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FINAL TIER II SAMPLING AND ANALYSIS PLAN ADDENDUM FOR SITE 4 REMEDIAL INVESTIGATION DIRECT PUSH TECHNOLOGY GROUNDWATER COLLECTION NWS YORKTOWN VA

8/1/2013

CH2M HILL

Title and Approval Page

Final

Tier II Sampling and Analysis Plan Addendum
Site 4 – Remedial Investigation
DPT Groundwater Collection

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, Virginia

Contract Task Order 055

August 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

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Prepared by

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Executive Summary

This Addendum to the Tier II Sampling and Analysis Plan (SAP) - Site 4 Remedial Investigation (RI) has been prepared to conduct direct-push technology (DPT) groundwater sample collection upgradient of Site 4 at Naval Weapons Station Yorktown Cheatham Annex (CAX), in Williamsburg, Virginia. The original Tier II SAP for the Site 4 RI was signed by Jonathan Tucker (Naval Facilities Engineering Command [NAVFAC] Chemist) on April 26, 2012, (Pre-Draft) and Ken Bowers (NAVFAC Chemist) on September 10, 2012 (Draft Final). The Final RI Report was signed on November 14, 2012, by Doug Bitterman (CH2M HILL Activity Quality Manager), Scott Park (NAVFAC Remedial Project Manager [RPM]), Sue Haug (United States Environmental Protection Agency [USEPA] RPM), and Wade Smith (Virginia Department of Environmental Quality [VDEQ] RPM). The Site 4 boundary, as shown on Figure 2 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (CH2M HILL, 2011) (**Appendix A**), encompasses Upstream Pond and consists of surface debris, two buried debris areas, and a small disposal area of metal banding, a few empty drums, and charred wood.

During the Sites 4, 9, and Area of Concern (AOC) 3 Site Inspection (SI), tetrachloroethene (PCE) was detected in groundwater at an estimated concentration of 1 microgram per liter (µg/L) in the upgradient, offsite temporary monitoring well CAS04-GW04 (**Figure 5A**). Based on the presence of PCE in groundwater at this location (CAS04-GW04), the CAX Partnering Team agreed to further investigation to determine whether the detection of PCE in groundwater in the vicinity of former temporary monitoring well sampling location CAS04-GW04 during the Site 4 SI is an isolated occurrence of PCE in groundwater or the leading edge of contamination from an unidentified source area. Therefore, DPT groundwater sample collection, as presented in this SAP Addendum, will be conducted in the immediate vicinity of sample location CAS04-GW04, as well as at upgradient, downgradient, and crossgradient locations, to determine the presence or absence of PCE in groundwater and, if present, determine its source. Based on the sampling results, the Partnering Team will decide if further action is required.

Approval to prepare a Tier II SAP Addendum was provided during a phone discussion between Jan Nielsen (Department of the Navy [Navy]) and Anita Dodson (CH2M HILL) on August 16, 2012. This SAP Addendum was prepared under the Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract N62470-08-D-1000, Contract Task Order 055, for submittal to NAVFAC Mid-Atlantic, USEPA Region 3, and VDEQ. NAVFAC Mid-Atlantic, USEPA, and VDEQ work jointly as the CAX Tier I Partnering Team.

This document is an addendum to the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**). The purpose of this SAP Addendum is to document additions to the data collection and analysis structure in the original Tier II SAP. Consequently, this addendum follows the same format; however, only those sections that contain additions from the original Tier II SAP are included herein. The sections, tables, and figures in this addendum are additions to the corresponding sections in the original Tier II SAP.

This SAP Addendum will help ensure that environmental data collected or compiled are scientifically sound, of known and documented quality, and suitable for the intended uses (such as environmental characterization, human health and ecological risk assessments, and path forward). The laboratory information cited in this SAP Addendum is provided by Katahdin Analytical Services, Scarborough, Maine.

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B Supporting Documentation – Approval to use Tier II SAP

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Acronyms and Abbreviations

µg/L	microgram per liter
AM	Activity Manager
AOC	Area of Concern
CAX	Naval Weapons Station Yorktown Cheatham Annex
CLEAN	Comprehensive Long-term Environmental Action—Navy
DPT	direct-push technology
EB	equipment blank
FB	field blank
FD	field duplicate
ID	identification
MCL	Maximum Contaminant Level
ml	milliliter
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NFA	No Further Action
ORP	oxidation/reduction potential
PAL	Project Action Limit
PCE	tetrachloroethene
QA	quality assurance
QC	quality control
RPM	Remedial Project Manager
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SI	Site Inspection
SOP	standard operating procedure
TAT	turnaround time
TB	trip blank
TM	technical memorandum
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

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1 Project Organization

For details regarding the project organization, please refer to Section 1 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (CH2M HILL, 2011) (**Appendix A**).

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2 Project Approach

The purpose of the Site 4 direct-push technology (DPT) groundwater collection is to determine whether the detection of tetrachloroethene (PCE) in groundwater in the vicinity of former temporary monitoring well sampling location CAS04-GW04 during the Site 4 Site Inspection (SI) is an isolated occurrence of PCE in groundwater or the leading edge of contamination from an unidentified source area.

2.1 Project Planning Session Participants Sheet

Seven scoping sessions were conducted in relation to the original Site 4 RI Sampling and Analysis Plan (SAP) from September 2011 through August 2012 and are documented in Sections 2.1.1 through 2.1.7 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**).

Two project scoping sessions were conducted in relation to this SAP Addendum with the Naval Weapons Station Yorktown Cheatham Annex (CAX) Partnering Team as described in the following sections.

2.1.8 September 2012 Scoping Session

TABLE 2-7A
September 2012 Scoping Session

Project Name: Site 4 DPT Groundwater Collection **Projected Date(s) of Sampling:** Winter 2013 **PM:** Stephanie Sawyer	**Site Name:** Site 4 **Site Location:** CAX, Williamsburg, VA
Date of Session: September 12, 2012 Scoping Session Purpose: To propose and discuss the method of investigation for addressing the United States Environmental Protection Agency's (USEPA's) request to identify the source of PCE that was detected in groundwater at sample location CAS04-GW04 during the Site 4 SI, prompted by their concern that this may be the leading edge of a plume.	

Name	Title	Affiliation	Phone #	E-mail Address
Scott Park	Remedial Project Manager (RPM)	Department of the Navy (Navy)	(757) 341-0481	scott.park@navy.mil
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Susanne Haug	RPM	USEPA Region 3	(215) 814-3394	haug.susanne@epamail.epa.gov
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Comments/Decisions

The Team reviewed the need for a SAP Addendum. As part of the Site 4 SI, four groundwater samples were collected from temporary wells. Groundwater from the inferred upgradient sample location (CAS04-GW04) had a PCE detection of 1 J microgram per liter (µg/L). Since Site 4 is not the source of the PCE detected at this location, this detection may represent an isolated occurrence of PCE in groundwater and the Team discussed the possibility of this detection being a "false positive," a laboratory artifact, or the leading edge of contamination from an unidentified source area. Additional groundwater sampling was proposed with the objective to confirm the presence or absence of PCE. The team agreed to collect 5 DPT groundwater samples around CAS04-GW04 (one at

the original SI location and four around it at a 10-foot radius) to fulfill the objectives of the investigation. The Team also agreed that analysis of the samples for only PCE was acceptable. The Team agreed that the only quality control (QC) samples that will be collected are a matrix spike (MS) and matrix spike duplicate(MSD) for the laboratory to QC their instruments because of the objective of the investigation to only look for presence or absence of contamination at this time. No duplicate or blank QC samples will be collected. The Team agreed that if no PCE is detected, a No Further Action (NFA) for PCE in groundwater technical memorandum (TM) would be prepared; if PCE is detected, the Team will discuss the path forward.

2.1.9 March 2013 Scoping Session

TABLE 2-7B
March 2013 Scoping Session

Project Name: Site 4 DPT Groundwater Collection **Projected Date(s) of Sampling:** Winter 2013 **PM:** Stephanie Sawyer	**Site Name:** Site 4 **Site Location:** CAX, Williamsburg, VA
Date of Session: March 13, 2013 Scoping Session Purpose: To refine the sampling approach to include step-out groundwater sampling at Site 4 and to agree on the revised path forward for the PCE investigation.	

