, the degree of saturation, and the conductivity of the pore fluids. The conductivity of the pore fluid is influenced by the presence of dissolved electrolytes. Contaminant plumes in the unsaturated and saturated zones can be mapped provided there is a sufficient change in the conductivity to be detected by the EM instrument. Generally, contaminant plumes of inorganic waste are easily detected because the pore fluids often have conductivity values as much as three orders of magnitude above background values. EM conductivity measurements can also be used to detect the presence of buried waste; filled disposal trenches, and buried metal objects such as drums, tanks or metal debris. Electromagnetic surveys can be used to locate conductive as well as and non-conductive bodies. The many applications include:

- Contaminant plume mapping
- Locating abandoned trenches and lagoons
- Delineating bedrock fracture zones
- Determining thickness of weathered layers
- Lithology mapping
- Locating buried metallic objects
- Lateral anomalies such as pockets or pits of different materials

Examples of EM applications at sites where groundwater is contaminated are presented by Duran (1982), Greenhouse (1983), and Greenhouse and Slaine (1983).

C. Equipment

The two-coil EM instrument and the VLF (very low frequency) instrument are basically the two different types of electromagnetic surveying instruments in use; each is capable of sensing to different depths. There are several models and manufacturers of this equipment.

The two-coil system consists of a transmitter coil and a receiver coil. The transmitter coil induces an electromagnetic field of known strength and the receiver coil measures the resulting quadrature, or ratio of primary to secondary fields resulting from subsurface features. Each instrument is read directly in units of milliohms per meter (conductivity). EM readings represent the average bulk conductivity at a point halfway between the two coils.

The VLF instrument is a receiver which relies on specialized, very low frequency communication antennas for induction of an electromagnetic field. Surveying with the VLF or equivalent instrumentation is commonly referred to as VLF surveying.

The VLF Instrumentation is a small, lightweight hand-held instrument which can be operated by one person. Principal components of the instrument are a pair of mutually perpendicular coils and a receiving crystal with a frequency specific to a transmitting antenna. The two receiving coils are used to measure local characteristics of the primary induced field and any secondary fields emanating from bodies of variable conductivity. Typical sources of induced electromagnetic fields for VLF surveying are the very low frequency antennas used for submarine communications.

D. Data Acquisition

The advantage of the EM survey method is the speed and accuracy with which lateral changes of terrain conductivity can be measured. The EM conductivity data can be acquired using sounding and profiling techniques similar to those used in electrical resistivity. EM profiling is accomplished by traversing an area with a fixed coil spacing and orientation; EM sounding is accomplished by expanding the inter-coil spacings in a manner similar to that used by electrical resistivity soundings. Some commonly used EM equipment is limited in the number of available inter-coil spacings that can be used; however, there are other EM instruments available that can operate at many coil spacings and frequency ranges to provide numerous sounding data points necessary for accurate computer modeling and profiling.

The factors determining which instrument is used and what the grid spacing should be at particular sites are:

- Depth to target and size of target
- Accessibility of the site
- Effects of manmade structures and utilities, such as electric power lines
- Conductivity of the earth materials

EM induction instruments may have a depth of investigation of up to 200 feet depending upon coil spacing and orientations used. The very low frequency VLF device has the greatest depth of investigation and is generally used to evaluate large geologic structures.

In conducting a VLF survey, VLF readings should be acquired with the instrument oriented perpendicular to a straight line from the site to the transmitter antennas. This orientation is necessary to ensure optimum data quality. All readings from a particular VLF station must be obtained with the instrument oriented in the same direction.

For an EM induction survey, a regular pattern of survey stations will provide coverage of the area in question. Typically, use of a grid spacing which is approximately equal to the size of the target sought by the survey, and coil spacing with a maximum response for the depth of interest will produce satisfactory results. Specific needs for local detail, however, may require a refined coverage. The chosen spacing should always be site and target specific.

In conducting an EM survey, the field operator must avoid or note any potential sources of anomalous (noise) conductivity values such as power lines, buildings, fences, buried pipelines or any other large metal objects. Noise sources should be noted on the profiles or contour maps accounting for anomalies due to these known sources.

Important information that should be known for planning and before conducting an EM conductivity survey are: assumed hydrogeologic characteristics of the site, potential source locations and migration paths, characteristics of the hazardous substance of interest, and depths of interest. The level of detail necessary (size of object of interest and detail of resolution) determines the number of lines and station spacings of readings required.

EM data, if not recorded on a strip chart or digital recording instrument, should be recorded on standardized data sheets. At a minimum all data (strip chart, digital disks, or standard forms) should have the following information listed:

- Project/site location identification
- Company
- Date and time
- Operators name
- Instrument make, model
- Coil spacings and configuration

- Line and station numbers
- Instrument reading scales
- Weather conditions/temperature

E. Interpretation

1. Data Analysis

In general, electromagnetic survey data require relatively little processing before they can be interpreted. This is especially true for fixed coil spacing surveys because the data are recorded in units of conductivity; preliminary interpretations are made by comparison of conductivity values. A contour map can be prepared from the data and compared with results of other surveys. EM instruments also can be used for vertical soundings similar to resistivity sounding. Vertical sounding with EM equipment, however, has lower resolution than that performed with the resistivity technique. As a result, EM data are generally more useful for continuous profiling surveys.

VLF instruments do not read directly in units of conductivity. The in-phase measurement (the tilt of primary induced field) is read in terms of the tangent to the angle of tilt and is given as a percentage. Quadrature measurements, which are the ratios of voltage required to equalize the primary to secondary signal strengths, are also given as percentages. For field interpretation these two sets of data can be plotted in profile form, percentage versus distance. Greenhouse and Slaine (1983) describe a simple mathematical conversion so that VLF data can be presented in contour format and compared to other available data such as resistivity and magnetics. Digital data acquisition systems are now available that allow calculation of conductivity.

2. Presentation of Results

Results of an EM conductivity survey can be presented in profile and/or contour map form. The orientation of the traverses should be indicated on profiles in lines of coverage on contour maps. Locations of observed surface metal and other cultural features such as topography, buildings, fences, power lines etc. should be noted on both the profiles and the contour maps.

3. Interpretation

EM conductivity data can be analyzed qualitatively and quantitatively. Generally, profiling data are presented as a contour map or profiles. Profile lines should be stacked and aligned. A qualitative analysis of the contour map or aligned profiles usually can allow an interpreter to identify any conductivity trends that may be indicative of buried metal, groundwater flow and contaminant transport. A comparison of available geologic data, cultural ferrous

metal and debris maps prepared during data acquisitions should be made to evaluate the causes of any conductivity trends observed.

Computer or chart comparisons of EM sounding data with available theoretical models can be made. This type of interpretation is similar to that used in electrical resistivity, but in EM sounding it is limited to relatively simple hydrogeologic conditions.

F. Advantages and Limitations

Advantages of the electromagnetic induction method include:

- No ground contact required
- Rapid data acquisition (faster than resistivity)
- Lightweight, one or two man operation
- Wide range of applications
- High lateral resolution
- Field interpretation possible

Limitations of the electromagnetic induction method include:

- Limited dynamic range l-1,000 milliohm/meter
- Susceptible to effects of man-made structures, utilities, etc.
- Less vertical resolution than resistivity
- Limited penetration
- Does not distinguish even simple layering without more complex application and interpretation
- Setting and maintaining instrument at zero

VI. Quality Assurance Records

Field data will be recorded in log books and/or data recording sheets accompanying the monitoring equipment. Data recorded in a field log book will be entered with the following data: date, site location, Contract Task Order number, personnel conducting the investigation, time (military time), start time and end time, weather.

VII. References

Duran, P.B. and Haeni, F.P., 1982, The use of electromagnetic conductivity techniques in the delineation of groundwater contamination plumes, in Novitzki, R.P. and Levine, G., eds., The impact of waste storage and disposal on groundwater resources: A Northeast Conference, presented by U.S. Geological Survey and Cornell University Center for Environmental Research, June 18 - July 1, 1982, Ithaca, New York, p. 8.4.1 to 8.4.33.

Geonics Limited, EM 31 Operating Manual: Mississauga, Ontario, Canada, 58 p.

Geonics Limited, EM 16 VLF Electromagnetic Unit, Operating Instructions: Mississauga, Ontario, Canada.

Grant F.S., and West, G.G., 1965, Interpretation theory in applied geophysics: New York, McGraw-Hill 583 p.

Greenhouse, J.P., 1983, Surface geophysics in contaminant hydrogeology, in Field methods in contaminant hydrogeology: Proceedings of a hydrogeology field school sponsored by The Groundwater Research Institute, University of Waterloo, April 18-22, 1983, Canadian Forces Base, Borden, Ontario, Canada, 53 p.

Greenhouse, J.P., and Slaine, D.D., 1983, The use of reconnaissance electromagnetic methods to map contaminant migration: Ground Water Monitoring Review, v. 3, no. 2, p. 47-59.

Griffiths, D.H., and King, R.F., 1981, Applied geophysics for geologists and engineers, 2nd ed.: Elmsford, New York, Pergamon Press, 230 p.

Telford, W.M., Geldart, L.P., Sheriff, R.E. and Keys, D.A., 1976, Applied geophysics: New York, Cambridge University Press, 860 p.

Zohdy, A.A.R., Eaton, G.P., and Mabey, D.R., 1974, Application of surface geophysics to groundwater investigations: U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 2, Chapter DI, 116 p.

STANDARD OPERATING PROCEDURE C-3

Magnetometry

I. Purpose

This SOP provides general reference information and standard techniques for using magnetometry.

II. Scope

This SOP provides a description of the field procedures, equipment, and interpretation methods necessary to fully utilize this procedure.

III. Definitions

Diurnal variations - daily changes in the total magnetic field strength due to solar activity and which (may be as large as 100 gammas or more)

Gradient - change in magnetic field strength in a given vertical or horizontal distance

Magnetic storm - sudden and simultaneous variations of up to several hundred gammas throughout the world. Magnetic storms can occur as often as several times a month and can last one to several days.

Total magnetic field intensity - a scaler measurement of the magnitude of the earth's magnetic field vector independent of its direction.

IV. Responsibilities

Project Manager - The Project Manager is responsible for ensuring that the project-specific plans are in accordance with these procedures, where applicable, or that other approved procedures are developed. The Project Manager is responsible for ensuring that the personnel operating and interpreting the geophysical data are trained, skilled in that endeavor, so far as to receiving documentation on the training and experience of the operating personnel.

Field Team Leader - The Field Team Leader is responsible for selecting and detailing the geophysical technique and equipment to be used. It is the responsibility of the Field Team Leader to ensure that these procedures are implemented in the field and to ensure that the field investigation personnel performing the activities have been briefed and trained to execute these procedures.

V. PROCEDURES

A. Overview

Magnetic surveying is a passive geophysical technique which measures the strength of the earth's magnetic field. The earth's field is a vector quantity having a unique magnitude and direction at every point on the earth's surface. A magnetometer is the instrument which measures the magnetic field strength in units of gammas or nanoteslas. In order to recognize a magnetic anomaly, it must be several times larger than the background noise level along that profile. Buried ferrous metal objects such as steel drums or tanks cause local variations or anomalies in the earth's magnetic field that can be detected by a magnetometer. Geologic features such as igneous intrusion or iron rich sands can also be mapped using magnetic surveying.

The earth's magnetic field is not completely stable. It undergoes long-term (secular) variations over centuries; small, daily (diurnal) variations (less than 1% of the total field magnitude); and transient fluctuations called magnetic storms resulting from solar flare phenomena. Both naturally-occurring and manmade magnetic materials can modify the earth's magnetic field locally.

Analysis of magnetic data by an experienced geophysicist can provide an estimate of the areal extent and quantity of buried ferrous objects. Depth of burial approximations can be made using graphical methods of interpretation such as slope techniques and half-width rules as described in Nettleton (1976).

B. Application and Uses

Buried ferrous metal objects such as pipelines, barrels, tanks, etc., generally produce a perturbation in the earth's naturally occurring magnetic field. The size (amplitude) of this perturbation is related to the size of, distance to, susceptibility and remnant magnetization of the buried object. The magnetic survey method, therefore, is a useful tool for site studies to locate and identify buried ferrous metal. Non-anomalous magnetic data acquired over EM conductivity anomalies is an indication of the existence of buried conductive, non-ferrous metal (copper, aluminum, brass) objects.

Magnetic data also can be helpful in determining the size and geometry of geologic features such as fault zones, mineralized zones, and bedrock valleys and depressions. These features are characterized generally by longer wavelength anomalies and are readily distinguishable from anomalies associated with buried metal. In many areas, such geologic features may control or affect the direction and magnitude of groundwater flow.

The total field proton precession magnetometer, the fluxgate magnetometer, and the magnetic gradiometer are commonly used magnetometers in environmental site investigations. The total field proton precession magnetometer is the most commonly used magnetometer because they are easy to operate, have no instrumental drift, and can acquire data rapidly. The

The fluxgate magnetometer can better define the boundaries of buried ferrous objects than the proton precession magnetometer but is subject to instrument drift, and needs to be exactly oriented. Magnetic gradiometer measurements enhance anomalies resulting from shallow magnetic sources.

C. Equipment

Magnetometers commonly used in hazardous waste site investigations include the total field proton procession magnetometer, the flux gate magnetometer, and the magnetic gradiometer. Text books such as Telford (1976) and Nettleton (1976) discuss in detail the operation and construction of these and other magnetometers.

The total field proton procession magnetometer is the most commonly used magnetometer in hazardous waste investigations. This instrument utilizes the precession of spinning protons of hydrogen atoms in a sample fluid (kerosene, alcohol or water) to measure the total magnetic field intensity. Total field proton precession magnetometers are portable and do not require precise orientation and leveling; the sensor must be oriented with one side facing approximately north and the sensor held stationary during the cycling period. Proton precession magnetometers have no instrument drift, do not require calibrations, are easy to operate, and have an accuracy of 0.1 gamma. Most modern proton precession magnetometers have digital readouts and electronic storage of data.

Vertical magnetic gradiometers are magnetometers that measure vertical differences of the earth's total magnetic field. Gradient measurements enhance magnetic anomalies resulting from near surface magnetic source and discrimination between neighboring magnetic anomalies is also enhanced. These measurements are generally made using an instrument similar to a total field magnetometer that has two or more sensors mounted on a staff. The sensors are vertically separated by a constant distance, usually one to three feet. Gradient readings are adversely affected by ferrous metal surface debris since signals from this surface debris are also amplified. Consequently, removal of surface metal should be considered before conducting a gradiometer survey.

The flux gate magnetometer was developed during World War II as a submarine detector. Text books such as Telford (1976), RAO and Murthy (1978) explain in detail the principals of operation of the flux gate magnetometer. A fluxgate magnetometer can define the boundaries of regions of buried ferrous metal objects more precisely than the proton precession magnetometer. There are several sources of errors in flux gate magnetometers including unbalance in the two coils, thermal and shock noise, circuit drift and temperature sensitivity. The advantages are direct readout, no azimuth orientation, coarse leveling required, light weight and portability (Telford, 1976).

D. Field Procedures

Magnetic data are generally acquired at relatively close station spacings (5 to 50 foot intervals) along closely spaced (10 to 50 feet) parallel survey lines.

Magnetic data can be acquired in a rectangular grid pattern or along traverses. Grid data are readings acquired at the nodes of a rectangular grid; traverse data is acquired at fixed intervals along a line. Traverse data is often preferable to grid data because it generally is less expensive to acquire (heavily vegetated sites require time consuming brush cutting to establish a complete grid) and more useful for interpretation than an equal number of grid readings. Traverse lines generally ought to be oriented in a north-south direction so that the maximum amplitude of an anomaly can be detected. However, line orientations are often more dependent on site obstacles and sources of magnetic noise.

Station and line spacing intervals are determined on the basis of the desired resolution of the survey. If individual drums or clusters of deeply (greater than 25 feet) buried drums are the objective of the survey, then a detailed magnetic survey with relatively close station spacings (approximately 5 to 10 feet) and line spacings (approximately 10 to 25 feet) should be used. If large metal objects such as 10,000 gallon tanks or trenches filled with barrels are the objective of the magnetic survey, then a reconnaissance or screening survey with longer station spacings (25, 50, or 100 feet) and line spacings of (25, 50, or 100 feet) may be appropriate.

In conducting a survey, the field operator must avoid or note any sources of high magnetic gradients and alternating currents, such as power lines, buildings, and any large iron or steel objects. It is also important that the operator be relatively free of magnetic materials on his/her person and the magnetometer sensor be kept clean to avoid possible magnetic-bearing soil. Periodically during a survey, and particularly when an anomaly is detected, it is important to establish that the magnetometer is providing valid readings and not random, meaningless instrument noise. The simplest means of verifying magnetometer field readings is to take several successive readings at one location. These readings should repeat to within ± 1 gamma. Readings are taken at predetermined intervals which depend on the nature of the survey and which may have to be modified depending on the gradients encountered. For detailed surveys, a base station or the reoccupation of a set of stations several times a day or a continuous monitoring station (within 100 miles) is established to check for diurnal variations and magnetic storms. At the height of a magnetic storm, magnetic surveying may be impractical due to the large instantaneous changes in the total magnetic field.

E. Interpretation

1. Data Analysis

Magnetic data can be corrected for diurnal variations; however, diurnal changes are generally very gradual and linear and should not have the extreme fluctuations associated with buried ferrous metal objects. Magnetic data can be plotted in profile form or contoured depending upon the survey coverage. Noise sources (surface ferrous metal objects, fences, power lines, etc.) should be noted on the profiles or contour map so that anomalies due to these known sources can be accounted for. The amplitudes of similar sized surface metal objects should be compared. If similar sized ferrous metal surface objects have extremely different anomaly amplitudes, it may be an indication that buried ferrous metal objects exist in the vicinity of the higher amplitude anomalies.

2. Presentation of Results

The results of a magnetic survey should be presented in profile and/or contour map form. The orientation of the traverses should be indicated on profiles and lines of coverage on contour maps. Locations of observed ferrous metal and other cultural features (hills, valleys, streams, etc.) should be noted on both the profile and the contour maps.

3. Interpretation

Magnetic anomalies can be analyzed both qualitatively and quantitatively. The shape and gradient of an anomaly (slope, wave-length, amplitude, etc.) contains enough information to draw qualitative conclusions regarding the location and depth of the causative source.

Quantitative computer modeling interpretations of magnetic data are complicated both by the inherent complexity of dipole magnetic behavior and by the fact that a number of different types and configurations of sources can cause the same anomaly. Where the properties of the earth's field and the local geologic materials (inclination, declination, susceptibility, and remnant magnetization) are well known, reasonable assumptions regarding the nature of the source- can be made, and a fairly accurate model of the source generally can be derived.

F. Advantages and Limitations

Advantages of the magnetic survey method include:

- Rapid operation
- Low expense
- Identification of buried metal (ferrous)
- Sensitivity to small ferrous objects

Limitations of the magnetic survey method include:

- Susceptible to effects of manmade structures, utilities, buildings, fences, etc.
- Detection is limited to the distance to and quantity of ferrous metal present

VI. Quality Assurance Records

All data will be recorded in log books and/or data logging sheets designed for this procedure. All data will be entered with the following basic information: date, start and end times (military time), location, personnel on site, Contract Task Order number, and weather.

VII. References

Dobrin, M.B., 1976, "Introduction to Geophysical Prospecting," McGraw-Hill Inc., New York, 630 p.

Grant, F.S. and West, G.F., 1965, Interpretation Theory in Applied Geophysics: New York, McGraw-Hill.

Nettleton, L.L., 1976, "Gravity and Magnetics in Oil Prospecting," McGraw-Hill Book Company, New York, 453 p.

Nettleton, L.L., 1973, "Elementary Gravity and Magnetics For Geologists and Seismologists, "Society of Exploration Geophysicists, Monograph no.I, Tulsa, Oklahoma, 121 p.

Telford, W.M., Geldart, L.P., Sheriff, R.E., Keys, D.A., 1976, "Applied Geophysics," Cambridge University Press, New York, 860 p.

RAO and Murthy, "Gravity and Magnetic Methods of Prospecting," Safdarjang Enclave, New Delhi-1100166 390 p.

STANDARD OPERATING PROCEDURE C-4

Vegetation Clearance SOP for Environmental Investigations

The purpose of the Vegetation Clearance SOP is to minimize damage to plants, wildlife, and habitats (especially threatened, endangered, or otherwise sensitive) while enabling efficient and effective environmental investigations. This SOP contains some general guidance that will be followed, to the extent possible, when developing and implementing a vegetation clearance process for each site-specific investigation. Additionally, this SOP enumerates the process that will be implemented to facilitate US Navy (Navy) and US Fish and Wildlife Service (USFWS) concurrence on specific vegetation clearance activities at each environmental site prior to initiation of those activities.

This vegetation clearance SOP applies to only environmental investigation activities. The different objectives associated with other activities such as removal or remedial actions, or munitions response program (MRP) activities, necessitate a different approach to vegetation clearance. Therefore, this SOP is not applicable to activities other than environmental investigations, unless concurred upon by USFWS and Navy personnel on a case-by-case basis. For activities conducted under the MRP and environmental investigations conducted within the Live Impact Area (LIA), Surface Impact Area (SIA), Eastern Maneuver Area (EMA), and Eastern Conservation Area (ECA), collectively referred to here as "munitions areas," a threatened and endangered species survey will be conducted in accordance with the "*Methods and Approach for Threatened and Endangered Species and Habitat Surveys Within the ECA, SIA, and EMA on Vieques, Puerto Rico*" (Geomarine Inc., January 2007). Any mitigation measures for munitions areas identified based on the Threatened and Endangered Species and Habitat Surveys in those areas supersede any other vegetation clearance protocol discussed in this SOP.

General Guidance

Where technically practical and economically feasible, hand clearing of vegetation using hand or power tools (e.g., machetes, chainsaws, etc.) will be considered during evaluation of vegetation clearance routes. Whether clearing by hand or with mechanized equipment, large trees (3 inches in diameter or larger) will be avoided, if possible, while the thicker underbrush is cleared to make the investigation and site access easier. Because all vegetation clearance routes will be reviewed in the field by USFWS personnel prior to implementing the clearance activities, any large tree proposed for removal in order to meet the investigation objectives will be evaluated by USFWS.

Mechanized land clearing will be used judiciously, if possible, avoiding areas with old growth trees and favoring areas that have been previously cleared or disturbed, if present. The use of large wheeled or tracked vehicles makes selective vegetation clearance difficult, but its use may be necessary when clearing large areas or wide paths for access by large sampling equipment. The type of vegetation present will also be considered when

developing the site-specific vegetation clearance process. Large-vehicle mechanized vegetation clearance may not pose a concern in previously cleared areas, or areas with heavy mesquite infestations, but will be carefully evaluated in other mature forested or otherwise sensitive areas.

If mechanized land clearing is to be used, the smallest piece of equipment available will be favored. Equipment that can maneuver around certain trees and selectively cut according to the clearance criteria is preferable to that which needs to clear cut a wide access path for itself. The preferred method of mechanized clearing will be a brush hog type tractor where the cutting mechanism is attached to a tractor and can be lifted and lowered onto the vegetation. This machinery is sometimes referred to as a hydro ax. However, if not available, or not technically or economically practical, other types of machinery will be considered.

Areas such as the banks of ephemeral streams will be avoided if possible, and proposed for selective hand clearing if not. Maintaining the vegetative cover of the ephemeral stream banks to the extent possible helps assure that there is minimal bank failure and erosion. Fording of ephemeral streams with mechanized equipment will be avoided unless necessary to meet project objectives. As with vegetation clearance routes, any proposed ephemeral stream crossings and/or vegetation clearance will be discussed with USFWS personnel prior to the activity. Further, collection of samples within ephemeral streams will be conducted by hand equipment as long as the objectives of the investigation can still be met. Of note is that there are several ephemeral streams on the northeast side of Vieques that have been previously designated as conservation zones.

The primary wetland type on Vieques is mangrove wetlands and associated saltflats. Extensive mangrove wetlands are found on west Vieques associated with the Laguna Kiani/Boca Quebrada complex, and Laguna Grande. On east Vieques, there are numerous mangrove lagoons along the coastal areas and in the Live Impact Area (LIA). Like ephemeral streams, mangrove areas will be avoided if possible, and proposed for selective hand clearing if not and if the objectives of the investigation can still be met. Further, soil sampling and placement of monitoring wells in the soft soils associated with mangrove areas will be made by hand, if possible and if the objectives of the investigation can still be met.

Because the type and size of the necessary sample collection equipment dictates, in part, the type of vegetation clearance equipment to be used, the type and size of drilling equipment will be considered when selecting sample types and associated locations. Where possible, sample collection by hand will be considered as long as the investigation objectives can still be met. Because of the limited number of drill rigs available for mobilization to Vieques, control over the size and type of rigs used for site-specific investigations may not be possible.

In areas where threatened and endangered species surveys have been performed, any mitigation measures identified based on those surveys will be implemented during any subsequent vegetation clearance.

During identification of proposed vegetation clearance routes and during vegetation clearance, if threatened or endangered plant species are identified, they will be flagged and

reported to USFWS personnel. If during vegetation clearance a snake is accidentally killed by the mechanized equipment, it will be brought to USFWS personnel. Reasonable effort will be made to avoid cutting or damaging threat and endangered plant species, as well as snakes and other wildlife. Attached to this SOP is a list of threatened and endangered plant species (with pictures, where available) and a list of snakes on Vieques (with pictures).

Steps for Developing Site-specific Vegetation Clearance Process

Step 1 – Determine if a Threatened and Endangered Species and Habitat Survey has been Conducted or is Required.

For any site to be investigated, determine if a Threatened and Endangered Species and Habitat Survey has been conducted. If one has been conducted, incorporate that information, including any mitigation measures, into Step 2. If a survey has not been conducted, consult with USFWS to determine if a survey is required. If so, conduct the survey and incorporate that information, including any required mitigation measures, into Step 2. If not, proceed to Step 2.

Step 2 – Develop Study Area Map(s) Showing Proposed Sampling Locations, and Associated Tables Listing Sampling Methodology for Each Location

As part of site-specific work plan development and upon regulatory agency approval of the site-specific work plan, the following information will be provided to the Navy contractor site reconnaissance field team that will investigate routes of access to each sampling location.

1. Threatened and Endangered Species and Habitats Survey information, as applicable
2. Sampling Station Maps - Study area map(s) illustrating all sampling stations proposed for investigation.
3. Supplemental Maps - Aerial, topographic, or other maps of the study area that clearly show environmental features (e.g., roads, ephemeral streams), if available, will be compiled. Maps showing known locations of protected plants and animals and sensitive habitats (e.g., wetlands, salt flats, conservation zones), and identification guides (e.g., snake species flyer) will also be compiled, if available.
4. Information Tables - Tables will be produced summarizing investigation details for each station and provided to the field reconnaissance team. The tables will contain the following information:

   Table 1

   - Station ID
   - Station coordinates
   - Investigation activity (e.g., well installation; existing well sampling; or surface soil, subsurface soil, surface water, sediment sampling)
   - Mandatory equipment or acceptable alternatives needed on station to collect the samples (e.g., drill rig, 4 wheel drive truck, gear carried in by hand), excluding vegetation clearance equipment
   - Notes – Additional information for the field team to consider during the access route evaluation, as applicable.

Table 2

- A reference table will be produced outlining minimum surface clearances, maximum grades, and other limit information required for the transport and operation of each type of sampling equipment. This will allow the reconnaissance team to understand what characteristics of the route need to be achieved. Similarly, vegetation clearing equipment characteristics (e.g., minimum width and maximum height of clearance that can be achieved) will be outlined so that the reconnaissance team can better identify appropriate method(s) for clearing the route.

Step 3 – Initial Site Visit to Delineate Access Routes

A Navy contractor biologist and UXO technician (if required) will visit each proposed location and evaluate access conditions. The objective will be to ground truth and flag safe and effective routes of access to each target station through which vegetative clearing and equipment maneuvering will minimize damage to vegetation, habitat, and wildlife, while still enabling the investigation objectives to be met. In addition, the biologist will identify issues that may limit the types of investigative equipment or clearing methods to be used, or that may prevent investigation of the proposed station altogether.

The following steps will be conducted for each sampling location:

1. Have in hand the study area maps and information described in Step 2.
2. Ground truth a route from the nearest drivable roadway to the station, noting or conducting the following:
    a. Along the route use orange flagging to mark the proposed width of the path to be cleared of vegetation. The width will be based on the minimum distance required for the proposed investigative equipment type.
    b. Routes that can follow previously cleared areas will be given preference over older growth areas.
    c. Trees greater than 3 inches in diameter that fall within the route because they cannot be avoided will be tagged with white flagging to indicate that they should be left standing, if possible, which will be later evaluated by the USFWS personnel for any concerns regarding potential removal.
    d. Vegetation that should not be damaged or removed (e.g., a protected species or sensitive habitat) that is located within or adjacent to the route will be clearly flagged with red and white flagging. The dual-color flagging is intended to emphasize the vegetation not to be damaged or removed and to avoid confusion with other flag types/configurations.
    e. Ephemeral streams will be avoided, if possible, since clearing of vegetation in the ephemeral stream and movement of machinery across the ephemeral stream may increase the potential for erosion. If ephemeral stream crossing is unavoidable, preference will be given to identifying a route that will minimize damage to the ephemeral stream and associated vegetation.
    f. Wetlands (typically mangrove communities) will be avoided, if possible. If routes or stations necessarily occur in or near wetlands, minimal clearing will be

proposed, ideally conducted by hand, as long as this enables the objectives of the environmental investigation to be met.

g. GPS coordinates will be gathered along the centerline of the flagged route(s).
h. Any observations of protected plant and animal species on or near the route will be documented.
i. Photographs will be taken as deemed helpful

3. Complete a Draft - Route Documentation Form for each route while in the field. This form documents important characteristics of the proposed route, recommendations for and against certain equipment types to be used for investigation and vegetation clearing, and any other information that should be brought up for review with the Navy and USFWS personnel.

Step 4 –Documentation of Proposed Route and Clearing Methods

The station map from Step 2 will be updated to add the proposed routes to each station using the field GPS coordinates. The Draft - Route Documentation Form for each location will be modified to include a close-up map view of the proposed route and type-written documentation of key information. The station map and route documentation forms will be sent to the USFWS Refuge Manager, or his/her designee(s), prior to conducting a site reconnaissance with USFWS personnel.

If the USFWS Refuge Manager or his/her designee determine, based on the Draft Route Documentation Form and associated supporting documentation, that a coordinated site visit is not necessary in order to concur with the proposed vegetation clearance approach and route(s), skip to Step 6. If the USFWS Refuge Manager or his/her designee determines a coordinated site visit is necessary, he/she will notify the Navy RPM within 5 days of the receipt of the documentation from the Navy.

Step 5 – Conduct Site Visit with USFWS

The Navy contractor biologist (or other Navy contractor personnel, if appropriate) and UXO technician (if required) will escort the USFWS Refuge Manager and/or his/her designee(s) along each flagged route to determine if proposed plans regarding location, clearing equipment, investigation equipment, and vegetation to be cleared or protected are acceptable, and to document any recommended changes to the proposed plan. The Route Documentation Form will be used in the field to support review of the proposed route and record recommended changes by USFWS. If feasible, recommended adjustments along the route will be made during this visit. If no changes are made to proposed vegetation clearance procedures or routes alter the associated sample collection methods or sample locations, the Navy contractor will present the revised Route Documentation Form(s) to the Navy for concurrence.

If the USFWS personnel recommendations regarding vegetation clearance along any particular route alter the method of sample collection, ability to collect the sample as intended, or sample location, the Navy will set up a call or meeting with the Environmental Technical Subcommittee to discuss the proposed sample collection changes. If the changes are agreed upon, the updated Route Documentation Forms will be finalized. If the proposed sample collection changes are not acceptable to the regulatory agencies, additional

discussions among the agencies will be required before vegetation clearance and the field investigation can commence.

Step 6 – USFWS Concurrence Letter

Within 5 days of the final site-specific vegetation clearance process being concurred upon by the Navy and USFWS, the concurrence will be documented in a letter provided to the Navy by the USFWS Refuge Manager or his/her designee.

Step 7 – Oversight of Actual Clearing Activities

The Navy contractor biologist involved with the field reconnaissance and USFWS site review (or other Navy contractor personnel, if appropriate) will be present during implementation of clearing activities. Using the final, concurred upon Route Documentation Forms, the contractor biologist will ensure that final decisions regarding route layout, clearing machinery, plants to avoid, and any other documented issues are maintained during vegetation clearance.

STANDARD OPERATING PROCEDURE C-5

Slide Hammer Soil Sampling

I. Purpose

Collection of shallow soil samples with a direct push sampler driven by a slide hammer.

II. Scope

Methodology, safety and use of slide hammer to drive a direct push soil sampler to collect shallow soil samples.

III. Equipment and Materials

- Slide hammer, with appropriate weight.
- Direct push soil sampler

IV. Procedures and Guidelines

- Follow direct push soil sampling SOP for soil collection, using slide hammer to drive soil sampler instead of direct push rig.
- Follow HSE 112 Manual Lifting, and evaluate lifting and use of slide hammer with lift evaluation form and self-assessment checklist for lifting.

V. Attachments

Lift evaluation form and self-assessment checklist for lifting.

VI. Key Checks and Items

Use caution, get assistance carrying, watch for pinch points, follow HSE 112.

This page intentionally left blank

Attachment D
Data Management Plan

This page intentionally left blank

FINAL

DATA MANAGEMENT PROCESS OVERVIEW FOR THE NAVY CLEAN AND JOINT VENTURE PROGRAMS

Prepared 15 April 2008

Prepared by

CH2MHILL

This page intentionally left blank

Contents

Section **Page**

Contents ..... **ii**

1.0 Introduction **1**

2.0 Data Management Activities **2**
- 2.1 New Data Management 2
- 2.2 Historical Data Management 3
- 2.3 Data Management Team Members 3
- 2.4 Database Management and Administration 5
- 2.5 GIS Integration 5
- 2.6 Reporting and Submittals 6

3.0 Database Management System **6**
- 3.1 Project Database Requirements 6
- 3.2 Tools for Data Management System Requirements 7
- 3.3 Data Integrity 8
  - 3.3.1 Valid Values and Referential Integrity 8
  - 3.3.2 Electronic Data Deliverable Requirements 9
- 3.4 Security and Access 9
- 3.5 File Backup 9

4.0 Phases of Data Management **12**
- 4.1 Project Planning and Setup 12
- 4.2 Sample Collection and Tracking 12
  - 4.2.1 Sample Collection 12
  - 4.2.2 Field Data Collection 14
  - 4.2.3 Sample and Document Tracking 14
- 4.3 Laboratory Analysis and Reporting 14
  - 4.3.1 Sample Analysis 14
  - 4.3.2 Laboratory Reporting 14
  - 4.3.3 Laboratory Data QC 15
- 4.4 Data Validation and Reporting 15
  - 4.4.1 Data Validation 15
  - 4.4.2 Validated Data Reporting 15
  - 4.4.3 Validated Data QC 15
  - 4.4.4 Chemist PreLoad Check 16
- 4.5 Project Data Loading and Storage 16
  - 4.5.1 Data Loading 16
  - 4.5.2 Quality Assurance/Quality Control (QA/QC) 16
  - 4.5.3 Invoice Review 16
  - 4.5.4 Storage of Deliverables and Documentation 16
- 4.6 Reporting and Delivery of Results 17

Tables **Page**

Table 3-1 DMS Tools 7
Table 3-2 SNEDD Format 10
Table 3-3 Auxiliary EDD Format 11

Figures **Page**

Figure 4-1 Navy Data Management Process Flowchart 13

1.0 Introduction

This Data Management Plan (DMP) was developed to provide operating guidelines to satisfy the data management requirements for large quantities of data in support of the Navy CLEAN and Joint Venture (JV) Programs. The DMP is broadly applicable to the management and dissemination of data generated during environmental investigations. It is intended to be a living document and will be amended or revised to accommodate changes in the scope of environmental investigation or data management requirements.

During field investigations, CH2M HILL will collect a variety of environmental information that will support data analysis, reporting, and presentation. To ensure quality assurance/ quality control (QA/QC) and meet current regulatory requirements, a complete audit trail of the information flow must be established. Each step in the data management process (data collection, storage, and analysis) must be adequately planned, executed, and documented. The DMP provides the processes and guidelines for sample tracking, storage, access, delivery, and reporting of new chemical analytical, geologic, biologic and spatial data generated by investigation operations. Additionally, this plan addresses the management of historical data. Key data management objectives are identified and listed below.

- Provide data users with tools that allow simple and rapid access to stored data of various types
- Provide methods of data entry and data loading with known accuracy and efficiency
- Apply well-documented data validation modifications to the electronic database
- Manage sample data using a unique sample identification number
- Establish a sample inventory of new data collected, and provide methods of sample inventory reconciliation
- Store and provide sample-specific attributes, including location identifier, sample type, sample media, depth, date, and target study area
- Provide reporting and delivery formats from a single database source to support data analysis, site characterization, risk assessment, modeling, and spatial analysis
- Provide the ability to electronically compare results to project-specific reference or screening criteria
- Identify needs for incorporating historical data and establish a database of this information when possible; otherwise, establish a data inventory plan that identifies and catalogues historical data not suited for database entry

To facilitate information utilization and decision-making, a set of guidelines and specifications is presented for personnel qualifications, elements of the data management system (DMS), and activities related to data management. The following specifications are provided to ensure compatibility with the Navy CLEAN and JV Programs' goals and requirements.

These specifications include the routines, processes, and guidelines for sample tracking, storage, access, delivery, and reporting of chemical analytical, geologic, biologic and spatial data generated during site characterization, remedial investigation, and remedial action activities at the sites.

2.0 Data Management Activities

This section describes data management activities for new data and historical data. It also discusses the responsibilities of the data team members, coordination and administration of the database, integration with the geographic information system (GIS), and reporting of data from the database.

2.1 New Data Management

For new data being generated as part of field and laboratory operations, the DMP revolves around nine overlapping phases of activity.

1. **Project Planning and Setup:** A Kick-off Meeting is held to review project instructions, assign sample nomenclature, and detail the EIS level of effort and budget required for the project. Initial communication with the laboratory, data validator, and field crew is established to ensure that all project materials, deliverables, and specifications will be met.

2. **Sample Collection and Tracking:** Field efforts are carried out according to information detailed in the Project Instructions and Sampling and Analysis Plan (SAP). Sample information and field measurements are collected and catalogued for loading into the project database. Lab login reports are received from labs, entered into the Sample Tracking Sheet (STS) and compared to information from the Project Instructions in order to track the completeness and timeliness of sample handling and processing.

3. **Lab Analysis and Reporting:** Analyses are performed in accordance with the Laboratory Scope of Work (SOW) and the Uniform Federal Policy Sampling and Analysis Plan (UFP SAP). Hard copy and electronic data deliverables (EDDs) are delivered to the data management team in the agreed-upon format. Lab electronic data are checked for completeness and consistency with hard copy data reports.

4. **Data Validation and Reporting**: Validation or review is performed in accordance with the Data Validation SOW and the Uniform Federal Policy Sampling and Analysis Plan (UFP SAP). Hard copy and electronic data deliverables (EDDs) are delivered to the data management team in the agreed-upon format. Validated electronic data are checked for completeness and consistency with hard copy data reports.

5. **Project Data Loading and Storage:** Data from all phases of the data collection and analysis process are stored in a relational project repository database. Post Load reports are reviewed to verify that data was loaded correctly. Following data loading, reports

are generated and reviewed to verify that data was loaded correctly. Updates and/or corrections are made to the data as necessary. All hard copy and electronic data are catalogued and sent for archiving as appropriate. Hardcopy and electronic data are sent for archiving. All documentation generated during the projects is filed into the appropriate project notebooks.

6. **Reporting and Delivery of Results:** Data are exported to one or more exterior applications for generating geographic data maps, summary statistics, data tables, and other reports.

2.2 Historical Data Management

There have been a substantial number of previous studies and investigations conducted at Naval Bases. Managing historical data from these studies is complicated by the fact that the agencies and contractors performing these studies have used various data sampling, analysis, and management procedures. The variety of historical data sources and formats—including ecological reports, field data, and analytical data—must be addressed.

To manage historical data in a manner that addresses the variety of sources and formats, along with concerns regarding data validation, the following procedures will be implemented:

1. All source data received will be logged and saved to CH2M HILL servers. Electronic data received to support data from approved documents on original data collection forms, logs, or laboratory reporting sheets will undergo a limited check against accompanying written reports to ensure their accuracy.
2. If only hard copy files exist for desired results, these files will be used to perform manual entry of all data into electronic database files, following a "double blind" protocol for data entry. Any discrepancies found between the two versions of each entered record will be reviewed and corrected by the Data Management Coordinator (DMC).
3. When electronic data gaps occur, the DMC will make the data set as complete as possible by consulting the appropriate approved documents or completed laboratory reporting sheets, through direct communication with the appropriate environmental contractor or laboratory staff, or communication with the Program Chemist. To the greatest possible extent, data will not be entered without a reliable source.
4. After data clean up by the DMC has been completed, the data will be reviewed by a Project Chemist (PC) using all available information. If this process finds no errors, the data will be loaded into the data repository. Any assumptions or corrections made during the cleanup and review process will be noted and tracked in an Error Resolution file

2.3 Data Management Team Members

The CH2M HILL data management team will work together to properly execute the data management process. The team model presented here is based on a Project Manager

supported directly by key technology staff. The functional responsibilities of the team are described below. The responsibilities are identified by titles but not necessarily individual staff positions. The workflow among the members of the data management team is shown in Figure 1.

The Activity Manager (AM) and **the Project Manager (PM)** are responsible for preparing the work plan, schedule, milestones, and coordinating efforts with the client. The AM/PM may or may not have adequate skills to guide the data management driven aspects of their project. While the AM/PM must be willing to accept guidance from the technology leaders, they do not need to possess the technology skills as a background. The PM is also responsible for ensuring data quality and is brought into the team to perform data QA/QC at various times during the data management process.

The Environmental Information Specialist (EIS) assigned to the project team is responsible for the coordination of new or existing data generated by field activities or provided by laboratory analyses. The EIS oversees contracted analytical and data validation services, ensures that analytical data are complete and consistent, enters field data results into the **Field Data Entry Tool(FDETool)**, and assists the Database Specialist in resolving any data ambiguities. The EIS will conduct verification activities following receipt of electronic data and participate in QA/QC activities to resolve inconsistencies as necessary. The EIS acts as a liaison between the Database Specialist, the PM, and the PC.

The Database Specialist has overall responsibility for the design, operation, and maintenance of the Environmental Database. The DBC is responsible for the implementation, and evaluation of standard operating procedures to ensure integrity of the enterprise-wide database system. The Database Specialist coordinates the different activity data and enhances the database tools, and structure as required to increase performance and efficiency for the entire program. Additional duties include loading data into the Environmental database. This includes analytical results from laboratory electronic data deliverables and field data results that have been entered by the EIS into the **FDETool**. The Database Specialists work with the EIS and Program Data Management Coordinator to ensure that the data are loaded successfully and following established program standards and procedures.

The Field Team Leaders (FTLs) help prepare the work plan and implement the plan in the field. FTLs assign staff members to sampling teams; assign responsibilities to team members; prepare for and coordinate sampling activities; oversee the collection, recording, and documentation of the field data; and ensure that the chain-of-custody form is completed correctly.

The Project Chemist (PC) prepares the laboratory and data validation subcontracts, ensures that the electronic data deliverable was provided in accordance with the contract, assists the EIS in communicating with laboratories and data validators as needed, assists the EIS in interpreting analytical results, assists in designating CAS Numbers to new analytes, and maintains the regulatory criteria in the database.

The Program Data Management Coordinator (DMC) is responsible for the CH2M HILL data management process at all Navy bases. The DMC manages and tracks data management personnel schedules and deliverables for the Navy program; interacts with the

EIS on all aspects of data management activities; provides guidance and coordination to the EIS during resolution of data inconsistencies; coordinates completion of data queries for reports; coordinates database modification efforts with the DBC; is responsible for designing, developing, and implementing standard data entry and data retrieval tools; and leads the data management continuous process improvement investigation.

The IS Operations Lead monitors workload across all IS activities (GIS, Web, and Database) for resource and schedule conflicts, and works with IS resources to make recommendations for process change and improvement.

The IS Program Lead serves as the primary point of contact for the Navy regarding IS issues, coordinates resource requirements with the regional IS Staffing Lead, and provides direction and management to the DBC, DMC, and IS Operations Lead.

2.4 Database Management and Administration

Database management and administration will be coordinated and conducted by the Database Specialist. Activities will be conducted using a suite of previously developed tools and products: Field Data Entry Tool (FDETool) for field data loading; EDD and Supplemental Naval Installation Restoration Information Solution (NIRIS) Electronic Data Deliverable (SNEDD) formats for analytical data loading; formatting macros for data table creation, Archive and Load Prep Tool (ALPTool) for electronic file QC and generation, EnDat and/or NIRIS for long-term storage; and EnStat for rendering, reporting, and presentation of results. The data management team will focus their efforts on providing rapid data loading, entry, and retrieval, while promoting data integrity through various standardized procedures. Database administration, at the minimum, will consist of:

- Allocating system storage for the database
- Adding, altering, and deleting users, roles, and privileges
- Periodically defragmenting the database for more efficient operation
- Upgrading database software as necessary
- Providing routine backup of the database
- Maintaining an approved list of valid values for data consistency
- Maintaining redundancy control to ensure that each data record is unique and consistent with conventions

In addition to electronic tools, all required paper documentation, including hard copy of laboratory results, field notebooks, and COC sheets, will be matched to EDD files, logged, and filed in project paper files.

2.5 GIS Integration

To the greatest degree possible, spatial coordinate data will be captured and associated with all field sampling events. This will be done to facilitate the creation of spatial data maps of the sampling activities and results, which will be rendered using GIS software tools. Various

data management tools used in the DMS process will provide a means of storing geospatial coordinate data.

GIS integration will allow the project team to couple results information with geospatially correct images of water bodies, topography, building and transportation infrastructure, and other types of analytical maps. More detailed information on the requirements and specifications for GIS can be found in the project documentation for that activity.

2.6 Reporting and Submittals

The project repository database will be the analytical data source for all reports presented to the Navy CLEAN and JV Programs by CH2M HILL. Data for the reports will be extracted and aggregated using standard software tools.

As mentioned above, the EnStat application will be provided to project EISs. EnStat will allow users to electively query results from the project repository database. Internally developed table formatting macros will present the results in a variety of pre-formatted tabular reports.

3.0 Database Management System

The following sections identify the required project database tools and their relationships to each other. In addition, they discuss the procedures that maintain data integrity and security through standardized tasks, data verification through valid values and redundancy control, security and controlled access to the stored data, and file backup.

3.1 Project Database Requirements

The project repository database will be a relational database system that stores information in a series of data tables. Relational database systems are designed so that each piece of information is stored only once. Data tables can then be linked so that duplication of fields in multiple tables is avoided and consistent nomenclature is enforced between related sets of data. This architecture ensures relatively high data quality and information integrity, saves storage space on the data server, and speeds up data manipulation for large data files.

It is essential that the DMS provide features to enhance data management, including the following:

- Tools preloaded with drop down menus and valid values to limit data entry errors
- Built-in QA/QC routines to protect against data redundancy and errors
- Routines that electronically compare results to project-specific reference or screening criteria
- A project repository database that securely stores all historical and present project data

- Standard but flexible reporting and delivery formats from a single database source

3.2 Tools for Data Management System Requirements

This section describes the required data management tools to be utilized. The software tools described are internally developed applications that will provide a fully integrated solution for meeting the requirements listed above.

TABLE 3-1
DMS TOOLS

Tools	Description
Checklist - Data Management Process	Standardized checklist to ensure that all phases data management are completed.
Checklist - EDD Prep for Load and Archive Files	Standardized checklist to ensure that Load and Archive Files are generated correctly.
Checklist - EDD Prep for Raw and Detects Tables for Unvalidated or Validated Data	Standardized checklist to ensure that reporting tables are generated and formatted appropriately.
Checklist - EIS QC Checklist for Unvalidated and Validated EDDs and Hard Copy Data	Standardized checklist detailing QC checks to be performed on data
Form - Data Request/Needs	Form detailing data loading into the database repository
Form - EIS DM Budget Tracking	Form to track EIS budget allotted on project
Form - EIS Questions to Ask at Start of Project	Standardized list of questions that EISs should posed at project startup to ensure appropriate data management related project planning and implementation
Macro - EcoRisk Tables from EnStat Output	Macro to format EcoRisk data tables
Macro - HHRA Tables from EnStat Output	Macro to format HHRA data tables
Macro - Raw & Detects Tables from Unvalidated or Validated EDD	Macro to generate and format Unvalidated or Validated data tables
Macro - Raw, Detects, & Exceedance Tables from EnStat Output	Macro to format final Raw, Detects, and Exceedances data tables pulled from EnStat
Template - Corrections to File Letter	General template for the generation of Corrections to File Letters
Template - Data Archiving (List of Contents) Form	Template to generate Data Archiving forms to affix to laboratory and data validation reports
Template - EnDat Post Load Reports	Used to assess and QC data loaded into EnDat to ensure data load accuracy and completeness
Template - IS Costing LOE	Template to generate the level of effort and overall data management budget for projects
Template - QC Association Table	General template for the generation of QC Association tables used in data validation
Tools	Description

Tools	Description
Template - Sample Tracking Sheet	General template for the set up of project Sample Tracking Sheets
Template - Station and Sample Nomenclature	Program template outlining the Station and Sample Nomenclature rules to be used on environmental projects
Tool - ALPTool	Internally developed tool for performing an Analyte ID QC on SNEDD files, and generating EnDat Archive, EnDat Load, and NIRIS Analytical NEDD files.
Tool - EnDat	Internally developed relational database repository
Tool - EnStat	Internally developed tool for querying and reporting data from EnDat
Tool - FDETool	Internally developed tool for the input and loading of sample and field data.
Tool - NIRIS	Navy developed relational database repository
Tool - Projects Currently in DM Tracking Table	Internal tool for tracking the status of all current data management projects
Tool - EDD	Standardized internal CH2M HILL electronic deliverable format for loading data into only EnDat
Tool - SNEDD	Standardized internal CH2M HILL electronic deliverable format for loading data into EnDat and NIRIS
Tool - Valid Value Reference Tables	Reference tables detailing all valid values utilized in the DMS

3.3 Data Integrity

3.3.1 Valid Values and Referential Integrity

Applications and tools throughout the DMS will use the same reference tables when applying reference attributes to project data. Such reference data include the names of site objects and sampling locations, sampling matrix and method categories, detection limits, analyte names, etc. The use of these reference tables is critical for maintaining the completeness and accuracy of data sets and how they are grouped and categorized.

All data must be loaded and stored in such a manner that relationships between categories of data are enforced. For instance, all sampling records must be associated with a valid site object such as a planned sediment sampling location. The project repository database and all collection, analysis, and reporting tools used in the DMS are designed to enforce, for any project data record entered, entries in fields that refer to other types of data as required by the overall data model.

Note that the DMS has numerous features that reduce or eliminate manual data entry and manipulation. Automation generally promotes the integrity of data by eliminating the need for manual keystrokes and, hence, key stroke errors. These features include look-up lists on data entry forms to ensure the values of key reference information, and standardized QA/QC routines on lab and validated data.

3.3.2 Electronic Data Deliverable Requirements

Tables 3-2 and 3-3 provide the format standards for laboratory electronic data. The SNEDD format depicted in Table 3-2 is intended for use by all laboratories supplying electronic data deliverables for newly acquired Contract Task Orders (CTOs). The format depicted in Table 3-3 is an auxiliary file intended for use on previous CTOs that were established before the SNEDD process was implemented.

Laboratories and Data Validators will be provided with comprehensive Reference and Lookup tables detailing the most current valid values to be entered into all EDDs submitted to CH2M HILL . Laboratories and Validators may submit requests for the addition of new valid values if values had not been previously established.

3.4 Security and Access

The EnDat project repository database implements controlled access to data through password-protected user accounts. These accounts, with Read, Write, and Modify access, are maintained by the Database Specialist. EISs can access the project repository database, with Read Only access, using established querying tools.

The NIRIS database is hosted and maintained by NITC. Access is strictly controlled and granted on a case by case basis. An ORC ECA Digital Certificate must be obtained before requesting access. Once access is granted, the database can only be accessed through querying tools, unless the user is a Regional Data Manager.

3.5 File Backup

All internal CH2M HILL electronic files (including data management project files) that reside on servers are automatically backed up nightly. An export file is created for the EnDat database nightly and that file is also automatically backed up. This allows for the ability to recover all data and the database structure in event of media failure.

TABLE 3-2
SNEDD Format

CH2M HILL SNEDD Format			
Field Name	**Field Format**	**REQ**	**Field Description**
Contract_ID	A13	R	Contract ID assigned by Division Contracting Office: format is UIC (6 char.) + FY (2 char.) + FAR code (1 char.) + Number (4 char.). (e.g. D459559365800)
DO_CTO_Number	A4	R	CTO or TO # assigned by Navy. (e.g. CTO-12 = 0012)
Phase	A8	RA	Task Phase, SubTask Number or Annual Quarter. (e.g. QTR1)
Installation_ID	A20**	R	Unique identifier for installation. (e.g. WHIDBEY)
Sample_Name	A50	R	CH2M HILL Sample ID (from Chain Of Custody).
CH2M_Code	A4*	R	CH2M HILL Preparation Method Code (e.g. NONS)
Analysis_Group	A9*	R	The CH2M HILL code for the analysis performed on the sample.
Analytical_Method	A20**	R	Analytical Method used to analyze sample fraction. (e.g. 6010)
PRC_Code	A15**	R	NIRIS code for the analytical method category (e.g. LEACH)
Lab_Code	A10**	R	CH2M HILL Code assigned to the laboratory (e.g. SHEA)
Lab_Name	A50**	R	The name of the laboratory that conducted the analysis.
Leachate_Method	A16**	RA	Code for the leachate method used on sample. (e.g. SW1310)
Sample_Basis	A16*	RA	Sample basis of analysis; wet weight, dry weight etc. (e.g. DRY)
Extraction_Method	A16**	RA	Code for the extraction method used on sample. (e.g. FLTRES)
Result_Type	A16*	RA	Type of results; dilution, reanalysis etc. (e.g. 000)
Lab_QC_Type	A15*	RA	Code for Laboratory Sample (MS, MSD, LBLK, LCS)
Sample_Medium	A16*	R	Sample medium reported by the laboratory. (e.g. L)
QC_Level	A16*	R	QC Level of data package : EPA levels I to IV. (e.g. 3)
DateTime_Collected	MM/DD/YYYY 00:00	R	Date and time sample was collected. Use 24 hour clock. (e.g. 02/13/07 15:34)
Date_Received	MM/DD/YYYY	R	The date the sample was received in the lab. (e.g. 03/24/07)
Leachate_Date	YYYYMMDD	RA	Date the sample was leached. (e.g. March 12, 2007 = 20070312)
Leachate_Time	HH:MM:SS	RA	Time the sample was leached. Use 24 hour clock. (e.g. 14:30:05)
Extraction_Date	YYYYMMDD	RA	Date that the lab extracted the sample.
Extraction_Time	HH:MM:SS	RA	Time of day that the lab extracted the sample. Use 24 hour clock.
Analysis_Date	YYYYMMDD	R	Date that the lab performed the analysis.
Analysis_Time	HH:MM:SS	R	Time of day that the lab extracted the sample. Use 24 hour clock.
Lab_Sample_ID	A20	R	Unique ID assigned to the sample by the laboratory.
Dilution	N10,2	R	Dilution factor used. (e.g. 10)
Run_Number	N4	RA	Number distinguishing multiple or repeat analyses by the same method, on the same day. Must be equal to or greater than 1.
Percent_Moisture	N6,3	RA	Percent moisture of the sample. (e.g. 20)
Percent_Lipid	N6,3	RA	Percent lipid of the sample.
Chem_Name	A45*	R	The compound being analyzed.
Analyte_ID	A20*	R	Analyte ID (CAS Number) assigned to the analyte. (e.g. 7440-47-3)
Analyte_Value	N18,7	R	Leave Blank for Validator to enter the final analyte concentration.
Original_Analyte_Value	N18,7	R	Analyte concentration value originally generated by the Laboratory.
Result_Units	A16*	R	Unit of measure for the analyte value. (e.g. UG_L)
Lab_Qualifier	A16*	RA	Lab data qualifier. Values will not be rejected if not in domain table.
Validator_Qualifier	A16*	RA	Leave blank for Validator. Values will not be rejected if not in domain table.
GC_Column_Type	A16*	RA	Data code for the type of GC column used in an analysis.
Analysis_Result_Type	A3*	R	Type of analysis performed (allowed: TIC or TRG).
Result_Narrative	A120	RA	Additional information or comments associated with the result.
QC_Control_Limit_Code	A16*	RA	Type of quality control limit. Req'd if QC criteria included. (eg. CLPA)
QC_Accuracy_Upper	N6,3	RA	Accuracy Upper Limit. Upper QC limit of % recovery as measured for a known target analyte spiked into a QC sample. (e.g. 25.45)
QC_Accuracy_Lower	N6,3	RA	Accuracy Lower Limit. Lower QC limit of % recovery as measured for a known target analyte spiked into a QC sample. (e.g. 10.15)
Control_Limit_Date	YYYYMMDD	RA	Date a control limit is established.
QC_Narrative	A120	RA	Leave blank for Validator. Enter EnDat EDD's DV_Qual_Code.
MDL	N18,7	RA	Method Detection Limit
Detection_Limit	N18,7	RA	Reported Detection Limit
SDG	A50	R	Lab code for a group of samples in a data deliverable package.
Analysis_Batch	A20	R	Laboratory code for a batch of analyses analyzed together.
Validator_Name	A50**	R	Leave Blank. Name of Validator. (e.g. CONTRACTOR INC.)
Val_Date	YYYYMMDD	RA	Populated by Validator/Reviewer. Validation/Review QC date.

TABLE 3-3
Auxiliary EDD Format

CH2M HILL EDD Format			
Field Name	**Field Format**	**Req'd**	**Description**
Sample_ID	A25	R	CH2M HILL sample ID (taken from the chain of custody).
Analysis_Group *	A9	R	The CH2M HILL code for the analysis performed on the sample.
DateTime_Collected	00/00/0000 00:00:00	R	The date the sample was collected (from the chain of custody). Use 24-hour clock
Date_Received	00/00/0000	R	The date the sample was received in the lab.
Date_Extracted	00/00/0000	RA	Extraction or preparation date.
Date_Analyzed	00/00/0000	R	The date the sample was analyzed.
Lab_Sample_ID	A15	R	The laboratory sample ID.
Dilution_Factor	N5	R	The dilution factor used. Use 1 if not diluted.
SDG_Number	A15	R	Laboratory code for the group of samples in a data deliverable package.
Chem_Code	A12	R	The ERPIMS parameter code.
Chem_Name *	A45	R	The compound being analyzed.
CAS_Number *	A6-A2-A1	R	CAS Number (Note dashes).
Ana_Value	N11	R	The analytical result. It should match the number of significant digits on the hard copy. Use detection limit when not detected.
Lab_Qual *	A5	RA	The lab qualifiers, if any (e.g., U, UJ, B); there may be a qualifier not on the valid value table in special cases.
DV_Qual	A5		Left blank for data validation qualifiers.
DV_Qual_Code*	A5		Left blank for data validation qualifier codes. Use valid values.
Units *	A15	R	The unit of the result (e.g., mg/L).
Detect_Limit	N5	R	The minimum available sample-specific detection limit for the compound, the laboratory reporting limit.
MDL	N10,3	R	Method detection limit.
Preparation	A15	R	ERPIMS code used for the preparation method of the sample fraction.
Analysis_Method	A15	R	Analytical method used to analyze the sample fraction. Use ERPIMS codes.
Result_Type *	A15	RA	The laboratory QC type for single compounds (e.g., SURR, IS) All surrogates and internal standard results are to be reported in % recovery units.
Lab_QC_Type *	A15	RA	Laboratory samples (lab blanks, dups., LCS, etc.).
PCT_Moisture	N3,3	RA	Percent moisture for soil samples; not applicable for aqueous samples.
Basis	A3	RA	Concentrations are reported on a wet or dry weight basis. Use ERPIMS codes.
Batch	A12	R	Laboratory code for the batch of samples analyzed together.
Lab_Code	A10	R	The ERPIMS code for the name of the laboratory.
ReRun*	A9	RA	To report dilutions, re-extractions, and/or re-analyses.
QC_Limits	AAA-AAA	RA	Laboratory QC limits in percent recovery for surrogates, internal standards, laboratory control spikes, calibration checks, interference check standards, serial dilutions, and MS/MSDs.
Comment	A 30	RA	For the laboratory to note exceptions.

Notes:
* - See valid value list
TICs are not reported on the EDD
R - Required field
NR - Not Required
RA - Required as Appropriate
EDD to be submitted in Excel

4.0 Phases of Data Management

As outlined in Section 2.1, the movement of data from the planning stage to the repository database follows six phases, as detailed in Figure 4-1. The following sections describe for each phase how data are managed and the responsibilities of team members.

4.1 Project Planning and Setup

An initial Kick-off meeting will be held to review project instructions, subcontractor information, sample logistics, nomenclature, and project level of effort and budgets. Activities will be supported by EIS Questions to Ask at Start of Project Form, Projects Currently in DM Tracking Table, IS Costing LOE Template, STS and the Station and Sample Nomenclature Template.

The EIS will be responsible for coordinating with the laboratory to discuss the sampling schedule, required turn around times, bottle orders, sample labels, etc. If requested, order bottle ware and create sample labels. If requested, once the bottles have arrived, the order will be reviewed to ensure the proper amount and type of equipment has arrived.

4.2 Sample Collection and Tracking

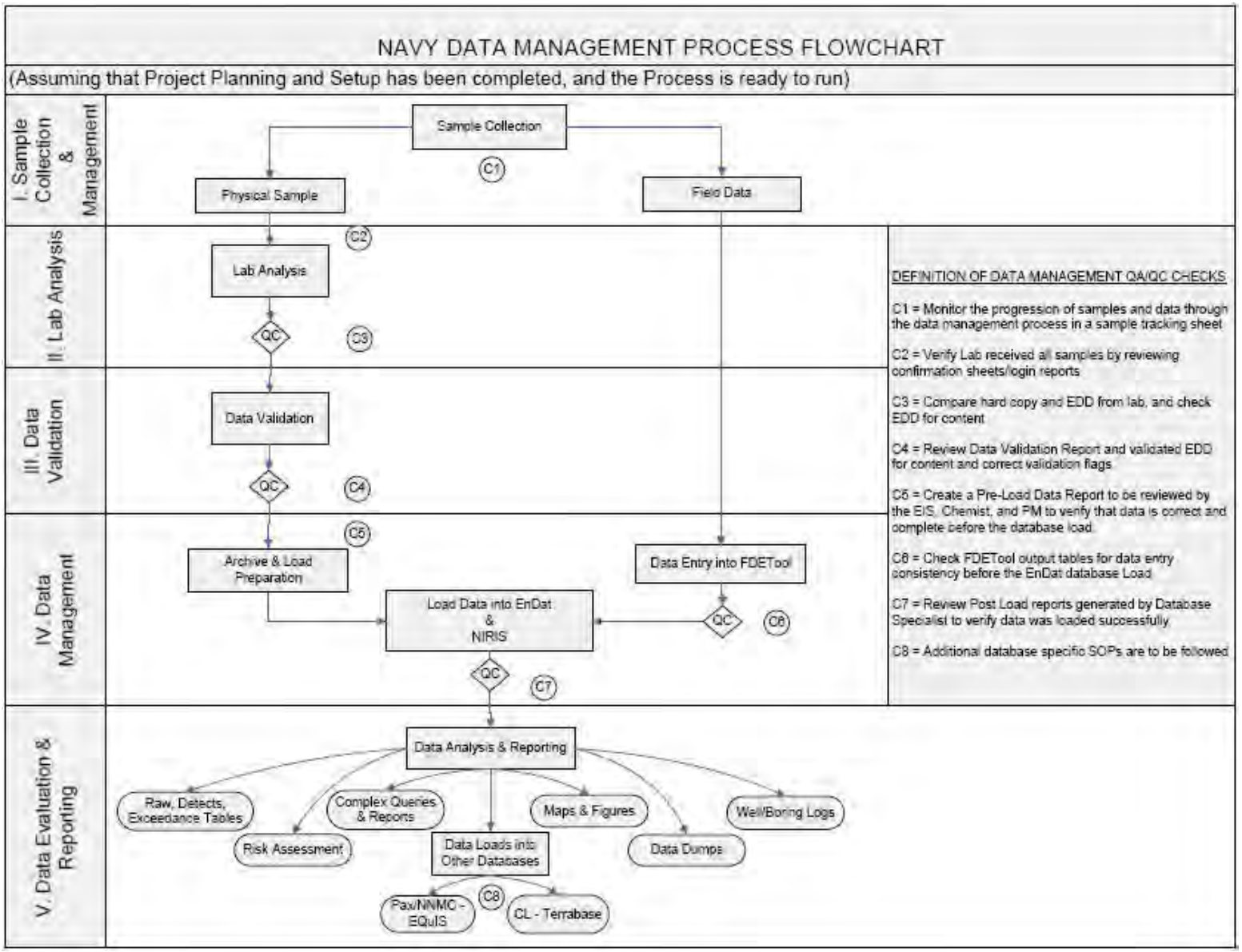
Sample control during the sampling phase is required to ensure the integrity of the associated analyte. Sample control must be maintained and documented from the point of collection through the point of disposal. Sample control will be managed both in the field and in the laboratory, and will be documented through the use of field log books and a Chain of Custody (COC). When custody of a sample is transferred from one party to another, the recipient of the sample assumes responsibility for maintaining control of the sample and documenting that control on the COC.

4.2.1 Sample Collection

A photocopy of each field logbook page completed during sampling, and of each COC, will be made by the FTL and forwarded to the DM at predefined intervals during sampling events. This information will serve as notification to the EIS of samples being shipped to an offsite lab and of the field crew's sampling progress.

Communication with field and laboratory staff will occur daily during the field event. The EIS will resolve issues that arise in the field (bottle ware shortage, equipment failure, etc). The lab will be informed of the shipment dates and the number of coolers or samples being sent. Laboratory login reports will be reviewed to ensure samples were received in good condition (no breakage, within holding time, within designated temperature). The field crew and PM will be notified if there were problems with shipment.

FIGURE 4-1 NAVY DATA MANAGEMENT PROCESS FLOWCHART



4.2.2 Field Data Collection

The FDETool can be completed at any time during the sampling event timeline, and will be turned in with the data load. After the lab has received the samples and submitted login reports, data will be entered into the FDETool using the STS, field log books and COCs. Once all field data has been entered, FDETool output reports will be generated and QC'd

In projects utilizing the SNEDD format deliverable, the NIRIS field-related NEDDs should be generated by the FDETool. These files will be reserved for use after the data has been loaded into EnDat and is ready for archiving.

4.2.3 Sample and Document Tracking

A STS will be generated and updated as samples are collected using Project Instruction Tables, Chains of Custody (COC), and Lab Login Reports. The Sample Tracking Sheet should be updated and kept current throughout the data management process. A 100% QC will be performed on COCs received from the field crew. The field crew and/or lab will be notified if corrections need to be made the COCs or lab login reports. Any corrections or modifications made will be noted in a Corrections-To-File Letter. All samples collected will be tracked throughout the data management process

All documentation acquired during the data management process, including Statements of Work (SOWs), Bids, COCs, Field Notes, Sample Tracking Sheets, Login Reports, Corrections-to-File Letters, FDETool QC tables, Post Load Reports, Invoices, and Communication Logs shall be compiled throughout the process to be stored in the appropriate Activity's Project Notebook.

4.3 Laboratory Analysis and Reporting

4.3.1 Sample Analysis

Upon receipt of samples from the field, the laboratory will check that the COC forms correctly cover all samples submitted. Each COC form must be signed with the date and time of receipt by the laboratory. Samples will be logged into the Laboratory Information Management System (LIMS) using information from the COC forms and the project instructions.
Samples will be analyzed as specified on the accompanying COC forms and in the Laboratory SOW. Generally, questions or noted inconsistencies identified by the laboratory should be addressed directly to the PC or EIS.

4.3.2 Laboratory Reporting

The laboratory will attach the signed COCs to their hard copy data deliverables to officially relinquish control of the data back to the Environmental Contractor within the specified turn around time.

4.3.3 Laboratory Data QC

Hard copy data and EDDs will be reviewed to ensure that they are complete and acceptable as outlined in the EIS QC Checklist for Unvalidated and Validated EDDs and Hard Copy Data Form. A 10% QC check will be performed on the analysis results to ensure that the hard copy data matches the EDD. All detected errors should be resolved with the laboratory.

Preliminary raw and detects will be generated by running the EDD through the Raw & Detects Tables from Unvalidated or Validated EDD Macro to assist the PM with a preliminary data analysis. A separate table must be created for each matrix.

Data archiving forms will be generated and affixed to each laboratory report received, for cataloguing, tracking, and archiving purposes.

4.4 Data Validation and Reporting

The data validator will be notified in advance of when to expect data, and of any samples or analyses that should not be validated. (i.e. grain size should not be validated). The hard copy data, **EDDs**, and a **QC Association Table** will be mailed or emailed to the data validator. The EIS will coordinate the return of the data package to CH2M HILL for archiving with the data validator.

4.4.1 Data Validation

Upon receipt of data from CH2M HILL, data validation will be performed in accordance with the Data Validation SOW, UFP SAP, and any other documents required. Generally, questions or noted inconsistencies identified by the validator should be addressed directly to laboratory, with the EIS notified of issues and resolutions identified.

4.4.2 Validated Data Reporting

The Data Validator will provide a hardcopy and electronic version of the Data Validation Report, as well as a validated version of the EDD to the data management team in the agreed-upon format within the required turn around time.

4.4.3 Validated Data QC

The validated data will be reviewed to ensure that they are complete and acceptable as outlined in the EIS QC Checklist for Unvalidated and Validated EDDs and Hard Copy Data Form. A 100% QC check will be performed on the validated results to ensure that the hard copy data matches the EDD. All detected errors should be resolved with the data validator.
.

Validated raw and detects tables will be generated by running the EDD through the Raw & Detects Tables from Unvalidated or Validated EDD Macro to assist the PM with a validated data analysis. A separate table must be created for each matrix.

Data archiving forms will be generated and affixed to each Data Validation Report received, for cataloguing, tracking, and archiving purposes.

4.4.4 Chemist PreLoad Check

All data must be submitted to the PC for a Chemist PreLoad check prior to data loading. All EDDs will be compiled into a single excel Archive file. If data were not validated, the hardcopy data, Archive or PreLoad EDDs, QC association table, and Unvalidated Raw and Detects tables will be provided to the PC for a PreLoad Check that will ensure the hard copy data and EDDs are complete and acceptable. If data were validated, the hardcopy data validation report, validated EDDs, QC association table and Validated Raw and Detects tables will be provided to the PC for a PreLoad Check that will ensure the hard copy data and EDDs are complete and acceptable.

4.5 Project Data Loading and Storage

All fully evaluated data will be stored in the project repository database(s). This includes other field data acquired with the tools described in the previous sections.

4.5.1 Data Loading

EDDs will be formatted into Load and Archive files with or without the use of the ALPTool, as specified on the EDD Prep for Load and Archive Files Checklist. The Load EDD and FDETool will then be provided to the Database Specialist, who will load the data into the project repository database(s).

4.5.2 Quality Assurance/Quality Control (QA/QC)

Following data loading, the Database Specialist will generate Post Load reports and provide them to the EIS for review and QC. The EIS will review these reports to verify that all data was loaded into the project repository database(s)correctly. Updates or corrections to loaded data will be coordinated with the Database Specialist as necessary. Any changes made to the data by the Database Specialist prior to load, or that will be completed after the load should be tracked, and incorporated into the hard copy and EDD files that are to be archived after project completion.

4.5.3 Invoice Review

Laboratory invoices should be submitted once the laboratory has completed requested analyses, and submitted all results and requested corrections. Data validation invoices should be submitted shortly after the validation has been completed, and the report submitted to CH2M HILL. Invoices will be submitted to the PM through AP Workflow for approval. After all data has been loaded into the data repository and corrections made, the PM should submit all laboratory and data validator invoices to the EIS for review and approval. The EIS will compare costs billed to CH2M HILL to the STS, project instructions, and EDD to ensure that the company is billed correctly for the sample, analysis, and cost totals.

4.5.4 Storage of Deliverables and Documentation

After all corrections identified through the data management process have been completed (if any), the final report written, and the project determined complete, the PM can grant approval to archive the EDD and hard copy data.

Electronic files should be provided to the DMC for archiving on the project servers. The hardcopy reports for any data that was not validated should be sent to the Data Archiving Specialist. For validated data, efforts will be coordinated with the Data Validator to ensure that both the hardcopy Data Validation Report and Laboratory Report are sent to the Data Archiving Specialist. The data will be prepped for archiving and filed within the building until the Data Archiving Specialist has received authorization to send the data to storage.

All project-related documentation generated, such as the STS, Corrections to File Letters, Login Reports, COCs, etc, should be filed into the appropriate project binder for future reference.

4.6 Reporting and Delivery of Results

EnStat will be the primary tool for project staff to access project data. EnStat provides options for querying different types of data and reports, including: raw tables, detects tables, Exceedance tables, regulatory criteria, etc. Adhoc queries or special requests will need to be coordinated with the Database Specialist.

Data requests should be coordinated with the project EIS. The PM will specify the data needs, requirements and formatting (i.e. headers, footers, or other special needs) to be applied to their requests. Raw, detects, and exceedance tables must be queried with EnStat and formatted separately with the Raw, Detects, & Exceedance Tables from EnStat Output Macro for EACH matrix (solid/aqueous). Other macro templates that can be utilized to assist with the formatting of EnStat output files include the HHRA Tables from EnStat Output Macro and EcoRisk Tables from EnStat Output Macro.

This page intentionally left blank

Attachment E
Final Response to Comments

This page intentionally left blank

Final Responses to
EPA comments on the *Draft Site Inspection/Expanded Site Inspection Sampling and Analysis Plan*, Former Vieques Naval Training Range (VNTR),
Vieques, Puerto Rico, dated July 2008

GENERAL COMMENTS

1. It is not always clear from the SAP text what types of samples are to be collected (i.e., grab samples or composite samples). For example, Worksheet 14 indicates that composite samples will be collected at Area of Concern (AOC) A. However, Worksheet 10 does not discuss composite sampling at AOC A. To avoid potential confusion, it is suggested that the type of samples (e.g., grab samples or composite samples) to be collected at each area be discussed consistently in the SAP text.

Navy response: All samples will be grab samples except for composite soil samples within the waste at SWMU 1 and composite soil samples of the backfill material at AOC A, as described in Worksheet #14. There are two types of samples collected at AOC A. The confirmatory soil samples collected following soil excavation are grab and it is these samples that will be used to answer the environmental questions stated in Worksheet #10. The composite sampling done at AOC A is simply to ensure the backfill material that will be used to backfill the excavation is acceptable to refill the excavation once the additional soil removal is completed. These samples are not being used to make site determinations (i.e., whether sufficient excavation has occurred), which is why they are not included in Worksheet #10.

For clarity, a footnote has been added to the bottom of Worksheet #18 stating that all samples are grab samples unless cited as composite in the "Depth" column of the table.

2. SAP Worksheet 15 lists "NC" (no applicable criterion) for several compounds. In some cases, NC is listed for all of the screening levels (SLs) for a particular compound (e.g., bromochloromethane on page 161 of the SAP). It is unclear how compounds will be assessed when a SL is not specified. Revise the SAP to clarify how compounds without any specified SLs will be evaluated.

Navy Response: Some compounds do not have an applicable criterion, so "NC" is provided as the PAL on Worksheet 15. This occurs when a full list of compounds is analyzed (such as TCL VOCs). For constituents without PALs, the data will be used for presence/absence determination at the quantitation limit achievable by the laboratory. Detections of constituents that fall into this category will be discussed qualitatively in the report. The "NC" footnote in Worksheet #15 has been revised to read:

"NC: No applicable criterion. Constituents detected for which there are no screening criteria available (i.e., no human health, no ecological, and no leaching) will be discussed qualitatively in the report."

3. In Worksheet 24, the minimum relative response factor (RRF) for many organic compounds is 0.010. However, standard validation procedures call for rejecting data with RRFs less than 0.050. Clarify why lower RRFs are being accepted by the laboratory and if the 0.050 criterion will be used in validation.

Navy Response: Worksheets #24a-d are no longer applicable since SOM01.2 is not being performed. Worksheet #24 does not refer to them and Worksheets #24a-d have been removed.

4. Worksheet 28 lists quality control (QC) samples for the various toxicity characteristic leaching procedure (TCLP) analyses. However, SAP Worksheet 12 lists "N/A" for the QC samples associated with the different TCLP analyses. Revise Worksheet 12 to present information consistent with Worksheet 28.

Navy Response: Worksheet #12 describes field QC samples and Worksheet #28 describes lab QC samples. Since Investigation Derived Waste (IDW) samples will not include field QC samples, the Worksheet #12s for them are "N/A." However, IDW samples are still subject to laboratory QC for the applicable analytical methods. Worksheet #28s describe the laboratory QC samples that will be analyzed. Therefore, no revisions are warranted.

5. Several compounds in Worksheet 28 have a percent recovery (%R) lower limit of 10% or less. For example, Worksheet 28-10A on page 323 has a lower %R limit of "0" for the semivolatile organic compound (SVOC) phenol. It is unclear why QC limits as low as 10% are considered acceptable, especially for compounds that are not normally poor performers [e.g., benzo(g,h,i)perylene]. Revise the SAP to justify why %R values of 10% or less should be considered acceptable for each compound. Alternatively, revise the SAP to require tighter QC limits.

Navy Response: There are several instances where the statistically-generated acceptance limits have been reworked by the laboratory and the new acceptance limits have been incorporated into the draft final version of the UFP-SAP. For example, vinyl chloride's old limits were 16-149% and the new limits are 80-142%. For benzo(g,h,i)perylene, the new soil limits are 43-121% and the new water limits are 48-126%. For phenol, Section D.5 of the DoD QSM lists phenol as a poor performer and has recovery limits for this compound of 0-115%. Nevertheless, the laboratory will increase to a lower QC limit of 10%. For SVOC SIM compounds, the laboratory will default to a lower QC limit of 30% if a lower limit cannot be statistically-generated greater than 30%. In addition, the laboratory has submitted its master QC limits worksheet to show the most-current QC limits for all analytes. For informational purposes, this worksheet has been provided along with these responses to comments.

6. While the SAP contains all of the Uniform Federal Policy QAPP (UFP QAPP) worksheets, it does not appear that all of the information required by the UFP QAPP is presented. The following are examples of the information that is not included in the SAP:

   The SAP does not appear to discuss the field, laboratory, and project percent completeness goals.

Navy Response: The following statement has been included in Worksheet #11: "Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. The objective of the overall completeness goal for this project is set at 95% valid data. This goal is inclusive of both field and laboratory analytical data." Worksheet #37 also refers the reader to this statement, since it is during the data quality review that the actual project completeness will be determined.

   It does not appear that a discussion of precision, accuracy, representativeness, comparability, and completeness is provided.

Navy Response: These data quality indicators are addressed in Worksheets #12 and #28. In addition, these data quality indicators are assessed during the data quality review process. Therefore, the following statement has been added to Worksheet #37:

"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."

The SAP does not present an itemized list of what will be presented in the analytical data packages (e.g., second column confirmations, chromatograms before and after each manual integration, etc.).

Navy Response: The laboratory has provided a detailed list of what will be in the data packages (i.e., their definition of a Level IV package). Worksheet #29a (included with the preliminary responses) has been added to provide this information.

Revise the SAP to provide all information required by the UFP QAPP or reference where this information can be found.

Navy Response: Other than the information cited above, please provide specificity regarding missing information so that it can be added.

SPECIFIC COMMENTS

1. Table ES-1: The sample analysis list for SWMU 1 – Camp Garcia Landfill includes analysis for VOCs, SVOCs, pesticides, PCBs, inorganics and explosives. The pertinent historical information provided indicates that soil and groundwater data collected in 2004 were not spatially adequate to sufficiently characterize potential source areas. The sample analysis list for PAOC X and Regional Groundwater includes only VOCs, SVOCs and inorganics though the rationale given for the additional sampling in the pertinent historical information section is similar to that provided for SWMU 1. Therefore, the BTAG recommends that pesticides and explosives, including perchlorate, be added to the sample analysis list for PAOC X and Regional Groundwater due to this uncertainty and to be consistent with what was decided for SWMU 1.