Name	Title	Affiliation	Phone #	E-mail Address
Scott Park	RPM	Navy	(757) 341-0481	scott.park@navy.mil
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Wade Smith	RPM	VDEQ	(804) 698-4125	wade.smith@deq.virginia.gov
Laurel Boucher	CAX Partnering Team Facilitator	Management Edge	(906) 387-4272	lboucher@up.net
Susanne Haug	RPM	USEPA Region 3	(215) 814-3394	haug.susanne@epamail.epa.gov
Stephanie Sawyer	Deputy AM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com

Comments/Decisions

The Team reviewed the need for refining the plan for investigating a potential PCE source upgradient of Site 4, where PCE was detected in one location (1 J µg/L at CAS04-GW04). Although this detection is below the current adjusted Tapwater Regional Screening Level (RSL) (3.5 µg/L) and the Maximum Contaminant Level (MCL) (5 µg/L), the concern is that this detection could be at the leading edge of a plume. During the first scoping (September 2012 Partnering), the Team agreed to the collection of five additional groundwater samples (one at the SI location where the PCE detection occurred and four around it) and to analyze for PCE only. If PCE is detected in these new locations, the Team would discuss the path forward. However, to improve efficiency and reduce the need for another SAP Addendum, incorporation of the path forward into this SAP should be discussed.

The Team discussed step-out groundwater sampling and how it would be conducted. Following Team discussion, the Partnering Team revised the path forward for the PCE investigation at Site 4 and agreed to the following:

- Conduct the DPT sampling of the original five DPT groundwater samples for PCE analysis only; the samples will be run on a 24-hour turnaround time (TAT).
- If PCE is not detected in any of the original five locations, NFA will be required and a consensus letter/TM will be prepared for NFA.
- If PCE is detected in any of the original five locations, the sampling team will initially step out approximately 70 feet (the maximum distance upgradient [west] of the site, within the woods to avoid the paved parking areas) in the upgradient direction (perpendicular to groundwater flow) of those locations where PCE was detected and collect additional DPT groundwater samples. Up to eight additional samples will be collected for

PCE analysis and run on a standard TAT. The locations of the additional DPT groundwater samples will be discussed and agreed to by the CAX Partnering Team prior to their collection.

- If PCE is not detected in any of the step-out samples and the PCE concentrations in all of the original five locations are below the MCL, NFA will be required and a consensus letter/TM will be prepared for NFA.
- If PCE is not detected in any of the step-out samples and the PCE concentrations in any of the original five locations are above the MCL, the Team will need to discuss and agree to the appropriate path forward, the details of which is outside the scope of this investigation/SAP Addendum.
- If PCE is detected in any of the step-out samples the sampling team will continue step-out sampling approximately 70 feet (consistent with the initial step-out distance) in the upgradient direction until PCE concentrations are no longer detected. These samples will be evaluated as outlined in the previous two bullets.

2.2 Conceptual Site Model

2.2.1 Site Background and History

For details regarding the Site 4 background and history, please refer to Section 2.2.1 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**).

2.2.2 Physical Setting

For details regarding the Site 4 physical setting, please refer to Section 2.2.2 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**).

2.2.3 Distribution of Contamination

During the SI field activities in October 2009, PCE was detected upgradient of Site 4 in groundwater at temporary monitoring well sample location CAS04-GW04 at an estimated value of 1 µg/L (CH2M HILL, 2011). Since PCE was not detected in any other groundwater samples within the Site 4 boundary during the SI and the RI (based on preliminary data; RI report currently being developed), the distribution of this contaminant is unknown.

Comments provided by the USEPA on May 13, 2011, regarding the *Final Site Inspection Report Site 4, Site 9, and Area of Concern 3, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (CH2M HILL, 2011) stated that the source of PCE detected in groundwater upgradient of Site 4 must be found. While the Navy agreed that the source of PCE must be identified, the location of the detection (approximately 150 feet upgradient of Site 4) and the type of buried debris present at Site 4 (railroad ties, metal, and construction material) indicated that the PCE detection is not likely related to historical activities conducted at Site 4. The Navy recommended in the Response to Comments letter dated June 16, 2011, that the CAX Partnering Team discuss creating a new Area of Concern (AOC) in order to determine the source of the PCE detection; however, the initial investigation into the presence or absence of PCE will be conducted under investigations related to Site 4.

2.2.4 Release History

While buried materials within the two burial debris areas and miscellaneous surface debris scattered throughout the site are the primary known and suspected sources of contamination at Site 4, these buried debris areas are downgradient of sample location CAS04-GW04. Presently, there are no known or suspected sources of PCE contamination at or upgradient of sample location CAS04-GW04.

2.3 Data Quality Objectives and Systematic Planning Process Statements

2.3.1 Project Statement and Objectives

The objective of the Site 4 DPT groundwater sampling is to determine whether the detection of PCE in groundwater in the vicinity of former temporary monitoring well sampling location CAS04-GW04 during the Site 4 SI is an isolated occurrence of PCE in groundwater or the leading edge of contamination from an unidentified source area. Field activities will include collecting DPT groundwater samples upgradient of Site 4.

2.3.2 Data Quality Objectives

Quantifiable analytical results will be the primary basis for project decisions. The limit of quantitation, which is defined as the minimum concentration or quantity of a target analyte that can be reported with accurate quantitation, will be the metric to define whether an analytical result is quantifiable.

The analytical data will be evaluated in accordance with the decision tree presented on **Figure 4A**. If the analysis of samples determines that PCE is not detected, an NFA for PCE in groundwater TM will be prepared.

If PCE is detected in groundwater, a round of step-out groundwater sampling, consisting of a maximum of eight groundwater samples collected approximately 70 feet from temporary monitoring well sampling location CAS04-GW04, will be conducted. If PCE is not detected in the step-out groundwater samples and the PCE concentrations in the five original samples are below the MCL, then an NFA for PCE in groundwater TM will be prepared. If PCE is not detected in the step-out samples and the PCE concentrations in the five original samples are above the MCL, then the CAX Partnering Team will discuss the appropriate path forward for addressing the source of PCE in groundwater. If PCE is detected in any of the step-out samples, additional rounds of step-out sampling, with a maximum of eight groundwater samples collected per sampling round, will be conducted in the upgradient direction from temporary monitoring well sampling location CAS04-GW04, and the previous decision analysis will be repeated as presented on **Figure 4A**.

2.3.3 What are the environmental questions being answered?

The following environmental question will be answered during the DPT groundwater collection.

Does PCE exist in groundwater upgradient of Site 4?

During the Site 4 SI (CH2M HILL, 2011), PCE was detected upgradient of Site 4 in groundwater at sample location CAS04-GW04 at an estimated value of 1 µg/L. However, PCE was not detected in any groundwater samples within the Site 4 boundary. Additional groundwater samples are needed to confirm if an unidentified source area is potentially located upgradient of Site 4.

> ***The following work is proposed to answer this environmental question:***
>
> Five DPT groundwater samples and one MS/MSD will be collected from the immediate vicinity of the previous SI groundwater sample location CAS04-GW04 (**Figure 5A**) and analyzed for PCE. One DPT groundwater sample will be collected from approximately the same location as the previous groundwater sample CAS04-GW04, and four DPT groundwater samples will be collected surrounding this location at roughly equidistant points along a circle with a 10-foot radius from groundwater sample location CAS04-GW04. The MS/MSD is designed to evaluate potential matrix interferences, accuracy, and precision. If PCE is detected in the DPT groundwater samples, the MS/MSD analytical results will be used to verify whether or not the detected concentration(s) are a “false positive” or laboratory artifact.

2.3.4 What are the Project Action Limits?

The detected DPT groundwater PCE data will be compared to the following criteria, which are included in **Attachment A-1**, **Table A-9A**:

- Groundwater: USEPA Adjusted Tap-water RSL and the federal MCL

The USEPA Adjusted Tap-water RSL is the Project Action Limit (PAL) since it is the lower value of the two criteria previously listed.

Because PCE was detected in groundwater upgradient of Site 4 at a concentration of 1 µg/L, prompting USEPA concern that there could potentially be an unidentified source area, this is the value that has been set as the project quantitation limit goal. This value is less than the PAL and is achievable by the laboratory.

2.3.5 How will the data be used?

The DPT groundwater PCE concentrations will be used to determine the absence or presence of PCE in groundwater and to assist in identifying the leading edge of a potential source area.

2.3.6 What types of data are needed?

Additional groundwater data are required for this project to determine the presence or absence of PCE in groundwater upgradient of Site 4. All analytical samples will be submitted to an offsite subcontracted laboratory for analysis. Refer to **Section 2.4** and **Section 3** for sample locations, numbers, rationale, and methodology. Sample locations are provided on **Figure 5A**.

2.5 Sampling Design and Rationale

The CAX Partnering Team met, as presented in **Section 2.1**, for a scoping session related to this investigation. During this meeting, the Team discussed and agreed to the proposed sampling rationale for the Site 4 DPT groundwater sample collection. **Figure 5A** presents the proposed DPT groundwater sample locations. Sample locations will ultimately be field-determined based on location-specific constraints (man-made obstructions, such as gates, bollards, and so forth), but will be in close proximity to the proposed sample locations.

The proposed sampling design and rationale for the Site 4 DPT groundwater collection are included in **Table 2-20A**.

Since the purpose of the groundwater sampling is limited to determining the absence or presence of PCE in groundwater within a small area, standard QC sample frequency will not be followed; however, one MS/MSD sample will be collected to assist in determining matrix effects on the accuracy and precision of the PCE concentration determinations. One equipment blank (EB) will also be collected to assist in determining whether any detected concentration is inherent to the groundwater or may be attributed to cross-contamination.

TABLE 2-20A
Proposed Sampling Design and Rationale

Media	Sample Count	Analysis	Rationale
Groundwater	5	PCE	Collect to confirm the absence or presence of PCE in groundwater in the vicinity (upgradient, downgradient, cross-gradient, and at the location) of former temporary monitoring well sample location CAS04-GW04, located upgradient of Site 4.
	8	PCE	If PCE is detected in any of the initial five groundwater samples, collect a maximum of eight groundwater samples during the first round of step-out sampling to assist in identifying the source of PCE. These groundwater samples will be collected ~70 feet from former temporary monitoring well sample location CAS04-GW04, in the upgradient direction (perpendicular to groundwater flow) of those locations where PCE was detected.
	8	PCE	If PCE is detected in any of the first round of step-out groundwater samples, collect a maximum of eight groundwater samples during the second round of step-out sampling to assist in identifying the source of PCE. These groundwater samples will be collected ~70 feet from the first round of step-out sample locations, in the upgradient direction (perpendicular to groundwater flow) of those locations where PCE was detected during the first round of step-out sampling.

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3 Field Project Implementation

The following sections provide a summary of field activities. Project logistics will be in accordance with Section 3.1 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**).

3.2 Field Project Tasks

Applicable standard operating procedures (SOPs) for project tasks outlined in this section are listed in **Section 3.2.**

Utility clearance, mobilization, vegetation clearance, equipment decontamination, investigation-derived waste handling, and QC will be conducted as documented in Section 3.2 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**).

3.2.15 Direct-push Technology Groundwater Sampling

Five DPT groundwater sampling points will be installed at the proposed locations shown on **Figure 5A**, as described in Field SOP-31 (in **Table 3-1A**). Sampling points will be installed in the aquifer unit where groundwater is first encountered, the Yorktown-Eastover aquifer.

Groundwater will be collected from the DPT groundwater sampling points using a peristaltic pump and low-flow purging and sampling methodology as described in Field SOP-11 in Appendix C of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**). During purging, field geochemical parameters (dissolved oxygen, oxidation/reduction potential, temperature, conductivity, pH, turbidity, and salinity) will be collected using a water quality meter in accordance with Field SOP-026 in Appendix C of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**). Purging will continue until geochemical parameters stabilize to within 10 percent between subsequent readings collected at least 5 minutes apart.

3.1.16 Surveying

Following sample collection, CH2M HILL will survey the DPT groundwater sampling locations and any other relevant site markers to the nearest 1 meter for horizontal control using a portable Global Positioning System unit, as detailed in SOP-007 in Table 3-1 of the *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (**Appendix A**). The survey coordinates will be used to properly locate the sampling locations in a Geographic Information System.

3.3 Field SOPs Reference Table

Table 3-1A includes information regarding the SOP for additional work that will be conducted as part of this SAP Addendum. This SOP is included as **Attachment C-1**.

TABLE 3-1A
Field Standard Operating Procedure

SOP Reference Number	Title/Author	Revision Date or Version Number	Location of SOP (if not included in the SAP)	Any planned deviation for Project Work	Comments
031_DPGW	Direct Push Groundwater Sample Collection	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	Not applicable (N/A)	N/A

3.4 Sample Details Table

Details regarding sample nomenclature, sampling, and analysis are provided in **Table 3-4.**

TABLE 3-4
Sample Details Table

CAX Site 4 - Remedial Investigation Main Laboratory [6] Katahdin Analytical Services, Inc. 600 Technology Way Scarborough, ME 04074 Jennifer Obrin - 207-874-2400			**Analysis Group**	**Volatile Organic Compound (VOC) - PCE only**
			Analytical Method	SW-846 8260B
			Analytical Laboratory/ Analytical SOP Reference[1]	Katahdin / CA-202
			Data Package TAT[2]	28 days (24 hours where specified below)
			Container Type/ minimum amount required	3 of 40-milliliter (ml) vial / 40 ml
			Preservative	zero-headspace, HCl to pH < 2, cool to 0-6 degrees Celsius
			Holding Time (Preparation/ Analysis)[3]	14 days
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**	
Round 1 DPT Groundwater Samples[4]				
GW	CAS04-DW01	CAS04-DW01-MMYY	N/A	**X - 24-hour TAT**
	CAS04-DW02	CAS04-DW02-MMYY		**X - 24-hour TAT**
	CAS04-DW03	CAS04-DW03-MMYY		**X - 24-hour TAT**
	CAS04-DW04	CAS04-DW04-MMYY		**X - 24-hour TAT**
	CAS04-DW05	CAS04-DW05-MMYY		**X - 24-hour TAT**
Groundwater Quality Assurance (QA)/QC Samples[5]				
MS	CAS04-DW01	CAS04-DW01-MMYY-MS	N/A	**X - 24-hour TAT**
MSD	CAS04-DW01	CAS04-DW01-MMYY-SD		**X - 24-hour TAT**
EB	CAS04-QC	CAS04-EB-MMDDYY		**X - 24-hour TAT**
Round 2 DPT Groundwater Samples[4]				
GW	CAS04-DW06	CAS04-DW06-MMYY	N/A	**X**
	CAS04-DW07	CAS04-DW07-MMYY		**X**
	CAS04-DW08	CAS04-DW08-MMYY		**X**
	CAS04-DW09	CAS04-DW09-MMYY		**X**
	CAS04-DW10	CAS04-DW10-MMYY		**X**
	CAS04-DW11	CAS04-DW11-MMYY		**X**
	CAS04-DW12	CAS04-DW12-MMYY		**X**
	CAS04-DW13	CAS04-DW13-MMYY		**X**

TABLE 3-4
Sample Details Table

			Analysis Group	**VOC - PCE only**
Matrix	**Station Identification (ID)**	**Sample ID**	**Sampling Depth**	
Round 3 DPT Groundwater Samples[4]				
GW	CAS04-DW14	CAS04-DW14-MMYY	N/A	**X**
	CAS04-DW15	CAS04-DW15-MMYY		**X**
	CAS04-DW16	CAS04-DW16-MMYY		**X**
	CAS04-DW17	CAS04-DW17-MMYY		**X**
	CAS04-DW18	CAS04-DW18-MMYY		**X**
	CAS04-DW19	CAS04-DW19-MMYY		**X**
	CAS04-DW20	CAS04-DW20-MMYY		**X**
	CAS04-DW21	CAS04-DW21-MMYY		**X**
Groundwater QA/QC Samples[5]				
MS	CAS04-DW14	CAS04-DW14-MMYY-MS	N/A	**X**
MSD	CAS04-DW14	CAS04-DW14-MMYY-SD		**X**
EB	CAS04-QC	CAS04-EB-MMDDYY		**X**
			Total Number of Samples to the Laboratory:	**27**

Notes:
[1] For a complete reference of laboratory SOPs, see the Analytical SOP References Table (Appendix A; Tables A-25 through A-29 of the Final SAP).
[2]All samples will be reported with a level IV report within 28 calendar days of sample receipt.
[3] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared.
[4] This table shows the maximum number of samples to be collected. In rounds 2 and 3, zero to eight new DPT locations may be sampled. For each round, station and sample IDs will continue chronologically from the last DPT station at Site 4.
[5] Field QC counts may change depending on the duration of field event. Frequency of QA/QC sample collection is noted on the Measurement Performance Criteria Table in Section 2.4 of the Uniform Federal Policy (UFP)-SAP and is as follows :

Trip Blank (TB) - No TBs will be collected for this project
Field Duplicate (FD) - No FDs will be collected for this project
MS/MSD - One pair per 20 field samples of similar matrix (including FDs)
EB - one per type of sampling equipment, per day of sampling
Field Blank (FB) - No FBs will be collected for this project

[6] For Saturday delivery, contact the project chemist, and send to
Katahdin Analytical Services
95 Hutchins Drive
Portland, ME 04102
Mark as “Hold for pickup” and check the Saturday delivery box.