Navy Response: PAOC X is not similar to SWMU 1. SWMU 1 was the Camp Garcia landfill. The types of material buried at the site are somewhat unknown because test pitting has not yet confirmed the historical information gathered for the site. Therefore, it is reasonable to evaluate a conservative analytical suite including pesticides, PCBs, inorganics and explosives. PAOC X is a very small area, the debris is construction-related and an automobile on the ground surface (i.e., able to be visually identified), and the site has already had samples collected at the location of the debris. Therefore, a more focused analytical suite at PAOC X is appropriate.

2. Acronyms and Abbreviations: Please include RL and RSL.

Navy Response: RL (Reporting Limit) and RSL (Regional Screening Level) have been included in the acronyms and abbreviations table.

3. SAP Worksheet #3 – Distribution List, Page 25: Modify the Title /Project Role for Carl Soderberg to read "Caribbean Environmental Protection Division Director." Also, please replace the q for a g in Rodríguez in Worksheet #3 and #4.

Navy Response: Comment incorporated.

4. SAP Worksheet #10a – SWMU 1 (Camp Garcia Landfill) Problem Definition, Page 59: The document notes ephemeral stream samples (soil or surface water/sediment) will be collected, one upgradient and three adjacent to the landfill. The actual locations of the samples are to be based on consensus made during a site visit by the ERP Technical Subcommittee. Sample locations should be biased towards depositional areas, seeps, areas near known source areas, and areas near site surface water drainage. Further, the upstream sample should be relocated away from the roadway. The proposed additional investigation will also serve to determine the presence of an ephemeral stream on the southwest side of SWMU 1. In the event that such a stream is identified, sediment and surface water or surface and subsurface samples (depending upon the presence of water) should be collected from this stream as well.

Navy Response: The information stated above is already contained in the SAP on Page 59, Problem Definition #5. The following text has been added after the parenthetical list at the end of the second sentence on page 59, SWMU 1 Problem Definition #5:

". . . , as well as from seeps, areas near known source areas and areas near site surface water drainage."

5. SAP Worksheet #10b – SWMU 2 (Fuels Offloading Site) Problem Definition, Page 62: Soil borings are to be advanced if the former fuel transfer pipeline can be "visually identified in the field by the ERP Technical Subcommittee". It is unclear if other methods of identifying the pipeline have been considered. For instance, geophysical surveys and metal detectors are to be used at other sites. Ensure that all appropriate methods are considered to locate the former fuel transfer pipeline.

Navy Response: There are two fuels offloading site schematic drawings in historical records, including one referring to demolition of the fuel facilities, that show the location of the pipeline (the figures are located in Appendix R of the Final PA/SI Report [CH2M HILL, 2008] and are included with the preliminary responses). However, the schematics do not indicate whether the fuel pipeline was removed or abandoned in place. Therefore, geophysical techniques using instrumentation available for the SWMU 1 and PAOC N/S geophysical survey will be used to try to locate the buried pipeline. Figure 5 has been revised to show where the geophysical transects will be performed. If the pipeline is located, surface and subsurface soil samples will be taken along the actual pipeline transect at the approximate spacings shown on Figure 5. If the pipeline or its former location cannot be located, the two samples will be collected at the locations shown in Figure 5. Worksheet #10b has been updated with this new approach as follows:

- **Under "Background and Potential Release History," the fourth sentence has been updated as follows: "In addition, a buried fuel transfer pipeline was located . . . " and the seventh sentence revised as follows: "The remaining ASTs and fuel transfer pipeline were reportedly demolished between 1978 and 1979, but it is not known whether the fuel pipeline was removed or abandoned in place."**

- **Under "Environmental Questions to be Answered by the Expanded SI" a fifth question has been added (as Question 1; remaining questions renumbered accordingly) which states: "1) Was the buried pipeline from the fuel offloading area to the ASTs removed or abandoned in place?**

  If the buried pipeline is found using geophysical techniques, then two surface/subsurface soil samples will be collected along the actual pipelines transect at the approximate locations shown in Figure 5. If the geophysical techniques do not find the pipeline, then the two surface/subsurface soil samples will be collected at the locations shown in Figure 5."

In addition to the above, Worksheet #11 has been updated as follows:

- **Under question 4, page 110, the first sentence under "Geophysical Data" has been edited to read: "Geophysics will be performed at SWMU 1, SWMU 2, and between PAOCs N and S . . . " and the second sentence has been edited to read: ". . . and whether an underground fuel pipeline exists at SWMU 2 and between PAOCs N and S."**

In addition to the above, Worksheet #14 has been updated as follows:

- **Under SWMU 2, page 156, a new heading has been added after "Reconnaissance:" which reads:**

  "Geophysical Survey: A magnetic and electromagnetic geophysical survey will be conducted at SWMU 2 in an attempt to determine whether the former buried fuel transfer pipeline exists or has been removed."

6. SAP Worksheet #10b – SWMU 2 (Fuels Offloading Site) Problem Definition, Page 62: This section indicates that additional borings will be advanced if evidence of a release is observed. However, the number of additional borings is not discussed. Revise this section to indicate how the number of additional borings will be determined.

Navy Response: There is no strict protocol for determining the number of additional borings because there are numerous variables associated the visual and PID observations within the borings (e.g., number and magnitude of PID readings, depth(s) of readings, etc.), especially considering that PID readings and visual observations are highly qualitative. Whether additional borings are warranted and, if so, how many will be based on professional judgment in the field with the ultimate objective being "to sufficiently delineate the extent of the source area," as stated in Worksheet #10b. Whether the resulting dataset adequately characterized the source area will be subject to regulatory review and judgment via the SI/Expanded SI Report.

7. SAP Worksheet #10d – SWMU 10 (Sewage Treatment Lagoons) Problem Definition, Page 66: This section indicates that data from the two proposed thallium samples will be substituted for the historical data set. However, differences in thallium concentrations could be attributed to soil heterogeneity as well as the analytical questions discussed in the SAP. Therefore, it is suggested that either additional samples be analyzed for thallium or that both sets of data be used. Alternatively, the SAP should be revised to indicate what steps are being taken to reduce potential soil heterogeneity concerns.

   Also, it was noted that thallium concentrations in soil (surface and subsurface) are elevated. Please add discussion of the possible sources for thallium; is it related to explosives?

Navy Response: There are no suspected sources of thallium at SWMU 10; the thallium results are suspected of being falsely elevated, which the new data will help to confirm. In the PA/SI Report (CH2M HILL, June 2008), Introduction, it is stated: "The uncertainty associated with the thallium data is due to probability of the thallium results being falsely elevated because of the analytical method used." In addition, in Section 9.3 Step 5, it is stated "However, the thallium analytical method utilized for these samples was prone to falsely elevated results." This falsely elevated thallium tendency has specifically been noted by EPA and is the reason the proposed samples at SWMU 10 are to be analyzed only for thallium using the new analytical method. In fact, for east Vieques sites where samples were collected for thallium analyses using the old method and the new method, the new method showed lower thallium concentrations (see PA/SI Report). The fact that 16 new samples will be collected will address thallium variability in the soil. The 16 new soil samples to be collected for thallium will provide further evidence of whether the old thallium results are falsely high or not.

8. SAP Worksheet #10f – AOC G (Pump Station and Chlorination Building at Sewage Treatment Lagoons) Problem Definition, Page 70: This section describes a fuel release. However, no information is provided in the Background and Potential Release History or Synopsis of Secondary Data sections about the potential source of the fuel release or the data collection effort that identified this release. Revise SAP Worksheet #10f to provide a more complete description of the fuel release.

   In addition, no sampling is proposed for Total Petroleum Hydrocarbon-Diesel Range Organics (TPH-DRO) even though it was elevated during previous sampling. Provide additional information to justify the proposed analyses.

Navy Response: Because the Worksheet #10 for a particular site was often used as a template for another site (and edited accordingly), the first paragraph of Worksheet #10f was an inadvertent carry-over from another site. There was no fuel release, elevated TPH-DRO, or soil removal at AOC G. The correct information is included in the second paragraph where pump maintenance fluids are discussed. The first paragraph has been deleted and replaced with the intended paragraph below:

"Although there are no records of past releases adjacent to the building at the AOC G pump station, the potential presence of CERCLA-related hazardous substances cannot be confidently ruled out without sample collection due to the nature of the historical activities at the site. Therefore, an Expanded SI is warranted to determine if a CERCLA-related release(s) occurred outside the doorway of the pump station and, if so, whether it warrants further action."

9. SAP Worksheet #10g – PI 4 (Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage) Problem Definition, Page 71: PI 4 is composed of several sub-areas. The Synopsis of Secondary Data provides a general discussion of releases, but does not indicate which analyte groups were found in which sub-area. Revise the SAP to provide discussion of the potential releases or other data for each sub-area.

Navy Response: Worksheet #10g, "Synopsis of Secondary Data," second paragraph, sentences 2 through 5 have been replaced with the following text:

"Within the bermed area used for fuel bladder storage, the data show that one SVOC and several inorganics were detected in surface soil, inorganics were detected in subsurface soil, and inorganics were detected in groundwater. Within the former helicopter maintenance area, two VOCs, pesticides and inorganics were detected in surface soil; pesticides and inorganics were detected in subsurface soil; and one VOC and inorganics were detected in groundwater. Within one of the disturbed areas (1962 aerial), pesticides and inorganics were detected in surface soil, pesticides and inorganics were detected in subsurface soil, and two VOCs and inorganics were detected in groundwater. Within the former trenched area, and the other disturbed area (1964 aerial), one SVOC, pesticides, one PCB, and inorganics were detected in surface soil; pesticides and inorganics were detected in subsurface soil; and VOCs and inorganics were detected in groundwater."

10. SAP Worksheet #10h – PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) Problem Definition, Page 74: The number of confirmation samples is not specified in Worksheet #10h of the SAP. It is unclear if the number of samples will be based on some set of criteria or simply a field judgment. Page 52 of the SAP, Technical Subcommittee meeting minutes, provides specific recommendations for the number of confirmation samples beneath the drums. However, this information is not incorporated into the sections that the field personnel will likely refer to when performing the sampling. Revise SAP Worksheet #10h and any other applicable worksheets to describe how the number of confirmation samples at PI 7 will be determined. In addition, revise this section to state if the samples will be grabs or composite samples.

Navy Response: The protocol for collecting the confirmation samples is presented in Worksheet #14 under PI 7, which matches the protocol documented in the April 2008 project scoping session (see Worksheet #9c). The following has been appended to the end of the first sentence of Environmental Question 1 of SAP Worksheet #10h:

". . . in accordance with the confirmatory sample collection criteria detailed in Worksheet #14, under the PI 7 Site-specific Protocol."

All samples are grab. Please see response to EPA General Comment 1.

11. SAP Worksheet #10j – PAOC N (Former Fuel Farm and Filling Station) and PAOC S (Former Power Plant) Problem Definition, Page 77: The Navy agreed to further investigate if the POL pipeline in PAOC S was an aboveground line as was suggested in the April 2-3, 2008, ERP technical subcommittee meeting. This was not addressed in this section.

Navy Response: There is no such agreement documented in the April 2-3, 2008 ERP technical subcommittee meeting minutes. Rather, the meeting minutes state that if the pipeline was found to be subsurface, the need for groundwater sampling would be discussed. The pipeline was found to be above ground, as stated in the Final PA/SI Report (CH2M HILL, June 2008). Additionally, the PA/SI Report states that no constituents exceeded the most conservative screening values for the pipeline portion of PAOC S (see Step 4 in the PA/SI Report), that a fuel release did not likely occur, and that further investigation of the pipeline portion of PAOC S is not warranted (see Section 20.4 of the PA/SI Report). Further, the report states that no further action is likely warranted for all of PAOC S, but the ERP Technical Subcommittee concurred that a geophysical survey would be conducted between PAOC N and the <u>power plant portion</u> of PAOC S to determine if a buried fuel line exists in that area.

12. SAP Worksheet #10p – PAOC M (Former Fuel Facility) Problem Definition, Page 95: The first sentence of this worksheet indicates PAOC M is shown in Figure 35. However, Figure 35 does not appear to depict PAOC M. Revise SAP Worksheet #10p to resolve this discrepancy, as appropriate.

Navy Response: SAP Worksheet #10p, "Background and Potential Release History," first sentence has been revised to read:

"PAOC M is shown in Figures 36, 38, 39, and 40."

13. SAP Worksheet #10p – PAOC M (Former Fuel Facility) Problem Definition, Page 96: Under Question 1, the potential for contamination will be evaluated based on visual evidence or photo-ionization detector (PID) screening information. Another factor that should be considered is the presence of odors, particularly those suggesting a fuel release. Revise Worksheet #10p to include odors in the criteria used to evaluate a potential fuel release at PAOC M.

Navy Response: SAP Worksheet #10p, "Environmental Questions to be Answered by the SI:," Question 1, the second sentence has been revised to read:

"The soil cores will be screened visually and with a PID, and the presence of any odor potentially indicative of contamination will be noted."

The fourth sentence has been revised to read:

"If no contamination is suspected via visual, odor, and /or PID screening, then no release will be suspected."

14. SAP Worksheet #10r – PAOC P (Former Water Treatment Pumphouse) Problem Definition, Page 99: The proposed sampling for PAOC P includes target compound list (TCL) SVOCs and target analyte list (TAL) inorganic based on the presence of a generator. It is unclear why only

these analyses, and not volatile organic compounds (VOCs), TPH-Gasoline Range Organics (TPH-GRO), or TPH-DRO were considered. Provide the rationale for excluding VOCs, TPH-GRO and TPH-DRO analyses at PAOC P or modify the proposal, as appropriate.

Navy Response: The Environmental Technical Subcommittee concurred that no sampling at the former water treatment pumphouse is necessary; rather, sampling beneath a nearby portable generator was concurred upon. Because fuel-related constituents are the release concern from the generator, the proposed analyses have been revised to BTEX, MTBE, PAHs, lead, TPH-GRO, and TPH-DRO. This edit has been added to Worksheet #10r, page 29, Question 1 under Environmental Questions to be Answered; Worksheet #11, page 115, under Sample Analysis in the table; Worksheet #18, page 248, Analytical Group column; and Worksheet #19, page 249, Analytical Group and QC columns.

15. SAP Worksheet #10u – Regional Groundwater Problem Definition, Page 105: The proposed locations of the two monitoring wells as part of the area-wide Camp Garcia groundwater investigation are not shown in the figure referenced in this worksheet (Figure 51). However, the wells are shown in Figure 3. Please clarify in the text.

Navy Response: Figure 51 has been edited to include the two proposed monitoring wells.

16. SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements, Page 108: The description of sampling for Solid Waste Management Unit (SWMU) 10 indicates "all subsurface soil samples will be collected just above the bottom of the lagoon material, if it can be visually distinguished from the native material." It is understood that the intention is to bias the samples to the site conditions in this case. However, the proposed subsurface sample depth is not consistent with the specified depths in the QAPP. Therefore, this description should also be included in the other sections of the SAP describing the SWMU 10 sampling (i.e., SAP Worksheet #10d and Table ES-1). In addition, ensure that all site-specific procedures are described consistently in all appropriate worksheets.

Navy Response: It is recognized that the subsurface sampling depths at SWMU 10 are not consistent with the protocol specified in the Master QAPP. That is explicitly stated in the last paragraph on page 107, under Question 3. The text in Worksheet #11 then goes on to describe the variance from the Master QAPP protocol and the rationale for it at SWMU 10 (as well as for every other site where it will not be followed). It is not necessary to repeat the same discussion from Worksheet #11 in all places where sampling at SWMU 10 is discussed. Each worksheet has different purposes, and the document should be utilized as a whole. Repetition of information contained in one place will make the document unnecessarily longer. However, there is an inconsistency for SWMU 10 between what is stated in Worksheet #11 and Worksheet #18 regarding subsurface soil sampling. To correct this inconsistency, the "Depth" column for SWMU 10 subsurface soil samples in Worksheet #18 has been corrected to state "Just above the bottom of the lagoon material, if it can be visually distinguished from the native material."

In addition to the above, the following inconsistencies have been corrected in Worksheet #18 "Depth" column:

PI 6, subsurface sample VEP6-SO04: "As per MQAPP Attachment 7" has been replaced with "Bottom of accumulated material, measured depth TBD in field."

PI 10, all subsurface soil sample depths have been changed from "As per MQAPP Attachment 7" to "Just above the bottom of the lagoon material, if distinguishable from the native material."

As noted in Worksheet #11 for PAOC M, soil samples may not be collected for analysis (depends on screening results during the investigation). Based on this, samples were not originally included in Worksheet #18, but have now be added to aid the sampling team should sampling be necessary. The "Depth" criterion has been listed as "From depth interval of suspected contamination."

PAOC X, the surface soil depth criteria has been changed from "As per MQAPP Attachment 7" to "0 to 6 inches below removed debris." Also for PAOC X subsurface soil samples, each "Number of Samples" cell has been edited from "1" to "1 only if contamination is suspected in surface soil sample" to comply with the protocol in Worksheet #11.

17. SAP Worksheet # 11 – Project Quality Objectives/Systematic Planning Process Statement, Page 107, Question # 2: It is stated that Regional Screening Levels (RSLs) have replaced Region 9 PRGs as action levels for this site. EPA Region 2 agreement with this change should be documented.

Navy Response: The following sentence has been added at the end of the first and third bullets in Worksheet #11, Question 2:

"EPA Region 2 concurs with the adoption of the RSLs. "

18. SAP Worksheet # 12 – Measurement Performance Criteria: The reasons for not identifying measurement performance criteria for surrogates for organic compounds should be provided.

Navy Response: Surrogates are generally considered laboratory QC; therefore, this information is already provided in Worksheet #28.

19. SAP Worksheet #14 – Summary of Project Tasks, Page 156: This section indicates that AOC A backfill samples will be composited. However, the number of aliquots per composite is not discussed. Revise this worksheet to provide the number of aliquots to be collected per composite sample.

Navy Response: Under the "Site-specific Protocol" for AOC A in SAP Worksheet #14, the fourth sentence has been revised to state:

"This potential backfill material will be composite sampled such that 4 locations for every approximate 10 lf of trench excavation will be combined into one composite sample."

20. SAP Worksheet # 15 – Reference Limits and Evaluation Table:

    a. The reasons for basing the Project Quantitation Limit Goals (PQLg) on the RSLs, as opposed to adjusted RSLs should be discussed. If Region 2 agreed that the adjusted RSLs are appropriate for this project, then using the adjusted RSLs should be also appropriate.

Navy Response: The PQLs are based on the adjusted RSLs. Please note the column headings in Worksheet #15 say "adjusted."

    b. The approach that will be used for used for incorporating background levels in the decision making process should be provided.

Navy Response: Please refer to Figure 1, the decision tree, and Question 9 of Worksheet #11. This is consistent with the approach documented in the PA/SI Report (CH2M HILL, June 2008).

    c. The reasons for providing Worksheet 15 information for blanks should be provided.

Navy Response: If blanks are used to assess the quality of the groundwater and surface water samples, they need to meet the same criteria. Therefore, aqueous blanks were grouped with aqueous field samples.

d. Various worksheets reference the draft Master QAPP from November 2006 rather then the final QAPP from May 2007 (footnote "1","Vieques Eco criteria are derives from various sources, which are summarized in the 'Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program[Draft MQAPP, CH2MHILL, November, 2006").

Navy Response: All the references to the "(Draft MQAPP, CH2M HILL, November 2006)" in Worksheet #15 have been changed to "(Final MQAPP, CH2M HILL, May 2007)."

21. SAP Worksheet #15-6 - Reference Limits and Evaluation Table, Page 183: This table provides several different background metals concentrations for various Vieques areas. However, the source of the background concentration data is not provided. Revise the SAP to indicate the source of the background concentration data.

Navy Response: This information is from the Final Background Report for East Vieques (CH2M HILL, 2007a). This reference is listed in the References section. Footnote 6 has been modified to include this reference.

22. SAP Worksheet # 19 – Analytical SOP Requirements Table: H2O is not a preservative for VOC spoil samples. Please correct this error.

Navy Response: Water is not a preservative in the field, but it is a preservative at the laboratory. The wording under maximum holding time for soil VOCs has been revised to: "EnCore samplers - 48 hours from collection to preservation into three water-preserved vials and one methanol-preserved vial; 48 hours from collection to freezing of low-level preserved vials; 14 days from collection to analysis of water-preserved or methanol-preserved vial."

23. SAP Worksheet #20 - Field Quality Control Sample Summary Table, Page 251: The number of sampling locations is listed as 14 for several analyses associated with SWMU 2. However, the table indicates that only one field duplicate will be collected. The SAP specifies in several locations that one field duplicate will be collected for every ten samples. Revise Worksheet 20 to indicate that two field duplicate will be collected for the SWMU 2 analyses listed at the bottom of page 251.

Navy Response: Worksheet #20 for SWMU 2 has been revised to reflect one field duplicate for every ten samples collected. In addition, the entire Worksheet #20 has been reassessed to ensure that the number of field QA/QC samples associated with each site is correct.

24. SAP Worksheet #28-1A - LCS, MS/MSD, and Surrogate Recovery Limits, Page 287: This page lists the soil %R limits for dichlorodifluoromethane as "10-200%". This %R range appears to be wider than normal. Please revise the SAP to clarify why these limits are acceptable for dichlorodifluoromethane.

Navy Response: Please see response to EPA General Comment 5. For this compound in particular, the soil limits have been revised by the laboratory to 72-196% and the water limits have been revised by the laboratory to 40-192%.

25. SAP Worksheet #28-4 - Laboratory QC Samples Table, Page 300: This table indicates that Method 8330 will be utilized. However, a significant revision to the method was made in Method 8330B. Revise the SAP to require the use of Method 8330B for soils and sediments.

Navy Response: The most significant revision is that Method 8830B requires multi-incremental sampling for explosives which will not be conducted. Therefore, Method 8330 will be retained.

26. SAP Worksheet # 29 – Project Documents and Records Table, Page 367: The final SI report should be included in this table.

Navy Response: The SI/Expanded SI Report has been added to Worksheet #29.

27. SAP Worksheet 37 – Usability Assessment, Page 390 – It is stated that ten percent of the data will be checked manually to identify discrepancies. The steps that will be taken if discrepancies are found should be listed.

Navy Response: The 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.

28. Attachment A, Figure 4, Proposed Additional Investigation (SWMU 1): The figure shows the location of the four samples to be collected from the ephemeral stream. It may be necessary to add a fifth sample that is located downgradient of the landfill to delineate the potential extent of contamination, as all of the proposed locations are either upgradient or adjacent to the landfill.

Navy Response: As stated on page 59, the actual locations of samples will be based on consensus made during the site visit by the ERP Technical Subcommittee. If additional samples are deemed warranted, they can be concurred upon during the site visit.

29. Attachment A, Figure 10, PI 7 Central Subsection – Former Quarry: There are several metallic subsurface anomalies identified on the figure. However, there is no discussion of these items in the SAP and no sampling is proposed near these anomalies or debris areas. Revise SAP Worksheet #10 h to discuss the metallic subsurface anomalies and surface debris. Provide the rationale for not sampling in the vicinity of these features.

Navy Response: The rationale is included in the PA/SI Report (CH2M HILL, June 2008), which provides very detailed descriptions of the site reconnaissance surveys and results at PI 7. All subsurface anomalies were dug up to evaluate their nature. Please refer to the Final PA/SI Report, Section 15.1.1, which describes the items identified during the surveys and concludes that: "Other than the drums found within the former quarry and tar drum disposal area, none of the surface debris was suspected of being a potential contamination source" and "None of the subsurface items found, which consisted mainly of metal wire, screws, and rocks, were suspected of being a potential contamination source." Further, the PA/SI Report states that the only further action required at PI 7 is drum removal and associated confirmatory soil sampling. This was concurred upon during the April 2008 scoping session (see Worksheet #9c).

30. Attachment A, Figure 48, PAOC s P and X Sample locations, 2005 Aerial Photograph: Debris piles will be removed, and samples will be collected directly beneath the debris in 6" intervals at PAOC X (SAP Worksheet #10t). All of the proposed samples to be collected at PAOC X are in the general vicinity of the surface soil samples that were previously collected during the Environmental Baseline Survey (EBS). It is recommended that one additional sample be

collected between the proposed SS/SB-4 sample at PAOC X and SS/SB-1 at PAOC P to better evaluate the potential release of any contaminants from PAOC X.

Navy Response: The samples to be collected are not necessarily in the same location as the previous samples; that is simply what is shown in the figure. The text states the samples will be collected beneath the removed debris. In addition, there is no relationship between site PAOC X and site PAOC P. The objective of the soil sampling at the PAOC X site is described in Question 1 on page 104, which states: "Do the soil data suggest there was an historic release(s) from the debris?" Collecting soil samples below the debris is the most appropriate means to answer this question. However, if additional debris is discovered within the ephemeral stream, such as other parts of the car, additional soil sampling will be accomplished at that location(s). The second sentence of response to Question 1 has edited as follows:

"Approximately four confirmatory soil samples will be collected in the 6-inch interval immediately beneath the debris."

This page intentionally left blank.

Final Responses to Puerto Rico Environmental Quality Board Comments on Draft Site Inspection/Expanded Site Inspection Sampling and Analysis Plan Former Vieques Naval Training Range Vieques, Puerto Rico (CH2M HILL, July 2008)

1) Executive Summary

a) Clarify why SWMU 4 is not included in this SI/Expanded SI SAP According to the April 2008 ERP meeting minutes, one purpose of installing the regional groundwater wells is to confirm that there has been no release from SWMU 4.

Navy Response: It would be misleading to explicitly include SWMU 4 in the SI/Expanded SI SAP because the site itself is not under investigation. As discussed in the Final PA/SI Report (CH2M HILL, June 2008), SWMU 4 is recommended for no further action pending the regional groundwater study. This recommendation was made based on the fact that none of the data collected at the site suggest a CERCLA-related release occurred that poses a potentially unacceptable risk to human health or the environment. However, as stated in the April 2008 ERP Technical Subcommittee Meeting minutes (second paragraph under '<u>Discussing and Concurring on the Preliminary Responses to Comments on the Draft PA/SI Report</u>'), the team agreed it would be beneficial to evaluate the groundwater quality leaving Camp Garcia because of the number of sites within the Camp Garcia boundary. That is why one well location is intended to evaluate groundwater migrating from the eastern half of the facility and the other is intended to evaluate groundwater migrating from the western half of the facility. Neither well specifically targets one particular site, as discussed in the April 2008 Meeting minutes. However, if the data from either of these wells suggest the need for further evaluation, additional sampling may be done to identify the source(s) of any potential contamination, including SWMU 4. This is the reason that SWMU 4, although recommended for no further action in the PA/SI Report, was not included in the Draft No Action Decision Document submitted for agency review in August 2008. This leaves open the ability to further evaluate SWMU 4, if necessary, depending on the results of the regional groundwater study.

To help clarify, the following text has been added after the first sentence of the first paragraph following the third set of bullets in the Executive Summary and at the end of the first Environmental Question to be Answered in SAP Worksheet #10u:

"The purpose of this evaluation is to determine if the quality of the groundwater migrating from beneath Camp Garcia has been affected by any of the sites within the facility boundary, including those sites recommended for no further action (i.e., SWMU 4, PAOC J, and PAOC K) in the Final PA/SI Report (CH2M HILL, 2008) pending this regional groundwater evaluation and sites where no groundwater information has been collected (e.g., SWMUs 6/7). Should the groundwater data along the downgradient boundary of Camp Garcia suggest further evaluation is warranted to identify a potential source of contamination, an individual site or sites may be further evaluated, including those currently recommended for no further action pending the regional groundwater evaluation."

b) Table ES-I

i) SWMU 2 -The Sample Analysis parameters listed are not in agreement with the Navy's responses to the November 2007 EPA comments 17a and 17b on the Draft PA/SI report. The

Navy's response provided new language for Section 44 of the PA/SI report which stated that the sample analyses would include TCL VOCs (not only BTEX/MTBE), TCL SVOCs (not only PAHs), TAL metals (not only lead), TPH-GRO, and TPH-DRO, Since the Navy's response was accepted during the April 2-3, 2008 meeting, please revise Table ES-I to reflect these parameters. It should also be noted that the PA/SI report includes TCL VOCs, TCL SVOCs, and TAL metals under the Recommendations Section for this SWMU.

Navy Response: The Navy recognizes that it is proposing a subset of the parameters proposed in the PA/SI Report. However, the UFP-QAPP process promotes critical consideration of each element of proposed sampling. SWMU 2 was a fuel transfer and storage facility, and the objective of the Expanded SI is to determine if there were historic releases of fuel. Therefore, during the project quality objective and systematic planning process, it was recognized that the full suites of VOCs, SVOCs, and metals (most of which are not fuel-related) are not warranted to determine if fuel release(s) occurred. Therefore, the fuel-related constituent subsets of VOCs (i.e., BTEX and MTBE), SVOCs (i.e., PAHs), and metals (i.e., lead), as well as TPH-GRO and TPH-DRO, are proposed as the appropriate analyses to determine whether fuel release(s) occurred. Going forward, when a proposed approach differs from that in a previous final document or from what is documented in meeting minutes or other inter-agency communication, this deviation will be highlighted to the agencies in document transmittal letters or similar communication.

ii) SWMU 6/7 - Clarify why the installation of a monitoring well downgradient of these sites is not included under Investigation Tasks since the reasoning for the well is to determine if groundwater has been affected by these sites.

Navy Response: See response to comment 1a, above. These wells are addressed under "Regional Groundwater" at the end of the table.

iii) SWMU 10 - Change the reference to Figure 10 under Investigation Tasks to Figure 7.

Navy Response: The figure number reference has been changed to Figure 7.

iv) PI 5 - Under Investigation Tasks, include the potential to collect additional samples if contamination is found in samples near the runway but not further downstream and if contamination is found in all samples, as discussed in Worksheet #9b.

Navy Response: That additional samples may be necessary based on the findings of the SI/Expanded SI is true for every site included in the SAP. If the data suggest additional samples are necessary at PI 5, they will be proposed following collection and evaluation of the SI samples.

v) PAOC M -The Sample Analysis parameters listed are not in agreement with Worksheet #9b which summarizes the scoping meeting on October 18, 2007. As per Worksheet #9b, update the Sample Analysis parameters to include TCL SVOCs and TAL metals (not BTEX/MTBE, PAHs, lead, TPH-GRO, and TPH-DRO)

Navy Response: Like SWMU 2, the potential contaminants at PAOC M are fuel-related. Therefore, BTEX, MTBE, PAHs, lead, TPH-GRO, and TPH-DRO are more appropriate parameters to evaluate the potential for a fuel-related release.

vi) Regional Groundwater - During the scoping meeting on April 2-3, 2008, it was agreed upon to analyze groundwater samples for the same parameters done on previous

Regional groundwater samples in order to be able to compare the new data to previously collected groundwater data. Therefore, the Sample Analysis parameters should additionally include pesticides and PCBs. It should be noted that Worksheet #20 includes all parameters (VOCs, SVOCs, pesticides, PCBs, and inorganics).

Navy Response: Pesticide/PCB analysis has been added to the regional groundwater analytical suite.

2) Worksheet #3 -Distribution List

a) The Navy QA Officer, Sherri Eng, should be included on the Distribution List for the SAP.

Navy Response: Worksheet #3 already has the Navy personnel the Navy wants on the distribution list. Sherri is involved in the SAP development process; she is not a recipient of the final document.

b) As per Section 2.3.1 of the UFP for QAPPs Manual (EPA-505-B-04-900A, March 2005), add the CH2M Hill Field Team Manager (Stephen Brand), CH2M Hill Project Manager (John Swenfurth), Laboratory personnel, and the Data Validation subcontractor to the Distribution List for the SAP

Navy Response: Stephen Brand/Field Team leader, John Swenfurth/Project Manager, Mike Zamboni/Project Chemist, Andrea Colby/Project Manager (Katahdin), and Laura Maschoff/Project Manager (DataQual) have been added to the distribution list.

c) Change the name of PREQB president to Javier Rua, Esq. Also, please change his email to: JavierRua@jca.gobierno.pr

Navy Response: Comment incorporated.

3) Worksheet #4 - Project Personnel Sign-off Sheet

a) Include Diana Wehner on this worksheet since she is included on Worksheet #5 as one of the regulatory/stakeholder agencies

Navy Response: Diana Wehner has been included on Worksheet 4.

b) Include CH2M Hill Project Chemist and Project Data Manager on this list. It is imperative that these people also read and understand the SAP.

Navy Response: Mike Zamboni/Project Chemist has been added to the list. Bhavana Reddy/Project Data Manager has been added to the list.

c) Wilmarie Rivera phone extension should read: (x 6141)

Navy Response: Comment incorporated.

4) Worksheet #5: Project Organizational Chart

a) See comment #6b.

Navy Response: Please see response to PREQB Comment #6b.

5) Worksheet #6: Communication Pathways

a) The CH2M Hill Project Chemist is listed as the person responsible for Analytical Corrective Actions. The table refers the procedure for these corrective actions to Worksheets #24, 25, and 28. However, per these latter worksheets, the person responsible for analytical corrective actions is the Lab Analyst or Analyst Supervisor, not the CH2M Hill Project Chemist. The latter worksheets appear to be more accurate in this regard. Update the worksheets accordingly to ensure consistency and accuracy.

Navy Response: The lab analyst or supervisor is responsible for Analytical CAs. Worksheet #6 has been updated to reflect this.

6) Worksheet #7: Personnel Responsibilities and Qualifications Table

a) Add education and experience qualifications for Sherri Eng, the Navy QA Officer.

Navy Response: Sherri Eng's education and experience qualifications have been added to Worksheet #7.

b) Please clarify why Madeline Rivera, the Vieques ERP Site Manager, is not included on Worksheet #5, Project Organizational Chart.

Navy Response: Madeline Rivera has been added to the Project Organization Chart and linked by a line of communication to the CH2M HILL Field Team Leaders.

7) Worksheet # 9a: Project Scoping Session Participant Sheet

a) Wilmarie Rivera's phone extension should read: (x6141)

Navy Response: Comment incorporated.

8) Worksheet #9b: Project Scoping Session Participants Sheet

a) October 18, 2007 meeting, PI 5 -The last sentence of this section notes that if contamination is found in samples near the runway, but not further downstream, additional samples between these locations may be necessary. In addition, it also states that if contamination is found in all of the samples, additional downstream samples may be necessary. This sampling strategy is not included in any other Worksheets in this SAP. Add this sampling strategy and rationale for sampling to Worksheets #10k and 17.

Navy Response: Please see the response to PREQB Comment 1b(iv).

9) Worksheet #9c: Project Scoping Session Participants Sheet

a) Page 50, Paragraph 6 states that the anticipated specifications of the wells (depths, screen lengths, etc.) will be added to site-specific worksheets. This information could not be located in any of the Worksheets included in this SAP and must be provided for SWMU 1, PI 4, and Regional Groundwater investigations.

Navy Response: This information is in the "General Protocol" section of Worksheet #14 under "Monitoring Well Construction." It states that the well screens will be 10 feet and that they will be installed at the depth of first encountered groundwater. Other information, such as well construction material, is contained in the relevant SOPs, which are called out under "Monitoring Well Construction."

b) Add phone extension (x.6141) to Wilmarie Rivera's phone number.

Navy Response: Comment incorporated.

10) Worksheet #10: Problem Definition

a) Please clarify why SWMU 4 is not being included as a site since the installation of one well is being used to confirm there has not been a release from this SWMU.

Navy Response: Please see response to PREQB Comment 1a.

b) Page 55, Problem Definition -Please describe or include a reference to the methodology that will be used to conduct "more realistic evaluations" should exceedances of the screening criteria presented in Worksheet #15 occur.

Navy Response: The following text that is located in Worksheet #11, page 118, regarding more realistic evaluations has been added to the end of the paragraph on page 55: "Examples of more realistic evaluations are presented in Section 1.1.2 of the Final PA/SI Report (CH2M HILL, June 2008). When these more realistic evaluations include making estimates of exposure point concentrations (EPCs), the 95% upper confidence limit of the mean concentrations will be calculated for datasets comprising eight or more samples, and the maximum detected concentrations will be used for datasets comprising less than eight samples. This information will then be discussed qualitatively in site-specific sections of the associated report."

11) Worksheet #10a: SWMU 1 (Camp Garcia Landfill) Problem Definition

a) Environmental questions to be Answered by the Expanded SI, Question 2 - the question asks about the nature of the waste materials. The response is to refer the reader to Question 1 to determine the vertical extent of contamination. The response should address the nature (i.e., what action will be taken to determine what types of wastes and contaminants are present), not the vertical extent. Please revise the response to this question accordingly.

Navy Response: The third sentence o f Question 1 has been edited to read: "The delineation of the nature and extent of the landfilled waste . . . ." The sentence in Question 2 has been edited to read: "See Question #1 above for the procedure to delineate the nature and extent of the landfilled waste."

b) Environmental Questions to be Answered, Question 3 -The text states that a three-point composite will be collected from the soil surrounding the waste (if present). Worksheets #9c and 14 and Table ES-I state that the soil will be collected within through the vertical debris profile. Clarify if "soil surrounding the waste" is equivalent to soil "within or through the vertical debris profile."

Navy Response: The statements are synonymous. However, for clarity, the first two sentences of Question 3 on page 59 have been edited to read: "At each of the 20 test pit locations, a three-point composite sample will be collected from the soil surrounding the waste <u>within the waste debris profile</u> (if present) and a grab sample . . ." "If no soil is found surrounding the waste <u>within the vertical debris profile</u> in any particular test pit, this . . ."

c) Environmental Questions to be Answered, Question 5 - Clarify in this section whether surface water samples will be collected for total and filtered metals. It is assumed that filtered surface water samples will be collected in addition to total since Worksheet #15-15a (metals, filtered surface water) was provided. This is the only site where surface water is applicable so it is

assumed that Worksheet #15-15a was included on the basis of the surface water collected from this site.

Navy Response: Question 5 on page 59 has been edited to read: ". . . TCL VOCs, SVOCs, pesticides, PCBs, TAL inorganics (filtered and unfiltered), and explosives, including perchlorate."

12) Worksheet # l0b: SWMU 2 (Fuels Offloading Site) Problem Definition

a) Synopsis of Secondary Data, Paragraph 2,- **Change SWMU 1 to SWMU 2 in the first sentence.**

Navy Response: Comment incorporated.

b) Environmental Questions to be Answered, Question 1 - The text states that a subsurface soil sample will be collected only if bedrock is deeper than the surface soil interval. This stipulation was not mentioned in any of the meeting notes from Worksheets #9b and 9c. Please clarify.

Navy Response: Based on past soil sampling activities at this site, bedrock is very shallow at SWMU 2, and may be within the first 6 inches of the ground surface. So, if there is no subsurface soil (i.e., bedrock is directly below the surface soil interval), no subsurface soil sample can be collected.

c) Environmental Questions to be Answered, Question 1-The last sentence lists the analysis parameters which are not in agreement with the Navy's responses to the November 2007 EPA comments 17a and 17b on the Draft PA/SI report. The Navy's response provided new language for Section 44 of the PA/SI report which stated that the sample analyses would include TCL VOCs (not only BTEX/MTBE), TCL SVOCs (not only PAHs), TAL metals (not only lead), TPH¬GRO, and TPH-DRO. Since the Navy's response was accepted during the April 2-3, 2008 meeting, this section must be revised to reflect these parameters. It should also be noted that the PA/SI report includes TCL VOCs, TCL SVOCs, and TAL metals under the Recommendations Section for this SWMU.

Navy Response: Please see the response to PREQB Comment 1b(i).

d) Environmental Questions to be Answered by the Expanded SI, Question 2 - Please revise the last three words of the response to this question to "will be installed during the Expanded SI" Although observations may not indicate contamination, the final decision will be made concerning whether monitoring wells are needed once the laboratory data have been reviewed.

Navy Response: The last sentence has been edited to read: ". . . no monitoring wells or groundwater sampling will be necessary during the initial mobilization of the Expanded SI. Should evaluation of all site data suggest the need for monitoring wells, they may be installed as part of a follow-up mobilization."