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4 References

CH2M HILL. 2011. *Final Site Inspection Report, Site 4, Site 9, and Area of Concern 3, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia.* December.

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Figures

Project Decision Analysis

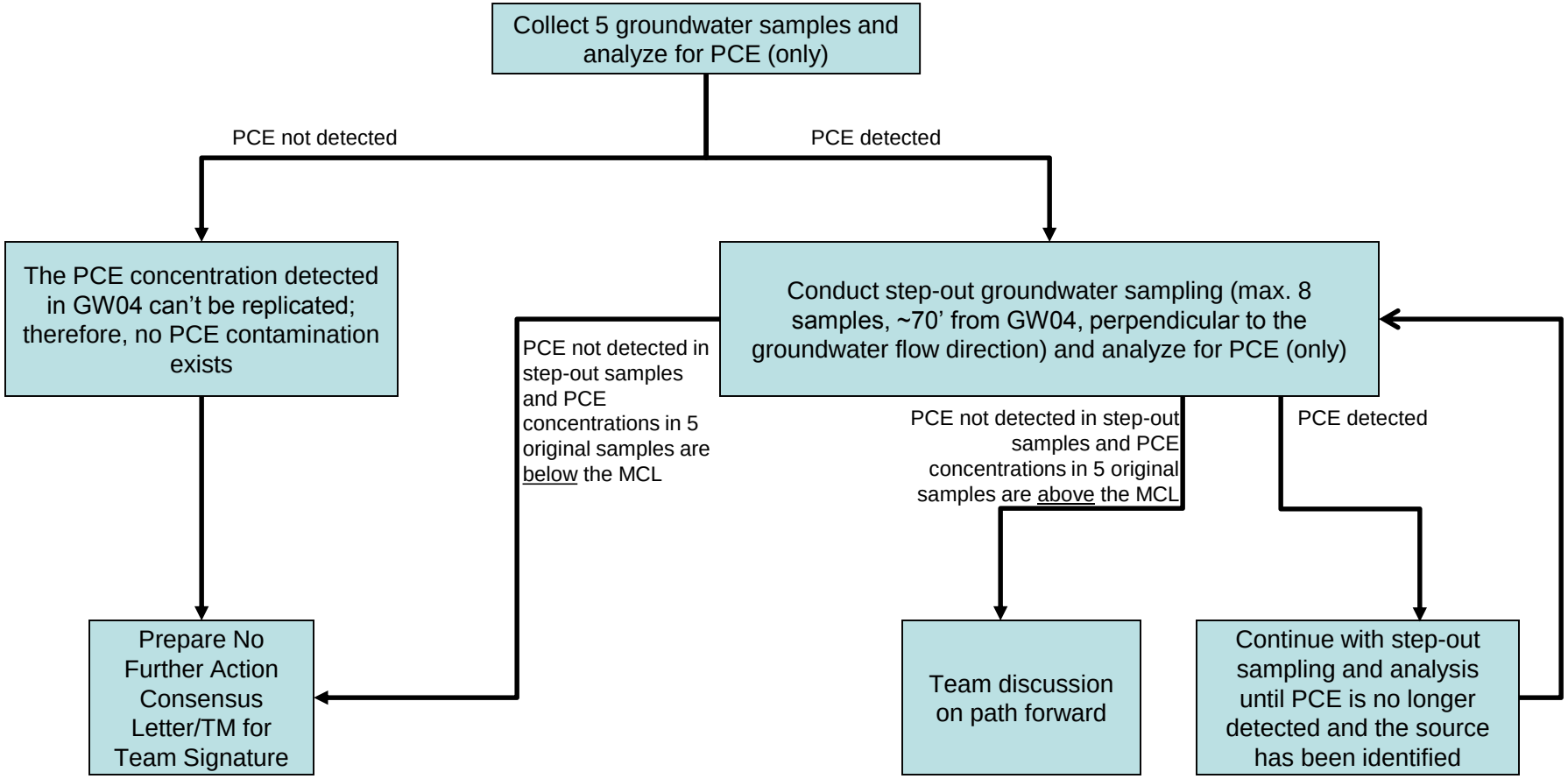
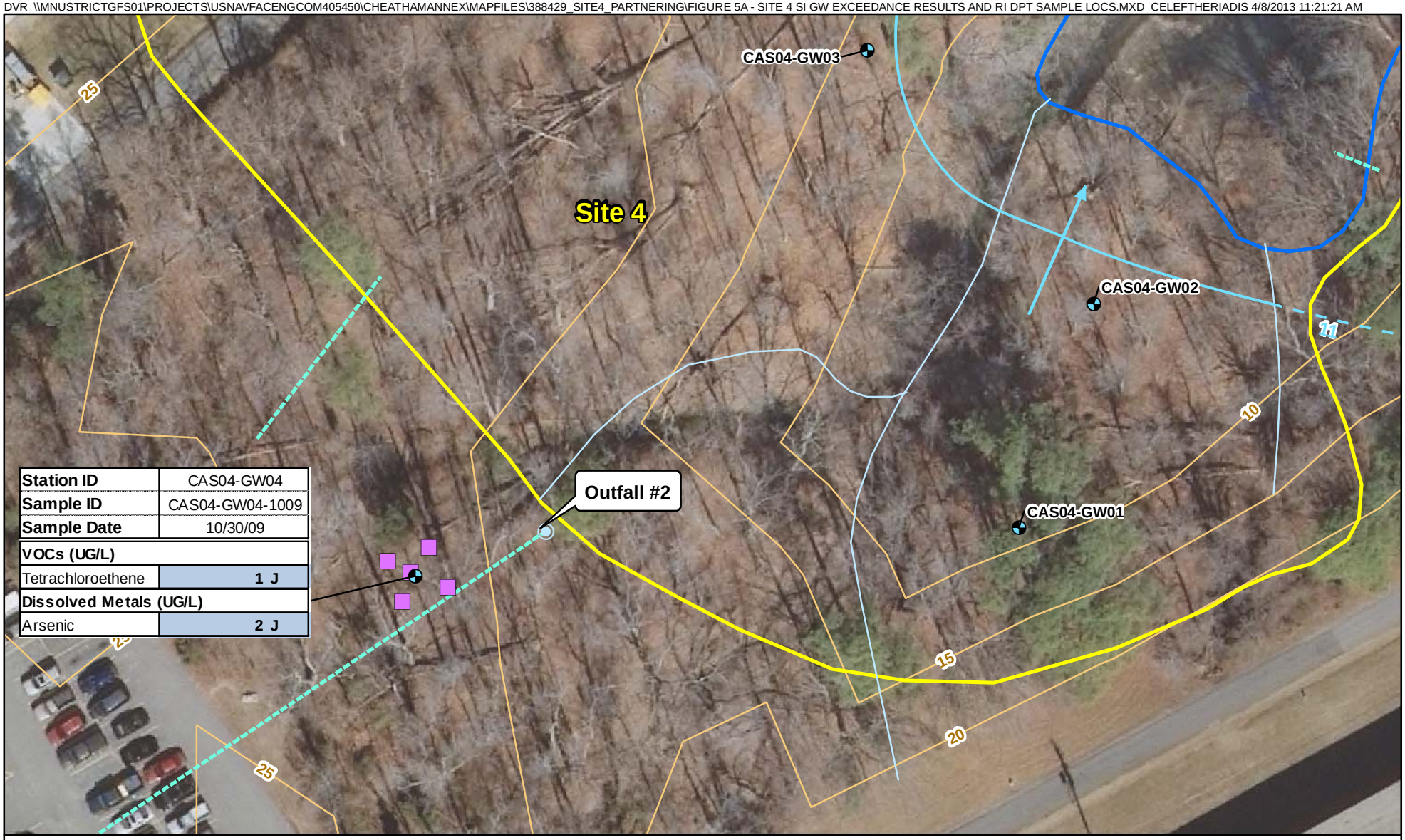


Figure 4A
Site 4 Decision Tree – PCE Sampling
Sampling and Analysis Plan Addendum
Cheatham Annex
Williamsburg, Virginia

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\388429_SITE4_PARTNERING\FIGURE 5A - SITE 4 SI GW EXCEEDANCE RESULTS AND RI DPT SAMPLE LOCS.MXD CELEFTHERIADIS 4/8/2013 11:21:21 AM



Station ID	CAS04-GW04
Sample ID	CAS04-GW04-1009
Sample Date	10/30/09
VOCs (UG/L)	
Tetrachloroethene	1 J
Dissolved Metals (UG/L)	
Arsenic	2 J

Legend

- 2009 SI Well Point Groundwater Sample Location
- Proposed DPT Groundwater Sample Location
- Outfall
- Drainage Channel
- Elevation Contour (5 ft interval)
- Storm Water Line
- Potentiometric Surface Contour (dashed where inferred)
- (11) - Groundwater Elevation (feet above mean sea level)
- Groundwater Flow Direction
- Site 4 Boundary
- Water Body
- **Exceeds BKG & RSL**

N
W E
S

0 25 50
Feet

Figure 5A
Site 4 SI Groundwater Exceedance Results and Proposed DPT Sample Locations
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

Appendix A
Original SAP – *Final Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia*

Title and Approval Page

Final

Tier II Sampling and Analysis Plan
Site 4 – Remedial Investigation

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, Virginia

Contract Task Order 055

September 2012

Prepared for:
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

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

Prepared by:

CH2MHILL®

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Signature Page

Quality Assurance Approval:

*

NAVFAC Chemist / Date

Quality Assurance Review:

11/14/12

Doug Bitterman
CH2M HILL Activity Quality Manager / Date

Other Approvals:

Scott Park
NAVFAC Remedial Project Manager / Date 11/14/2012

Sue Haug
USEPA Remedial Project Manager / Date 11/14/2012

Wade Smith
VDEQ Remedial Project Manager / Date 11/14/2012

*Pre-draft digitally signed by Jonathan Tucker, April 26, 2012.
*Draft Final digitally signed by Ken Bowers, September 10, 2012.

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Executive Summary

This Remedial Investigation (RI) Sampling and Analysis Plan (SAP) was prepared by the United States Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, under the Comprehensive Long-term Environmental Action—Navy (CLEAN) 1000 Contract, Contract Task Order (CTO) 055, for submittal to NAVFAC, United States Environmental Protection Agency (USEPA) Region 3, and the Virginia Department of Environmental Quality (VDEQ). The Navy, USEPA, and VDEQ work jointly as the Cheatham Annex (CAX) Partnering Team. This SAP was written in accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) guidance document (USEPA, 2005) using the modified Tier II format.

Naval Weapons Station (WPNSTA) Yorktown CAX is located in Williamsburg, Virginia (**Figure 1**). CAX encompasses 2,300 acres east of Williamsburg, between Interstate 64 and the York River on the York-James Peninsula (**Figure 1**). The majority of CAX is undeveloped and heavily wooded. Significant surface water features at CAX consist of Cheatham Pond, Jones Pond, Penniman Lake, and the York River. Site 4 is located upslope of Upstream Pond, as shown on **Figure 2**, and consists of surface debris, two buried debris areas, and a small disposal area of metal banding, a few empty drums, and charred wood.

This SAP details various aspects of the environmental investigation process that will serve as guidelines for the field sampling event to gather the required soil, sediment, groundwater, and biota (i.e., tissue) sample data to conduct the RI, which will incorporate the newly collected data and existing historical data. Adherence to this document will ensure that environmental data collected are scientifically sound, of known and documented quality, and suitable for intended uses. The laboratory information cited in **Appendix A** of this SAP is specific to the laboratories that were selected based on a competitive selection process and that possess the necessary Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certification for the analytical methods required by this project. In the event of changes, revisions will be submitted to the CAX Partnering Team prior to commencement of fieldwork.

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Chart

1-1 Project Organization Chart

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Acronyms and Abbreviations

AM	Activity Manager
AOC	area of concern
AVS/SEM	Acid Volatile Sulfide/Simultaneously Extracted Metals
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CA	corrective action
CAD	Cheatham Annex Depot
CAX	Cheatham Annex
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
COPC	constituent of potential concern
CSM	conceptual site model
CTO	Contract Task Order
cy	cubic yard
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct push technology
DQI	data quality indicator
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
ERA	Ecological Risk Assessment
GPS	Global Positioning System
H&S	health and safety
HHRA	Human Health Risk Assessment
HQ	hazard quotient
HSM	Health and Safety Manager
HSP	Health and Safety Plan
ID	inner diameter
IDW	investigation-derived waste
IV	Intravenous
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantification
µg/L	micrograms per liter
µg/mg	micrograms per milligrams
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
MPC	Measurement Performance Criteria
MS/MSD	matrix spike/matrix spike duplicate

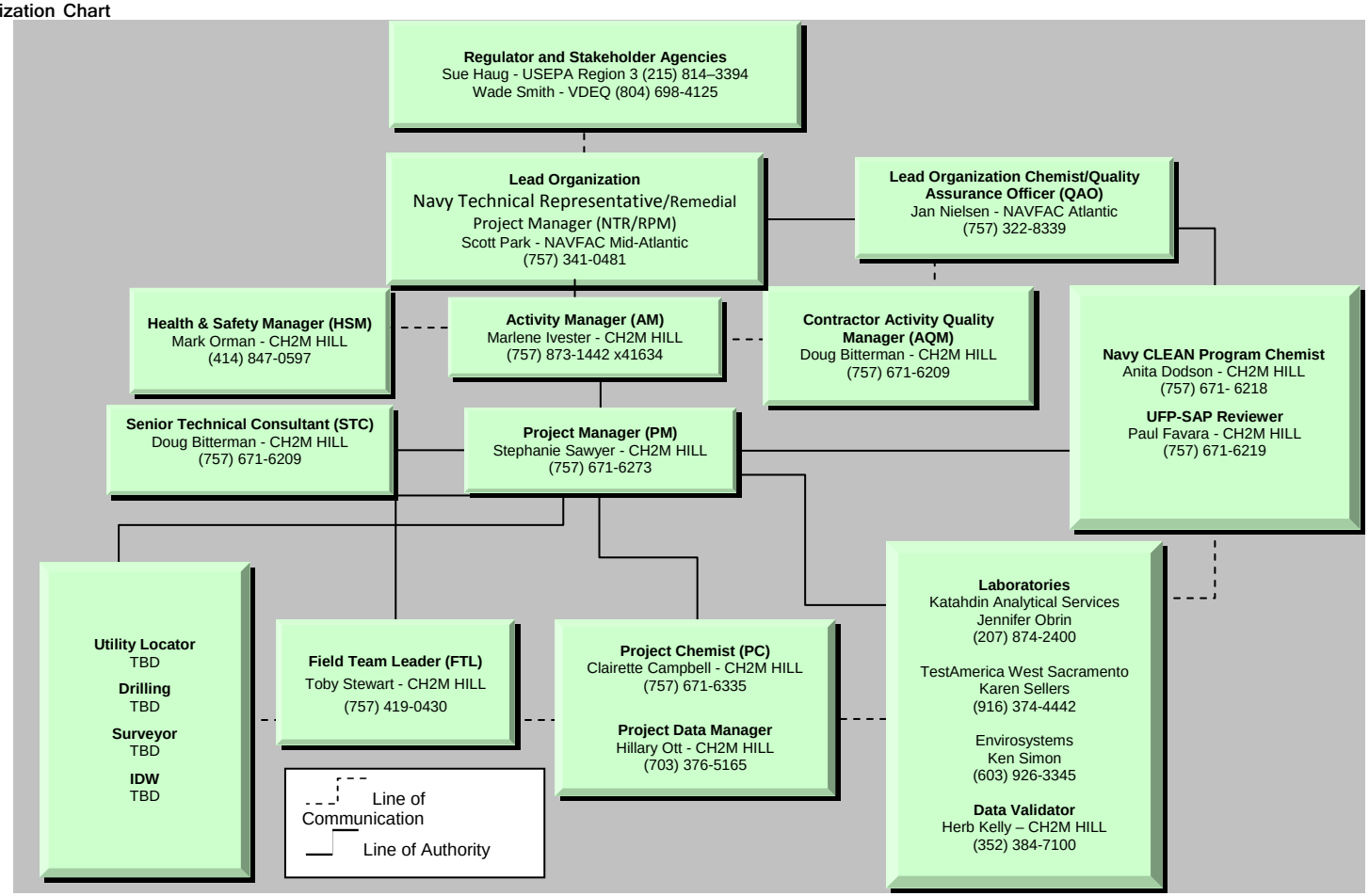
NAIP	Natural Attenuation Indicator Parameter
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PM	Project Manager
POC	point of contact
PPE	personal protective equipment
PQL	project quantitation limit
PVC	polyvinyl chloride
QA	quality assurance
QAP	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual
RI	Remedial Investigation
RPM	Remedial Project Manager
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SERA	Screening Ecological Risk Assessment
SI	Site Investigation
SSC	Site Safety Coordinator
SSL	Soil Screening Level
STC	Senior Technical Consultant
SVOC	semivolatile organic compound
TAL	Total Analyte List
TCL	Total Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	total organic carbon
UCL	upper confidence limit
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WPNSTA	Naval Weapons Station

1 Project Organization

1.1 Project Organization Chart

The project organization chart (**Chart 1-1**) includes lines of authority and lines of communication.