13) Worksheet #10c: SWMUs 6/7 (Waste Oil and Paint Accumulation Areas) Problem Definition

a) Clarify why the installation of a monitoring well downgradient of these sites is not included under Environmental Questions to be Answered by the Expanded SI since the reasoning for the well is to determine if groundwater has been affected by these sites.

Navy Response: Once the regional groundwater data are collected, they will be evaluated with respect to site-specific data for sites within Camp Garcia to determine if there is a potential correlation. Sites where there appear to be a correlation may require additional evaluation.

Decisions for those sites where no correlation with regional groundwater data is identified will be made based on the site-specific data. For further detail on the rationale for the regional groundwater data, please see Worksheet #10u.

14) Worksheet #10f: AOC G (Pump Station and Chlorination Building at Sewage Treatment Lagoons) Problem Definition

a) Background and Potential Release History, Paragraph 1, last sentence -Change AOC A to AOC G.

Navy Response: Comment incorporated.

b) Problem Definition -The first paragraph does not appear to present information consistent with the current understanding of AOC G. This paragraph indicates that a spill has occurred that warrants soil removal and confirmatory sampling. Please review and revise accordingly.

Navy Response: Please see the response to EPA Specific Comment 8.

15) Worksheet #10h: PI 7 (Former Quarry, Tar Drum Disposal Area, and Radar Communication Area) Problem Definition

a) Synopsis of Secondary Data -The 2002 reference in the first sentence is not included in the References Section. Either include this reference in the References Section or revise it to 2003, which is included in the References Section.

Navy Response: The date of the reference has been corrected to 2003.

b) Environmental Questions to be Answered, Question 1 -Include the potential to collect subsurface soil samples to evaluate vertical extent if visual observations or PID show evidence of a release, as per Worksheets #9c and 11.

Navy Response: The following additional question has been inserted between the two existing questions:

"<u>2. Does visual or PID observations beneath the drums suggest the presence of contamination?</u>

If contamination is suspected directly beneath the drums (either visually or via PID), subsurface soil samples will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol in the Master QAPP (CH2M HILL, 2007b). If collected, the samples will be analyzed for the same parameter list as the surface soil samples."

16) Worksheet #10i: PAOC L (Former Paint and Transformer Storage Area) Problem Definition

a) Clarify why the installation of a monitoring well downgradient of this site is not included under Environmental Questions to be Answered by the Expanded SI since the reasoning for the well is to determine if groundwater has been affected by this site.

Navy Response: Once the regional groundwater data are collected, they will be evaluated with respect to site-specific data for sites within Camp Garcia to determine if there is a potential correlation. Sites where there appear to be a correlation may require additional evaluation. Decisions for those sites where no correlation with regional groundwater data is identified will be made based on the site-specific data. For further detail on the rationale for the regional groundwater data, please see Worksheet #10u.

17) Worksheet #10k: PI 5 (Former Airfield and Associated Ditches) Problem Definition

a) Environmental Questions to be Answered, Question 2 -Include the potential to collect additional samples if contamination found in samples near runway but not further downstream and if contamination found in all samples, as discussed in Worksheet #9b.

Navy Response: Please see the response to PREQB Comment 1b(iv).

18) Worksheet #10L: PI 6 (Former PCB Storage Pad Vehicle Wash Pad) Problem Definition

a) Synopsis of Secondary Data, Paragraph 2, third sentence. Include the six metals which were detected, as done for other sites on Worksheets #10.

Navy Response: The sentence has been edited to read: "Six inorganics (arsenic, lead, mercury, selenium, thallium, and zinc) were detected above . . ."

19) Worksheet #10m: PI 8 (Former Motor Pool Maintenance Area) Problem Definition

a) Background and Potential Release History, Page 87 -The text states that the 1962 aerial photograph shows the location of a drainage ditch between PI 8 and PI 5. However, this was not evident on the associated Figure 27 because PI 5 cannot be seen. Label Figure 27 accordingly, as one sampling location is based on the location of this drainage ditch.

Navy Response: The drainage ditch leading from PI 8 to PI 5 has been labeled on Figure 27.

20) Worksheet # 10n: PI 10 (Former Wastewater Leach Field) Problem Definition

a) Environmental Questions to be Answered by the Expanded SI, Question 1 - Please clarify that the sample collected at the base of the sludge will be representative of sludge only and not include native material from beneath the base of the sludge.

Navy Response: The second sentence of Question 1 has been edited as follows: "The subsurface soil samples will be sludge material collected at the base of the sludge, if it can be visually distinguished from native material."

21) Worksheet #10p: PAOC M (Former Fuel Facility) Problem Definition

a) Background and Potential Release History -Delete the reference to Figure 35 in the first sentence as this Figure is not associated with PAOC M

Navy Response: The first sentence has been revised to read:

"PAOC M is shown in Figures 36, 38, 39, and 40."

b) Environmental Questions to be Answered, Question 1 - Change the reference of Figure 38 to Figure 36.

Navy Response: The first sentence of Question 1 has been edited as follows: ". . . the footprint of the former small white building shown in Figure 38 (the soil boring locations are shown in Figure 36)."

c) Environmental Questions to be Answered, Question 1 -The analytical parameters cited in the text are not in agreement with Worksheet #9b which summarizes the scoping meeting on October 18, 2007. As per Worksheet #9b, update the analytical parameters to include TCL SVOCs and TAL metals (not BTEX/MTBE, PAHs, lead, TPH-GRO, and TPH-DRO).

Navy Response: Please see the response to PREQB Comment 1b(v).

22) Worksheet #10u: Regional Groundwater Problem Definition

a) Change the header of Environmental Questions to Be Answered to reflect the groundwater sampling instead of debris removal.

Navy Response: The header has been edited to read: "Environmental Questions to be Answered by the SI:"

b) Environmental Questions to be Answered, Question 1 - During the scoping meeting on April 2-3, 2008, it was agreed upon to analyze groundwater samples for the same parameters done on previous Regional groundwater samples in order to be able to compare the new data to previously collected groundwater data. Therefore, the analytical parameters should additionally include pesticides and PCBs. It should be noted that all agreed-upon parameters are listed on Worksheet #20 for this investigation.

Navy Response: Please see the response to PREQB Comment 1b(vi).

c) Please reference Figure 3 in this section. The location of the well downgradient from the western half of Camp Garcia appears to be too far to the west to be representative of groundwater conditions. This monitoring well should be moved easterly to a location directly downgradient from the western sites at Camp Garcia.

Navy Response: The location of this well has been moved east to a location directly downgradient of the western sites at Camp Garcia. The location is also shown in Figure 51. The final location will be determined during the inter-agency site visit prior to the implementation of the fieldwork.

23) Worksheet #11: Project Quality Objectives/Systematic Planning Process Statements

a) Question #3 -Paragraph 2 should also include surface water and sediment sampling.

Navy Response: Paragraph 2, first sentence has been edited as follows: "Monitoring well installation, soil and groundwater sampling, surface water and sediment sampling, and related activities . . ."

b) Question #3, SWMU 1 -The procedure listed for collection of samples for VOCs within the waste profile (selection of one depth) is not in accordance with the procedure discussed at the April 2-3, 2008 meeting and summarized in Worksheet #9c. The agreed-upon procedure would include collection of three separate EnCore samplers at each of the three depth intervals within the waste profile and the laboratory would combine these for a three-point composite sample. There should not be a concern over obtaining a sample for low-level VOC analysis (as mentioned in this section) since the majority of the Residential Regional Screening Levels (RSLs) will be achieved via methanol preservation. As per Question #5 in this worksheet, these are the more relevant action levels. Therefore, the agreed-upon procedure should be used for collection of samples for VOCs within the waste profile, and this section should be updated accordingly.

Navy Response: The reason the sample collection process was altered in the draft SAP is that when this process was discussed with the laboratory (subsequent to the April 2008 meeting), the laboratory stated that combining three separate EnCore samples in the laboratory in methanol will result in an increase in the analytical quantitation limit by a factor of about 50. Therefore,

the collection protocol was revised to collect a single EnCore sample from the zone of highest concentration (based on PID readings) to allow for low-level quantitation. However, it is noted that only three VOCs (vinyl chloride, ethylene dibromide, and 1,2-dibromo-3-chloropropane) will have quantitation limits slightly above Residential RSLs; therefore, the protocol for VOC sample collection has been changed back to three Encores through the vertical profile of the debris (and composited by the laboratory) as originally documented in the April 2008 meeting minutes. The associated revisions to the text are:

Question #3, SWMU 1: The fourth, fifth, sixth, and seventh sentences have been replaced with: "For the composite soil sample, soil from the three intervals will be composited and sampled for all target analytes. For the VOC sample, individual Encore samples will be collected from each of the three composite intervals and provided to the laboratory. The laboratory will composite the sample for VOC analysis. Although this will result in a 50-fold increase (approximate) in the QL for VOCs, the QL for most VOCs will still be below the adjusted residential RSLs. For those VOCs whose QL will be above the adjusted residential RSL (vinyl chloride, ethylene dibromide, and 1,2-dibromo-3-chloropropane), the uncertainty is acceptable because the sampling procedure facilitates a more representative characterization of the vertical waste profile and the QLs will be only slightly above the adjusted residential RSLs."

c) Question #5, bullet 3 -This bullet should be clarified to note that reporting of estimated values between the MDL and RL only applies to VOCs and SVOCs (i.e., GC/MS analyses). This approach could result in significant false positive results for pesticides, PCBs, and metals and should therefore not be used with these analyses.

Navy Response: It is recognized that GC/MS analyses provide more accurate identification of particular analytes between the RL and MDL. However, estimated concentrations between the quantitation limit and the MDL are commonly reported for all parameters and the data are used as qualified by "J" flags.

d) Table on pages 113-115:

   i) SWMU 2, Sample Analyses column - See comment #12c.

Navy Response: Please see the response to PREQB Comment 12c.

   ii) SWMU 2, Target Analytes column -The target analytes for this site should not be listed as "no target analytes" As per pages 4 and 5 of the April 2-3, 2008 meeting minutes, these are SVOCs and lead.

Navy Response: The Target Analytes text for SWMU 2 has been changed to: "Fuel-related constituents."

   iii) SWMU 2, RLs > PALs for Target Analytes column - Clarify why residential RSL exceedances for target analyte RLs are not called out Based on the fact that PAHs are constituents of concern at this site, the residential RSL exceedances for benzo(a)pyrene and dibenz(a,h)anthracene RLs need to be called out. In addition, conclusions on how this will be dealt with for decision-making need to be provided.

Navy Response: For the SWMU 2 analyte list, the constituent RLs that exceed PALs are:

Hexachloroethane RL exceeds Regional SSL
Hexachlorobenzene RL exceeds Regional SSL

Pentachlorophenol RL exceeds Regional SSL
Benzo(a)anthracene RL exceeds Regional SSL
Benzo(a)pyrene RL exceeds Residential RSL adjusted
Dibenzo(a,h)anthracene RL exceeds both Regional SSL and Residential RSL adjusted.

Based on the above, the text in the RLs>PALs for Target Analytes text for SWMU 2 has been changed to: "Benzene, MTBE, hexachloroethane, hexachlorobenzene, pentachlorophenol, benzo(a)anthracene, and dibenzo(a,h)anthracene RLs> Regional SSLs. Dibenzo(a,h)anthracene and benzo(a)pyrene RLs>RSLs."

The text in the Conclusion column for SWMU 2 is still accurate.

iv) SWMU 6/7, RLs > PALs for Target Analytes column - Clarify why the SSL exceedance for the delta-BHC RL and the ecological screening level for the heptachlor RL are not called out Based on the fact that these pesticides were detected above screening criteria in the RFI, the exceedances for these RLs need to be called out. In addition, conclusions on how this will be dealt with for decision-making need to be provided.

Navy Response: SWMUs 6/7 are not being sampled for pesticides.

v) SWMU 6/7, Conclusion column -The text states that the methylene chloride MDL is below the RSL and SSL and therefore, the MDL and RL are sufficient for making site-specific determinations. However, according to Worksheet #15-1, the MDL for methylene chloride is 2.71 ug/kg and the SSL is 1.3 ug/kg. Therefore, this is a false statement and needs to be corrected.

Navy Response: The text has been revised to remove methylene chloride from the statement regarding the MDL. However, due to reason (2) in SAP Worksheet #11 Question 5 and because the methylene chloride RL is less than both the RSL and ECO, the conclusion is still valid.

vi) SWMU 10, Conclusion column - Samples are being collected at this site to confirm past thallium results due to significant uncertainty associated with past laboratory methods. Justifying an elevated RL for thallium with the MDL is not acceptable; concentrations reported between the MDL and RL have a significant level of uncertainty. Therefore, please ensure that the laboratory RL is 1 ug/L as shown in the Worksheet 15-14 that was presented in the April 2008 meeting, and delete the discussion of justifying the elevated RL in this section.

Navy Response: The 1 ug/L quantitation limit discussed during the April, 2008 meeting is no longer applicable, as it was based on the Region IX adjusted tap water PRG. The adjusted tap water Regional Screening Level (RSL) is 0.24 ug/L. Five Navy-approved laboratories, in addition to Katahdin (the laboratory procured for the SI/Expanded SI), were asked to provide their reporting and method detection limits for thallium. The results are below:

Test America Burlington: QL = 2 ug/L; MDL = 0.016 ug/L
Mitkem: QL = 1 ug/L; didn't provide an MDL
CompuChem: QL = 1 ug/L; didn't provide an MDL, IDL = 0.011 ug/L
Test America Pittsburgh: QL = 1 ug/L; MDL = 0.0181 ug/L
GPL: QL = 2 ug/L; MDL = 0.16 ug/L

For comparison, the values provided by Katahdin (Worksheet 15-14) are: QL = 2 ug/L; MDL = 0.62 ug/L

As shown above, it is unlikely that a Navy-approved laboratory is capable of achieving the adjusted tap water RSL with their QL. However, some laboratories can achieve the adjusted tap water RSL with their MDL. Therefore, if Katahdin cannot achieve an MDL less than the adjusted tap water RSL, it is recommended that they be required to subcontract thallium analysis of groundwater for SWMU 10 to a laboratory that can achieve an MDL less than 0.24 ug/L. In addition, the Navy is working with Katahdin to determine whether they can achieve an MDL less than 0.24 ug/L and a QL less than 2 ug/L. This information will be communicated to PREQB for further discussion and determination of the appropriate laboratory to use for thallium analysis.

vii) PI 4, RLs > PALs for Target Analytes column. Add tetrachloroethene to the list of RLs > PALs. The Tap Water RSL is 0.11 ug/L and the RL, per Worksheet #15-9, is "To Be Determined" This could be a potential uncertainty and an explanation is needed on how the objectives will still be met if the RL exceeds 0.11 ug/L. Since this was one of the VOCs detected in the 2006 PA/SI and is therefore one of the reasons for the resampling, this needs to be explained.

Navy Response: At the time of submission of the draft UFP-SAP, the QL for tetrachloroethene was not yet known. Katahdin has determined the QL for tetrachloroethene in water by 8260-SIM to be 0.05 ug/L. This information has been added to Worksheet #15-9 and the QL does not exceed the PAL in this case.

viii) PAOC L, Conclusion column -The text justifies the endrin RL above the ecological screening level by stating that the endrin MDL is similar to the ecological screening level. However, according to Worksheet #15-3, the MDL for endrin is 0.77 ug/kg and the ecological screening level is 0.04 ug/kg. Therefore, this is a false statement and needs to be corrected.

Navy Response: Endrin has been removed from the MDL statement, and the following statement has been added: "Endrin detected in only one sample. Other pesticides detected more frequently and at significantly higher concentrations and are therefore more representative of site conditions."

ix) PI 6, Target Analytes column -Based on the Background Summary and Synopsis of Secondary Data provided in Worksheet #10l, change the target analytes for this site to metals and PCBs instead of "no target analytes."

Navy Response: PCBs and inorganics are target analyte groups, not target analytes.

x) PI6, RLs > PALs for Target Analytes and Conclusion column - As per comment #18a, the metals which exceeded screening levels in the past investigation were not provided. If arsenic is included in this list of metals, the RL exceedance of the residential RSL and the justification should be provided in these two columns, as was done for SWMU 6/7.

Navy Response: In the RLs > PALs for Target Analytes column, "N/A" has been changed to As RL> RSL. In the Conclusion column, "As MDL< RSL" has been inserted at the beginning.

xi) PI 8, Conclusion column -The text states that the methylene chloride MDL is below the SSL and therefore, the MDL and RL are sufficient for making site-specific determinations. However, according to Worksheet #15-1, the MDL for methylene chloride is 2.71 ug/kg and the SSL is 1.3 ug/kg. Therefore, this is a false statement and needs to be corrected.

Navy Response: The text has been revised to remove methylene chloride from the statement regarding the MDL. However, due to reason (2) in SAP Worksheet #11 Question 5 and because the methylene chloride RL is less than both the RSL and ECO, the conclusion is still valid.

xii) PAOC M, Sample Analyses column - see comment #21c

Navy Response: Please see the response to PREQB Comment 21c.

xiii) PAOC M, RLs > PALs for Target Analytes column. Clarify why residential RSL exceedances for target analyte RLs are not called out. Based on the fact that PAHs are constituents of concern at this site, the residential RSL exceedances for benzo(a)pyrene and dibenz(a,h)anthracene RLs need to be called out. In addition, conclusions on how this will be dealt with for decision-making need to be provided.

Navy Response: The same revision made in accordance with the response to PREQB Comment 23d(iii) has been made for PAOC M.

xiv) Regional Groundwater, Sample Analyses column - PCBs are included in the list of sample analyses which falls more in line with the request made in comment #22b. However, based on comment #22b, pesticides must also be added to this list. In addition, Worksheet #20 includes pesticides as well for the Regional Groundwater investigation.

Navy Response: Please see the response to PREQB Comment 1b(vi).

xv) Regional Groundwater, RLs > PALs for Target Analytes column -This column should not be listed as "N/A". Add tetrachloroethene to the list of RLs > PALs. The Tap Water RSL is 0.11 ug/L and the RL, per Worksheet #15-9, is "To Be Determined". This could be a potential uncertainty and an explanation is needed on how the objectives will still be met if the RL exceeds 0.11 ug/L. In addition, the Tap Water RSL for chloroform is 0.19 ug/L and the RL, per Worksheet #15-9 is 1 ug/L; include this exceedance in this column.

Navy Response: The "N/A" in the RLs>PALs for Target Analytes column for Regional Groundwater is correct as there are no specific target analytes; rather, there are target analyte groups for Regional Groundwater, which is the basis for the rationale provided in the Conclusions column. However, reason (2) has been removed from the Conclusions column for Regional Groundwater.

e) Question #6 - In the second to last sentence, include "drums" with debris and/or soil removal as this is applicable to PI 7 also referenced in this sentence.

Navy Response: The second to last sentence in Question #6 has been edited as follows: "Confirmatory samples at AOC A, PI 7, and PAOC X will be collected following debris/drums and/or soil removal."

f) Please remove the criterion "order of magnitude" from the PQO statement for determining that additional soil sampling data will be collected. The information collected during the Expanded SI will be evaluated to determine if additional sampling, including soil sampling, is warranted to determine trends, extent and sources of contamination. The revised text should indicate that the data provided in the Expanded SI will be used to determine if additional sampling is warranted.

Navy Response: The parenthetical statement "(greater by an order of magnitude)" has been removed from the first sentence of the fifth paragraph under PI 4.

24) Worksheet #12: Measurement Performance Criteria Table

a) As per Section 2.6.2 of the UFP QAPPs Manual, laboratory QC (e.g., surrogates, LCS, method blanks) is also required to be included in these worksheets. It is understood that this information is also included in Worksheet #28. Include a footnote on all Worksheets #12 (12-1 through 12-24) to refer to Worksheet #28 for laboratory QC measurement performance criteria.

Navy Response: Footnote #2: "Refer to Worksheet #28 for measurement performance criteria of laboratory QC samples." has been added to Worksheets #12-1 through 12-24.

b) As per Section 2.6.2 of the UFP QAPPs Manual, completeness goals are required to be included. Either add a row to Worksheets #12-1 through 12-24 with the completeness goals or include a section on Worksheet #11 for this information on a project-wide basis.

Navy Response: The following text has been added in Worksheet #11: "Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. The objective of the overall completeness goal for this project is set at 95% valid data. This goal is inclusive of both field and laboratory analytical data." Worksheet #37 also refers the reader to this statement, since it is during the data quality review that the actual project completeness will be determined.

c) Worksheet #12-2 -As per Worksheets #15-2, 15-2a, and 15-2b, di-n-butylphthalate and bis(2-ethylhexyl)phthalate are being analyzed by SIM. Therefore, the SIM equipment rinsate blank measurement performance criteria should be the same as the full scan low method.

Navy Response: The MPC for equipment rinseate blanks under SIM has been updated to read:

"No analytes detected > PQL; up to 5 times PQL for phthalate esters" such that it matches the full scan method immediately above.

d) Worksheet #12-5 -Include a trip blank for TPH-GRO.

Navy Response: A trip blank row has been added for TPH-GRO.

e) Worksheet #12-9 - Include an MS/MSD for the VOC-SIM analyses. Note that MS/MSDs were included for VOC-SIM in Worksheet #28-9.

Navy Response: An MS row and an MSD row have been added to Worksheet #12-9 under SIM.

f) Worksheet #12-10 - As per Worksheets #15-10 and 15-10a, di-n-butylphthalate and bis(2-ethylhexyl)phthalate are being analyzed by SIM. Therefore, the SIM equipment rinsate blank measurement performance criteria should be the same as the full scan low method.

Navy Response: The MPC for equipment rinseate blanks under SIM has been updated to read:

"No analytes detected > PQL; up to 5 times PQL for phthalate esters" such that it matches the full scan method immediately above.

g) Worksheet #12-11 - Change the last column to "A" for Analytical for the MS and MSD.

Navy Response: "S + A" has been updated to "A" for the MS and MSD rows on Worksheet #12-11.

h) Worksheet #12-13 - Include a trip blank for TPH-GRO.

Navy Response: A trip blank row has been added for TPH-GRO.

i) Worksheet #12-14 - Change the Data Quality Indicator for MS/MSDs under Metals and mercury to include Precision in addition to Accuracy/bias.

Navy Response: "accuracy/bias" has been updated to "accuracy/bias/precision" for MS/MSD under Metals and Mercury on Worksheet #12-14.

j) Worksheet #12-15 - Change the Data Quality Indicator for MS/MSDs under Metals and mercury to include Precision in addition to Accuracy/bias.

Navy Response: "accuracy/bias" has been updated to "accuracy/bias/precision" for MS/MSD under Metals and Mercury on Worksheet #12-15.

25) Worksheet #13: Secondary Data Criteria and Limitations Table

a) As per page 5 of the minutes to the April 2-3, 2008 meeting, this worksheet should note where historical data are going to be combined with newly collected data for purposes of screening. The same statement was included for all sites but there should be a description of how data will be considered "appropriate" for incorporating into the comprehensive data set for each site. For example, at SWMU 10, data being collected to confirm previous thallium results. If results are different from the previous investigation, will the historical data still be combined into the comprehensive data set?

Navy Response: The rationale for including or excluding historical data will be provided in the site-specific sections of the SI/Expanded SI Report for regulatory review. With respect to SWMU 10, Worksheet #13 specifically states the historical thallium data will be replaced by the new thallium data.

b) As per Section 2.7, page 58 of the UFP QAPPs Manual, the column entitled "Limitations on Data Use" should note if the data in question have not been validated. If this applies to any of these data sets, add this notation to the column.

Navy Response: Data collected during the EBS (NAVFAC, 2003) were not validated. A notation has been added in the column labeled "Limitations on Data Use" for the EBS that states: "Unvalidated data used to generate report." Based on this, the following notations have been made for sites where EBS data were collected:

- **PI 4: "EBS surface soil data collected. Additional surface and subsurface soil data were collected from approximately the same locations during the PA/SI (see Figure 9)."**
- **PI 7: "EBS surface soil data collected. Additional surface and subsurface soil data were collected in the same area during the PA/SI (see Figure 10)."**
- **PI 6: "EBS surface soil and wipe sample data collected. Additional surface and subsurface soil samples will be collected in the vicinity of wipe samples during the SI/Expanded SI (see Figure 22)."**
- **PI 8: "EBS surface soil data collected. Additional surface and subsurface soil samples will be collected in the same area during the SI/Expanded SI (see Figure 27)."**

- **PI 10: "EBS surface soil data collected. Additional surface and subsurface soil samples will be collected from approximately the same locations during the SI/Expanded SI (see Figure 32)."**
- **PAOC X: "EBS surface soil data collected. Additional surface (and potentially subsurface) soil samples will be collected from approximately the same locations (beneath debris) during the SI/Expanded SI (see Figure 48)."**

26) Worksheet #14: Summary of Project Tasks

a) Monitoring Well Development - Please clarify how it will be determined in the field if a well will be redeveloped. This affects SWMU 1, PI 4, and PAOC L where previously installed wells will be sampled. The procedure that will be used at each of these wells and the criteria used for determining the need for redevelopment must be included in the QAPP.

Navy Response: The text under "Monitoring Well Development" has been revised to read: "To the extent practicable, the development protocol in the well installation SOP will be followed for any new well (or previously installed well being redeveloped) and any deviation from the SOP will be documented in field notes and the associated report. Existing wells will be redeveloped if turbidity readings do not stabilize to within approximately 10 percent of each other over three consecutive readings during low-flow sampling (assuming the well has sufficient capacity to sustain low-flow purging and sampling)."

b) Sample Analysis - Include sediment and surface water with the list of matrices that will be analyzed by the laboratory.

Navy Response: The second sentence under "Sample Analysis has been revised to read: "The laboratory will analyze soil, sediment, groundwater, and surface water samples for . . . "

c) SWMU 1:

i) Subsurface Soil Characterization within the Waste Material - see comment #23b regarding the collection of samples within the vertical waste profile for VOCs.

Navy Response: Please see the response to PREQB Comment 23b.

ii) Ephemeral Stream Bed Sampling - Add the possibility of sampling a stream along the southwestern portion of the landfill.

Navy Response: The following sentence has been added after the third sentence in the Ephemeral Stream Bed Sampling Section: "If an additional ephemeral stream is identified along the southwest portion of the landfill during the site visit, additional samples will be added in accordance with Worksheet 10a."

iii) Monitoring Well Development - As per comment #26a, include the possibility of redeveloping the existing 2004 wells

Navy Response: The following sentence has been added at the end of "Monitoring Well Development": "The existing wells may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol."

d) PI 4, Monitoring Well Development - As per comment #26a, include the possibility of redeveloping the existing 2006 wells

Navy Response: The following sentence has been added at the end of "Monitoring Well Development": "The existing wells may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol."

e) PAOC L, Monitoring Well Sampling - As per comment #26a, include the possibility of redeveloping the existing 2006 well.

Navy Response: A section has been added entitled "Monitoring Well Re-development:" and the following text inserted:

"The existing well may be redeveloped in accordance with the Monitoring Well Development protocol provided under the General Protocol."

f) PAOC X, Soil Sampling - Worksheet #10t states that four confirmatory soil samples will only be collected in the 6-inch interval immediately beneath the debris. This section states that surface and subsurface soil samples will be collected beneath the removed debris piles. Please confirm the sampling approach and ensure both this worksheet and Worksheet #10t are consistent.

Navy Response: The sentence under "Soil Sampling:" in Worksheet #14 has been revised to state: "Surface soil samples and potentially subsurface soil samples will be . . . "

In addition, the following additional question has been inserted between the two existing questions in Worksheet #10t:

"<u>2. Does visual or PID observations beneath the debris suggest the presence of contamination?</u>

If contamination is suspected directly beneath the debris (either visually or via PID), subsurface soil samples will be collected in accordance with the Soil Sample Depth Selection Criteria Protocol in the Master QAPP (CH2M HILL, 2007b). If collected, the samples will be analyzed for the same parameter list as the surface soil samples."

27) Worksheet #15: Reference Limits and Evaluation Table

27) Worksheet #15: Reference Limits and Evaluation Table

a) Worksheet #15-1 (VOCs, surface soil):

i) Footnote #5 - As per comments #12c and #21c, the exceptions to all VOCs at SWMU 2 and PAOC M need to be deleted from the footnote.

Navy Response: Please see the responses to PREQB Comments 12c and 21c.

ii) Footnote #6 - It is unclear why the QLs were elevated to 3x the MDL for strict DOD QSM compliance. If these elevated QLs are included in this Worksheet, then the laboratory must be informed that they must use these instead of their routine QLs. This may result in confusion in reporting data. The elevation of these QLs to 3x the MDL may want to be reconsidered. As long as the QL is based on the lowest calibration standard, it is still technically accurate

Navy Response: The laboratory has already been informed that they need to use the Worksheet #15 QLs instead of their routine QLs. In addition, the laboratory will be receiving a copy of the UFP-SAP and they must sign and return Worksheet #4 indicating they have read and fully understand the portion of the UFP-SAP that pertains to them.

b) Worksheets #15-1a, 15-1b, 15-2, 15-2a, 15-2b, 15-3, 15-3a, 15-3b, 15-6, 15-6a, 15-6b, 15-9, 15-9a, 15-10, 15-10a, 15-11, 15-11a, 15-14, 15-14a -Footnote #6 from Worksheet #15-1 should be included here since several QLs were elevated to 3x the MDL. However, if this procedure is being eliminated, the addition of the footnote is not required.

Navy Response: That footnote, as written in Worksheet #15-1, should be present on most of the Worksheet #15s. Unfortunately, it got cut-off during formatting, which has been fixed.

c) Worksheet #15-1b (VOCs, sediment) -Delete footnote #5; it is not applicable to sediment

Navy Response: Footnote #5 has been deleted from Worksheet #15-1b.

d) Worksheets #15-2 (SVOCs, surface soil), 15-2a (SVOCs, subsurface soil), and 15-2b (SVOCs, sediment):

i) The Concentration Range column should be changed to SIM for benzo(g,h,i)perylene based on the laboratory QL.

Navy Response: "Low" has been changed to "SIM" for Benzo(g,h,i)perylene on these three Worksheet #15s.

ii) Footnote #5 -As per comments #12c and #21c, the exceptions to all SVOCs at SWMU 2 and PAOC M need to be deleted from the footnote.

Navy Response: Please see the responses to PREQB Comments 12c and 21c.

iii) Footnote #5 -The footnote includes those compounds to be analyzed by SIM. But, the table shows many more compounds being analyzed by SIM that are not included in this footnote (hexachloroethane, 2-chloronaphthalene, hexachlorobenzene, carbazole, di-n-butylphthalate, bis-[2-ethylhexyl]phthalate, and I,4-dioxane). Please clarify. The use of SIM should also be dependent on the matrix, depending on the project action levels; therefore, QLs for Worksheets #15-2, 15-2a, and 15-2b may need to be different.

Navy Response: The footnote in Worksheets 15-2 and 15-2a has been revised to state: "SVOCs in soil analyzed by "low" and "SIM" as noted above under the Concentration Range column." The same change has been made for Worksheet 15-2b, substituting "sediment" for "soil."

iv) Footnote #5 - Clarify what is meant by "Low" analysis for SVOCs.

Navy Response: "Low" allows differentiation between full-scan and SIM analyses. The word "Low" is used instead of "medium" because a higher-concentration range exists than described for this method. To reduce confusion, the footnote has been revised to begin "SVOCs in soil will be analyzed via the "Low" concentration range (SW-846 8270C)" on these three worksheets. The footnote then continues as in the response to PREQB Comment 27d(iii).

e) Worksheets #15-3, 15-3a, 15-3b, 15-11, 15-11a, Footnote #5 -Clarify what is meant by "Low" analysis for Pesticides and Aroclors.

Navy Response: The "Concentration Range" column is not necessary and has been removed from these five worksheets.

f) Worksheets #15-6 (Metals, surface soil), 15-6a (Metals, subsurface soil), and 15-6b (Metals, sediment) - Footnote #5 - Clarify what is meant by "Low" analysis for metals and cyanide.

Navy Response: The "Concentration Range" column is not necessary and has been removed from these three worksheets.

g) Worksheet #15-9 (VOCs, groundwater)

i) Provide a rationale for why 1,1-dichloroethene is being performed using SIM; the full scan QL is below the project action levels.

Navy Response: For VOCs, the laboratory can only provide vinyl chloride, 1,1-dichloroethene, carbon tetrachloride, 1,2-dichloroethane, and tetrachloroethene by SIM. Because at least one of these compounds has a PAL low enough to necessitate SIM analysis, analysis by SIM is being required. Therefore, the laboratory is being allowed to also report the remaining four compounds by SIM. In general, lower QLs are better since various factors can elevate QLs.

ii) Many other compounds are listed as having QLs above the project action levels. Provide the rationale for which compounds were selected to analyze using SIM and why others (i.e., benzene, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, and 1,4-dichlorobenzene) were not.

Navy Response: The list of compounds analyzed by SIM is based on the laboratory's capability. Per the response to PREQB Comment 27g(i), the laboratory can analyze only five VOCs by SIM. The laboratory will be requested to add the four compounds listed above to the SIM list, recognizing the laboratory has to modify its SOP, established MDLs and QLs, etc. for these compounds. If the laboratory can add the four compounds listed above to the SIM list, Worksheet #15-9 and #15-9a will be modified accordingly.

h) Worksheets #15-10 (SVOCs, groundwater) and 15-10a (SVOCs, surface water)

i) Footnote #5 -The footnote includes those compounds to be analyzed by SIM. But, the table shows many more compounds being analyzed by SIM that are not included in this footnote (hexachloroethane, 2-chloronaphthalene, hexachlorobenzene, carbazole, di-n-butylphthalate, bis-(2-ethylhexyl)phthalate, and 1,4-dioxane). Please clarify. The use of SIM should also be dependent on the matrix, depending on the project action levels; therefore, QLs for Worksheets #15-10 and 15-10a may need to be different.

Navy Response: The footnote in Worksheet #15-10 has been revised to state: "SVOCs in groundwater analyzed by "low" and "SIM" as noted above under the Concentration Range column." The same change has been made for Worksheet #15-10a, substituting "surface water" for "groundwater."

ii) Footnote #5 - Clarify what is meant by "Low" analysis for SVOCs.

Navy Response: Low refers to the full-scan as opposed to SIM analysis. This column is necessary to differentiate which compounds will come from which concentration range. "Low" was chosen because higher concentration ranges exist. Footnote #5 on Worksheets #15-10 and 15-10a has been updated to indicate that "Low" refers to the full-scan.

i) Worksheet #15-14 (Metals, groundwater) - Worksheet 15-14 presented at the April 2008 meeting shows a RL for thallium of 1 ug/L. Please revise this worksheet to show the RL as presented at the meeting and confirm that the laboratory will be reporting down to 1 ug/L.

Navy Response: Please see the response to PREQB Comment 23d(vi).

j) Worksheet #15-14a (Metals, surface water) - Remove the shading from the antimony row since the QL is below both project action levels.

Navy Response: The shading has been removed from the antimony row.

28) Worksheet #16: Project Schedule Timeline Table

a) Well development and sampling of SWMU 10 preexisting wells is scheduled for March 11 and 12, 2009. EPA Guidance (OSWER Directive 9360.4-16) recommends a two week period between development and sampling to allow the groundwater around the well to recover. Update the schedule accordingly.

Navy Response: The five monitoring wells at SWMU 10 were developed in January 2004. If during sampling it is determined that the wells need to be re-developed because the turbidity is not stabilizing (see response to PREQB Comment 26a), then the wells will be redeveloped. The OSWER directive states that the 2-week recovery period is to allow the water levels to recover and for any LNAPL to partition itself. Based on previous sampling, no NAPL is present in the SWMU 10 monitoring wells. Therefore, the water levels in the SWMU 10 monitoring wells will be measured immediately before the initial attempt to sample and, if redevelopment is deemed necessary, the groundwater samples will be collected once the water levels have recovered to approximately their pre-redevelopment levels. Worksheet #14, SWMU 10, "Monitoring Well Redevelopment" has been revised to read: "If during sampling it is determined that a particular well needs to be redeveloped because the turbidity is not stabilizing, then that well will be redeveloped and its water level allowed to recover to its approximate pre-redevelopment level prior to sampling."

b) Section 2.8.2 of the UFP QAPPs Manual states that dates of quality assessments and deliverables should be provided on this Worksheet. Include the dates that data validation will be performed and the dates that reports will be generated summarizing the results of the investigations.

Navy Response: It is not realistic to provide the dates of data validation and report. There are too many variables with respect to the field work duration and sample analyses to conclude the data validation and report dates with certainty this far in advance. The SMP schedule (updated monthly) is used to keep the team apprised of the deliverable dates.

29) Worksheet #18: Sampling Locations and Methods/SOP Requirements Table

a) SWMU 1

i) For all subsurface soil samples below the waste, change the depth to "6 inches below the waste" instead of "bottom of waste". This is consistent with Worksheet #10a.

Navy Response: The depth of subsurface soil samples has been changed to "6 inches below the waste."

ii) Depending on the resolution to comment #23b, the matrix and depth may need to be changed for composite samples for VOCs.

Navy Response: Please see the response to PREQB Comment 23b.

iii) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Duplicates and matrix spike samples are not intended for pH and TOC analyses. Worksheet #12-8 has been corrected to remove these analyses. All applicable worksheets have been revised to remove QA/QC samples associated with pH, TOC, general chemistry, and geochemical parameters.

iv) Specify total and dissolved metals under Analytical Group for the surface water samples SW-01, SW-02, and SW-03, as was done for sample SW-04.

Navy Response: The Analytical Group text for SW-01, SW-02, and SW-03 has been revised to match that for SW-04.

v) Worksheet #20 shows one of the solid samples from the ephemeral stream will be submitted for pH, TOC, bulk density, and grain size analyses. Update these two worksheets to be consistent (with or without these analyses).

Navy Response: The worksheets have been updated to identify that all solid samples from the ephemeral stream will be submitted for pH, TOC, bulk density and grain size.

vi) Worksheet #20 shows one of the surface water samples from the ephemeral stream will be submitted for TDS and chloride analyses. Update these two worksheets to be consistent (with or without these analyses).

Navy Response: Both TDS and chloride have been removed from Worksheet #20 for the ephemeral stream surface water samples. TDS and chloride analyses are intended for the groundwater samples in order to assess the potability.

vii) Groundwater sample MW01 is the only groundwater sample not being analyzed for TDS and chloride. Please confirm this is correct.

Navy Response: The objective of the TDS and chloride analysis is to determine the potability of the groundwater. While one well is likely sufficient, groundwater samples from four wells at SWMU 1 will be analyzed for TDS and chloride. Worksheets #18 and #20 have been revised accordingly.

b) SWMU 2

i) Please refer to comment #12c regarding the Analytical Group listed in this worksheet for the soil samples.

Navy Response: Please see the response to PREQB Comment 12c.

ii) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses.

Navy Response: Please see the response to PREQB Comment 29a(iii).

c) SWMU 6/7 - As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses.

Navy Response: Please see the response to PREQB Comment 29a(iii).

d) SWMU 10

i) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

ii) The Depth column for subsurface soil should not state per MQAPP Attachment. As per Worksheet #11, Question #3, subsurface soil sample depths will not follow the Master QAPP; these samples will be collected just above the bottom of the lagoon material, if it can be visually distinguished from the native material. Therefore, include TBD for the depth of these subsurface soil samples.

Navy Response: The "Depth" column for SWMU 10 subsurface soil samples in Worksheet #18 has been revised to state "Just above the bottom of the lagoon material, if it can be visually distinguished from the native material."

e) AOCA

i) Change the Depth column for all subsurface soil samples at the bottom of the excavation from "TBD" to "0-6 inches below the bottom of the excavation"

Navy Response: The "Depth" column for all subsurface soil samples collected from the bottom of the excavation has been revised to state "0-6 inches below the bottom of the excavation."

ii) Change the Depth column for all subsurface soil samples on the sides of the excavation from "TBD" to "0-1 foot below the depth of backfill."

Navy Response: The "Depth" column for all subsurface soil samples collected from the sides of the excavation has been revised to state "0-1 foot below the depth of backfill." In addition, in Worksheet #14, page 157, under AOC A, the statement ". . . (at a depth of approximately 2 ft bls) . . . " has been replaced with ". . . (0-1 foot below the depth of backfill) . . . "

f) AOC G - As per Worksheet #12-8, add one matrix spike sample for TOC

Navy Response: Please see the response to PREQB Comment 29a(iii).

g) PI7 - As per Worksheet #12-8, add one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

h) PAOC L - As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

i) PI 5 -As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

j) PI6

i) Add one field duplicate for PCBs in soil.

Navy Response: Comment incorporated.

ii) Change the Depth column for the sump surface soil sample to "0-1 foot"; change the Depth column for the sump subsurface soil to TBD.

Navy Response: The "Depth" column for sump surface soil sample VEP6-SS04-AA-MMYY has been changed to "0-1 foot" and the "Depth" column for sump subsurface soil sample VEP6-

SB04-AA-MMYY has been changed to "Bottom of accumulated material, measured depth TBD in field.."

iii) Add one MS/MSD for VOCs, SVOCs, and metals in soil and one MS for TOC.

Navy Response: An MS/MSD has been added to a sample analyzed for VOCs, SVOCs, and metals in soil. With respect to TOC, please see the response to PREQB Comment 29a(iii).

k) PI8

i) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses.

Navy Response: Please see the response to PREQB Comment 29a(iii).

ii) For sample VEP8-SO13, add the number "1" in the Number of Samples column.

Navy Response: Comment incorporated.

l) PI 10

i) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

ii) The Depth column for subsurface soil should not state per MQAPP Attachment 7. As per Worksheets 11, Question #3, subsurface soil sample depths will not follow the Master QAPP; these samples will be collected just above the bottom of the lagoon material, if it can be visually distinguished from the native material. Therefore, include TBD for the depth of these subsurface soil samples.

Navy Response: The "Depth" column for PI 10 subsurface soil samples in Worksheet #18 has been revised to state "Just above the bottom of the lagoon material, if it can be visually distinguished from the native material."

m) PAOC I - As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

n) PAOC O - As per Worksheet #12-8, add one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

o) PAOC M -Add this site to Worksheet #18 in order to show the sample identification scheme, the parameters that will be analyzed, and the sampling SOP reference that will be used in the event samples are collected.

Navy Response: The requested information has been added with a footnote that the samples will be collected only if visual/PID/odor screening suggests the presence of contamination.

p) PAOC Q - As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses.

Navy Response: Please see the response to PREQB Comment 29a(iii).

q) PAOCX

i) As per Worksheet #12-8, add one field duplicate sample for pH and TOC analyses and one matrix spike sample for TOC analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii).

ii) The Depth column for subsurface soil should not state "As per MQAPP Attachment 7" As per Worksheet #11, Question #3, soil sample depths will not follow the Master QAPP Change surface soil sample depths to "0-6 inches below the bottom of the debris." Change subsurface soil sample depths to "TBD"

Navy Response: The "Depth" column for all surface soil samples has been revised to state "0-6 inches below the bottom of the debris."

The "Depth" column for all subsurface soil samples has been revised to state "TBD" and a footnote has been added that indicates subsurface soil samples will be collected only if visual/PID screening suggests the presence of contamination.

To make PI 7 in Worksheet #18 consistent with the above revision, subsurface soil samples have been added for PI 7 and "TBD" inserted in the "Depth" column and a footnote has been added that indicates subsurface soil samples will be collected only if visual/PID screening suggests the presence of contamination.

r) Regional Groundwater Study -As per comment #22b, the Analytical Group column should also include pesticides and PCBs. It should also be noted that Worksheet #20 includes pesticides and PCBs for the Regional Groundwater investigation.

Navy Response: Please see the response to PREQB Comment 22b.

30) Worksheet #19: Analytical SOP Requirements Table

a) Add sediment to all surface (SS) and subsurface (SB) soil rows.

Navy Response: Sediment has been added to all SS and SB rows as described above.

b) Add surface water to all groundwater (GW) and aqueous (AQ) sample rows.

Navy Response: Surface Water has been added to all GW and AQ rows as described above.

c) Clarify what "WM" stands for in the Containers column.

Navy Response: WM stands for a wide mouth soil jar. For consistency, WM will be changed to "soil jar" with the exception of the cell describing grain size containers, where WM will be changed to "wide mouth".

d) Add a row for TPH-GRO in surface and subsurface soil (SOPs CA-316 and CA-320).

Navy Response: TPH-GRO has been added to a row for SS and SB samples. Both TPH-GRO and TPH-DRO have been added as rows and split in the third column under "Anaytical and Preparation Method/ SOP Reference" similar to the EXPLO format on the row above.

e) Matrix SS & SB, VOCs

i) Add SOP CA-214 (5035) to the SOP Reference column.

Navy Response: 5035 / CA-214 has been added for SS&SB VOCs.

ii) Confirm containers and preservation columns; according to previous documentation, none of the solid samples for VOCs will be preserved in the field. Therefore, references to these vials can be removed.

Navy Response: EnCores will be used for VOCs in soil. References to the preserved vials have been removed. Also, please see the response to PREQB Comment 30e(iv).

iii) Change the sample volume from 1 VOA vial to three 5-gram EnCores.

Navy Response: Sample volume has been changed to four 5-gram EnCores.

iv) Change the holding time as follows for EnCore samplers.

(1) EnCore samplers - 48 hours to preservation in two water-preserved vials and one methanol-preserved vial; 48 hours from preservation to freezing of low-level preserved vials; 14 days from collection to analysis of water-preserved or methanol-preserved vial.

Navy Response: The text has been changed to read:

"EnCore samplers - 48 hours from collection to preservation into three water-preserved vials and one methanol-preserved vial; 48 hours from collection to freezing of low-level preserved vials; 14 days from collection to analysis of water-preserved or methanol-preserved vial."

v) If field preservation will actually be left in the SAP, change the holding time for field-preserved vials as follows:

(1) Water-preserved vials - 48 hours to freezing; 14 days from collection to analysis.

Navy Response: Field preservation of VOCs will not be performed.

(2) Methanol-preserved vials -14 days from collection to analysis

Navy Response: Field preservation of VOCs will not be performed.

f) Matrix SS & SB, SVOCs - Clarify which preparation procedure (3540 or 3550) will be used for each matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: The laboratory will use 3550 (sonication) unless a difficult matrix necessitates the use of 3540 (soxhlet). Since either method may be used, the table cell will remain as is, but the following footnote has been added to explain the preparation procedure hierarchy:

"The laboratory will use 3550 (sonication) unless a difficult matrix necessitates the use of 3540 (soxhlet)."

g) Matrix SS & SB, Pesticides/PCBs - Clarify which preparation procedure (3540 or 3550) will be used for each matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: Please see the response to PREQB Comment 30f.

h) Matrix SS & SB, Perchlorate - Under Preservation Requirements, add the requirement to ensure there is headspace in the sample jar as per SW-846 method 6850.

Navy Response: The Preservation Requirements cell has been revised to read: "Field filtering with 0.2 um PTFE membrane filter, (4 +/- 2) C, headspace in jar, protect from light."

i) Matrix SS & SB, TPH-DRO:

   i) Clarify that this is TPH-DRO since it does not cover GRO

Navy Response: Since GRO samples will be collected by EnCore, the TPH row has been split into GRO and DRO.

   ii) Clarify which preparation procedure (3540, 3545, or 3550) will be used for each matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: The laboratory will use 3550 (sonication) unless a difficult matrix necessitates the use of 3540 (soxhlet) or 3545 (pressurized fluid extraction). Since any of these three methods may be used, the table cell will remain as is, but the following footnote has been added to explain the preparation procedure hierarchy:

"The laboratory will use 3550 (sonication) unless a difficult matrix necessitations the use of 3540 (soxhlet) or 3545 (pressurized fluid extraction)."

   iii) SOP CA-536 is listed on this Worksheet but was not included on Worksheet #23, which lists all SOPs Clarify if this SOP will be used, and if so, add it to Worksheet #23.

Navy Response: SOP CA-536 will not be used. It has been removed from Worksheet #19.

j) Matrix SS & SB, Metals - Clarify that this is metals and cyanide.

Navy Response: A footnote has been added to read "The METAL analysis group includes metals, mercury, and cyanide. The FMETAL analysis group includes metals and mercury."

k) Matrix SS & SB, pH - Change the SOP listed for pH analysis to CA-709. The SOP currently listed is for TOC.

Navy Response: The SOP for pH in soil has been changed to CA-709.

l) Matrix GW & AQ, VOCs - Add SOP CA-320 (5030) to the SOP References column.

Navy Response: SOP CA-320 (5030) has been added to the SOP column for VOCs in water.

m) Matrix GW & AQ, SVOCs - Clarify which preparation procedure (3510 or 3520) will be used for each matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: Separatory funnel extraction (3510) is the preferred method. Continuous Liquid Liquid Extraction (3520) will be used when a difficult matrix necessitates its use. This SOP covers both methods, so the following footnote has been added to explain the preparation procedure hierarchy:

"The laboratory will use 3510 (separatory funnel extraction) unless a difficult matrix necessitations the use of 3520 (continuous liquid liquid Extraction)."

n) Matrix GW & AQ, Pesticides/PCBs.

i) Clarify which preparation procedure (3510 or 3520) will be used for each matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: Please see the response to PREQB Comment 30m.

ii) The containers listed are (2) 1000 mL amber bottles. Confirm that there will be one extraction for pesticides and PCBs, as listed in this table. If there will be separate extractions for each analysis, (4) 1000 mL amber bottles will need to be collected.

Navy Response: There will be one extraction for both pesticides and PCBs, and so only 2 ambers are required.

0) Matrix GW & AQ, Perchlorate

i) Under Preservation Requirements, add the requirement to ensure there is headspace in the sample jar as per SW-846 Method 6850.

Navy Response: Please see the response to PREQB Comment 30h.

ii) Section 8.2 of SW-846 Method 6850 requires that the samples be filtered using 0.2 um PTFE membrane filtration. Clarify whether or not this will be performed in the field and include under Preservation Requirements.

Navy Response: Based on Appendix F of the DOD Perchlorate Handbook (March 2006), field filtering is preferable; therefore, it will be conducted to the extent practicable. The Preservation Requirements cell has been revised to read: "Field filtering with 0.2 um PTFE membrane filter; (4 +/- 2) C headspace in jar, protect from light."

p) Matrix GW & AQ, TPH-DRO - Clarify that this is TPH-DRO since it does not cover GRO.

Navy Response: The liquid TPH row has been split into rows for TPH-DRO and TPH-GRO.

q) Matrix GW & AQ, Metals

i) Clarify that this is metals and cyanide.

Navy Response: Please see the response to PREQB Comment 30j. Also, please note that Worksheet #15 already defines each analysis group and its analytes.

ii) SOP CA-751 is listed on this Worksheet but was not included on Worksheet #23, which lists all SOPs Clarify if this SOP will be used, and if so, add it to Worksheet #23.

Navy Response: Please see the response to PREQB Comment 30q(iii).

iii) Add SOPs CA-7'73 (cyanide) and CA-615 (mercury) to the SOP Reference column.

Navy Response: This cell has been updated to read: "SW-846 6020, 7470, 9012, 3010 / CA-627. CA-615, CA-773, CA-604."

r) Matrix GW & AQ, Filtered Metals - Clarify why SW-846 6010 (SOP CA-608) is included. The analysis of filtered metals is being performed in conjunction with groundwater and surface water samples, which are utilizing SW-846 6020 only. The analysis for filtered metals should be performed by the same technique as the total metals In addition, according to Worksheet #23, SW-846 6010 (SOP CA- 608) is associated with IDW samples only.

Navy Response: This cell has been updated to read: "SW-846 6020, 7470, 3010 / CA-627, CA-615, CA-604."

s) Matrix GW & AQ, Wet Chemistry - Clarify why nitrate, nitrite, and sulfate are included in the holding time column. These analyses are not being performed on any samples in this SAP.

Navy Response: The holding time cell has been changed to read: "28 Days for Cl."

t) Matrix LIQ, TCLP VOCs

i) Delete SOP CA-510 in the Analytical SOP Reference column; this is applicable to non-VOC TCLP according to Worksheet #23.

Navy Response: CA-510 has been replaced with CA-209 in the Analytical SOP Reference column.

ii) Add SOP CA-209 (ZHE) to the Analytical SOP Reference column.

Navy Response: Please see the response to PREQB Comment 30t(i).

u) Matrix, LIQ, TCLP SVOCs

i) Clarify which preparation procedure (3510 or 3520) will be used for this matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: Please see the response to PREQB Comment 30m.

ii) Add SOP CA-51O (1311) to the Analytical SOP Reference column.

Navy Response: CA-510 has been added to this cell.

v) Matrix, LIQ, TCLP Pesticides

i) Clarify which preparation procedure (3510 or 3520) will be used for this matrix. There needs to be consistency in how the samples are extracted as there can be differences in the extraction efficiency of each method.

Navy Response: Please see the response to PREQB Comment 30m.

w) Matrix, LIQ, TCLP Herbicides -Add SOP CA-510 (1311) to the Analytical SOP Reference column.

Navy Response: CA-510 has been added to this cell.

x) Matrix, LIQ, TCLP Metals - Add SOP CA-510 (1311) to the Analytical SOP Reference column.

Navy Response: CA-510 has been added to this cell.

31) Worksheet #20: Field Quality Control Sample Summary Table

a) The table was not completed properly as far as the No. of Sampling Locations. A footnote (#2) was included stating that samples collected at different depths at the same location would be counted as a separate sampling location but this was not performed. As a result, the No. of Sampling Locations will double for most sites where soil sampling is being performed due to the collection of both surface and subsurface samples. The following sites are affected and need

to double the No. of Sampling Locations in most cases - SWMU 1, SWMU 2, SWMUs 6/7, SWMU 10, AOC G, PI-5, PI-8, PI-10, PAOC I, PAOC O, PAOC P, PAOC Q, and PAOC X.

Navy Response: Based on the final comment responses, the number of samples in Worksheet #20 has been reconciled with the number of samples in Worksheet #18 to ensure consistency.

b) Based on comment #31a above, for each site and matrix, the number of field duplicates and MS/MSDs will have to be increased accordingly to be at the required frequency of one per 10 samples for field duplicates and one per 20 samples for MS/MSDs, as listed on Question #4 on Worksheet #11 and in Worksheet #12.

Navy Response: The number of field duplicates and MS/MSDs has been increased to satisfy the 1/10 and 1/20 frequency, respectively.

c) Clarify how the equipment blanks for VOCs in solid matrices are being collected since these samples are being collected using an EnCore sampler. Due to the nature of VOC soil sampling, equipment blanks may not be required.

Navy Response: Footnote #5 has been modified to read "Equipment blanks may be collected for VOCs samples because the soil may be obtained using split spoon, direct push acetate liner, hand auger, etc., which may require decontamination.

d) As per Worksheet #12-8, add one matrix spike sample and one equipment blank for TOC analysis of each matrix at each site

Navy Response: Please see the response to PREQB Comment 29a(iii).

e) Put the soil wet chemistry analyses in separate rows due to the different QC requirements associated with each analysis.

Navy Response: Please see the response to PREQB Comment 29a(iii). Worksheet #20 has been updated accordingly.

f) SWMU 1

i) Two sample locations are listed for the soil wet chemistry and grain size analyses. However, according to Worksheets 18, the wet chemistry analyses are only being performed at one sample location (subsurface soil, SO06) Clarify and update the worksheets accordingly to be consistent.

Navy Response: Worksheet #18 shows that SO16 will also be analyzed for these parameters.

ii) Due to the nature of sampling, surface water should be listed separately from the solid sample matrices The EnCore listed for VOCs does not apply to surface water and equipment blanks may not be required for any of the surface water analyses due to the nature of the sampling.

Navy Response: SW VOCs have been split from SS/SB or SD (as is done for FMETAL). Equipment blanks may be necessary for SW sampling depending on the method used to collect SW samples. Please refer to the surface water sampling SOP G-2 in the Master QAPP. Equipment blanks will be collected if non-disposable equipment is used.

iii) One sample location is listed for the wet chemistry analyses of a solid sample and surface water sample in the ephemeral stream. However, according to Worksheet #18, none of these

samples are being analyzed for these parameters. Clarify and update the worksheets accordingly to be consistent.

Navy Response: All SS/SB/SD samples (associated with the stream) shall be analyzed for pH, TOC, dry bulk density, and grain size. SW samples (associated with the stream) will not be analyzed for WCHEM (chloride and TDS). Both Worksheets #18 and #20 have been updated accordingly.

iv) Six groundwater sample locations are listed for most analyses. However, according to Worksheet #18, nine groundwater samples will be collected. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Please see the response to PREQB Comment 31a.

v) One groundwater sample is listed for the wet chemistry analyses. However, according to Worksheet #18, at least eight locations will be submitted for these analyses. This may be increased to nine locations depending on the resolution of comment #29a (vii). Clarify and update the worksheets accordingly to be consistent.

Navy Response: Please see the response to PREQB Comment 29a(vii).

g) SWMU 2 - Please refer to comment #12c regarding the Analytical Group listed in this worksheet for the soil samples.

Navy Response: Please see the response to PREQB Comment 12c.

h) Wells South of Camp Garcia

i) One groundwater sample is listed for the wet chemistry analyses. However, according to Worksheet #18, two locations will be submitted for these analyses. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Worksheet #20 has been updated for the wells south of Camp Garcia to indicate samples from both wells will be analyzed for wet chemistry parameters.

ii) Four equipment blanks and four trip blanks seems excessive for two groundwater samples. The number of QC samples here should be revisited.

Navy Response: The number of equipment blanks and trip blanks has been corrected to two. The number of equipment blanks is approximate in that they are collected at a particular frequency of wells sampled per day, which may vary by day.

i) SWMU 6/7 - One soil sample is listed for the wet chemistry and grain size analyses. However, according to Worksheet #18, four locations will be submitted for these analyses. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Worksheets #18 and #20 have been revised to reflect two soil samples for wet chemistry and grain size.

j) SWMU 10 - One groundwater sample is listed for the wet chemistry analyses. However, according to Worksheet #18, five locations will be submitted for these analyses. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Worksheets #18 and #20 have been revised to reflect two groundwater samples for wet chemistry analyses.

k) PI 4 - One groundwater sample is listed for the wet chemistry analyses. However, according to Worksheet #18, seven locations will be submitted for these analyses. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Worksheets #18 and #20 have been revised to reflect two groundwater samples for wet chemistry analyses.

l) PI 7 - Two soil samples are listed for the wet chemistry and grain size analyses. However, according to Worksheet #18, only one location will be submitted for these analyses. Clarify and update the worksheets accordingly to be consistent.

Navy Response: Both Worksheet #18 and Worksheet #20 indicate that two soil samples will be collected for these analyses.

m) PI 6 - Four soil samples are listed for the PCB analyses. However, according to Worksheet #18, six locations will be submitted for this analysis. Clarify and update the Worksheets accordingly to be consistent.

Navy Response: Worksheet #20 has been updated to show six samples for PCB analyses.

32) Worksheet #21, Project Sampling SOP References Table -The Comments column for the SOP in Attachment C-4 states "Not included in MQAPP." Include this comment for SOPs in Attachments C-l, C-2, C-3, and C-5 also.

Navy Response: The comment "Not included in MQAPP" has been added to the Comment column in Worksheet #21 for Attachments C-1, C-2, C-3, and C-5.

33) Worksheet #22 -Field Equipment Calibration, Maintenance, Testing, and Inspection Table

a) In the SOP Reference column, note MQAPP next to each SOP number so that the location of the SOP is easily located.

Navy Response: In all but the TPH field assay kit row, the SOP reference has been prefaced by "MQAPP Attachment 1." In the TPH field assay kit row, the text has been changed to "SAP Attachment C-1."

b) YSI pH probe -The table states the acceptance criterion is pH 4.0 ±3% However, the referenced SOP C-l requires the calibration to include two standards (pH 7 and one other standard). The acceptance criterion in SOP C-l is ±0.2 standard units of the true value. The table must be updated to be consistent with the referenced SOP.

Navy Response: In SAP Worksheet #22, YSI pH probe row, the "Acceptance Criteria" cell has been changed to "Std X-0.2<Reading<Std X+0.2."

c) YSI Specific Conductance Probe -The table states the acceptance criterion is 4.49 ±3%. However, the referenced SOP C-l requires the calibration to include a 1000 úmhos standard. It is unclear what the 4.49 is referring to. The table must be updated to be consistent with the referenced SOP.

Navy Response: In SAP Worksheet #22, YSI Specific conductance probe row, the "Acceptance Criteria" cell has been changed to "±3%."

d) Hach Turbidity Probe

i) Clarify if this is a probe or meter. The Corrective Action column in this table refers to a "probe" but the referenced SOP C-l refers to an instrument.

Navy Response: In SAP Worksheet #22, the "Field Equipment" cell has been changed to "Hach Turbidity Meter."

ii) The calibration acceptance criterion in this table is not in agreement with the referenced SOP. The table must be updated to be consistent with the referenced SOP.

Navy Response: In SAP Worksheet #22, Hach Turbidity Meter row, the "Acceptance Criteria" cell has been changed to " 0.1 to 10 NTU standard - ±10%; 11 to 40 NTU standard - ±8%; 41 to 100 NTU standard - ±6.5%; >100 NTU standard - ±5%."

e) YSI Dissolved Oxygen and Temperature Probes

i) The table states the acceptance criterion is to be consistent with the current atmospheric pressure and ambient temperature. However, the referenced SOP C-l requires the calibration at 100% saturation with an acceptance criterion of ±0.3 mg/L DO. In addition, the table states that this calibration is performed daily before use but the referenced SOP C-l states that this calibration should be performed prior to use as well as at the end of the day. The table must be updated to be consistent with the referenced SOP.

Navy Response: In SAP Worksheet #22, YSI Dissolved oxygen and Temperature Probes row, the "Acceptance Criteria" cell has been changed to "±3 mg/L DO of what the tabulated DO is for the measured temperature." In addition, the "Frequency" cell has been changed to "Daily, before use, at the end of the day (if practicable), and when unstable readings occur."

ii) As per the referenced SOP C-l, update the Inspection Activity column to include checking the sensor for bubbles and checking the membrane for wrinkles.

Navy Response: In SAP Worksheet #22, YSI Dissolved oxygen and Temperature Probes row, the following text has been added in the Testing/Inspection Activity cell: "Check sensor for bubbles and membrane for wrinkles or tear." In addition, for the "Frequency," "Daily, before use" has been added. Finally, for "Corrective Action," "Follow manufacturer's instructions to remove bubble or replace torn membrane" has been added.

f) PID - As per the referenced SOP C-8, update the Calibration Frequency column to additionally include when erratic readings are observed and at the end of the day.

Navy Response: In SAP Worksheet #22, PID row, the "Frequency" cell has been changed to "Daily, before use, at the end of the day (if practicable), and when unstable readings occur." In addition, in the "Acceptance Criteria" cell, the following has been added to "ambient air reads 0.0 ppm ±3%": "(if possible)." Atmospheric moisture on Vieques does not always facilitate this.

g) FID

i) As per the referenced SOP C- 7, update the Calibration Frequency column to additionally include when erratic readings are observed and at the end of the day.

Navy Response : In SAP Worksheet #22, FID row, the "Frequency" cell has been changed to "Daily, before use, at the end of the day (if practicable), and when unstable readings occur."

ii) As per the referenced SOP C- 7, update the Acceptance Criteria column to additionally include the requirement for ambient air readings, similar to what is listed for the PID.

Navy Response: Please see the response to PREQB Comment 33f.

h) If ORP is going to be measured as part of the water quality parameters for groundwater or surface water, add this probe to Worksheet #22.

Navy Response: In SAP Worksheet #22, a row has been added for ORP as follows:

"Field Equipment - ORP; Calibration Activity - Calibrate using ORP standard solution; Maintenance Activity - check batteries and have a replacement set on hand; Testing/Inspection Activity - Visual inspection; Frequency - Daily, before use, at the end of the day (if practicable), and when unstable readings occur; Acceptance Criteria - ±10 mV of the theoretical redox standard value at that temperature; Corrective Action - Clean probe with deionized water and calibrate again. Do not use this instrument if unable to calibrate properly; Resp. Person - FTL; SOP Reference-MQAPP Attachment C-1."

i) TPH Field Assay Kit

i) Update the Maintenance Activity column to include recharging the battery prior to use and keeping the instrument out of sunlight when not in use.

Navy Response: In SAP Worksheet #22, TPH field assay kit row, Maintenance Activity column, the following statement has been inserted: "Recharge the battery prior to use and keep the instrument out of sunlight when not in use."

ii) Update the Calibration Frequency column to include a calibration check daily prior to use and after every 10 samples. In addition, as per the manufacturer, if the ambient temperature varies by more than ±10 °C from the original calibration temperature, recalibration is required at the new temperature; add this requirement also to the Calibration Frequency column.

Navy Response: In SAP Worksheet #22, TPH field assay kit row, the "Frequency" cell has been changed to "Daily prior to use, after every 10 samples, and if the ambient temperature varies by more than ±10 °C from the original calibration temperature."

iii) Change the SOP Reference column to C- 1.

Navy Response: Please see the response to PREQB Comment 33a.

34) Worksheet #23: Analytical SOP References Table

a) SOP CA-736 for ignitability is included on Worksheet #19; therefore, include it on this worksheet.

Navy Response: A row has been added for CA-736 and it will be included with the rest of the SOPs.

b) Clarify if SOPs for SIM analysis (CA-213 and CA-220) are inclusive of all compounds being analyzed by SIM in these investigations. If not, the last column will need to be changed to "Y" with the modifications provided for each SOP.

Navy Response: <u>CA-213:</u> Table 5 in SOP CA-213 was reviewed against SIM compounds for Worksheet #15 SVOCs. All SIM compounds in Worksheet #15 are addressed in CA-213 with the exception of 1,4-Dioxane. Therefore, the "N" in the "Modified for Project Work?" cell has been changed to a "Y" and Footnote 1 revised to indicate that the SOP has been modified to include 1,4-Dioxane.
<u>CA-220:</u> Table 3 in SOP CA-220 was reviewed against SIM compounds for Worksheet #15 aqueous VOCs. All SIM compounds in Worksheet #15 are addressed in CA-220. Therefore, "N" in the "Modified for Project Work?" cell is accurate.

c) SOP CA-512 - Revise the Matrix and Analytical Group column to show SVOC instead of PEST/PCB.

Navy Response: Comment incorporated.

d) SOP CA-515 - Revise the Matrix and Analytical Group column to show GW, SW, and AQ in addition to IDW. If this is not appropriate, provide the applicable SOP for extraction of these matrices for pesticides and PCBs.

Navy Response: The "Matrix and Analytical Group" cell for SOP CA-515 has been revised to "GW, SW, AQ, IDW/PEST."

e) SOPs CA-604 and CA-605 -The title of these SOPs indicates they are associated with preparation of samples for ICP-AES analysis. However, all samples are being analyzed by ICP/MS. Clarify if these SOPs are appropriate for preparation of samples for ICP/MS. If modifications will need to be made to accommodate ICP/MS, the last column will need to be changed to "Y" with the modifications provided for each SOP.

Navy Response: Both of these SOPs are applicable to both ICP-AES and ICP-MS. The title of SOP CA-605 has been changed to "Acid Digestion of Solid Samples by USEPA Method 3050 for Metals Analysis by ICP-AES and ICP-MS" to reflect the second page of the SOP.

f) SOP CA-627 - Should surface soil, subsurface soil and sediment be included in the applicable matrices? If not, provide the SOP appropriate for ICP/MS analysis of solid samples.

Navy Response: The "Matrix and Analytical Group" cell for SOP CA-627 has been revised to "SS, SB, SD, GW, SW, AQ/METAL."

g) SOP CA-709 - Should surface soil, subsurface soil and sediment be included in the applicable matrices? If not, provide the SOP appropriate for pH analysis of these solid matrices.

Navy Response: The "Matrix and Analytical Group" cell for SOP-709 has been revised to "SS, SB, SD, IDW/CORR, WCHEM."

h) Clarify where SOPs CA-722 and 739 will be used. If not being used, delete from this worksheet.

Navy Response: Sulfide and Alkalinity are not being analyzed. Therefore, these SOPs have been deleted from this worksheet.

i) Clarify what the asterisk indicates for SOPs CA-739, CA-741, CA-742, and CA- 761.

Navy Response: The asterisk footnote was cut off during publication. footnote read: "*These SOPs have been revised and are being reviewed and finalized as of June, 2008.". It has since been determined that these SOPs have been updated and so the footnote has been removed, the

asterisks have been removed, and the titles for these SOPs have been updated (the revision date is in the title).

35) Worksheet #24: Analytical Instrument Calibration Table

a) There are references to footnotes (1) and (2) in the last two column headers. Define these footnotes at the bottom of the table.

Navy Response: The following footnotes have been added: "1. Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23). 2. Name or title of responsible person may be used."

b) The following instruments were not included and must be added to the table

i) pH probe for SOP CA-709

Navy Response: A row has been added for the pH probe.

ii) Ion chromatograph for chloride (SOP CA - 742)

Navy Response: A row has been added for the IC.

iii) Analytical balance for TDS (SOP CA-720)

Navy Response: A row has been added for the TDS balance.

c) In some cases, the information provided in the first column labeled Instrument was not correct. Please change the following rows as follows:

i) GC (TPH-DRO) and GC (TPH-GRO) - change to GC/FID

Navy Response: The referenced rows have been changed as follows:

"GC (TPH-DRO)" to "GC/FID (TPH-DRO)"

"GC (TPH-GRO)" to "GC/FID (TPH-GRO)"

ii) SW846 6010 - change to ICP-AES

Navy Response: The referenced row has been changed as follows:

"SW846 6010 and TCLP Metals" to "ICP-AES (SW-846 6010 and TCLP Metals)"

iii) SW846 6020 - change to ICP/MS

Navy Response: The referenced row has been changed as follows:

"SW846 6020 (Metals)" to "ICP/MS (SW-846 6020)"

iv) MS (Perchlorate) - change to LC/MS/MS

Navy Response: The referenced row has been changed as follows:

"MS (EXPLO (Perch))" to "LC/MS/MS (Perchlorate)"

d) The Calibration Procedure for LC/MS/MS (Perchlorate) is not correct. As per the method, add rows for Initial Calibration, CCV, and ICV.

Navy Response: Per SOP BR-LC-004, rows have been added for Initial Calibration, ICV, and CCV.

e) Frequency of Calibration column

i) Mercury - Calibration procedure refers to an ICV and CCV but the frequency of calibration column and corrective action column only discusses the CCV. Update all columns to be consistent.

Navy Response: The "Initial calibration verification and continuing calibration verification" row has been split into rows for ICV and CCV.

ii) GC/ECD (8082) -The information in this column does not cover the frequency of calibration. Please update.

Navy Response: The frequency of calibration for ICAL was updated to read "IC-instrument receipt, major instrument change, when CC does not meet criteria."

iii) LC/MS/MS (Perchlorate) - Update to include frequency of initial calibration, ICV (immediately after initial calibration), and CCV (prior to samples, every 10 samples, and at end of sequence), as per SW846 method 6850.

Navy Response: Please see the response to PREQB Comment 35d.

f) Acceptance Criteria column

i) Mercury - Include the number of required calibration points.

Navy Response: The "Acceptance Criteria" for mercury has been updated to include, for the initial calibration verification, the analysis of a calibration blank and five calibration standards which must fall within 90-100 percent of the expected value. The acceptance criteria for the continuing calibration verification is "80-120 percent of the true value".

ii) TOC -Include the number of required calibration points.

Navy Response: The "Acceptance Criteria" for TOC has been updated to show that a six-point curve will be run.

iii) VOC (8260)

(1) It is unclear if the criteria in the table are being used or if the criteria in Worksheet #24a are being used. Clarify and update, as necessary.

Navy Response: Worksheets #24a-d are no longer applicable since SOM01.2 is not being performed. Worksheet #24 does not refer to them. Worksheets #24a-d have been removed.

(2) Provide separate calibration criteria for the SIM analysis as the calibration criteria will be different from the Low method and not dependent on CCCs and SPCCs. There should be specific criteria for each compound being analyzed by SIM.

Navy Response: The calibration rows for 8260 have been split into rows for 8260 and 8260-SIM. 8260-SIM calibration information is present in Table 1 of CA-220.

iv) SVOC (8270)

(1) It is unclear if the criteria in the table are being used or if the criteria in Worksheet #24c are being used. Clarify and update, as necessary.

Navy Response: Please see the response to PREQB Comment 35f(iii)[1].

(2) Provide separate calibration criteria for the SIM analysis as the calibration criteria will be different from the Low method and not dependent on CCCs and SPCCs. There should be specific criteria for each compound being analyzed by SIM.

Navy Response: The calibration rows for 8270 have been split into rows for 8270 and 8270-SIM. 8270-SIM calibration information is present in Table 1 and section 7.5.2.1 of CA-213.

v) GC/ECD (8082) - The information in this column does not cover the acceptance criteria. It appears that this information was inadvertently placed in the Frequency of Calibration column. Update as necessary.

Navy Response: Please see the response to PREQB Comment 35e(ii).

vi) HPLC (Explosives) - Initial calibration acceptance criteria should be > 0.990.

Navy Response: The "³" has been changed to a "≥".

vii) LC/MS/MS (Perchlorate) - Add acceptance criteria for initial calibration (6-points plus blank; r > 0.995), ICV (±15%), and CCV (±50% for low-range standard and ±15% for mid-range standard), as per SW846 method 6850.

Navy Response: Please see the response to PREQB Comment 35d.

g) Corrective Action column, LC/MS/MS (perchlorate) - Update this column to include specific corrective action for the initial calibration, ICV, and CCV. CCV corrective action should require reanalysis of samples not bracketed by acceptable CCV.

Navy Response: Please see the response to PREQB Comment 35d.

h) SOP Reference column

i) VOC (8260) - Add SOP CA-220 which includes SIM.

Navy Response: Comment incorporated.

ii) SVOC (8270) - Add SOP CA-213 which includes SIM.

Navy Response: Comment incorporated.

i) Delete Worksheet #24b; this is not applicable to calibrations. In addition, the header of this table is incorrect.

Navy Response: Please see the response to PREQB Comment 35f(iii)[1].

j) If Worksheet #24c is being used for calibration criteria of SVOCs (see comment #35 f(iv)(1)), update the header of this table to state Semivolatile instead of Volatile.

Navy Response: Please see the response to PREQB Comment 35f(iii)[1].

k) Delete Worksheet #24d; this is not applicable to calibrations. In addition, the header of this table is incorrect.

Navy Response: Please see the response to PREQB Comment 35f(iii)[1].

36) Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

a) SOP Reference column - As per the footnote #1, the SOP References should match the SOPs provided in Worksheet #23. This was not done as follows:

i) ICP-AES (metals) -Change from SOP CA-630 to CA-608

Navy Response: Comment incorporated.

ii) GC/ECD (pesticide) - Delete SOPs CA-340 and CA-34l and add SOP CA-329.

Navy Response: Comment incorporated. Applicable SOPs are CA-302 and CA-329.

iii) GC/MS (VOC) - Delete SOP CA-225 and add SOPs CA-214 and CA-320.

Navy Response: Comment incorporated. Applicable SOPs are CA-202, CA-214, and CA-320. CA-220 will also be added.

iv) GC/MS (SVOC) - Delete SOP CA-224 and add SOP CA-213.

Navy Response: Comment incorporated.

v) Mercury - Delete SOP CA-631 and add SOPs CA-611 and CA-615.

Navy Response: Comment incorporated. CA-629 has also been added.

vi) ICP/MS - Change SOP CA-631 to CA-627.

Navy Response: Comment incorporated.

b) Delete reference to metals after the Konelab instrument. This is for cyanide only.

Navy Response: Cyanide belongs to the METAL analysis group. To clarify this, "CN" has been changed to "CN only."

c) Clarify what the Konelab Autosampler is for on page 280 and how this is different from the Konelab on page 279 using SOP CA-773. In addition, the Kone1ab Autosampler references SOP CA-751 which was not included on Worksheet #23. Clarification is required and worksheets need to be updated as needed to be consistent.

Navy Response: SOP CA-751 was an old SOP and the row corresponding to it and the Konelab Autoanalyzer has been removed. The row referencing SOP CA-773 is correct and SOP CA-769 has also been added to this cell.

d) Combine the last two rows so there is only one row for the LC/MS/MS for perchlorate.

Navy Response: Comment incorporated.

e) The following instruments were not included and must be added to the table:

i) Ion chromatograph for chloride (CA-742)

Navy Response: A row has been added for the IC.

ii) Analytical balance for TDS (CA-720)

Navy Response: A row has been added for the TDS balance.

iii) pH meter (CA-709)

Navy Response: A row has been added for the pH probe.

37) Worksheet #27: Sample Custody Requirements Table

a) Sample Labeling - Tape should not be used on the aqueous VOC vials as the tape could interfere with the robotics of the autosampler. Add this exception to the text.

Navy Response: This is a common field procedure and the laboratory has not experienced this problem because the field staff do not use an excess of tape on the VOC vials.

b) Sample Identification Procedures - Revise the text to clarify that the receiving clerk will check the pH values of water samples requiring preservative, with the exception of VOCs.

Navy Response: The third sentence under "Sample Identification Procedures:" has been revised to read:

"Next, if any water samples (with the exception of VOC samples) require . . ."

38) Worksheet #28: Laboratory QC Samples Table

a) Worksheet #28-1: VOCs/solid matrices

i) Clarify why the method blank acceptance criteria is different than the trip and equipment blank acceptance criteria in Worksheet #12-1. Typically, these are all the same.

Navy Response: The Trip Blank and Equipment Rinseate Blank criteria on Worksheet #12-1 have been updated to match method blank criteria on Worksheet #28-1.

ii) LCS Corrective action - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated.

iii) Surrogates -The corrective action must be revised to reanalyze, regardless if still within holding time. Sometimes, a sample analyzed outside of holding time is of better quality than a sample with very low surrogate recoveries within holding time. Therefore, this must be revised.

Navy Response: Typically, a laboratory automatically reanalyzes samples if they are within hold time, but contacts the client first before reanalyzing outside of hold time. To clarify, though, the "Corrective Action" cells for Surrogates have been changed to read:

"Re-extract and re-analyze if sufficient sample volume is available."

iv) Clarify why there is a SIM section on this worksheet. The corresponding Worksheet #12-1 did not have a SIM section. In addition, SIM is not included on any of the VOC-soil Worksheets #15 (15-1, 15-1a, and 15-1b). If SIM is being performed on soil samples for VOCs, specify which analytes and update Worksheets #15 and 12-1 accordingly. If the SIM section stays, the three comments listed above apply to this section also.

Navy Response: The laboratory does not analyze soil VOC compounds by a SIM method. These rows have been removed.

v) Worksheet #28-1a

(1) Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

(2) The lower recovery acceptance limit for vinyl chloride at 16% is very low, especially at sites where chlorinated VOCs are the primary constituents of concern. A higher recovery in the LCS is required to ensure the reported accuracy of this compound.

Navy Response: The laboratory regenerates its statistical acceptance limits occasionally and has provided new limits for most analyses. These new limits will be implemented into the draft final version of the UFP-SAP. In general, most of the limits have improved, although a few have not. For vinyl chloride in particular, the old limits were 16-149% and the new limits are 80-142%. In addition, the laboratory has submitted its master QC limits worksheet to show the most-current QC limits.

b) Worksheet #28-2: SVOCs/solid matrices

i) Clarify why the method blank acceptance criteria is different than the equipment blank acceptance criteria in Worksheet #12-2. Typically, these are all the same.

Navy Response: The "Acceptance Criteria" cell for MB on Worksheet #28-2 has been updated to match acceptance criteria for equipment rinseate blank on Worksheet #12-2.

ii) Surrogates -The corrective action must be revised to reextract and reanalyze, regardless if still within holding time. Sometimes, a sample extracted outside of holding time is of better quality than a sample with very low surrogate recoveries within holding time. Therefore, this must be revised.

Navy Response: Please see the response to PREQB Comment 38a(iii).

iii) LCS Corrective action - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated.

iv) The three comments listed above apply to the SIM section of this worksheet as well.

Navy Response: These revisions made in response to the three comments have been made to the SIM section. Also, please see the response to PREQB Comment 24c.

v) Worksheet #28-2a

(1) Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

(2) The lower recovery acceptance limits for indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene via SIM are very low, especially at sites where PAHs are the primary constituents of concern. Higher recoveries in LCSs are required to ensure the reported accuracy of these compounds.