CHART 1-1
Project Organization Chart



1.2 Communication Pathways

The communication pathways for the Sampling and Analysis (SAP) are shown in **Table 1-1**.

TABLE 1-1
Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
Communication with Navy (lead agency)	Naval Facilities Engineering Command (NAVFAC) Remedial Project Manager (RPM)	Scott Park	(757) 341-0481 scott.park@navy.mil	Primary point of contact (POC) for Navy; can delegate communication to other internal or external POCs. Any issues that may impact project work are to be reported to Scott immediately. RPM will notify the United States Environmental Protection Agency (USEPA) and Virginia Department of Environmental Quality (VDEQ) via email or telephone within 24 hours of field changes affecting the scope or implementation of the work. Navy will have 30 days for SAP review.
Communication with USEPA Region 3	USEPA RPM	Sue Haug	(215) 814-3394 Haug.Susanne@epamail.epa.gov	Primary POC for USEPA; can delegate communication to other internal or external POCs. Upon notification of field changes, USEPA will have 24 hours to approve or comment on the field changes. Responses will be communicated via email or phone.
Communication with VDEQ	VDEQ RPM	Wade Smith	(804) 698-4125 wade.smith@deq.virginia.gov	Primary POC for VDEQ; can delegate communication to other internal or external POCs. Upon notification of field changes, VDEQ will have 24 hours to approve or comment on the field changes. Responses will be communicated via email or phone.
Communication regarding overall project status and implementation and primary POC with Navy RPM, USEPA, and VDEQ	CH2M HILL Activity Manager (AM)	Marlene Ivester	(757) 873-1442 x41634 marlene.ivester@ch2m.com	Primary POC for stakeholder and agency managers; can delegate agency communication to other contract staff as appropriate. Oversees project and will be informed of project status by the Project Manager (PM). If field changes occur, the AM will work with the Navy RPM to communicate field changes to the USEPA and VDEQ via email within 24 hours.
Communications regarding project management and implementation	CH2M HILL Deputy AM; PM	Stephanie Sawyer	(757) 671-6273 stephanie.sawyer@ch2m.com	Primary modes of communication are phone, email, letter, document submittal; timing dependent on nature of communication and predefined schedule as applicable and as requested by stakeholder agencies. The PM will have 24 hours to respond to the request for field corrective actions (CAs). Responses will be communicated to the FTL via phone. All information and materials about the project will be forwarded to the AM on a daily basis.
Technical communications for project implementation, and data interpretation	CH2M HILL Senior Technical Consultant (STC) and Activity Quality Manager (AQM)	Doug Bitterman	(757) 671-6209 doug.bitterman@ch2m.com	Team members will contact the STC regarding questions/issues encountered in the field, input on data interpretation, etc., as needed. The STC will have 24 hours to respond to technical field questions as necessary. Responses will be communicated to the PM via email or phone. In addition, the STC/AQM will review data and deliverables as necessary prior to Cheatham Annex (CAX) Partnering Team discussion or distribution.

TABLE 1-1
Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
SAP/Work Plan Changes prior to Field/Laboratory work	PM	Stephanie Sawyer	(757) 671-6273 stephanie.sawyer@ch2m.com	Notify the CAX Partnering Team by phone or email of changes to the SAP made prior to beginning field work and the reasons within 24 hours.
Field Progress Reports	Field Team Leader (FTL)	Toby Stewart	(757) 419-0430 toby.stewart@ch2m.com	Email or fax daily field progress reports to contractor PMs on a weekly basis; telephone communication with PMs on an as-needed basis.
Stop Work due to Safety Issues	Site Safety Coordinator (SSC)	Toby Stewart	(757) 419-0430 toby.stewart@ch2m.com	Notify field personnel that work is to stop immediately if a safety issue is observed. Report all health and safety (H&S) incidents and near misses to PM and Health and Safety Manager (HSM) via email or phone immediately if an incident occurred or within 24 hours if a near miss occurred.
SAP/Work Plan Changes in the Field	FTL	Toby Stewart	(757) 419-0430 toby.stewart@ch2m.com	Notify the PM by phone and email of changes to the SAP made in the field and the reasons within 24-hours. Documentation of deviations from the SAP will be kept in the field logbook; deviations made only with the approval of the PM. Approvals will be made via email or phone.
Field CAs	FTL	Toby Stewart	(757) 419-0430 toby.stewart@ch2m.com	The need for CA for field or analytical issues will be determined by the FTL and/or senior risk assessors and STC. Senior support will ensure SAP requirements are met by the field staff. The FTL will notify the PM via phone of any need for CA within 4 hours.
Reporting Laboratory Data Quality Issues	Laboratory PM	Jennifer Obrin (Katahdin) Karen Sellers (TestAmerica) Ken Simon (Envirosystems)	(207) mailto:mailto:874-2400 (916) 374-4442 (603) 926-3345	All quality assurance (QA)/quality control (QC) issues with project field samples will be reported within 1 day to the Project Chemist (PC) by the laboratory. Should analytical laboratory issues affect data usability by rendering a significant amount of rejectable or unusable data, such that the project completeness goal cannot be obtained, the PC will notify the project team, including the Navy RPM and Navy QAO.
Reporting Data Validation Issues	Data Validator (DV)	Herb Kelly	(352) 381-7100 hkelly1@ch2m.com	All DV issues regarding resubmissions from the laboratory will copy the CH2M HILL Chemist on communications. The DV report will be due within 14 calendar days of data receipt.
Data Validation CAs	PC	Clairette Campbell	(757) 671-6335 clairette.campbell@ch2m.com	All issues discovered during data validation will be reported to the PC. CAs (revisions and additional information, if necessary) will be requested from the laboratory. The PC will review the data validation narrative and request CA from the validator if necessary.
Data tracking from field collection to database upload	Project Data Manager (PDM)	Hillary Ott	(703) 376-5165 hillary.ott@ch2m.com	Tracking data from sample collection through database upload.

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2 Project Approach

The purpose of this Remedial Investigation (RI) is to collect additional soil, sediment, and groundwater data to supplement the existing Site Investigation (SI) dataset in order to adequately characterize Site 4. In addition, a reconnaissance-level biological survey of aquatic/wetland habitats will be conducted and animal tissue samples (earthworms, frogs, and fish) will be collected to support the Baseline Ecological Risk Assessment (BERA) through Step 7. All data evaluated in the SI (CH2M HILL, 2011) and collected as part of this RI will be used to characterize the site and support the completion of a Human Health Risk Assessment (HHRA) and a BERA.

2.1 Project Planning Session Participants Sheet

Three project scoping sessions were conducted with the CAX Partnering Team as described in the following sections.

2.1.1 September 2011 Scoping Session

TABLE 2-1
September 2011 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 9/14/11				
Scoping Session Purpose: Site 4 RI UFP-SAP Scoping Session				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
Wade Smith	RPM	VDEQ	(804) 698-4125	wade.smith@deq.virginia.gov
Krista Parra	RPM	NAVFAC Mid-Atlantic	(757)-341-0395	krista.parra@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com

Comments/Decisions:

Stephanie led the discussion. Stephanie showed the CAX Partnering Team a large-scale version of the proposed new Site 4 boundary (that encompasses Area of Concern [AOC] 3) and asked for Team agreement. Wade asked what if debris was found outside of the boundary? Stephanie replied that if debris was found, the boundary would be expanded. Wade asked what would be easier – to expand it now or later if needed? However, overall, it didn't matter to him, or John, if the boundary was expanded now or not. The Team agreed on the new Site 4 boundary.

Stephanie next summarized the 8/31/11 site visit with John McCloskey from EPA Region 3's Biological Technical Assistance Group (BTAG). Key points from the site visit:

- Enough data have been collected to date to conduct a BERA through Step 3a; therefore, conducting a BERA through Step 7 is the appropriate next step.
- The Navy should conduct a biological survey of the aquatic/wetland portion of the site to characterize aquatic communities (invertebrates, amphibians, fish) and to select organisms (earthworms/fish/frogs) for tissue sampling.