Navy Response: Please see response to PREQB Comment 38a(v)2. If any lower limits were less than 30%, Katahdin has defaulted to 30% as the lower limit. The lower limit for indeno(1,2,3-cd)pyrene has been updated from 16 to 32 %. The lower limit for dibenz(a,h)anthracene has been updated from 24 to 30 %. The lower limit for benzo(g,h,i)perylene has been updated from 10 to 43 %.

(3) Worksheets #15-2, 15-2a, and 15-2b show that additional compounds (hexachloroethane, 2-chloronaphthalene, hexachlorobenzene, carbazole, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate) will also be analyzed by SIM. Add these compounds to Worksheet #28-2a or revise other worksheets accordingly.

Navy Response: These compounds were inadvertently omitted from Worksheet #28-2a and Worksheet #28-10a and have been added. For hexachloroethane, 2-chloronaphthalene, hexachlorobenzene, carbazole, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate, the limits for accuracy are 30-150%R and the limits for precision are 30%RPD for water and 50%RPD for soil.

c) Worksheet #28-3: Pesticides & PCBs/solid matrices

i) Add the Endrin/DDT breakdown check standard to the list of QC samples for pesticides.

Navy Response: The breakdown evaluation check occurs before samples are analyzed and at the beginning of each 12 hour shift. Breakdown of DDT or endrin should be less than or equal to 15%. The corrective action is to perform instrument maintenance and reanalyze all samples analyzed after the failing breakdown check. The analyst, supervisor, and QA manager are responsible for this corrective action. The data quality indicators are accuracy/bias and contamination. This information has been added to Worksheet #28-3.

ii) LCS Corrective action (for pesticides and PCBs) -The last sentence must be revised to read, Otherwise, reextract LCS (not blank) and affected samples.

Navy Response: Comment incorporated.

iii) Worksheet #28-3a - Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

d) Worksheet #28-4: Explosives/solid matrices

i) Change the SOP Reference in the header for perchlorate to BR-LC-004 (not BR-LC-003).

Navy Response: Comment incorporated.

ii) LCS Collective action for explosives and perchlorate - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated. Please note that this applies to the explosives (nitroaromatics/nitroamines) section.

iii) Add the following QC Samples to the perchlorate section of the table:

(1) Conductivity Limit Standard - performed prior to analysis of samples; perchlorate must be between 80-120% of the true value and the internal standard must be ± 50% of the ICV or CCV; corrective action is to decrease anion concentration in the TDS standard and re-perform test; measure of Accuracy/Bias.

Navy Response: Comment incorporated with the following exceptions: An ICS ("conductivity limit standard") is analyzed with each analytical batch. The ICS comprises of a mixture of Cl, SO4, and carbonate anions at 1000 ppm with perchlorate spiked in at the RL. DoD limits are 70-130%. The IRCS must pass the 50-150% criterion as well. Since there is no specified DoD requirement to measure sample conductivity, resetting the concentration of the Cl, SO4, and carbonate is not required; however, changing analytical conditions (or column) may be.

(2) Internal Standard (IRCS) - added to every sample and QC sample; area counts must be ±50% of the CCV; corrective action is to reanalyze sample; measure of Accuracy/Bias.

Navy Response: Comment incorporated with the following exceptions: According to the DoD, the IRCS must be within 50-150% of the mean responses detected in the initial calibration, not the CCV. DoD specification is to dilute sample until the IRCS passes provided the batch ICS passes criteria.

iv) Various acceptance limits for perchlorate QC samples refer to an MRL. This is the first mention in the SAP of this term. Define or use the same terminology used in previous worksheets.

Navy Response: References to "MRL" have been changed to "QL."

v) The corrective action for the matrix spike and matrix spike duplicates for perchlorate should include a similar contingency as done for the explosives (i.e., if the LCS results are acceptable, apply "J" flag to results of the parent sample; if both the LCS and MS/MSD are unacceptable, reprep the samples and QC).

Navy Response: Comment incorporated.

vi) Include RPD <15 for the acceptance limits for the perchlorate matrix spike duplicate.

Navy Response: Comment incorporated.

vii) Clarify what the perchlorate LFB is and how it differs from the LCS.

Navy Response: The LFB is identical to an LCS. The row has been removed from the worksheet.

e) Worksheet #28-5: TPH-GRO & DRO/solid matrices, LCS Corrective action (TPH-DRO & GRO) - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated for both TPH-GRO and TPH-DRO.

f) Worksheet #28-6, Metals and cyanide/solid matrices

i) Preparation blank corrective action (metals, mercury, and cyanide) -Revise the last sentence to read, Otherwise, redigest the blank and the associated samples.

Navy Response: Comment incorporated. Note that for CN, the sentence will read "reprep" instead of "redigest."

ii) LCS Corrective action (metals, mercury, and cyanide) - Revise the last sentence to read, Otherwise, redigest and reanalyze the LCS and all associated samples for the affected analyte.

Navy Response: Comment incorporated. Note that for CN, the sentence will read "the LCS and other samples."

iii) Metals -Add the Interference Check Sample and Calibration blanks to the list of QC Samples.

Navy Response: Rows for ICS-A, ICS-B, ICB, and CCB have been added to Worksheet #28-6 Metals as per Table 1 in SOP CA-627.

iv) Mercury - Add Calibration blanks to the list of QC Samples.

Navy Response: Rows for ICB and CCB have been added to Worksheet #28-6 Mercury as per Table 1 in SOP CA-611.

g) Worksheet #28-8: Wet chemistry/solid matrices

i) LCS Corrective action (TOC) - Revise the last sentence to read, Otherwise, reprep the LCS and all associated samples.

Navy Response: The sentence has been revised to read: "Reprep an LCS and the remaining samples." Non-detect results should be okay if the LCS fails high.

ii) TOC Low-level calibration sample - the acceptance criteria provided are for the initial calibration curve, not for a low-level calibration sample. Please clarify.

Navy Response: "Low-level calibration sample" has been changed to "low-level standard in the initial calibration."

h) Worksheet #28-9: VOCs/aqueous matrices

i) Clarify why the method blank acceptance criteria are different than the trip and equipment blank acceptance criteria in Worksheet #12-9. Typically, these are all the same.

Navy Response: TB and EB criteria in Worksheet #12-9 have been updated to match MB criteria in Worksheet #28-9.

ii) LCS Collective action (Low and SIM methods) -Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples..

Navy Response: Comment incorporated.

iii) Surrogates (Low and SIM methods) - The corrective action must be revised to reanalyze, regardless if still within holding time. Sometimes, a sample analyzed outside of holding

time is of better quality than a sample with very low surrogate recoveries within holding time. Therefore, this must be revised.

Navy Response: Please see the response to PREQB Comment 38a(iii).

iv) Worksheet #28-9a: Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

i) Worksheet #28-10: SVOCs/aqueous matrices

i) Clarify why the method blank acceptance criteria for the Low method is different than the equipment blank acceptance criteria in Worksheet #12-10. Typically, these are all the same. Depending on the response to comment #38i) iv) (3) below, this may also apply to the SIM method.

Navy Response: The MB criteria in Worksheet #28-10 (SVOC and SVOC-SIM) have been updated to match that of EB in Worksheet #12-10. Note that references to the CRQL have been changed to QL.

ii) Surrogates (Low and SIM methods) - The corrective action must be revised to reextract and reanalyze, regardless if still within holding time. Sometimes, a sample extracted outside of holding time is of better quality than a sample with very low surrogate recoveries within holding time. Therefore, this must be revised.

Navy Response: Please see the response to PREQB Comment 38a(iii).

iii) LCS Corrective action (Low and SIM methods) - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated.

iv) Worksheet #28-10a

(1) Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

(2) The lower recovery acceptance limit of 0% for phenol is not acceptable. Based on the recovery limits of other phenols, the lower limit should be no lower than 30%; revise accordingly.

Navy Response: Please see the response to PREQB Comment 38a(v)[2]. There was a typo here: Phenol's acceptance limits should have been 10-126% and not 0-126%, but the lower limit will need to be lower than 30%. Note that Table D.2 of the DoD QSM lists phenol as a poor performer and has recovery limits for this compound of 0-115%. Thus, the limits were set to 10-115%.

(3) Worksheets #15-10 and 15-10a show that additional compounds (hexachloroethane, 2-chloronaphthalene, hexachlorobenzene, carbazole, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate) will also be analyzed by SIM. Add these compounds to Worksheet #28-10a or revise other worksheets accordingly.

Navy Response: Please see the response to PREQB Comment 38b(v)[3].

j) Worksheet #28-11: Pesticides & PCBs/aqueous matrices

i) Add the Endrin/DDT breakdown check standard to the list of QC samples for pesticides.

Navy Response: Please see the response to PREQB Comment 38c(i).

ii) LCS Corrective action (for pesticides and PCBs) - Revise the last sentence to read, Otherwise, reextract LCS (not blank) and affected samples.

Navy Response: Comment incorporated.

iii) Worksheet #28-11a

(l) Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

(2) Include the surrogate recovery acceptance limits for the PCB analysis.

Navy Response: : The acceptable recovery limits for tetrachloro-m-xylene (57-111%) and for decachlorobiphenyl (15-93%) have been added. Note that the headings that indicated <u>soil</u> accuracy and precision and have been changed to <u>aqueous</u> accuracy and precision.

k) Worksheet #28-12: Explosives/aqueous matrices

i) LCS Corrective action for explosives and perchlorate - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated.

ii) Add the following QC Samples to the perchlorate section of the table:

(l) Conductivity Limit Standard - performed prior to analysis of samples; perchlorate must be between 80-120% of the true value and the internal standard must be ± 50% of the ICV or CCV; corrective action is to decrease anion concentration in the IDS standard and reperform test; measure of Accuracy/Bias.

Navy Response: Please see the response to PREQB Comment 38d(iii)[1].

(2) Internal Standard (IRCS) - added to every sample and QC sample; area counts must be ±50% of the CCV; corrective action is to reanalyze sample; measure of Accuracy/Bias.

Navy Response: Please see the response to PREQB Comment 38d(iii)[2].

iii) Various acceptance limits for perchlorate QC samples refer to an MRL. This is the first mention in the SAP of this term. Define or use the same terminology used in previous worksheets.

Navy Response: Please see the response to PREQB Comment 38d(iv).

iv) The corrective action for the matrix spike and matrix spike duplicate for perchlorate should include a similar contingency as done for the explosives (i.e.., if the LCS results are acceptable, apply "J" flag to results of the parent sample; if both the LCS and MS/MSD are unacceptable, reprep the samples and QC).

Navy Response: Please see the response to PREQB Comment 38d(v).

v) Include RPD < 15 for the acceptance limits for the perchlorate matrix spike duplicate.

Navy Response: Please see the response to PREQB Comment 38d(vi).

vi) Clarify what the perchlorate LFB is and how it differs from the LCS.

Navy Response: Please see the response to PREQB Comment 38d(vii).

l) Worksheet #28-13: TPH-GRO & DRO/aqueous matrices, LCS Corrective action (TPH-DRO & GRO) - Revise the last sentence to read, Otherwise, reprep and reanalyze the LCS and all associated samples.

Navy Response: Comment incorporated.

m) Worksheets #28-14 and 28-15: Metals and cyanide/aqueous matrices

i) Preparation blank corrective action (metals, mercury, and cyanide) -Revise the last sentence to read, Otherwise, redigest the blank and the associated samples.

Navy Response: Please see the response to PREQB Comment 38f(i).

ii) LCS Corrective action (metals, mercury, and cyanide) - Revise the last sentence to read, Otherwise, redigest and reanalyze the LCS and all associated samples for the affected analyte.

Navy Response: Please see the response to PREQB Comment 38f(ii).

iii) Metals - Add the Interference Check Sample and Calibration blanks to the list of QC Samples.

Navy Response: Please see the response to PREQB Comment 38f(iii).

iv) Mercury -Add Calibration blanks to the list of QC Samples.

Navy Response: Please see the response to PREQB Comment 38f(iv).

n) Worksheet #28-16: Wet chemistry/aqueous matrices

i) Chloride matrix spike recovery acceptance limits listed in this worksheet do not agree with the limits listed in Worksheet #12-16. Update the worksheets to be consistent.

Navy Response: The field team will not request MS/MSD for chloride. Therefore, the rows corresponding to chloride (and TOC) in Worksheet 12 have been removed. Please note that the

laboratory could still run an MS/MSD on chloride if deemed necessary, and so the rows in Worksheet 28 have been retained. In Worksheet 28, the frequency has been updated to "if deemed necessary by the laboratory".

ii) LCS Corrective action (TDS) - Revise the last sentence to read, Otherwise, reprep an LCS (not blank) and all associated samples.

Navy Response: Comment incorporated. Note that the same change has been made for TOC.

o) Worksheet #28-17: TCLP VOC

(l) Method blank - Delete reference to methylene chloride in the acceptance limits as this is not a TCLP VOC. However, allowances should be added for 2-butanone.

Navy Response: Comment incorporated.

(2) According to Worksheet #12-17, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent.

Navy Response: Although an MS/MSD will not be designated for a TCLP sample, the laboratory may choose to perform an MS. To clarify, the frequency has been updated to "if deemed necessary by the laboratory."

(3) LCS Corrective action - Revise the last sentence to read, Otherwise, reprep an LCS and all associated samples.

Navy Response: Comment incorporated.

(4) Worksheet #28-17a: Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: The "Measurement Performance Criteria Table" header has been changed to read:

"Lab and Field QC Samples"

p) Worksheet #28-18: TCLP SVOC

(l) Method blank -Delete reference to phthalates as these are not TCLP SVOCs.

Navy Response: Comment incorporated.

(2) Method blank - Last sentence of corrective action should end with " ....reextract and reanalyze the associated samples." The reference to the holding time should be removed as it does not apply.

Navy Response: Comment incorporated.

(3) LCS -Remove the reference to the holding time in this corrective action; it does not apply.

Navy Response: Comment incorporated.

(4) Surrogates - Include the acceptance limits or include a reference to another worksheet for these limits.

Navy Response: Acceptance limits are already listed in Worksheet #28-18a. A reference to this worksheet has been added to Worksheet #28-18.

(5) Internal standards - Corrective action should state "reanalysis of sample".

Navy Response: Comment incorporated.

(6) Please explain what the low-level calibration standard is in this worksheet. This standard has not been required in any of the other SVOC worksheets and the acceptance criteria do not make sense.

Navy Response: The row has been removed from the worksheet.

(7) Worksheet #28-18a: Revise header to state Lab and Field QC Samples since this table is for LCS criteria also.

Navy Response: Comment incorporated.

(8) According to Worksheet #12-18, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent

Navy Response: Please see the response to PREQB Comment 38o(2).

q) Worksheet #28-19: TCLP Pesticides

(l) Add endrin breakdown standard to the list of QC samples.

Navy Response: Please see the response to PREQB Comment 38j(i).

(2) Provide the LCS and matrix spike acceptance limits as done in other worksheets.

Navy Response: Worksheet #28-19a was inadvertently omitted. It has been included with the preliminary response to comments and will ultimately be inserted into the appropriate location in the SAP.

(3) According to Worksheet #12-19, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent.

Navy Response: Please see the response to PREQB Comment 38o(2).

(4) LCS Corrective action - Revise the last sentence to read, Otherwise, reextract an LCS and all associated samples.

Navy Response: Comment incorporated.

r) Worksheet #28-20: TCLP Herbicides

i) LCS Corrective action - Revise the last sentence to read, Otherwise, reprep an LCS and all associated samples.

Navy Response: Comment incorporated.

ii) According to Worksheet #12-20, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent.

Navy Response: Please see the response to PREQB Comment 38o(2).

s) Worksheet #28-21: TCLP Metals

i) Preparation blank corrective action (metals, mercury) -Revise the last sentence to read, Otherwise, redigest the blank and the associated samples.

Navy Response: Please see the response to PREQB Comment 38f(i), although cyanide is no longer applicable.

ii) LCS Corrective action (metals, mercury) - Revise the last sentence to read, Otherwise, redigest and reanalyze the LCS and all associated samples for the affected analyte.

Navy Response: Please see the response to PREQB Comment 38f(ii), although cyanide is no longer applicable.

iii) Metals - Add the Interference Check Sample and Calibration blanks to the list of QC Samples.

Navy Response: Please see the response to PREQB Comment 38f(iii).

iv) Mercury - Add Calibration blanks to the list of QC Samples.

Navy Response: Please see the response to PREQB Comment 38f(iv).

v) According to Worksheet #12-21, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent.

Navy Response: Please see the response to PREQB Comment 38o(2).

t) Worksheet #28-22: Reactivity

i) Nominal limits of 0-100% for the LCS are unacceptable. Provide limits that will allow some degree of accuracy for the reactive cyanide and sulfide analyses 0% recovery is not sufficient for this purpose.

Navy Response: Reactive sulfide limits have been revised to 50-150%. Reactive cyanide must remain at 0-100% recovery for the LCS and MS as these are historic and statistically determined limits. While these methods have been withdrawn from Chapter 7 of SW-846, disposal facilities still like to see these results because they are used to seeing them.

ii) According to Worksheet #12-22, matrix spikes are not applicable for these analyses. Clarify and revise worksheets to be consistent.

Navy Response: Please see the response to PREQB Comment 38o(2).

39) Worksheet #29: Project Documents and Records Table

a) Add field data sheets (which are included in the sampling SOPs), decontamination records, and the TPH-field screening results to the list of documents.

Navy Response: The above information, as applicable, is kept in the field notebooks, which are already listed in Worksheet #29.

b) The following items are not typically included in the full CLP-like data packages. Confirm with the proposed Laboratories that this information will be provided. Otherwise, update this table

i) Standard Traceability logs

Navy Response: The laboratory does not typically provide these, so this row has been removed.

ii) Equipment Maintenance, Testing, and Inspection Logs

Navy Response: The laboratory does not typically provide these, so this row has been removed.

iii) Data Package Completeness Checklists (these are typically provided by CLP labs but not routine commercial labs)

Navy Response: The laboratory does not typically provide these (unless the client requests it and provides a template), so this row has been removed.

c) The Extraction/clean-up records are listed as being "maintained by the laboratory" However, these are required to be included in the full data package.

Navy Response: The "Extraction/Clean-up Records" row has been updated to indicate they will be included in the full data package.

40) Worksheet #30: Analytical Services Table - Update the number of Sample Locations to be consistent with Worksheet #20, which will be revised based on comment #31.

Navy Response: The number of samples in Worksheet #30 has been updated from the revised Worksheet #20.

41) Worksheets #32-1 and 32-2 have the incorrect titles and need to be switched.

Navy Response: The SAP Worksheet #32-1 title has been changed to "Corrective Action Form." The SAP Worksheet #32-2 title has been changed to "Field Performance Audit Checklist."

42) Worksheet #33: QA Management Reports Table - This table should also include Data Validation Reports and Data Usability Assessments.

Navy Response: Data Validation Reports and Data Usability Assessments have been added to Worksheet #33 as follows:

"Data Validation Reports" Frequency: "Once, after analysis by laboratory, for all laboratory analytical data except pH, TOC, grain size, dry bulk density, and . . ." Projected Delivery Date(s): "Submitted by the validators no later than 21 days following their receipt of the analytical data from the laboratory." Person(s) Responsible for Report Preparation: "Contracted Data Validation company." Report Recipients: "Project Chemist, EIS, Project Manager."

"Data Usability Assessments" Frequency: "once in SI/ESI Report." Projected Delivery Date: "with SI/ESI Report, to be submitted draft in August 2009." Person(s) Responsible for Report Preparation: "Project Chemist, CH2M HILL." Report Recipient(s): "USEPA, PREQB, USFWS."

43) Worksheet #34: Verification (Step I) Process Table -Brett Doerr is listed as the Project Manager in this worksheet. This worksheet needs to be consistent with Worksheets #3, 4, 5, 6, and 7. In these worksheets, Brett Doerr is referred to as the Environmental Manager and John Swenfurth is referred to as the Project Manager. Update worksheets to be consistent.

Navy Response: The Project Manager in Worksheet #34 has been corrected to "John Swenfurth."

44) Worksheet # 36: Analytical Data Validation (Steps IIa and IIb) Summary Table

a) The first two sentences listed in the metals validation criteria apply to all methods. Either add these sentences to all of the other methods or include a generic footnote at the bottom of the table for all methods.

Navy Response: This wording was reserved for methods for which Region II validation guidance does not exist. However, this wording has been added to the other methods.

b) Explosives - The referenced SOP is outdated; Region 2 has a new SOP for validation of explosives data (SOP HW-16, Nitroaromatics and Nitroamines by HPLC, Rev. 2, September 2006). Include the most current version in this table.

Navy Response: Comment incorporated.

c) Pesticides/PCBs -The referenced Region 2 SOP (HW-23) is obsolete. Region 2 has two new SOPs available for the validation of pesticide and PCB data; HW-44 and HW-45, both from October 2006. Include the most current versions in this table.

Navy Response: Comment incorporated.

d) SVOCs -The referenced Region 2 SOP (HW-22) is outdated; the newest version is Revision 3, dated October 2006. Include the most current version in this table.

Navy Response: Comment incorporated.

e) VOCs -The referenced Region 2 SOP (HW-24) is outdated; the newest version is Revision 2, dated October 2006. Include the most current version in this table.

Navy Response: Comment incorporated.

The wet chemistry (WCHEM) row on Worksheet #36 has been deleted.

45) Worksheet # 37: Usability Assessment

a) Please clarify where in the SI Expanded SI report the results of the review to determine if the dataset is spatially adequate for making project-specific determinations will be presented, as discussed in paragraph 4 of this section.

Navy Response: Please see Figure 1. Worksheet #37, paragraph 4, 2nd sentence, the parenthetical statement "(in Step 7 of the SI/Expanded SI decision analysis process)" has been inserted after "spatially adequate." This evaluation will be presented in the site-specific sections of the associated report.

46) References - Ensure that the correct versions of the Region 2 SOPs, as per comment #44, are included in this section.

Navy Response: The References section has been updated to match the versions of SOPs as per PREQB Comment 44.

47) Sections 3.5.3, 3.5.4, and 3.5.5 of the UFP QAPPs Manual were not addressed in this SAP. Provide this information (data reporting formats, data handling and management procedures, data tracking and control procedures).

Navy Response: The 2008 Navy CLEAN Data Management Plan, which contains data reporting formats, data handling and management procedures and data tracking and control procedures, has been incorporated in the SAP as Attachment D.

48) Figure 3 -This figure should include SWMU 4.

Navy Response: The figure was intended to show sites specifically under investigation under this SI/Expanded SI. However, PAOCs J, K, and U, and SWMU 4 have been added to Figures 2 and 3 for perspective relative to the regional groundwater evaluation.

49) Figure 22 -The figure should callout the location of the former PCB storage pad and sump since two proposed sample locations are based on these items.

Navy Response: Identification of the approximate locations of the PCB storage pad and sump has been added to Figure 22.

50) Figure 27 -See comment #19a

Navy Response: Please see the response to PREQB Comment 19a.

51) Figure 51 -For the table in the top left comer of the figure which summarizes screening criteria, delete the row that spells trichloroethene incorrectly. In addition, correct the spelling of trichloroethene for well EPAL-MW01.

Navy Response: Comment incorporated.

IN ADDITION TO THE REVISIONS MADE BASED ON THE RESPONSES TO REGULATORY AGENCY COMMENTS, THE FOLLOWING REVISIONS HAVE BEEN MADE:

1. **The title of the document has been changed to: "Site Inspection/Expanded Site Inspection, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico" to account for the addition of PAOC R.**
2. **Page 62, SAP Worksheet #10b, Problem Definition, second paragraph, first sentence: corrected spelling of "methyl tert butyl ether."**
3. **Page 79, SAP Worksheet #10k, Background and Potential Release History, last paragraph, first sentence, changed "necessary" to "necessarily."**
4. **Worksheet #18, several of the AOC A sample designations repeat the designations used for historical samples. To avoid confusion with historical sample designations, the sample designations in Worksheet #18 have been changed to start with sample VEAA-SO11.**
5. **Page 263, SAP Worksheet #23, CA-720, in the column "Instrument," the spelling of the word "Gravimetric" has been corrected.**
6. **For consistency with other worksheets, in SAP Worksheet #11, Question #5, Page 112, paragraphs 1, 3, 4 and 5, "RL" has been replaced with "QL" and "reporting limits" has been replaced with "quantitation limits." The same change has been made in the accompanying table.**
7. **During historical records evaluation conducted as part of preparing the Draft SI/Expanded SI SAP, a design drawing for the PAOC S Power Plant showing a 5000-gallon fuel oil UST was found. This drawing has been inserted into the SAP as a figure associated with PAOC S (also attached to the preliminary comment responses). The other figure numbers have been revised accordingly. There are no known records of whether the UST was ever installed. However, to address this possibility, the geophysical survey planned between PAOC N and PAOC S has been expanded to include the entire footprint of the Power Plant. The revised figure showing the expanded geophysical survey area has also been included with the preliminary responses.**
8. **In accordance with the responses to EPA comments on the Draft No Action Decision Document (CH2M HILL, August 2008), PAOC R has been combined with PAOC Q for the SI/Expanded SI. The text regarding PAOC Q in the SAP has been updated to include the information about PAOC R, as applicable, from the Draft No Action Decision Document and associated response to comments. "PAOC Q" will hereafter be referred to as "PAOC Q/R."**
9. **During a recent field reconnaissance to SWMU 1 in preparation for vegetation clearance, it was observed that monitoring well MW-05 had been destroyed. This well will be replaced during the Expanded SI. Applicable worksheets have been updated to reflect this.**

This page intentionally left blank

Attachment B
Lab Accreditation

Page intentionally left blank

Katahdin Analytical Services, Inc.

This page intentionally left blank

LABORATORY
ACCREDITATION
BUREAU

Certificate Number L2223

Certificate of Accreditation

Accredited to DoD ELAP and ISO/IEC 17025:2005

Katahdin Analytical Services, Inc.

600 Technology Way
Scarborough, ME 04074

has met the requirements set forth in L-A-B's policies and procedures, all requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the U.S. Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP).*

The accredited lab has demonstrated technical competence to a defined "Scope of Accreditation" and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Accreditation Granted through: November 4, 2012

R. Douglas Leonard, Jr., Managing Director
Laboratory Accreditation Bureau
Presented the 4th of November, 2009

*See the laboratory's Scope of Accreditation for details of the DoD ELAP requirements
Laboratory Accreditation Bureau is found to be in compliance with ISO/IEC 17011:2004 and recognized by ILAC (International Laboratory Accreditation Cooperation) and NACLA (National Cooperation for Laboratory Accreditation).

LABORATORY ACCREDITATION BUREAU

Certificate # L2223

Scope of Accreditation For Katahdin Analytical Services, Inc.

600 Technology Way
Scarborough, ME 04074
Leslie Dimond
207-874-2400

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 Katahdin Analytical Services to perform the following tests:

Accreditation granted through: **November 4, 2012**

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081B	2, 4`-DDD
GC/ECD	EPA 8081B	2, 4`-DDE
GC/ECD	EPA 8081B	2, 4`-DDT
GC/ECD	EPA 608 / 8081B	4, 4`-DDD
GC/ECD	EPA 608 / 8081B	4, 4`-DDE
GC/ECD	EPA 608 / 8081B	4, 4`-DDT
GC/ECD	EPA 608 / 8081B	Aldrin
GC/ECD	EPA 608 / 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane
GC/ECD	EPA 608 / 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Cis-Nonaclor
GC/ECD	EPA 608 / 8081B	Chlordane (tech.)
GC/ECD	EPA 608 / 8081B	delta-BHC
GC/ECD	EPA 608 / 8081B	Dieldrin
GC/ECD	EPA 608 / 8081B	Endosulfan I
GC/ECD	EPA 608 / 8081B	Endosulfan II

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 608 / 8081B	Endosulfan sulfate
GC/ECD	EPA 608 / 8081B	Endrin
GC/ECD	EPA 608 / 8081B	Endrin aldehyde
GC/ECD	EPA 8081B	Endrin Ketone
GC/ECD	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	gamma-Chlordane
GC/ECD	EPA 608 / 8081B	Heptachlor
GC/ECD	EPA 608 / 8081B	Heptachlor epoxide
GC/ECD	EPA 8081B	Hexachlorobenzene
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	EPA 8081B	Mirex
GC/ECD	EPA 8081B	Oxychlordane
GC/ECD	EPA 608 / 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	EPA 8081B	trans-Nonachlor
GC/ECD	EPA 608 / 8082A	Aroclor-1016 (PCB-1016)
GC/ECD	EPA 608 / 8082A	Aroclor-1221 (PCB-1221)
GC/ECD	EPA 608 / 8082A	Aroclor-1232 (PCB-1232)
GC/ECD	EPA 608 / 8082A	Aroclor-1242 (PCB-1242)
GC/ECD	EPA 608 / 8082A	Aroclor-1248 (PCB-1248)
GC/ECD	EPA 608 / 8082A	Aroclor-1254 (PCB-1254)
GC/ECD	EPA 608 / 8082A	Aroclor-1260 (PCB-1260)
GC/ECD	EPA 8082A MOD	Aroclor-1262 (PCB-1262)
GC/ECD	EPA 8082A MOD	Aroclor-1268 (PCB-1268)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)
GC/ECD	EPA 8082A	2,2',3,3',4,4'-Hexachlorobiphenyl (BZ 128)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 180)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5', 6-Heptachlorobiphenyl (BZ 183)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5-Hexachlorobiphenyl (BZ 138)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 6, 6'-Heptachlorobiphenyl (BZ 184)

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8082A	2, 2', 3, 4', 5, 5', 6-Heptachlorobiphenyl (BZ 187)
GC/ECD	EPA 8082A	2, 2', 3, 4, 5'-Pentachlorobiphenyl (BZ 87)
GC/ECD	EPA 8082A	2, 2', 3, 5'-Tetrachlorobiphenyl (BZ 44)
GC/ECD	EPA 8082A	2, 2', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 153)
GC/ECD	EPA 8082A	2, 2', 4, 5, 5'-Pentachlorobiphenyl (BZ 101)
GC/ECD	EPA 8082A	2, 2', 4, 5-Tetrachlorobiphenyl (BZ 48)
GC/ECD	EPA 8082A	2, 2', 4, 5'-Tetrachlorobiphenyl (BZ 49)
GC/ECD	EPA 8082A	2, 2', 5, 5'-Tetrachlorobiphenyl (BZ 52)
GC/ECD	EPA 8082A	2, 2', 5-Trichlorobiphenyl (BZ 18)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5-Hexachlorobiphenyl (BZ 156)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5'-Hexachlorobiphenyl (BZ 157)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4'-Pentachlorobiphenyl (BZ 105)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 189)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 167)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 118)
GC/ECD	EPA 8082A	2, 3', 4, 4',5'-Pentachlorobiphenyl (BZ 123)
GC/ECD	EPA 8082A	2, 3', 4, 4'-Tetrachlorobiphenyl (BZ 66)
GC/ECD	EPA 8082A	2, 3, 4, 4', 5-Pentachlorobiphenyl (BZ 114)
GC/ECD	EPA 8082A	2, 4, 4'-Trichlorobiphenyl (BZ 28)
GC/ECD	EPA 8082A	2, 4'-Dichlorobiphenyl (BZ 8)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 169)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 126)
GC/ECD	EPA 8082A	3, 3', 4, 4'-Tetrachlorobiphenyl (BZ 77)
GC/ECD	EPA 8082A	3, 4, 4', 5-Tetrachlorobiphenyl (BZ 81)
GC/ECD	EPA 8082A	Decachlorobiphenyl (BZ 209)
GC/ECD	EPA 8151A	2, 4, 5-T
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	Dichloroprop

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8151A	Dinoseb
GC/ECD	EPA 8151A	MCPA
GC/ECD	EPA 8151A	MCPP
GC/ECD	EPA 8151A	Pentachlorophenol
GC/ECD	EPA 8151A	Silvex (2, 4, 5-TP)
GC/FID	EPA 8015C/D MOD	Diesel range organics (DRO)
GC/FID	EPA 8015C/D MOD	Total Petroleum Hydrocarbon (TPH)
GC/FID	EPA 8015C/D MOD	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable Petroleum Hydrocarbons
GC/FID	CT ETPH	Total Petroleum Hydrocarbons
GC/FID	TNRCC Method 1005	Total Petroleum Hydrocarbons
GC/FID	FL-PRO	Petroleum Range Organics
GC/ECD	EPA 8011 / 504	1, 2-Dibromoethane (EDB)
GC/ECD	EPA 8011 / 504	1, 2-Dibromo-3-chloropropane
GC/FID	RSK-175	Methane Ethane Ethene
GC/MS	EPA 8260B,C / 524.2	1, 1, 1, 2-Tetrachloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 1-Trichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 2-Trichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1-Dichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1-Dichloroethene
GC/MS	EPA 8260B,C / 524.2	1, 1-Dichloropropene
GC/MS	EPA 8260B,C / 524.2	1, 2, 3-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 3-Trichloropropane
GC/MS	EPA 8260B,C	1,2,3-Trimethylbenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 4-Trimethylbenzene
GC/MS	EPA 8260B,C / 524.2	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C / 524.2	1, 2-Dibromoethane (EDB)

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichlorobenzene
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichloropropane
GC/MS	EPA 8260B,C	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 3, 5-Trimethylbenzene
GC/MS	EPA 624 / 8260B,C / 524.2	1, 3-Dichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 3-Dichloropropane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 4-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 4-Dioxane
GC/MS	EPA 8260B,C	1-Chlorohexane
GC/MS	EPA 8260B,C / 524.2	2, 2-Dichloropropane
GC/MS	EPA 8260B,C / 524.2	2-Butanone
GC/MS	EPA 624 / 8260B,C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B,C / 524.2	2-Chlorotoluene
GC/MS	EPA 8260B,C / 524.2	2-Hexanone
GC/MS	EPA 8260B,C / 524.2	4-Chlorotoluene
GC/MS	EPA 8260B,C / 524.2	4-Methyl-2-pentanone
GC/MS	EPA 8260B,C / 524.2	Acetone
GC/MS	EPA 8260B,C	Acetonitrile
GC/MS	EPA 624 / 8260B,C	Acrolein
GC/MS	EPA 624 / 8260B,C / 524.2	Acrylonitrile
GC/MS	EPA 8260B,C / 524.2	Allyl chloride
GC/MS	EPA 624 / 8260B,C / 524.2	Benzene
GC/MS	EPA 8260B,C	Benzyl chloride
GC/MS	EPA 8260B,C / 524.2	Bromobenzene
GC/MS	EPA 8260B,C / 524.2	Bromochloromethane
GC/MS	EPA 624 / 8260B,C / 524.2	Bromodichloromethane
GC/MS	EPA 624 / 8260B,C / 524.2	Bromoform
GC/MS	EPA 8260B,C / 524.2	Carbon disulfide
GC/MS	EPA 624 / 8260B,C / 524.2	Carbon tetrachloride
GC/MS	EPA 624 / 8260B,C / 524.2	Chlorobenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 624 / 8260B,C / 524.2	Chloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	Chloroform
GC/MS	EPA 8260B,C	Chloroprene
GC/MS	EPA 8260B,C / 524.2	cis-1, 2-Dichloroethene
GC/MS	EPA 624 / 8260B,C / 524.2	cis-1, 3-Dichloropropene
GC/MS	EPA 8260B,C	Cis-1,4-Dichloro-2-butene
GC/MS	EPA 8260B,C	Cyclohexane
GC/MS	EPA 624 / 8260B,C / 524.2	Dibromochloromethane
GC/MS	EPA 8260B,C / 524.2	Dibromomethane
GC/MS	EPA 624 / 8260B,C / 524.2	Dichlorodifluoromethane
GC/MS	EPA 8260B,C / 524.2	Diethyl ether
GC/MS	EPA 8260B,C	Di-isopropylether
GC/MS	EPA 8260B,C / 524.2	Ethyl methacrylate
GC/MS	EPA 624 / 8260B,C / 524.2	Ethylbenzene
GC/MS	EPA 8260B,C	Ethyl-t-butylether
GC/MS	EPA 8260B,C / 524.2	Hexachlorobutadiene
GC/MS	EPA 8260B,C	Iodomethane
GC/MS	EPA 8260B,C	Isobutyl alcohol
GC/MS	EPA 8260B,C	Isopropyl alcohol
GC/MS	EPA 8260B,C / 524.2	Isopropyl benzene
GC/MS	EPA 8260B,C / 524.2	m p-xylenes
GC/MS	EPA 8260B, C	Methyl acetate
GC/MS	EPA 8260B,C / 524.2	Methacrylonitrile
GC/MS	EPA 624 / 8260B,C	Methyl bromide (Bromomethane)
GC/MS	EPA 624 / 8260B,C / 524.2	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B,C / 524.2	Methyl methacrylate
GC/MS	EPA 8260B,C / 524.2	Methyl tert-butyl ether
GC/MS	EPA 8260B,C	Methylcyclohexane
GC/MS	EPA 624 / 8260B,C / 524.2	Methylene chloride
GC/MS	EPA 8260B,C / 524.2	Naphthalene
GC/MS	EPA 8260B,C / 524.2	n-Butylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C / 524.2	n-Propylbenzene
GC/MS	EPA 8260B,C / 524.2	o-Xylene
GC/MS	EPA 8260B,C	Pentachloroethane
GC/MS	EPA 8260B,C / 524.2	p-Isopropyltoluene
GC/MS	EPA 8260B,C / 524.2	Propionitrile
GC/MS	EPA 8260B,C / 524.2	sec-butylbenzene
GC/MS	EPA 8260B,C / 524.2	Styrene
GC/MS	EPA 8260B,C	t-Amylmethylether
GC/MS	EPA 8260B,C / 524.2	tert-Butyl alcohol
GC/MS	EPA 8260B,C	tert-Butylbenzene
GC/MS	EPA 624 / 8260B,C / 524.2	Tetrachloroethene (Perchloroethylene)
GC/MS	EPA 8260B,C / 524.2	Tetrahydrofuran
GC/MS	EPA 624 / 8260B,C / 524.2	Toluene
GC/MS	EPA 624 / 8260B,C / 524.2	trans-1, 2-Dichloroethylene
GC/MS	EPA 624 / 8260B,C / 524.2	trans-1, 3-Dichloropropylene
GC/MS	EPA 8260B,C / 524.2	trans-1, 4-Dichloro-2-butuene
GC/MS	EPA 624 / 8260B,C / 524.2	Trichloroethene (Trichloroethylene)
GC/MS	EPA 624 / 8260B,C / 524.2	Trichlorofluoromethane
GC/MS	EPA 8260B,C	Vinyl acetate
GC/MS	EPA 624 / 8260B,C / 524.2	Vinyl chloride
GC/MS	EPA 624 / 8260B,C	Xylene
GC/MS	EPA 8270C,D	1, 2, 4, 5-Tetrachlorobenzene
GC/MS	EPA 625 / 8270C,D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 625 / 8270C,D	1, 2-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Diphenylhydrazine
GC/MS	EPA 8270C,D	1, 3, 5-Trinitrobenzene
GC/MS	EPA 625 / 8270C,D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 3-Dinitrobenzene
GC/MS	EPA 625 / 8270C,D	1, 4-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 4-Dioxane
GC/MS	EPA 8270C,D	1, 4-Naphthoquinone