- Constituents of Potential Concern (COPCs) within sediment, based upon the SI data, are polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals. In addition, pesticides are possible COPCs, but they are likely attributable to normal pesticide applications or "general use" not regulated under CERCLA.
- The collection of five sediment sample locations within Youth Pond was discussed; however, at the end of the discussion the consensus was that only one surface/subsurface sediment sample, at the end of the culvert from Upstream Pond, would be proposed in the UFP-SAP scoping session. Wade asked who proposed removing the Youth Pond sample locations. Stephanie replied, "John McCloskey," since Youth Pond will be investigated later in its own study.
- No additional surface water samples are needed.
- Possible aquatic reference area for fish tissue sampling and invertebrate toxicity testing – Cheatham Pond and/or Jones Mill Pond.
- Site 4 can be subdivided into three areas from an ecological exposure perspective – near confluence of the two streams; the southern end of pond and wetland where the streams enter; and the northern end of the pond, near AOC 3.
- John expressed concern about terrestrial exposures to soil in the areas near AOC 3 with elevated PAHs.

Stephanie then showed the CAX Partnering team a large-scale version of the proposed sampling locations and the following questions were then discussed in order to frame the issues to be addressed by the SAP:

1. ***What is the nature of Site 4 related contaminants in Youth Pond at the outfall that connects Upstream Pond to Youth Pond?***

Proposal: One surface/subsurface sediment sample collected from Youth Pond (downstream) side of culvert. (Note: Culvert not visible and exact location has not been determined.) Wade asked if Bill Kappleman (CH2M HILL ecological risk assessor) had an issue with only collecting one surface/subsurface sediment sample from Youth Pond. Stephanie replied that five sediment samples from Youth Pond were discussed during the site visit; however, further discussion resulted in John McCloskey recommending their removal. It was Bill Kappleman that wanted one surface/subsurface sediment sample collected at the culvert outfall. John asked what about explosives and volatile organic compounds (VOCs) as parameters/COCs? Stephanie replied the VOCs did not exceed any screening criteria in the SI sediment samples and the samples were not analyzed for explosives, as the type of debris (metal banding, RR ties, syringes, concrete) did not warrant it. Wade asked if there would be any effort to make sure there are not two outfalls/culvert, as originally thought? Krista replied they checked during the site visit (and previous site visits when the fieldwork was conducted), and there was no obvious location for a second one. Wade added if a second culvert is found, to sample it as well on the Youth Pond side. Krista agreed. John and Wade agreed with collecting one surface and one subsurface sediment sample from Youth Pond, at the outfall that connects it to Upstream Pond. In addition, the Team agreed if any additional outfalls/culverts from Upstream Pond into Youth Pond are found, samples on the Youth Pond side would be collected at those outfalls as well.

2. ***What is the extent of buried debris at the site?***

Proposal: A minimum of two test pits to determine the extent of buried debris. If debris is found, more test pits will be excavated and two subsurface soil samples will be collected below the debris in the pits with the most extensive debris. John asked if removal was the intended remedy? Stephanie replied it was unknown at this time until the extent and potential risk is determined. Wade asked if the two proposed test pit locations are based on the site visit? Stephanie replied no, they were based on what was discovered during the SI and how close we can get to Upstream Pond without going into the pond. Wade asked if there was any reason to believe that there was anything buried where the test pit locations are proposed – did anything look obvious? Krista and Stephanie replied no, the proposed test pit locations are on the opposite shore of the pond from the known extent of debris (downgradient of the former AOC 3 banding pile). The Team agreed with the test pit proposal.

3. What is the nature and extent of contamination in soil?

Proposal: Enough soil data from the SI have been collected to conduct the HHRA. However, two surface and two subsurface soil samples will be collected in the vicinity of where the test pits are proposed and additional soil samples are necessary to complete the BERA (Note: Additional soil samples for the BERA are discussed separately below). John asked if the new test pit vicinity soil samples would be included in the HHRA? Stephanie replied yes. John is concerned with making sure we define the nature and extent of contamination. Stephanie replied that the nature and extent will be defined during the RI and that some sample locations will need to be field determined – this is discussed in more detail later on in the presentation with regard to the BERA. John asked if we were going to sample up the drainages [meaning immediately downgradient of Outfall #2]? Krista said it was originally considered; however, during the site visit, John McCloskey said the drainages were too scoured and where the streams converge would be a better sampling location (more depositional). The Team agreed with the locations and collection of two surface/two subsurface soil samples.

4. What is the nature and extent of contamination in groundwater and the groundwater flow direction and velocity?

Proposal: Install 6 permanent monitoring wells (gauge and slug test each well) and analyze groundwater for VOCs, PAHs, and inorganics (total and dissolved). Wade asked how the SI groundwater samples were collected? Stephanie said through pre-sandpacked temporary wells. The wells were purged and sampled similar to a permanent well. Were the proposed monitoring well locations discussed during the site visit? Stephanie replied no and that the locations are to determine the extent of contamination, as the nature of contamination is known. The Team agreed with both the well locations and the proposed groundwater sampling parameters.

5. What is the nature and extent of contamination in sediment and surface water within Upstream Pond?

Proposal: No additional surface water or sediment samples within Upstream Pond are needed to determine the nature and extent of contamination. John asked if John McCloskey was okay with NOT collecting additional surface water and sediment samples? Stephanie replied, yes, that he agreed there were enough data to determine the nature and extent of contamination. The Team agreed that additional surface water and sediment samples are not needed to determine the nature and extent of contamination. (Note: Additional sediment samples to evaluate ecological risk for the BERA are discussed below.)

6. Do site media pose a potentially unacceptable risk to human health?

Proposal: Existing and new samples will be evaluated in a baseline HHRA. Team agreed.

7. Are there any additional data that can be collected to refine the HHRA?

Proposal: Collect five additional surface soil samples and analyze the soil and groundwater samples for total chromium and hexavalent chromium to evaluate the assumption that the chromium detected during the SI is not the hexavalent form. The Team agreed. John asked that one of the soil samples be collected near SS06.

8. Do soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors?

Proposal: Collect 6 surface soil samples in the vicinity of surface soil samples CAA03-SS06 and CAS004-4-HA06 and analyze for site related contaminants (PAHs, PCBs, and metals). These sample locations will be field determined and based on the location of the natural drainage ways in these areas. The purpose of these samples is to see if there has been any surface runoff migration from the areas of high contaminant concentrations. The Team agreed. *Collect 14 surface sediment samples from Upstream Pond and two surface sediment samples from a reference pond and analyze for PAHs, PCBs, and metals*. The Team agreed on the 14 surface sediment samples from Upstream Pond and two surface sediment reference pond sample locations. However, John and Wade expressed concern with what surface water body to use as the reference pond. The reference pond to use will be determined later.

Six of the 14 proposed Upstream Pond locations and the two reference pond locations will also be evaluated for toxicity to invertebrates. John asked if John McCloskey agreed with the number and location of the surface

sediment and toxicity samples? Krista replied yes. The Team agreed on the proposed number and location of the toxicity tests. (Again, the actual reference pond to use will be determined later.)

Collect three earthworm tissue, up to seven whole-body composite fish tissue (five from Site 4 and two from reference site), and up to 7 frog tissue samples (five from Site 4 and two from reference site). The Team agreed.

Stephanie went over the summary of the samples and sample locations proposed (as discussed above). The Team agreed.

2.1.2 October 2011 Team Discussion

TABLE 2-2
October 2011 Team Discussion

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 10/26/11				
Scoping Session Purpose: Discussion of the perceived path forward presented in the Sites 4, 9, and AOC 3 SI Report				
Name	Title	Affiliation	Phone #	E-mail Address
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
Krista Parra	RPM	NAVFAC Mid-Atlantic	(757) 341-0395	krista.parra@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com
Jennifer Corrack	Human Health Risk Assessor (RA)	Navy Marine Corps Health Center	(757) 953-0950	Jennifer.Corack@med.navy.mil
Jennifer Wright	Ecological RA	NAVFAC Atlantic	(757) 322-8428	jennifer.h.wright@navy.mil
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Bruce Beach	Tier II Member	USEPA, Region 3	(215) 814-3364	Beach.Bruce@epa.gov
Peter Knight	Ecological RA	NOAA (USEPA BTAG)	(215) 814-3321	Peter.Knight@noaa.gov
Dawn Loven	Toxicologist	USEPA Region 3	(215) 814-3320	ioven.dawn@epa.gov
Doug Bitterman	CAX STC	CH2M HILL	(757) 671-6209	Doug.bitterman@ch2m.com
William Kappleman	Ecological RA	CH2M HILL	(703) 376-5152	William.kappleman@ch2m.com
Roni Warren	Human Health RA	CH2M HILL	(814) 364-2454	Roni.warren@ch2m.com

Comments/Decisions:

The Team and associated technical support, discussed USEPA concerns with the selection of COPCs and the perceived proposed path forward presented in the draft final Sites 4 and 9 and AOC 3 SI Report (discussion applies toward the Multiple AOC and Site 7 SI Reports as well). Marlene informed the Team that Wade Smith was not available for the call. She proposed continuing with the call since the issues were related to USEPA comments/concerns, and Wade could be briefed later to provide input and/or concurrence. Everyone agreed.