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	1, 4-Phenylenediamine
GC/MS	EPA 8270C,D	1-Chloronaphthalene
GC/MS	EPA 8270C,D	1-Methylnaphthalene
GC/MS	EPA 8270C,D	1-Naphthylamine
GC/MS	EPA 8270C,D	2, 3, 4, 6-Tetrachlorophenol
GC/MS	EPA 8270C,D	2, 4, 5-Trochlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4, 6-Trichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dimethylphenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dinitrophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dinitrotoluene (2, 4-DNT)
GC/MS	EPA 8270C,D	2, 6-Dichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 6-Dinitrotoluene (2, 6-DNT)
GC/MS	EPA 8270C,D	2-Acetylaminofluorene
GC/MS	EPA 625 / 8270C,D	2-Chloronaphthalene
GC/MS	EPA 625 / 8270C,D	2-Chlorophenol
GC/MS	EPA 625 / 8270C,D	2-Methyl-4 6-dinitrophenol
GC/MS	EPA 8270C,D	2-Methylnaphthalene
GC/MS	EPA 8270C,D	2-Methylphenol
GC/MS	EPA 8270C,D	2-Naphthylamine
GC/MS	EPA 8270C,D	2-Nitroaniline
GC/MS	EPA 625 / 8270C,D	2-Nitrophenol
GC/MS	EPA 8270C,D	2-Picoline
GC/MS	EPA 8270C,D	3-Methylcholanthrene
GC/MS	EPA 8270C,D	3-Nitroaniline
GC/MS	EPA 8270C,D	4-Aminobiphenyl
GC/MS	EPA 625 / 8270C,D	4-Bromophenyl phenyl ether
GC/MS	EPA 625 / 8270C,D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C,D	4-Chloroaniline
GC/MS	EPA 625 / 8270C,D	4-Chlorophenyl phenylether
GC/MS	EPA 8270C,D	4-Dimethyl aminoazobenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	3, 4-Methylphenol
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 625 / 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	4-Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
GC/MS	EPA 8270C,D	7, 12-DimethylphenethylamineDimethylbenz(a)anthracene
GC/MS	EPA 8270C,D	a a-Dimethylphenethylamine
GC/MS	EPA 625 / 8270C,D	Acenaphthene
GC/MS	EPA 625 / 8270C,D	Acenaphthylene
GC/MS	EPA 8270C,D	Acetophenone
GC/MS	EPA 8270C,D	Aniline
GC/MS	EPA 625 / 8270C,D	Anthracene
GC/MS	EPA 8270C,D	Aramite
GC/MS	EPA 8270C,D	Atrazine
GC/MS	EPA 8270C,D	Azobenzene
GC/MS	EPA 8270C,D	Benzaldehyde
GC/MS	EPA 625 / 8270C,D	Benzidine
GC/MS	EPA 625 / 8270C,D	Benzo(a)anthracene
GC/MS	EPA 625 / 8270C,D	Benzo(a)pyrene
GC/MS	EPA 625 / 8270C,D	Benzo(b)fluoranthene
GC/MS	EPA 625 / 8270C,D	Benzo(g h i)perylene
GC/MS	EPA 625 / 8270C,D	Benzo(k)fluoranthene
GC/MS	EPA 8270C,D	Benzoic Acid
GC/MS	EPA 8270C,D	Benzyl alcohol
GC/MS	EPA 8270C,D	1,1-Biphenyl
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroethoxy)methane
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroethyl) ether
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane))
GC/MS	EPA 625 / 8270C,D	bis(2-Ethylhexyl)adipate
GC/MS	EPA 625 / 8270C,D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 625 / 8270C,D	Butyl benzyl phthalate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Caprolactam
GC/MS	EPA 8270C,D	Carbazole
GC/MS	EPA 8270C,D	Chlorobenzilate
GC/MS	EPA 625 / 8270C,D	Chrysene
GC/MS	EPA 8270C,D	Diallate
GC/MS	EPA 8270C,D	Dibenzo(a,j)acridine
GC/MS	EPA 625 / 8270C,D	Dibenz(a h)anthracene
GC/MS	EPA 8270C,D	Dibenzofuran
GC/MS	EPA 8270C,D	Diethyladipate
GC/MS	EPA 625 / 8270C,D	Diethyl phthalate
GC/MS	EPA 8270C,D	Dimethoate
GC/MS	EPA 625 / 8270C,D	Dimethyl phthalate
GC/MS	EPA 625 / 8270C,D	Di-n-butyl phthalate
GC/MS	EPA 625 / 8270C,D	Di-n-octyl phthalate
GC/MS	EPA 8270C,D	Dinoseb
GC/MS	EPA 8270C,D	Disulfoton
GC/MS	EPA 8270C,D	Ethyl methanesulfonate
GC/MS	EPA 8270C,D	Ethyl parathion
GC/MS	EPA 8270C,D	Ethyl methacrylate
GC/MS	EPA 8270C,D	Famfur
GC/MS	EPA 625 / 8270C,D	Fluoranthene
GC/MS	EPA 625 / 8270C,D	Fluorene
GC/MS	EPA 625 / 8270C,D	Hexachlorobenzene
GC/MS	EPA 625 / 8270C,D	Hexachlorobutadiene
GC/MS	EPA 625 / 8270C,D	Hexachlorocyclopentadiene
GC/MS	EPA 625 / 8270C,D	Hexachloroethane
GC/MS	EPA 8270C,D	Hexachlorophene
GC/MS	EPA 8270C,D	Hexachloropropene
GC/MS	EPA 625 / 8270C,D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C,D	Isodrin
GC/MS	EPA 625 / 8270C,D	Isophorone

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Isosafrole
GC/MS	EPA 8270C,D	Kepone
GC/MS	EPA 8270C,D	Methapyriline
GC/MS	EPA 8270C,D	Methy methanesulfonate
GC/MS	EPA 8270C,D	Methyl parathion
GC/MS	EPA 625 / 8270C,D	Naphthalene
GC/MS	EPA 625 / 8270C,D	Nitrobenzene
GC/MS	EPA 8270C,D	Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	n-Nitrosodiethylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodimethylamine
GC/MS	EPA 8270C,D	n-Nitroso-di-n-butylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodi-n-propylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D	n-Nitrosomethylethylamine
GC/MS	EPA 8270C,D	n-Nitrosomorpholine
GC/MS	EPA 8270C,D	n-Nitrosopiperidine
GC/MS	EPA 8270C,D	n-Nitrosopyrrolidine
GC/MS	EPA 8270C,D	o,O o, o-Triethyl phosphorothioate
GC/MS	EPA 8270C,D	o,o-Diethyl o-pyrazinyl phosphorothiote
GC/MS	EPA 8270C,D	o-Toluidine
GC/MS	EPA 8270C,D	Pentachlorobenzene
GC/MS	EPA 8270C,D	Pentachloronitrobenzene
GC/MS	EPA 625 / 8270C,D	Pentachlorophenol
GC/MS	EPA 8270C,D	Phenacetin
GC/MS	EPA 625 / 8270C,D	Phenanthrene
GC/MS	EPA 625 / 8270C,D	Phenol
GC/MS	EPA 8270C,D	Phorate
GC/MS	EPA 8270C,D	Pronamide
GC/MS	EPA 625 / 8270C,D	Pyrene
GC/MS	EPA 8270C,D	Pyrididne
GC/MS	EPA 8270C,D	Safrole

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Sulfotepp
GC/MS	EPA 8270C,D	Thionazin
GC/MS	EPA 625 / 8270C,D	3, 3'-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3'-Dimethylbenzidine
HPLC/UV	EPA 8330A/8330B	1, 3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A/8330B	1, 3-Dinitrobenzene
HPLC/UV	EPA 8330A/8330B	2, 4, 6-Trinitrotoluene
HPLC/UV	EPA 8330A/8330B	2, 4-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2-Amino-4, 6 -Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2-Nitrotoluene
HPLC/UV	EPA 8330A/8330B	3-Nitrotoluene
HPLC/UV	EPA 8330A/8330B	3,5-Dinitroaniline
HPLC/UV	EPA 8330A/8330B	4-Amino-2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	4-Nitrotoluene
HPLC/UV	EPA 8330A/8330B	Ethylene glycol dinitrate (EGDN)
HPLC/UV	EPA 8330A/8330B	Hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	EPA 8330A/8330B	Nitrobenzene
HPLC/UV	EPA 8330A MOD	Nitroglycerin
HPLC/UV	EPA 8330B	Nitroglycerin
HPLC/UV	EPA 8330A/8330B	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	EPA 8330A/8330B	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	EPA 8330A/8330B	Tetryl
CVAA	EPA 245.1 / 7470A	Mercury
CVAF	EPA 1631E	Low Level Mercury
ICP/AES	EPA 200.7 / 6010B,C	Aluminum
ICP/AES	EPA 200.7 / 6010B,C	Antimony
ICP/AES	EPA 200.7 / 6010B,C	Arsenic
ICP/AES	EPA 200.7 / 6010B,C	Barium
ICP/AES	EPA 200.7 / 6010B,C	Beryllium
ICP/AES	EPA 200.7 / 6010B,C	Boron

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP/AES	EPA 200.7 / 6010B,C	Cadmium
ICP/AES	EPA 200.7 / 6010B,C	Calcium
ICP/AES	EPA 200.7 / 6010B,C	Chromium
ICP/AES	EPA 200.7 / 6010B,C	Cobalt
ICP/AES	EPA 200.7 / 6010B,C	Copper
ICP/AES	EPA 200.7 / 6010B,C	Iron
ICP/AES	EPA 200.7 / 6010B,C	Lead
ICP/AES	EPA 200.7 / 6010B,C	Magnesium
ICP/AES	EPA 200.7 / 6010B,C	Manganese
ICP/AES	EPA 200.7 / 6010B,C	Molybdenum
ICP/AES	EPA 200.7 / 6010B,C	Nickel
ICP/AES	EPA 200.7 / 6010B,C	Potassium
ICP/AES	EPA 200.7 / 6010B,C	Selenium
ICP/AES	EPA 200.7	Silicon
ICP/AES	EPA 200.7 / 6010B,C	Silver
ICP/AES	EPA 200.7 / 6010B,C	Sodium
ICP/AES	EPA 6010B,C	Strontium
ICP/AES	EPA 200.7 / 6010B,C	Thallium
ICP/AES	EPA 200.7 / 6010B,C	Tin
ICP/AES	EPA 200.7 / 6010B,C	Titanium
ICP/AES	EPA 200.7 / 6010B,C	Vanadium
ICP/AES	EPA 200.7 / 6010B,C	Zinc
ICP/MS	EPA 200.8 / 6020A	Aluminum
ICP/MS	EPA 200.8 / 6020A	Antimony
ICP/MS	EPA 200.8 / 6020A	Arsenic
ICP/MS	EPA 200.8 / 6020A	Barium
ICP/MS	EPA 200.8 / 6020A	Beryllium
ICP/MS	EPA 200.8 / 6020A	Boron
ICP/MS	EPA 200.8 / 6020A	Cadmium
ICP/MS	EPA 200.8 / 6020A	Calcium
ICP/MS	EPA 200.8 / 6020A	Chromium

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP/MS	EPA 200.8 / 6020A	Cobalt
ICP/MS	EPA 200.8 / 6020A	Copper
ICP/MS	EPA 200.8 / 6020A	Iron
ICP/MS	EPA 200.8 / 6020A	Lead
ICP/MS	EPA 200.8 / 6020A	Magnesium
ICP/MS	EPA 200.8 / 6020A	Manganese
ICP/MS	EPA 200.8 / 6020A	Molybdenum
ICP/MS	EPA 200.8 / 6020A	Nickel
ICP/MS	EPA 200.8 / 6020A	Potassium
ICP/MS	EPA 200.8 / 6020A	Selenium
ICP/MS	EPA 200.8 / 6020A	Silicon
ICP/MS	EPA 200.8 / 6020A	Silver
ICP/MS	EPA 200.8 / 6020A	Sodium
ICP/MS	EPA 6020A	Strontium
ICP/MS	EPA 200.8 / 6020A	Thallium
ICP/MS	EPA 200.8 / 6020A	Tin
ICP/MS	EPA 200.8 / 6020A	Titanium
ICP/MS	EPA 200.8 / 6020A	Tungsten
ICP/MS	EPA 200.8	Uranium
ICP/MS	EPA 200.8 / 6020A	Vanadium
ICP/MS	EPA 200.8 / 6020A	Zinc
IC	EPA 300.0 / 9056A	Bromide
IC	EPA 300.0 / 9056A	Chloride
IC	EPA 300.0 / 9056A	Fluoride
IC	EPA 300.0 / 9056A	Nitrate as N
IC	EPA 300.0 / 9056A	Nitrite as N
IC	EPA 300.0 / 9056A	Nitrate + Nitrite
IC	EPA 300.0 / 9056A	Orthophosphate as P
IC	EPA 300.0 / 9056A	Sulfate
Titration	EPA 310.1 / SM 2320B	Alkalinity
Caculation	SM 2340B	Hardness

Non-Potable Water		
Technology	**Method**	**Analyte**
Gravimetric	EPA 1664A / EPA 9070A	Oil and Grease, Oil and Grease with SGT
Gravimetric	SM 2540B,C,D	Solids
ISE	EPA 120.1 / SM 2510B	Conductivity
ISE	SM 2520B	Practical Salinity
ISE	SM 4500F- C	Fluoride
ISE	SM 4500H+ B	pH
ISE	SM 5210B	TBOD / CBOD
Physical	EPA 1010A	Ignitability
Physical	EPA 9040C	pH
Titration	SM 2340C	Hardness
Titration	SM 4500SO_3 B	Sulfite
Titration	EPA 9034 / SM 4500S^{2-} F	Sulfide
Titration	Chap. 7.3.4	Reactive Sulfide
IR	EPA 9060A / SM 5310B	Total organic carbon
Turbidimetric	EPA 180.1 / SM 2130B	Turbidity
Turbidimetric	EPA 9038 / ASTM 516-02	Sulfate
UV/VIS	EPA 335.4 / EPA 9012B / SM 4500-CN G	Amenable cyanide
UV/VIS	EPA 350.1 / SM 4500NH3 H	Ammonia as N
UV/VIS	SM 3500Fe D	Ferrous Iron
UV/VIS	EPA 351.2	Kjeldahl nitrogen - total
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrate + Nitrite
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrate as N
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrite as N
UV/VIS	EPA 365.2 / SM 4500P E	Orthophosphate as P
UV/VIS	EPA 365.4	Phosphorus total
UV/VIS	EPA 376.3	AVS-SEM
UV/VIS	EPA 410.4	COD
UV/VIS	EPA 420.1 / 9065	Total Phenolics
UV/VIS	SM 4500Cl G	Total Residual Chlorine

Non-Potable Water		
Technology	**Method**	**Analyte**
UV/VIS	SM 5540C	MBAS
UV/VIS	EPA 7196A / SM 3500-Cr D	Chromium VI
UV/VIS	EPA 9012B / 335.4	Total Cyanide
UV/VIS	EPA 9251 / SM 4500Cl E	Chloride
UV/VIS	Chap. 7.3.4	Reactive Cyanide
Preparation	**Method**	**Type**
Cleanup Methods	EPA 3640A	Gel Permeation Clean-up
Cleanup Methods	EPA 3630C	Silica Gel
Cleanup Methods	EPA 3660B	Sulfur Clean-Up
Cleanup Methods	EPA 3665A	Sulfuric Acid Clean-Up
Organic Preparation	EPA 3510C	Separatory Funnel Extraction
Organic Preparation	EPA 3520C	Continuous Liquid-Liquid Extraction
Inorganic Preparation	EPA 3010A	Hotblock
Volatile Organic Preparation	EPA 5030C	Purge and Trap

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	8081B	2,4`-DDD
GC/ECD	8081B	2,4`-DDE
GC/ECD	8081B	2,4`-DDT
GC/ECD	EPA 8081B	4, 4`-DDD
GC/ECD	EPA 8081B	4, 4`-DDE
GC/ECD	EPA 8081B	4, 4`-DDT
GC/ECD	EPA 8081B	Aldrin
GC/ECD	EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 608 / 8081B	Chlordane (tech.)
GC/ECD	8081B	Cis-Nonachlor
GC/ECD	EPA 8081B	delta-BHC
GC/ECD	EPA 8081B	Dieldrin
GC/ECD	EPA 8081B	Endosulfan I
GC/ECD	EPA 8081B	Endosulfan II
GC/ECD	EPA 8081B	Endosulfan sulfate
GC/ECD	EPA 8081B	Endrin
GC/ECD	EPA 8081B	Endrin aldehyde
GC/ECD	EPA 8081B	Endrin Ketone
GC/ECD	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	gamma-Chlordane
GC/ECD	EPA 8081B	Heptachlor
GC/ECD	EPA 8081B	Heptachlor epoxide
GC/ECD	8081B	Hexachlorobenzene
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	8081B	Mirex
GC/ECD	8081B	Oxychlordane
GC/ECD	EPA 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	8081B	Trans-Nonachlor
GC/ECD	EPA 8082A	Aroclor-1016 (PCB-1016)
GC/ECD	EPA 8082A	Aroclor-1221 (PCB-1221)
GC/ECD	EPA 8082A	Aroclor-1232 (PCB-1232)
GC/ECD	EPA 8082A	Aroclor-1242 (PCB-1242)
GC/ECD	EPA 8082A	Aroclor-1248 (PCB-1248)
GC/ECD	EPA 8082A	Aroclor-1254 (PCB-1254)
GC/ECD	EPA 8082A	Aroclor-1260 (PCB-1260)
GC/ECD	EPA 8082A MOD	Aroclor-1262 (PCB-1262)
GC/ECD	EPA 8082A MOD	Aroclor-1268 (PCB-1268)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5, 5', 6-Nonachlorobiphenyl (BZ 206)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5, 6-Octachlorobiphenyl (BZ 195)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5-Heptachlorobiphenyl (BZ 170)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4'-Hexachlorobiphenyl (BZ 128)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 180)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5', 6-Heptachlorobiphenyl (BZ 183)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5-Hexachlorobiphenyl (BZ 138)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 6, 6'-Heptachlorobiphenyl (BZ 184)
GC/ECD	EPA 8082A	2, 2', 3, 4', 5, 5', 6-Heptachlorobiphenyl (BZ 187)
GC/ECD	EPA 8082A	2, 2', 3, 4, 5'-Pentachlorobiphenyl (BZ 87)
GC/ECD	EPA 8082A	2, 2', 3, 5'-Tetrachlorobiphenyl (BZ 44)
GC/ECD	EPA 8082A	2, 2', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 153)
GC/ECD	EPA 8082A	2, 2', 4, 5, 5'-Pentachlorobiphenyl (BZ 101)
GC/ECD	EPA 8082A	2, 2', 4, 5-Tetrachlorobiphenyl (BZ 48)
GC/ECD	EPA 8082A	2, 2', 4, 5'-Tetrachlorobiphenyl (BZ 49)
GC/ECD	EPA 8082A	2, 2', 5, 5'-Tetrachlorobiphenyl (BZ 52)
GC/ECD	EPA 8082A	2, 2', 5-Trichlorobiphenyl (BZ 18)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5-Hexachlorobiphenyl (BZ 156)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5'-Hexachlorobiphenyl (BZ 157)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4'-Pentachlorobiphenyl (BZ 105)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 189)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 167)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 118)
GC/ECD	EPA 8082A	2, 3', 4, 4',5'-Pentachlorobiphenyl (BZ 123)
GC/ECD	EPA 8082A	2, 3', 4, 4'-Tetrachlorobiphenyl (BZ 66)
GC/ECD	EPA 8082A	2, 3, 4, 4', 5-Pentachlorobiphenyl (BZ 114)
GC/ECD	EPA 8082A	2, 4, 4'-Trichlorobiphenyl (BZ 28)
GC/ECD	EPA 8082A	2, 4'-Dichlorobiphenyl (BZ 8)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 169)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 126)
GC/ECD	EPA 8082A	3, 3', 4, 4'-Tetrachlorobiphenyl (BZ 77)
GC/ECD	EPA 8082A	3, 4, 4', 5-Tetrachlorobiphenyl (BZ 81)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8082A	Decachlorobiphenyl (BZ 209)
GC/ECD	EPA 8151A	2, 4, 5-T
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	Dichloroprop
GC/ECD	EPA 8151A	Dinoseb
GC/ECD	EPA 8151A	MCPA
GC/ECD	EPA 8151A	MCPP
GC/ECD	EPA 8151A	Pentachlorophenol
GC/ECD	EPA 8151A	Silvex (2, 4, 5-TP)
GC/FID	EPA 8015C/D	Diesel range organics (DRO)
GC/FID	EPA 8015C/D	Total Petroleum Hydrocarbons (TPH)
GC/FID	EPA 8015C/D	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable Petroleum Hydrocarbons
GC/FID	CT-ETPH	Total Petroleum Hydrocarbons
GC/FID	TNRCC Method 1005	Total Petroleum Hydrocarbons
GC/FID	FL-PRO	Petroleum Range Organics
GC/ECD	EPA 8011	1, 2-Dibromoethane (EDB)
GC/ECD	EPA 8011	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C	1, 1, 1, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 8260B,C	1, 1, 1-Trichloroethane
GC/MS	EPA 8260B,C	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1, 1, 2-Trichloroethane
GC/MS	EPA 8260B,C	1, 1-Dichloroethane
GC/MS	EPA 8260B,C	1, 1-Dichloroethylene
GC/MS	EPA 8260B,C	1, 1-Dichloropropene
GC/MS	EPA 8260B,C	1, 2, 3-Trichlorobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	1, 2, 3-Trichloropropane
GC/MS	EPA 8260B,C	1,2,3-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8260B,C	1, 2, 4-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C	1, 2-Dibromoethane
GC/MS	EPA 8260B,C	1, 2-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 2-Dichloroethane
GC/MS	EPA 8260B,C	1, 2-Dichloropropane
GC/MS	EPA 8260B,C	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B,C	1, 3, 5-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 3-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 3-Dichloropropane
GC/MS	EPA 8260B,C	1, 4-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 4-Dioxane
GC/MS	EPA 8260B,C	2, 2-Dichloropropane
GC/MS	EPA 8260B,C	2-Butanone
GC/MS	EPA 8260B,C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B,C	2-Chlorotoluene
GC/MS	EPA 8260B,C	2-Hexanone
GC/MS	EPA 8260B,C	4-Chlorotoluene
GC/MS	EPA 8260B,C	4-Methyl-2-pentanone
GC/MS	EPA 8260B,C	Acetone
GC/MS	EPA 8260B,C	Acetonitrile
GC/MS	EPA 8260B,C	Acrolein
GC/MS	EPA 8260B,C	Acrylonitrile
GC/MS	EPA 8260B,C	Allyl chloride
GC/MS	EPA 8260B,C	Benzene
GC/MS	EPA 8260B,C	Benzyl chloride
GC/MS	EPA 8260B,C	Bromobenzene
GC/MS	EPA 8260B,C	Bromochloromethane

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	Bromodichloromethane
GC/MS	EPA 8260B,C	Bromoform
GC/MS	EPA 8260B,C	Carbon disulfide
GC/MS	EPA 8260B,C	Carbon tetrachloride
GC/MS	EPA 8260B,C	Chlorobenzene
GC/MS	EPA 8260B,C	Chloroethane
GC/MS	EPA 8260B,C	Chloroform
GC/MS	EPA 8260B,C	Chloroprene
GC/MS	EPA 8260B,C	cis-1, 2-Dichloroethene
GC/MS	EPA 8260B,C	cis-1, 3-Dichloropropene
GC/MS	EPA 8260B,C	cis-1,3-Dichloro-2-butene
GC/MS	EPA 8260B,C	Cyclohexane
GC/MS	EPA 8260B,C	Dibromochloromethane
GC/MS	EPA 8260B,C	Dibromomethane
GC/MS	EPA 8260B,C	Dichlorodifluoromethane
GC/MS	EPA 8260B,C	Diethyl ether
GC/MS	EPA 8260B,C	Di-isopropylether
GC/MS	EPA 8260B,C	1,2-Dibromoethane (EDB)
GC/MS	EPA 8260B,C	Ethyl methacrylate
GC/MS	EPA 8260B,C	Ethylbenzene
GC/MS	EPA 8260B,C	Ethyl-t-butylether
GC/MS	EPA 8260B,C	Hexachlorobutadiene
GC/MS	EPA 8260B,C	Iodomethane
GC/MS	EPA 8260B,C	Isobutyl alcohol
GC/MS	EPA 8260B,C	Isopropyl alcohol
GC/MS	EPA 8260B,C	Isopropyl benzene
GC/MS	EPA 8260B,C	m p-xylenes
GC/MS	EPA 8260B, C	Methyl acetate
GC/MS	EPA 8260B,C	Methacrylonitrile
GC/MS	EPA 8260B,C	Methyl bromide (Bromomethane)
GC/MS	EPA 8260B,C	Methyl chloride (Chloromethane)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	Methyl methacrylate
GC/MS	EPA 8260B,C	Methyl tert-butyl ether
GC/MS	EPA 8260B,C	Methylcyclohexane
GC/MS	EPA 8260B,C	Methylene chloride
GC/MS	EPA 8260B,C	Naphthalene
GC/MS	EPA 8260B,C	n-Butylbenzene
GC/MS	EPA 8260B,C	n-proplybenzene
GC/MS	EPA 8260B,C	o-Xylene
GC/MS	EPA 8260B,C	pentachloroethane
GC/MS	EPA 8260B,C	p-Isopropyltoluene
GC/MS	EPA 8260B,C	Propionitrile
GC/MS	EPA 8260B,C	sec-butylbenzene
GC/MS	EPA 8260B,C	Styrene
GC/MS	EPA 8260B,C	t-Amylmethylether
GC/MS	EPA 8260B,C	tert-Butyl alcohol
GC/MS	EPA 8260B,C	tert-Butylbenzene
GC/MS	EPA 8260B,C	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260B,C	Tetrahydrofuran
GC/MS	EPA 8260B,C	Toluene
GC/MS	EPA 8260B,C	trans-1, 2-Dichloroethylene
GC/MS	EPA 8260B,C	trans-1, 3-Dichloropropylene
GC/MS	EPA 8260B,C	Trans-1, 4-Dichloro-2-butuene
GC/MS	EPA 8260B,C	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260B,C	Trichlorofluoromethane
GC/MS	EPA 8260B,C	Vinyl acetate
GC/MS	EPA 8260B,C	Vinyl chloride
GC/MS	EPA 8260B,C	Xylene
GC/MS	EPA 8270C,D	1, 2, 4, 5-Tetrachlorobenzene
GC/MS	EPA 8270C,D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Diphenylhydrazine

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	1, 3, 5-Trinitrobenzene
GC/MS	EPA 8270C,D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 3-Dinitrobenzene
GC/MS	EPA 8270C,D	1, 4-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 4-Dioxane
GC/MS	EPA 8270C,D	1, 4-Naphthoquinone
GC/MS	EPA 8270C,D	1, 4-Phenylenediamine
GC/MS	EPA 8270C,D	1,1-Biphenyl
GC/MS	EPA 8270C,D	1-Chlorohexane
GC/MS	EPA 8270C,D	1-Chloronaphthalene
GC/MS	EPA 8270C,D	1-Methylnaphthalene
GC/MS	EPA 8270C,D	1-Naphthylamine
GC/MS	EPA 8270C,D	2, 3, 4, 6-Tetrachlorophenol
GC/MS	EPA 8270C,D	2, 4, 5-Trochlorophenol
GC/MS	EPA 8270C,D	2, 4, 6-Trichlorophenol
GC/MS	EPA 8270C,D	2, 4-Dichlorophenol
GC/MS	EPA 8270C,D	2, 4-Dimethylphenol
GC/MS	EPA 8270C,D	2, 4-Dinitrophenol
GC/MS	EPA 8270C,D	2, 4-Dinitrotoluene (2 4-DNT)
GC/MS	EPA 8270C,D	2, 6-Dichlorophenol
GC/MS	EPA 8270C,D	2, 6-Dinitrotoluene (2 6-DNT)
GC/MS	EPA 8270C,D	2-Acetylaminofluorene
GC/MS	EPA 8270C,D	2-Chloronaphthalene
GC/MS	EPA 8270C,D	2-Chlorophenol
GC/MS	EPA 8270C,D	2-Methyl-4, 6-dinitrophenol
GC/MS	EPA 8270C,D	2-Methylnaphthalene
GC/MS	EPA 8270C,D	2-Methylphenol
GC/MS	EPA 8270C,D	2-Naphthylamine
GC/MS	EPA 8270C,D	2-Nitroaniline
GC/MS	EPA 8270C,D	2-Nitrophenol
GC/MS	EPA 8270C,D	2-Picoline

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	3, 3`-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3'-Dimethylbenzidine
GC/MS	EPA 8270C,D	3,4-Methylphenol
GC/MS	EPA 8270C,D	3-Methylcholanthrene
GC/MS	EPA 8270C,D	3-Nitroaniline
GC/MS	EPA 8270C,D	4-Aminobiphenyl
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 phenylether
GC/MS	EPA 8270C,D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	4-Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
GC/MS	EPA 8270C,D	7,12-7,12-Dimethylbenz(a)anthraceneDimethylphenethylamine
GC/MS	EPA 8270C,D	a a-Dimethylphenethylamine
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	Aramite
GC/MS	EPA 8270C,D	Atrazine
GC/MS	EPA 8270C,D	Azobenzene
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
GC/MS	EPA 8270C,D	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane))
GC/MS	EPA 8270C,D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 625 / 8270C,D	Bis(2-Ethylhexyl)adipate
GC/MS	EPA 8270C,D	Butyl benzyl phthalate
GC/MS	EPA 8270C,D	Caprolactam
GC/MS	EPA 8270C,D	Carbazole
GC/MS	EPA 8270C,D	Chlorobenzilate
GC/MS	EPA 8270C,D	Chrysene
GC/MS	EPA 8270C,D	Diallate
GC/MS	EPA 8270C,D	Dibenz(a h)anthracene
GC/MS	EPA 8270C,D	Dibenzo(a,j)acridine
GC/MS	EPA 8270C,D	Dibenzofuran
GC/MS	EPA 8270C,D	Diethyl phthalate
GC/MS	EPA 8270C,D	Diethyladipate
GC/MS	EPA 8270C,D	Dimethoate
GC/MS	EPA 8270C,D	Dimethyl phthalate
GC/MS	EPA 8270C,D	Di-n-butyl phthalate
GC/MS	EPA 8270C,D	Di-n-octyl phthalate
GC/MS	EPA 8270C,D	Disulfoton
GC/MS	EPA 8270C,D	Ethyl methacrylate
GC/MS	EPA 8270C,D	Ethyl methanesulfonate
GC/MS	EPA 8270C,D	Ethyl parathion
GC/MS	EPA 8270C,D	Famfur
GC/MS	EPA 8270C,D	Fluoranthene
GC/MS	EPA 8270C,D	Fluorene
GC/MS	EPA 8270C,D	Hexachlorobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Hexachlorobutadiene
GC/MS	EPA 8270C,D	Hexachlorocyclopentadiene
GC/MS	EPA 8270C,D	Hexachloroethane
GC/MS	EPA 8270C,D	Hexachlorophene
GC/MS	EPA 8270C,D	Hexachloropropene
GC/MS	EPA 8270C,D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C,D	Isodrin
GC/MS	EPA 8270C,D	Isophorone
GC/MS	EPA 8270C,D	Isosafrole
GC/MS	EPA 8270C,D	Kepone
GC/MS	EPA 8270C,D	Methapyriline
GC/MS	EPA 8270C,D	Methyl methanesulfonate
GC/MS	EPA 8270C,D	Methyl parathion
GC/MS	EPA 8270C,D	Naphthalene
GC/MS	EPA 8270C,D	Nitrobenzene
GC/MS	EPA 8270C,D	n-Nitrosodiethylamine
GC/MS	EPA 8270C,D	n-Nitrosodimethylamine
GC/MS	EPA 8270C,D	n-Nitroso-di-n-butylamine
GC/MS	EPA 8270C,D	n-Nitrosodi-n-propylamine
GC/MS	EPA 8270C,D	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D	n-Nitrosomethylethylamine
GC/MS	EPA 8270C,D	n-Nitrosomorpholine
GC/MS	EPA 8270C,D	n-Nitrosopiperidine
GC/MS	EPA 8270C,D	n-Nitrosopyrrolidine
GC/MS	EPA 8270C,D	o,O o, o-Triethyl phosphorothioate
GC/MS	EPA 8270C,D	o,o-Diethyl o-pyrazinyl phosphorothiote
GC/MS	EPA 8270C,D	o-Toluidine
GC/MS	EPA 8270C,D	Pentachlorobenzene
GC/MS	EPA 8270C,D	Pentachloronitrobenzene
GC/MS	EPA 8270C,D	Pentachlorophenol
GC/MS	EPA 8270C,D	Phenacetin

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Phenanthrene
GC/MS	EPA 8270C,D	Phenol
GC/MS	EPA 8270C,D	Phorate
GC/MS	EPA 8270C,D	Pronamide
GC/MS	EPA 8270C,D	Pyrene
GC/MS	EPA 8270C,D	Pyrididne
GC/MS	EPA 8270C,D	Safrole
GC/MS	EPA 8270C,D	Sulfotepp
GC/MS	EPA 8270C,D	Thionazin
HPLC/UV	EPA 8330A	1 ,3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A	1, 3-Dinitrobenzene
HPLC/UV	EPA 8330A	2, 4, 6-Trinitrotoluene
HPLC/UV	EPA 8330A	2, 4-Dinitrotoluene
HPLC/UV	EPA 8330A	2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A	2-Amino-4, 6-dinitrotoluene
HPLC/UV	EPA 8330A	2-Nitrotoluene
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
HPLC/UV	EPA 8330A	Ethylene glycol dinitrate (EGDN)
HPLC/UV	EPA 8330A	Hexahydr-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	EPA 8330A	Nitrobenzene
HPLC/UV	EPA 8330A MOD	Nitroglycerin
HPLC/UV	EPA 8330A	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	EPA 8330A	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	EPA 8330A	Tetryl
HPLC/UV	8330B (W/O Soil Grinding)	1, 3, 5-Trinitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	1, 3-Dinitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	2, 4, 6-Trinitrotoluene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
HPLC/UV	8330B (W/O Soil Grinding)	2, 4-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2, 6-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2-Amino-4, 6 -Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	3-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	3,5-Dinitroaniline
HPLC/UV	8330B (W/O Soil Grinding)	4-Amino-2,3-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	4-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	Ethylene glycol dinitrate (EGDN)
HPLC/UV	8330B (W/O Soil Grinding)	Hexahydr-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	8330B (W/O Soil Grinding)	Nitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	Nitroglycerin
HPLC/UV	8330B (W/O Soil Grinding)	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	8330B (W/O Soil Grinding)	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	8330B (W/O Soil Grinding)	Tetryl
CVAA	EPA 7471B	Mercury
CVAF	EPA 1631E	Low Level Mercury
ICP/AES	EPA 6010B,C	Aluminum
ICP/AES	EPA 6010B,C	Antimony
ICP/AES	EPA 6010B,C	Arsenic
ICP/AES	EPA 6010B,C	Barium
ICP/AES	EPA 6010B,C	Beryllium
ICP/AES	EPA 6010B,C	Boron
ICP/AES	EPA 6010B,C	Cadmium
ICP/AES	EPA 6010B,C	Calcium

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
ICP/AES	EPA 6010B,C	Chromium
ICP/AES	EPA 6010B,C	Cobalt
ICP/AES	EPA 6010B,C	Copper
ICP/AES	EPA 6010B,C	Iron
ICP/AES	EPA 6010B,C	Lead
ICP/AES	EPA 6010B,C	Magnesium
ICP/AES	EPA 6010B,C	Manganese
ICP/AES	EPA 6010B,C	Molybdenum
ICP/AES	EPA 6010B,C	Nickel
ICP/AES	EPA 6010B,C	Potassium
ICP/AES	EPA 6010B,C	Selenium
ICP/AES	EPA 200.7	Silicon
ICP/AES	EPA 6010B,C	Silver
ICP/AES	EPA 6010B,C	Sodium
ICP/AES	EPA 6010B,C	Strontium
ICP/AES	EPA 6010B,C	Thallium
ICP/AES	EPA 6010B,C	Tin
ICP/AES	EPA 6010B,C	Titanium
ICP/AES	EPA 6010B,C	Vanadium
ICP/AES	EPA 6010B,C	Zinc
ICP/MS	EPA 6020A	Aluminum
ICP/MS	EPA 6020A	Antimony
ICP/MS	EPA 6020A	Arsenic
ICP/MS	EPA 6020A	Barium
ICP/MS	EPA 6020A	Beryllium
ICP/MS	EPA 6020A	Boron
ICP/MS	EPA 6020A	Cadmium
ICP/MS	EPA 6020A	Calcium
ICP/MS	EPA 6020A	Chromium
ICP/MS	EPA 6020A	Cobalt
ICP/MS	EPA 6020A	Copper

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
ICP/MS	EPA 6020A	Iron
ICP/MS	EPA 6020A	Lead
ICP/MS	EPA 6020A	Magnesium
ICP/MS	EPA 6020A	Manganese
ICP/MS	EPA 6020A	Molybdenum
ICP/MS	EPA 6020A	Nickel
ICP/MS	EPA 6020A	Potassium
ICP/MS	EPA 6020A	Selenium
ICP/MS	EPA 6020A	Silver
ICP/MS	EPA 6020A	Sodium
ICP/MS	EPA 6020A	Strontium
ICP/MS	EPA 6020A	Thallium
ICP/MS	EPA 6020A	Tin
ICP/MS	EPA 6020A	Titanium
ICP/MS	EPA 6020A	Tungsten
ICP/MS	EPA 6020A	Vanadium
ICP/MS	EPA 6020A	Zinc
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride
IC	EPA 9056A	Nitrate as N
IC	EPA 9056A	Nitrite as N
IC	EPA 9056A	Orthophosphate
IC	EPA 9056A	Sulfate
Gravimetric	EPA 9071A / 9071B	Oil and Grease, Oil and Grease with SGT
Physical	EPA 1010A	Ignitability
Physical	EPA 9045D	pH
Titration	Chap 7.3.4	Reactive Sulfide
IR	Lloyd Kahn	Total organic carbon
Turbidimetric	EPA 9038 / ASTM 516-02	Sulfate
UV/VIS	EPA 350.1 / SM 4500NH3 H	Ammonia as N
UV/VIS	EPA 9251 / SM 4500Cl E	Chloride

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
UV/VIS	Chap. 7.3.4	Reactive Cyanide
UV/VIS	EPA 376.3	AVS-SEM
UV/VIS	SM 3500Fe D	Ferrous Iron
Cleanup Methods	EPA 3630C	Silica Gel
UV/VIS	EPA 7196	Chromium VI
UV/VIS	EPA 7196A	Chromium VI
UV/VIS	EPA 9012B	Total cyanide
Preparation	**Method**	**Type**
Preparation	EPA 1311	Toxicity Characteristic Leaching Procedure
Preparation	EPA 1312	Synthetic Precipitation Leaching Procedure
Cleanup Methods	EPA 3660B	Sulfur Clean-up
Cleanup Methods	EPA 3620C	Florsil Clean-up
Cleanup Methods	EPA 3630C	Silica Gel Clean-up
Cleanup Methods	EPA 3640A	GPC Clean-up
Organic Preparation	EPA 3540C	Soxhlet Extraction
Organic Preparation	EPA 3545A	Pressurized Fluid Extraction
Organic Preparation	EPA 3550C	Sonication
Inorganics Preparation	EPA 3050B	Hotblock
Inorganics Preparation	EPA 3060A	Alkaline Digestion
Volatile Organics Preparation	EPA 5035/5035A	Closed System Purge and Trap

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	Propene
GC/MS	EPA TO-15	1, 1, 1-Trichloroethane
GC/MS	EPA TO-15	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA TO-15	1, 1, 2-Trichloroethane

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	1, 1-Dichloroethane
GC/MS	EPA TO-15	1, 1-Dichloroethylene
GC/MS	EPA TO-15	1, 2, 4-Trichlorobenzene
GC/MS	EPA TO-15	1, 2, 4-Trimethylbenzene
GC/MS	EPA TO-15	1, 2-Dibromoethane (EDB)
GC/MS	EPA TO-15	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
GC/MS	EPA TO-15	1, 2-Dichlorobenzene
GC/MS	EPA TO-15	1, 2-Dichloroethane
GC/MS	EPA TO-15	1, 2-Dichloroethenes (Total)
GC/MS	EPA TO-15	1, 2-Dichloropropane
GC/MS	EPA TO-15	1, 3, 5-Trimethylbenzene
GC/MS	EPA TO-15	1, 3-Butadiene
GC/MS	EPA TO-15	1, 3-Dichlorobenzene
GC/MS	EPA TO-15	1, 4-Dichlorobenzene
GC/MS	EPA TO-15	1,4-Difluorobenzene
GC/MS	EPA TO-15	1, 4-Dioxane
GC/MS	EPA TO-15	2-Butanone
GC/MS	EPA TO-15	2-Hexanone
GC/MS	EPA TO-15	2-Propanol
GC/MS	EPA TO-15	4-Ethyltoluene
GC/MS	EPA TO-15	4-Methyl-2-pentanone
GC/MS	EPA TO-15	Acetone
GC/MS	EPA TO-15	Acrolein
GC/MS	EPA TO-15	Benzene
GC/MS	EPA TO-15	Benzyl chloride
GC/MS	EPA TO-15	Bromochloromethane
GC/MS	EPA TO-15	Bromodichloromethane
GC/MS	EPA TO-15	Bromoform
GC/MS	EPA TO-15	Carbon disulfide
GC/MS	EPA TO-15	Carbon tetrachloride
GC/MS	EPA TO-15	Chlorobenzene

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	Chloroethane
GC/MS	EPA TO-15	Chloroform
GC/MS	EPA TO-15	Cis-1, 2-Dichloroethene
GC/MS	EPA TO-15	Cis-1, 3-Dichloropropene
GC/MS	EPA TO-15	Cyclohexane
GC/MS	EPA TO-15	Dibromochloromethane
GC/MS	EPA TO-15	Dichlorodifluoromethane (Freon 12)
GC/MS	EPA TO-15	Ethanol
GC/MS	EPA TO-15	Ethyl acetate
GC/MS	EPA TO-15	Ethylbenzene
GC/MS	EPA TO-15	Hexachlorobutadiene
GC/MS	EPA TO-15	Isopropyl alcohol
GC/MS	EPA TO-15	m, p-Xylene
GC/MS	EPA TO-15	Methyl bromide (Bromomethane)
GC/MS	EPA TO-15	Methyl chloride (Chloromethane)
GC/MS	EPA TO-15	Methyl methacrylate
GC/MS	EPA TO-15	Methyl tert-butyl ether
GC/MS	EPA TO-15	Methylene chloride
GC/MS	EPA TO-15	Naphthalene
GC/MS	EPA TO-15	n-Heptane
GC/MS	EPA TO-15	n-Hexane
GC/MS	EPA TO-15	o-Xylene
GC/MS	EPA TO-15	Styrene
GC/MS	EPA TO-15	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA TO-15	Tetrahydrofuran
GC/MS	EPA TO-15	Toluene
GC/MS	EPA TO-15	trans-1, 2-Dichloroethylene
GC/MS	EPA TO-15	trans-1, 3-Dichloropropylene
GC/MS	EPA TO-15	Trichloroethene (Trichloroethylene)
GC/MS	EPA TO-15	Trichlorofluoromethane (Freon 11)
GC/MS	EPA TO-15	Trichlorotrifluoroethane (Freon 113)

LABORATORY ACCREDITATION BUREAU

Certificate # L2223

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	Vinyl acetate
GC/MS	EPA TO-15	Vinyl chloride
GC/MS	EPA TO-15	Xylenes (Total)

Notes:

1) This laboratory offers commercial testing service.

Approved by: _____ Date: February 10, 2012

R. Douglas Leonard
Chief Technical Officer

Issued: 11/04/09 Revised: 01/11/10 Revised: 04/06/10 Revised: 9/9/10 Revised: 10/13/10
Revised: 1/20/11 Revised: 4/13/11 Revised: 5/26/11 Revised: 2/10/12

TestAmerica – South Burlington

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board/ACLASS

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TestAmerica-South Burlington
30 Community Drive, Suite 11
South Burlington, VT 05403

has been assessed by ACLASS
and meets the requirements of

DoD-ELAP

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1492

Certificate Number

ACLASS Approval

Certificate Valid: 10/22/2010 – 10/22/2012

Version No. 002

SCOPE OF DoD-ELAP ACCREDITATION

TestAmerica – South Burlington

30 Community Drive, Suite 11, South Burlington, VT 05403
Kirsten McCracken Phone: 802-660-1990

TESTING

Valid to: October 22, 2012 Certificate Number: ADE – 1492

I. Environmental

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water	Acid Digestion for Metals	3005A	
Water	Acid Digestion for Metals	3010A	
Solids	Acid digestion	3050B	
Water	Separatory Funnel Extraction	3510C	
Solids	Soxhlet extraction	3540C	
Solids	Ultrasonic Extraction	3550C	
Water/Solids	Florisil Cleanup	3620C	
Water/Solids	Silica Gel Cleanup	3630C	
Water/Solids	Sulfuric Acid/ Permanganate Cleanup	3665A	
Water/Solids	GPC Cleanup	3640A	
Water	Purge and Trap	5030B	
Solids	Purge and Trap	5035	

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Perchlorate	6850	HPLC/MS
Water	Perchlorate	331.0	HPLC
Water / Solids	Nitroaromatics/ Nitramines	8330B	HPLC
Solids	pH	9045C / 9045D	pH Meter
Water	pH	9040B / 9040C	pH Meter
Water	TOC	9060A	Catalytic Combustion and Infrared Detector
Solids	TOC	Lloyd Kahn	Elemental Analyzer (Differential TCD)
Water	Cyanide	9012A/9012B	Automated Colorimetric
Solids	Extraction Procedure for Cyanide Analysis	9013	
Solids	Cyanide	9012A/9012B	Automated Colorimetric
Water	Mercury	7470A	CVAA
Solids	Mercury	7471A / 7471B	CVAA
Water / Solids	Metals	6010B / 6010C	ICP-OES
Water / Solids	Metals	6020 / 6020A	ICP-MS
Water / Solids	PCBs	8082 / 8082A	GC/ECD
Water / Solids	Pesticides	8081A / 8081B	GC/ECD
Water / Solids	Herbicides	8151A	GC/ECD
Water / Solids	Semivolatile Organic Compounds	8270C / 8270D	GC/MS
Water / Solids	Semivolatile Organic Compounds	8270C SIM	GC/MS

500 Montgomery St. Suite 625 | Alexandria, VA 22314 | 703-836-0025 | www.aclasscorp.com

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Volatile Organic Compounds	8260B	GC/MS
Air	Volatile Organic Compounds	TO15	GC/MS
Solids	Diesel Range Organics	8015B	GC/FID

Notes:

1. ** = As Applicable*
2. ***=Refer to Accredited Analyte Listing for analytes in which the laboratory is accredited*
3. *This scope is part of and must be included with the Certificate of Accreditation No. ADE-1492*

Vice President

500 Montgomery St. Suite 625 | Alexandria, VA 22314 | 703-836-0025 | www.aclasscorp.com

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
	Trace Metals						
1000	Aluminum	6010B/C	6020/A	6010B/C	6020/A		
1005	Antimony	6010B/C	6020/A	6010B/C	6020/A		
1010	Arsenic	6010B/C	6020/A	6010B/C	6020/A		
1015	Barium	6010B/C	6020/A	6010B/C	6020/A		
1020	Beryllium	6010B/C	6020/A	6010B/C	6020/A		
1025	Boron	6010B/C	6020/A	6010B/C	6020/A		
1030	Cadmium	6010B/C	6020/A	6010B/C	6020/A		
1035	Calcium	6010B/C	6020/A	6010B/C	6020/A		
1040	Chromium, total	6010B/C	6020/A	6010B/C	6020/A		
	Cobalt	6010B/C	6020/A	6010B/C	6020/A		
1055	Copper	6010B/C	6020/A	6010B/C	6020/A		
1070	Iron	6010B/C	6020/A	6010B/C	6020/A		
1075	Lead	6010B/C	6020/A	6010B/C	6020/A		
1085	Magnesium	6010B/C	6020/A	6010B/C	6020/A		
1090	Manganese	6010B/C	6020/A	6010B/C	6020/A		
1095	Mercury	7470A		7471A/B			
1100	Molybdenum	6010B/C	6020/A	6010B/C	6020/A		
1105	Nickel	6010B/C	6020/A	6010B/C	6020/A		
1125	Potassium	6010B/C	6020/A	6010B/C	6020/A		
1140	Selenium	6010B/C	6020/A	6010B/C	6020/A		
1150	Silver	6010B/C	6020/A	6010B/C	6020/A		
	Sodium	6010B/C	6020/A	6010B/C	6020/A		
1165	Strontium	6010B/C		6010B/C			
1165	Thallium	6010B/C	6020/A	6010B/C	6020/A		
1180	Tin	6010B/C		6010B/C			
1185	Titanium	6010B/C		6010B/C			
1185	Vanadium	6010B/C	6020/A	6010B/C	6020/A		
1190	Zinc	6010B/C	6020/A	6010B/C	6020/A		
	Misc Analytes						
1895	Perchlorate	331.0	6850	6850			
1900	pH	9040B/C		9045C/D			
1645	Total Cyanide	9012A/B		9012A/B			
2040	TOC	9060A		Lloyd Kahn			
	Petroloeum Hydrocarbons						
	Diesel Range Organics (DRO)			8015B			
	VOCs						
5105	1,1,1,2-Tetrachloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane					TO-15	
5110	1,1,2,2-Tetrachloroethane	8260B		8260B		TO-15	
	1,1,2-Trichloro-1,2,2-trifluroethane (Freon TF)	8260B		8260B		TO-15	
5165	1,1,2-Trichloroethane	8260B		8260B			
5165	1,1,2-Trichloroethane					TO-15	
4630	1,1-Dichloroethane	8260B		8260B		TO-15	
4640	1,1-Dichloroethene	8260B		8260B		TO-15	
4670	1,1-Dichloropropene	8260B		8260B			
4695	1,2 Dichlorotetrafluoroethane (Freon 114)					TO-15	
5150	1,2,3-Trichlorobenzene	8260B		8260B			
5180	1,2,3-Trichloropropane	8260B		8260B			
5155	1,2,4-Trichlorobenzene	8260B		8260B		TO-15	
5210	1,2,4-Trimethylbenzene	8260B		8260B		TO-15	
4570	1,2-Dibromo-3-chloropropane (DBCP)	8260B		8260B			
4585	1,2-Dibromoethane (EDB)	8260B		8260B		TO-15	

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
4610	1,2-Dichlorobenzene	8260B		8260B		TO-15	
4635	1,2-Dichloroethane	8260B		8260B		TO-15	
4655	1,2-Dichloropropane	8260B		8260B		TO-15	
5215	1,3,5-Trimethylbenzene	8260B		8260B		TO-15	
4615	1,3-Dichlorobenzene	8260B		8260B		TO-15	
4660	1,3-Dichloropropane	8260B		8260B			
	1,4 Dioxane	8260B		8260B		TO-15	
4620	1,4-Dichlorobenzene	8260B		8260B		TO-15	
	2,2 Dichloropropane	8260B		8260B			
4665	2,2-Dichloropropane			8260B			
4410	2-Butanone (MEK)	8260B		8260B		TO-15	
4500	2-Chloroethylvinylether	8260B		8260B			
	2-Chlorotoluene	8260B		8260B		TO15	
4860	2-Hexanone	8260B		8260B		TO15	
	2-Methyl-2-Propanol (tert-Butyl Alcohol)					TO15	
	3-Choro-1-propene					TO15	
	4-Chlorotoluene	8260B		8260B			
4910	4-Isopropyltoluene	8260B		8260B		TO15	
4995	4-Methyl-2-pentanone (MIBK)	8260B		8260B		TO15	
4315	Acetone	8260B		8260B			
4375	Benzene	8260B		8260B		TO-15	
	Benzyl chloride					TO-15	
4385	Bromobenzene	8260B		8260B			
4390	Bromochloromethane	8260B		8260B			
4395	Bromodichloromethane	8260B		8260B		TO-15	
4400	Bromoform	8260B		8260B		TO-15	
4950	Bromomethane	8260B		8260B		TO-15	
4450	Carbon disulfide	8260B		8260B		TO-15	
4455	Carbon Tetrachloride	8260B		8260B		TO-15	
4475	Chlorobenzene	8260B		8260B		TO-15	
4575	Chlorodibromomethane	8260B		8260B		TO-15	
	Chlorodifluoromethane (Freon 22)					TO-15	
4485	Chloroethane	8260B		8260B		TO-15	
4505	Chloroform	8260B		8260B		TO-15	
4960	Chloromethane	8260B		8260B		TO-15	
4645	*cis* -1,2-Dichloroethene	8260B		8260B		TO-15	
4680	cis-1,3-Dichloropropene	8260B		8260B		TO-15	
4555	Cyclohexane	8260B		8260B		TO-15	
4595	Dibromomethane	8260B		8260B		TO-15	
4625	Dichlorodifluoromethane	8260B		8260B		TO-15	
4975	Dichloromethane (Methylene Chloride)	8260B		8260B		TO-15	
4765	Ethylbenzene	8260B		8260B		TO-15	
4835	Hexachlorobutadiene	8260B		8260B		TO-15	
	Iodomethane	8260B		8260B			
	Isobutyl Alcohol	8260B		8260B			
	Isooctane (2,2,4-Trimethylpentane)					TO-15	
	Isopropyl Alcohol					TO-15	
4900	Isopropylbenzene	8260B		8260B			
	Isopropylbenzene (Cumene)					TO-15	
	Methycyclohexane	8260B		8260B			
	Methyl Acetate	8260B		8260B			
	Methyl methacrylate					TO-15	
5000	Methyl-tert-butylether (MTBE)	8260B		8260B		TO-15	
	m-Xylene & p-Xylene	8260B		8260B		TO-15	
5005	Naphthalene	8260B		8260B		TO-15	
	n-Butylbenzene	8260B		8260B		TO-15	
4825	n-Heptane					TO-15	
4855	n-Hexane					TO-15	
5090	n-Propylbenzene	8260B		8260B		TO-15	

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
	o-Xylene	8260B		8260B		TO-15	
4768	p-Ethyltoluene					TO-15	
	sec-Butylbenzene	8260B		8260B		TO-15	
5100	Styrene	8260B		8260B		TO-15	
4445	tert-Butylbenzene	8260B		8260B		TO-15	
5115	Tetrachloroethene	8260B		8260B		TO-15	
	Tetrahydrofuran	8260B		8260B		TO-15	
5140	Toluene	8260B		8260B		TO-15	
4700	trans-1,2-Dichloroethene	8260B		8260B		TO-15	
4685	*trans* -1,3-Dichloropropene	8260B		8260B		TO-15	
5170	Trichloroethene	8260B		8260B			
5170	Trichloroethene					TO-15	
5175	Trichlorofluoromethane (Freon 11)					TO-15	
5195	Trichlorotrifluoromethane (Freon 113)					TO-15	
5225	Vinyl acetate	8260B		8260B			
5230	Vinyl bromide					TO-15	
5235	Vinyl chloride	8260B		8260B		TO-15	
5260	Xylenes, total	8260B		8260B		TO-15	
	SVOCs - Base/Neutrals/Acids						
	1,1 Biphenyl	8270C/D	8270C SIM	8270C/D	8270C SIM		
6715	1,2,4,5-Tetrachlorobenzene	8270C/D		8270C/D			
5155	1,2,4-Trichlorobenzene	8270C/D		8270C/D			
4610	1,2-Dichlorobenzene	8270C/D		8270C/D			
4615	1,3-Dichlorobenzene	8270C/D		8270C/D			
4620	1,4-Dichlorobenzene	8270C/D		8270C/D			
6380	1-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	1-Methylphenanthrene		8270C SIM		8270C SIM		
	2,2-oxybis (1-chloropropane)	8270C/D		8270C/D			
6735	2,3,4,6-Tetrachlorophenol	8270C/D		8270C/D			
	2,3,5-Trimethylnapthalene		8270C SIM		8270C SIM		
6835	2,4,5-Trichlorophenol	8270C/D		8270C/D			
6840	2,4,6-Trichlorophenol	8270C/D		8270C/D			
6000	2,4-Dichlorophenol	8270C/D		8270C/D			
6130	2,4-Dimethylphenol	8270C/D		8270C/D			
6175	2,4-Dinitrophenol	8270C/D		8270C/D			
6185	2,4-Dinitrotoluene	8270C/D		8270C/D			
6005	2,6-Dichlorophenol	8270C/D		8270C/D			
	2,6-Dimethylnaphthalene		8270C SIM		8270C SIM		
6190	2,6-Dinitrotoluene	8270C/D		8270C/D			
5795	2-Chloronaphthalene	8270C/D		8270C/D			
5800	2-Chlorophenol	8270C/D		8270C/D			
	2-Fluorophenol	8270C/D		8270C/D			
	2-Flurorobiphenyl	8270C/D		8270C/D			
6360	2-Methyl-4,6-Dinitrophenol	8270C/D		8270C/D			
6385	2-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6400	2-Methylphenol	8270C/D		8270C/D			
6460	2-Nitroaniline	8270C/D		8270C/D			
6490	2-Nitrophenol	8270C/D		8270C/D			
5945	3,3'-Dichlorobenzidine	8270C/D		8270C/D			
	3-Methylcholanthrene	8270C/D		8270C/D			
6465	3-Nitroaniline	8270C/D		8270C/D			
5660	4-Bromophenyl-phenylether	8270C/D		8270C/D			
5700	4-Chloro-3-methylphenol	8270C/D		8270C/D			
5745	4-Chloroaniline	8270C/D		8270C/D			
5825	4-Chlorophenyl-phenylether	8270C/D		8270C/D			
6410	4-Methylphenol (and/or 3-Methylphenol)	8270C/D		8270C/D			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
6470	4-Nitroaniline	8270C/D		8270C/D			
6500	4-Nitrophenol	8270C/D		8270C/D			
5500	Acenaphthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5505	Acenaphthylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Acetophenone	8270C/D		8270C/D			
5545	Aniline	8270C/D		8270C/D			
5555	Anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Atrazine	8270C/D		8270C/D			
	Azobenzene	8270C/D		8270C/D			
5595	Benzidine	8270C/D		8270C/D			
	Benzo (e) pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5575	Benzo(a)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5580	Benzo(a)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5585	Benzo(b)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5590	Benzo(g,h,i)perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5600	Benzo(k)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5610	Benzoic acid	8270C/D		8270C/D			
5630	Benzyl alcohol	8270C/D		8270C/D			
5760	bis(2-Chloroethoxy)methane	8270C/D		8270C/D			
5765	bis(2-Chloroethyl)ether	8270C/D		8270C/D			
5780	bis(2-Chloroiospropyl) ether	8270C/D		8270C/D			
6255	bis(2-ethylhexyl) phthalate	8270C/D		8270C/D			
5670	Butyl benzyl phthalate	8270C/D		8270C/D			
5680	Carbazole	8270C/D		8270C/D			
5855	Chrysene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5895	Dibenzo(a,h)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5905	Dibenzofuran	8270C/D		8270C/D			
	Dibenzothiphene		8270C SIM		8270C SIM		
6070	Diethyl phthalate	8270C/D		8270C/D			
6135	Dimethylphthalate	8270C/D		8270C/D			
5925	Di-n-butylphthalate	8270C/D		8270C/D			
6200	Di-n-octylphthalate	8270C/D		8270C/D			
6265	Fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6270	Fluorene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6275	Hexachlorobenzene	8270C/D		8270C/D			
4835	Hexachlorobutadiene	8270C/D		8270C/D			
6285	Hexachlorocyclopentadiene	8270C/D		8270C/D			
4840	Hexachloroethane	8270C/D		8270C/D			
6315	Indeno(1,2,3, cd)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Isodrin	8270C/D		8270C/D			
6320	Isophorone	8270C/D		8270C/D			
5005	Naphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5015	Nitrobenzene	8270C/D					
6530	N-Nitrosodimethylamine	8270C/D		8270C/D			
6545	N-Nitroso-di-n-propylamine	8270C/D		8270C/D			
6535	N-Nitrosodiphenylamine	8270C/D		8270C/D			
6605	Pentachlorophenol	8270C/D		8270C/D			
	Perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6615	Phenanthrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6625	Phenol	8270C/D		8270C/D			
6665	Pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5095	Pyridine	8270C/D		8270C/D			
	Thionazin	8270C/D		8270C/D			
	PCBs						
8880	Aroclor 1016	8082/A		8082/A			
8885	Aroclor 1221	8082/A		8082/A			
8890	Aroclor 1232	8082/A		8082/A			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
8895	Aroclor 1242	8082/A		8082/A			
8900	Aroclor 1248	8082/A		8082/A			
8905	Aroclor 1254	8082/A		8082/A			
8910	Aroclor 1260	8082/A		8082/A			
	Aroclor 1262	8082/A		8082/A			
	Aroclor 1268	8082/A		8082/A			
	Herbicides						
8655	2,4,5-T	8151A		8151A			
8650	2,4,5-TP (Silvex)	8151A		8151A			
8545	2,4-D	8151A		8151A			
8560	2,4-DB	8151A		8151A			
8600	3,5-Dichlorobenzoic acid	8151A		8151A			
	4-Nitrophenol	8151A		8151A			
8555	Dalapon	8151A		8151A			
8595	Dicamba	8151A		8151A			
8605	Dichloroprop	8151A		8151A			
8620	Dinoseb	8151A		8151A			
6605	Pentachlorophenol	8151A		8151A			
	Nitroaromatic and Nitroamines						
6885	1,3,5-Trinitrobenzene	8330B		8330B			
6160	1,3-Dinitrobenzene	8330B		8330B			
	2,4,6 Trinitrophenol (Picric Acid)	8330B		8330B			
9651	2,4,6-Trinitrotoluene	8330B		8330B			
	2,4-diamino-6-nitrotoluene	8330B		8330B			
6185	2,4-Dinitrotoluene	8330B		8330B			
	2,6-diamino-4-nitrotoluene	8330B		8330B			
6190	2,6-Dinitrotoluene	8330B		8330B			
9303	2-Amino-4,6-dinitrotoluene	8330B		8330B			
9507	2-Nitrotoluene	8330B		8330B			
9510	3-Nitrotoluene	8330B		8330B			
9306	4-Amino-2,6-dinitrotoluene	8330B		8330B			
9513	4-Nitrotoluene	8330B		8330B			
9522	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8330B		8330B			
5015	Nitrobenzene	8330B		8330B			
	Nitroglycerin	8330B		8330B			
	PETN	8330B		8330B			
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	8330B		8330B			
6415	Tetryl (methyl-2,4,6-trinitrophenylnitramine)	8330B		8330B			
	Pesticides						
7025	Aldrin	8081A/B		8081A/B			
7110	alpha-BHC	8081A/B		8081A/B			
7240	alpha-Chlordane	8081A/B		8081A/B			
7115	beta-BHC	8081A/B		8081A/B			
7250	Chlordane (technical)	8081A/B		8081A/B			
7105	delta-BHC	8081A/B		8081A/B			
7470	Dieldrin	8081A/B		8081A/B			
7510	Endosulfan I	8081A/B		8081A/B			
7515	Endosulfan II	8081A/B		8081A/B			
7520	Endosulfan sulfate	8081A/B		8081A/B			
7540	Endrin	8081A/B		8081A/B			
7530	Endrin aldehyde	8081A/B		8081A/B			
7535	Endrin ketone	8081A/B		8081A/B			
7120	gamma-BHC (Lindane)	8081A/B		8081A/B			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
7245	gamma-Chlordane	8081A/B		8081A/B			
7685	Heptachlor	8081A/B		8081A/B			
7690	Heptachlor Epoxide (beta)	8081A/B		8081A/B			
7810	Methoxychlor	8081A/B		8081A/B			
8250	Toxaphene (total)	8081A/B		8081A/B			
7355	4,4'-DDD	8081A/B		8081A/B			
7360	4,4'-DDE	8081A/B		8081A/B			
7365	4,4'-DDT	8081A/B		8081A/B			

Attachment C
Final Response to USEPA Comments

This page intentionally left blank

FINAL RESPONSES TO
EPA COMMENTS ON THE
DRAFT SITE INSPECTION/EXPANDED SITE INSPECTION
SAMPLING AND ANALYSIS PLAN ADDENDUM
SITE INSPECTION FOR PHOTO-IDENTIFIED (PI) SITE 21
FORMER VIEQUES NAVAL TRAINING RANGE
VIEQUES, PUERTO RICO

DATED JULY 2012

Presented below are review comments on the *Draft Site Inspection/Expanded Site Inspection Sampling and Analysis Plan Addendum, Site Inspection for Photo-Identified (PI) Site 21, Former Vieques Naval Training Range, Vieques, Puerto Rico;* dated July 2012 (SAP Addendum).

General Comments

1. The Executive Summary indicates that several worksheets are incorporated by reference from the Final Site Inspection/Expanded Site Inspection Sampling and Analysis Plan, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico, dated February 2009 (SI/ESI SAP), and are not included in the SAP Addendum. However, Worksheet #20 contains site-specific information necessary for project planning and should be included in the SAP Addendum (e.g., Worksheet #20 includes the number of sampling locations and quality control [QC] samples planned). In addition, Worksheet #12 should be retained to reference the specific tables in the SI/ESI SAP, similar to how Worksheet #28 is presented. Revise the SAP Addendum to include these worksheets.

   Navy Response:

   A Worksheet #12 and Worksheet #20 specific to the PI 21 investigation have been prepared as requested.

2. The sample design and rationale is insufficiently detailed. For example, while Worksheet #9 indicates that the number of samples and analytes were determined during the scoping session, the SAP Addendum does not indicate why one sample location is considered sufficient for identifying possible contamination from the former tank. It is also unclear why the subsurface sample will be collected no deeper than six feet as described in Table ES-1 of the Executive Summary. Finally, the rationale for why the proposed analyte list is sufficient to characterize the potential release is not presented (i.e., perchlorate, nitrosodimethylamine, unsymmetrical dimethylhydrazine, total petroleum hydrocarbons, and herbicides are also contaminants of concern associated with military operations that have not been proposed). Revise the SAP Addendum to include additional detail regarding the sample design and rationale.

   Navy Response:

   As concurred upon during the Technical Subcommittee Meeting on October 23, 2012, the SAP has been modified to include five soil sampling locations (two depths per location). Based on the discussion held during the October Technical Subcommittee meeting, and to address the comment, the first paragraph under Item 5 of Worksheet #11 has been revised to read:

   > "As concurred upon by the Navy, USEPA, PREQB, and USFWS, one surface soil sample and one subsurface soil sample will be collected from five locations at the former vertical tank location to determine whether a CERCLA-related release occurred and, if so, whether the release warrants further investigation or action. One sample location will be from near the center of the former tank location,

and the remaining four locations will be approximately evenly spaced around the former tank location at a radial distance of about 25 feet from the central sample location. This sample layout provides sufficient coverage for identifying whether release(s) occurred from the tank. Note that two soil samples are located in potential migration pathways (such as areas with limited vegetation and potential drainage areas), as shown in Figure 3.

The surface and subsurface soil samples will be collected in accordance with the soil sampling protocol in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2010), which states that (in the absence of land crab habitat) surface soil will be collected from the top 12 inches of soil and subsurface soil will be collected from the 2-foot interval between the bottom of the surface soil interval and 6 feet (or bedrock or water table if encountered above 6 feet). The exact depth of the subsurface samples will be based on field observations as follows: at the depth of suspected contamination (based on visual and/or instrument-aided observation) or, in the absence of suspected contamination, within the 2-foot interval from 4 to 6 feet bgs, just above bedrock, or just above the water table, whichever is shallowest. Note that the land elevation at the former tank location is less than approximately 4 feet above mean sea level (amsl).

All samples will be analyzed for VOCs, SVOCs, pesticides, PCBs, and metals because these constituent groups represent the most likely contaminant types associated with the vertical tank, if the tank was used to store chemicals. Analysis for other constituents, such as perchlorate, nitrosodimethylamine, unsymmetrical dimethylhydrazine, total petroleum hydrocarbons, and herbicides, although potentially associated with military operations, are not likely associated with PI 21 based on its unlikely use for munitions training.

Worksheet #15 contains analytical methodology . . . . . of the SI for the following reasons:"

3. The effort involves collecting 1 surface sample and 1 subsurface sample for PI 21, located in the area of the former above ground storage tank. Additional sampling could increase the confidence in the conclusions. It might be beneficial to collect additional samples in and around this area. One approach would be to collect 5 samples from this area, one in the center of where the former tank was located, and 4 along the sides of this area, located some distance (25 feet?) from the center. Surface and subsurface samples would be collected at each location. Please revise the SAP addendum to include the additional samples.

Navy Response:

Please see the response to General Comment #2.

4. Worksheet #10 indicates that Global Positioning System (GPS) coordinates will be used to locate the former tank. It is unclear how GPS coordinates of the location of the former tank will be obtained and what is the anticipated accuracy for finding the former tank. Information such as accuracy, calibration, and maintenance should be provided in the SAP Addendum. Revise the SAP Addendum (e.g., Worksheets #14, #21 and #22) to provide this information.

Navy Response:

The following paragraph has been added under the "Sampling" heading of Worksheet #14:

> "The suspected tank location is known because it is observable on historical aerial photographs that have reference coordinates. These coordinates will be entered into a Trimble GPS, which has an accuracy greater than or equal to +/- 2.5 ft. Trimbles are self-calibrating."

The GPS equipment information has been added to Worksheet #22.

5. A lower limit of quantitation (LLOQ) check sample is recommended for all determinative methods. This QC sample is similar to a laboratory control sample that is carried through all preparation and determinative steps but is spiked at the method quantitation limit to demonstrate that the laboratory can recover target analytes at that level. SW-846 Methods 6010C and 6020A describe this concept and upcoming SW-846 method revisions are expected to include this concept as well. If decisions will be made using results between the limit of detection (LOD) and the limit of quantitation (LOQ), the LLOQ check should be spiked at the LOD. Revise the SAP Addendum to incorporate an LLOQ check sample and specify the spiking level, measurement performance criteria, and frequency requirements that will meet the data quality objectives of this investigation.

   Navy Response:

   The LLOQ check sample is implemented as required by DoD QSM for a given analysis method (e.g., SW-846). For this project, the LLOQ check is performed for metals, but the laboratory refers to it as their "PQL standard." The LLOQ check sample is performed at the lower limit of quantitation, which is where the LOQ is set.

   The LOD is useful for demonstrating absence. LODs are verified quarterly; there is a spike at the LOD and it must be demonstrated that the chemical can be detected, but there are no requirements for percent recovery. Furthermore, because accuracy is not known at levels below the LOQ, it would not be reasonable to expect reproducible or predictable recoveries at the LOD. Therefore, it is not reasonable to check accuracy below the range at which accuracy is assured.

6. Two laboratories (Katahdin Analytical Services and TestAmerica Burlington) are identified in Worksheet #11 but Worksheets #3 and #4 do not include a representative from TestAmerica. It is unclear which analyses will be performed by each laboratory and if a representative of TestAmerica should be included in Worksheets #3 and #4. Revise the SAP Addendum to clarify this information.

   Navy Response:

   TestAmerica-Burlington is responsible for grain size analysis, as shown in Worksheet #30 of Attachment B. There are various worksheets that indicate which analyses are performed by each laboratory but because this has not changed since the original SAP was prepared (Attachment B), no new worksheets are necessary. Worksheet #3 has been updated to add "Chris Anderson (Laboratory PM at TestAmerica; (802) 660-1990; Chris.Anderson@testamericainc.com)" as a SAP recipient. Worksheet #4 has been updated to include Chris Anderson on the sign-off sheet.

7. The SAP Addendum does not provide the most current laboratory QC acceptance limits. Since these values change over time, the SAP Addendum should be revised to present the current laboratory matrix spike/matrix spike duplicate (MS/MSD), surrogate and laboratory control sample (LCS) limits for all proposed methods.

   Navy Response:

   Worksheets #15 have been updated to include the limits and Worksheet #28 has been updated such that it no longer refers to old Worksheets #28-1A, #28-2A, and #28-3A.

8. It is unclear if regulators/stakeholders will be notified of SAP modifications, changed conditions, and significant corrective actions and if approval is required. Revise the SAP Addendum to indicate that regulators/stakeholders will be informed of SAP modifications, changed conditions, and significant corrective actions, to clarify if approval is required, and to provide the timing, form of communication, and responsible person for all notifications to regulators/stakeholders.

Navy Response:

The following row has been added to Worksheet #6 under "Communication Drivers": "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."

Under "Responsible Affiliation": "Navy RPM"
Under "Name": "Kevin Cloe"
Under "Phone Number and/or e-mail": "757-322-4736"

Under "Procedure": "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. Regulatory approval for SAP changes or deviations is not necessary during implementation of SAP; however, regulators will have the opportunity to evaluate whether the changes or deviations affect the ability to achieve the project objectives during report review."

9. The project personnel and responsibilities for the investigation are not clearly presented in the SAP Addendum. For example,

   a. Jose Font has been added to Worksheet #3 but is not listed in Worksheets #5, #6, or #7 so it is unclear what responsibilities and relationships this person has for this project. In addition, no email has been provided for this person.

      Navy Response:

      Jose Font's e-mail address has been added to Worksheet #3: Font.jose@epa.gov. He is included on Worksheet #3 because PREQB has asked that he receive a copy of the SAP. He is not listed on Worksheets #5, #6, or #7 because he has not project-specific involvement.

   b. Chelsea Barnes of Critigen is presented in Worksheets #5, #6, and #7 but is not included in Worksheet #3 or #4. Chelsea Bennet is included in Worksheet #4, but has been deleted from other worksheets. It appears that Worksheets #3 and/or #4 require revision.

      Navy Response:

      All worksheet rows referring to Chelsea Barnes/Bennet have been revised with the new database specialist.

   c. The new Navy Quality Assurance Officer, Jan Nielsen, has been added to Worksheets #5, #6, and #7 but is not included in Worksheet #3 or #4. It is unclear if this person will receive the SAP Addendum.

      Navy Response:

      Jan Nielsen is involved in the SAP preparation and provides her concurrence at the pre-draft stage prior to the draft document being submitted to regulatory agencies and does not wish to receive a copy of the document.

   d. Kenji Butler has been deleted from Worksheet #7 but the new field team lead, Stephen Brand, has not been added.

      Navy Response:

      The Field Team Lead has been changed to "TBD" on all pertinent worksheets.

10. Revise the SAP Addendum to clarify and consistently present the project personnel and responsibilities for this investigation.

Navy Response:

Worksheets #3, #4, #5, #6, and #7 have been reviewed and appropriate edits made to update project personnel.

Specific Comments

1. **Worksheet #10, Problem Definition, Page 23**: The section "Synopsis of Secondary Data" describes three soil samples that were collected as part of an Environmental Baseline Survey in 2002 and indicates that the data are not relevant for making further release assessment determinations at PI 21. It is unclear why the data are not relevant. Revise this section to provide additional details regarding this conclusion and how this relates to the current investigation.

Navy Response:

The last sentence of the first paragraph under "Synopsis of Secondary Data" has been modified to read:

"The Technical Subcommittee determined that the suspected former vertical tank is the only potential source of a release at the site warranting sampling (see Worksheets #9a and 9b, and associated meeting minutes). The three samples collected during the EBS are located approximately 1,000 feet from the suspected former vertical tank location. Therefore, the data from these samples is not relevant to characterizing potential releases associated with the suspected former vertical tank." However, the data will be considered in making the release assessment determinations for the site as a whole.

2. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 26:** Question 5, How much data should be collected, indicates that further action determinations for the site can be made with sufficient confidence by looking at the results for an analyte group as a whole rather than the individual analytes because if a particular analyte has an LOD above its screening level, there are other analytes in the same analytical group that would likely be detected if a release has occurred. However, analytes with LODs above screening levels should be considered data gaps and the uncertainty associated with these results should be discussed. Revise the SAP Addendum to discuss these potential data gaps and how they will be addressed.

Navy Response:

When the LOD is greater than the screening level, non-detects will be treated as non-exceedances and the uncertainty will be discussed in the data quality evaluation. This information has been provided in Worksheet #11.

3. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 26:** Question 5, How much data should be collected, indicates that the soil screening levels (SSLs) are overly conservative and not reliable indicators of leaching to groundwater and suggests the use of a dilution/attenuation factor of 20 as more appropriate due to the small size of the tank. It is unclear how deep the groundwater is at the location of the former tank. This information should be provided to support this conclusion. Revise the SAP Addendum to discuss the depth to groundwater and how this impacts the use of SSLs as screening values.

Navy Response:

The ocean is approximately 70 feet away from the suspected former tank location (i.e., sampling locations) and groundwater is expected to be within several feet of the ground surface and saline. This information has been included to Worksheet #10. However, it is important to note that SSLs have consistently been

shown to be overly conservative predictors of leaching on Vieques because they do not consider contaminant heterogeneity and other factors that affect contaminant migration, so they are not considered with the same significance as risk-based screening criteria.

4. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 26:** Question 5, How much data should be collected, indicates that for cases where the LODs are higher than project action limits (PALs), the detection limit (DL) may be lower than the PAL and in such cases, an estimated result would be reported. However, it is important to note that a result above the DL and below the LOQ is not quantifiable since LODs are only verified on a periodic basis (i.e., quarterly) and DL are statistical values only that are never verified. As such, it cannot be concluded that such a result is above or below a PAL that is between the DL and LOQ. Revise the SAP Addendum to correct this discrepancy.

Navy Response:

The following paragraphs have been inserted following the three ticks under question 5:

"The three ticks above are just examples of why LODs greater than PALs, while leading to some uncertainty, do not prevent conclusions from being drawn with respect to the objectives of this SI. Results between the DL and LOQ are quantified but are reported as 'estimated' with a J-qualifier because they are less than the LOQ. It is standard practice to use estimated values between the DL and LOQ as reported for performing data evaluation. While it is recognized there is increased uncertainty if the screening level is close to the detected result with estimated concentration, this is true for any result whose concentration is estimated (for whatever reason) and such uncertainty is discussed in the data quality evaluation.

Nondetect results (U-values) are reported at the LOD. When the LOD is greater than the PAL, it is standard practice that nondetects are not treated as a PAL exceedance."

5. **Worksheet #14, Summary of Project Tasks, Page 31:** The "Sampling" section indicates that the method for collecting soil samples (e.g., split spoon, direct push, slide hammer, or hand auger) will be selected based on the anticipated depths. However, Table ES-1 indicates the depths that are targeted for this investigation so the method should be specified in the SAP Addendum. In addition, since one sample result will be used to determine whether a release has occurred, it is important that representative subsamples from surface and subsurface soil be obtained. Laboratory subsampling is also critical. Revise the SAP Addendum to specify the method for collecting soil samples and discuss how representative subsamples are obtained in the field and laboratory for the various methods (e.g., VOCs, metals, and others).

Navy Response:

As noted previously and stated in Worksheet #14, the soil samples will be collected in accordance with the standard soil sampling protocol used for Vieques investigations and included in the regulatory-approved Master protocols document. For clarity in the Executive Summary, the following has been added in Table ES-1, to the end of the text in the "Investigation Tasks" column:

"Sampling will follow the Soil Sample Depth Selection Protocol as outlined in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2010)."

6. **Worksheet #15, Reference Limits and Evaluation Table, Pages 33 to 42:** It is unclear if results will be reported on a dry mass basis and if PALs will be compared to results corrected for dry mass. Revise Worksheet #15 to indicate that results will be reported on a dry mass basis and that PALs will be compared to results corrected for dry mass.

Navy Response:

A footnote (for example, Matrix: Soil6 on Worksheet #15-1) has been added to each Worksheet #15 to read: "Results for non-aqueous samples are reported on a dry-weight basis."

7. **Worksheet #22, Field Equipment Calibration, Maintenance, Testing, and Inspection Table, Page 51:** This worksheet presents information for a flame ionization detector (FID) but this equipment is not discussed elsewhere in the SAP Addendum and it is unclear what it will be used for. Revise the SAP Addendum to discuss the use of the FID or remove this instrument from Worksheet #22.

Navy Response:

The FID information has been removed from Worksheet #22.

8. **Attachment B, SI/ESI SAP, Worksheet #28, Laboratory QC Samples Table, Pages 332 to 393:** A post-digestion spike (PDS) is indicated as corrective action for failing metal analytes in the matrix spike duplicate. No acceptance criteria are provided for the PDS and it is unclear if a PDS will be analyzed when metal analytes in the matrix spike recover outside acceptance limits. Revise the SAP Addendum to clarify that a PDS will be analyzed when either the MS or MSD fails acceptance criteria and provide acceptance criteria for the PDS.

Navy Response:

The original SAP (Attachment B) is a final document and therefore will not be revised. However, Worksheet #28 of the SAP Addendum has been updated to include "For metals and MS or MSD recovery exceedances, perform post-digestion spike for all elements, except Ag, at 2X the indigenous level or 2X the PQL, whichever is greater. Acceptance limits are 75-125%. Corrective action is to run all associated samples by method of standard additions (MSA) or to apply J-flag to specific analytes in the parent sample where acceptance criteria are not met."

Minor Comments

1. **Worksheet #14, Summary of Project Tasks, Page 32:** The "Sample Analysis" section discusses analysis of matrices that are not proposed for this investigation (i.e., sediment, groundwater, and surface water). Revise the text to remove these matrices.

Navy Response:

The text has been revised as requested.

Page Intentionally left blank