Krista informed everyone the goal of the call was to resolve any issues with the SI COPC selection and asked EPA to state their overall concern(s). The EPA felt any constituent that exceeds screening criteria in the SI phase should be carried through to the next phase, as an SI is not a detailed risk assessment and has a high degree of

uncertainty. The Team and associated technical support discussed these concerns. *Everyone agreed that the Sites 4, 9, and AOC 3 SI Report would be revised prior to re-submittal to the USEPA and VDEQ*.

2.1.3 November 2011 Scoping Session

TABLE 2-3
November 2011 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 11/7/11				
Scoping Session Purpose: Discussion of Site 4 RI UFP-SAP				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
Krista Parra	RPM	NAVFAC Mid-Atlantic	(757) 341-0395	krista.parra@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com

Comments/Decisions:

This scoping session was conducted as a follow-up to a CAX Partnering Team conference call held October 26, 2011 (summarized above). Marlene informed the Team that Wade Smith was not available for the call. She proposed continuing with the call since the issues were related to USEPA comments/concerns, and Wade could be briefed later to provide input and/or concurrence. Everyone agreed.

Prior to discussing the items related specifically to the October 26, 2011 call, Stephanie presented an overview of the Site 4 SI data set and proposed RI sampling plan from the September meeting scoping session (presentation file was sent to the Team ahead of the meeting). The purpose of the presentation was to address USEPA's concerns regarding the perceived difference between the Site 4 COPC selection outlined in the SI and the actual proposed sampling plan for the Site 4 RI and to get Team concurrence to continue with preparation of the RI SAP as scoped in September 2011. John asked what was the context of the 1ppm comment from John McCloskey (John M.) regarding pesticides, meaning did he intend for it to be used as noted in the presentation? Stephanie replied that during the Site 4 site visit conducted before the September scoping session, John M. stated where there are records of known pesticide applications, and detections were typically not above 1 ppm. John asked what are the pesticide detections at Site 4 in relation to 1 ppm? Steph replied they were generally less than 100 ppb; however, one surface soil detection (located next to CAX Depot [CAD] 12) showed concentrations above 1 ppm. Stephanie added that the SI pesticide data will be used in the RI to run the risk assessments, but the recommendation is to not collect any new pesticide data, as no more pesticide data are needed (we have enough coverage). John has concern with the 1 ppm for pesticide argument, as he is unsure BTAG will agree. Krista didn't think BTAG had ever commented on the "intended use" argument presented in the SI. Stephanie added the pesticide results were generally low (less than 100 ppb) and J-qualified.

John asked about the soil VOC detections at Site 4/AOC 3. Krista directed him to SI Figure 5-3. While the soil VOC concentrations are identified as exceedances, they are only above the Soil Screening Levels (SSLs) for the protection of groundwater and not above the residential Regional Screening Levels (RSLs).

John stated USEPA's technical support had some real issues with the SI Report format – why eliminate COPCs at the SI phase? Stephanie replied because the SI data will be included in the RI risk assessments, COPCs were not being eliminating, they were just used to refine the field sampling strategy for the Site 4 RI.

John agreed it was fine to continue with the SAP preparation as proposed/scoped in September. The regulators will have the opportunity to review and comment on the SAP in the near future.

Action Items and Results

The Team will discuss a threshold level for pesticides when determining if detected pesticides are as a result of normal base operations. Follow Up: *The Team agreed during the November 16, 2011 Partnering Meeting to use the threshold of 50 ppb when making risk management decisions on pesticides (i.e., pesticide detections of 50 ppb or below could be attributable to basewide pesticide use and not attributable to a CERCLA-related release).*

2.1.4 January 2012 Scoping Session

TABLE 2-4
January 2012 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 1/18/12				
Scoping Session Purpose: Site 4 RI UFP-SAP Scoping Session				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
Wade Smith	RPM	VDEQ	(804) 698-4125	wade.smith@deq.virginia.gov
Krista Parra	RPM	NAVFAC Mid-Atlantic	(757)-341-0395	krista.parra@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com

Comments/Decisions

Krista informed the Team that her human health tech support said collecting two, instead of five, samples for hexavalent chromium speciation in soil is sufficient. John would prefer three samples for stats. Krista mentioned the hexavalent chromium results from each site would be used to create a basewide number. John and Wade were fine with this approach. Stephanie added that the two samples collected for hexavalent chromium analysis at each site would be collected from the areas of the highest chromium concentrations in the SI samples. Krista proposed no sampling for hexavalent chromium in groundwater, unless there is a known source. John agreed and added that his human health tech support said most of the time hexavalent chromium, not trivalent, is what you see in groundwater. John suggested doing one surface and one subsurface soil sample at each site for the hexavalent chromium analysis so we can get a number for both intervals. However, this was not agreed to by the team.

Based on this discussion, the Team agreed that two, instead of five, surface soil samples from Site 4 will be collected for total and hexavalent chromium analysis, taken near SI locations CAS04-SS02 and CAA03-SS02 and groundwater samples would not be analyzed for hexavalent chromium as originally scoped in September 2011.

2.1.5 February 2012 Scoping Session

TABLE 2-5
February 2012 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 2/1/12				
Scoping Session Purpose: Site 4 RI UFP-SAP Scoping Session				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
Wade Smith	RPM	VDEQ	(804) 698-4125	wade.smith@deq.virginia.gov
Krista Parra	RPM	NAVFAC Mid-Atlantic	(757)-341-0395	krista.parra@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com
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Jennifer Wright	Ecological RA	NAVFAC Atlantic	(757) 322-8428	jennifer.h.wright@navy.mil
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Dawn Ioven	Toxicologist	USEPA Region 3	(215) 814-3320	ioven.dawn@epa.gov
Kyle Newman	RA	VDEQ	(804) 698-4452	kyle.newman@deq.virginia.gov
William Kappleman	Ecological RA	CH2M HILL	(703) 376-5152	William.kappleman@ch2m.com
Roni Warren	Human Health RA	CH2M HILL	(814) 364-2454	Roni.warren@ch2m.com
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Comments/Decisions:

The team held a conference call to discuss whether PCB congener analysis should be added to the fish tissue samples being collected at Site 4 (and additional sites at CAX). John Burchette asked the EPA ecological and human health risk assessors whether they would be comfortable making decisions on PCBs using Aroclor data only, especially in human health assessment. Dawn Ioven replied that dioxin-like congener data would be good to have to conduct risk; however, the tests are expensive. She recommended analyzing a percentage of samples for dioxin-like congeners.

The team discussed the sampling parameters further and agreed that sediment samples would be analyzed for Aroclors only. Human health risk animal tissue samples (which are not applicable at Site 4 since no fishing occurs in Upstream Pond) would be analyzed for the 12 dioxin-like congeners and Aroclors, and ecological tissue samples would be analyzed for the 12 dioxin-like congeners and homologues (unless the cost to do this was greater than or equal to full congener analysis, in which case the full 209 congeners would be used). This would apply to all tissue samples, not to subsets of tissue samples. In addition, if necessary, the team agreed that tissue samples could be frozen for potential later analysis for up to 1 year.

2.1.6 June 2012 Scoping Session

TABLE 2-6
June 2012 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 6/15/12				
Scoping Session Purpose: Site 4 RI UFP-SAP Scoping Session				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
John Burchette	RPM	USEPA Region 3	(215) 814-3378	burchette.john@epa.gov
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Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
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Comments/Decisions:

Following receipt of the EPA's preliminary comments on the draft version of this SAP, Stephanie e-mailed the team on June 14, 2012 with a proposal to add the collection of two subsurface soil samples for total and hexavalent chromium to the SAP. The EPA and DEQ responded back with their approval of this proposal and the proposed sampling locations on June 20, 2012 and June 26, 2012, respectively.

2.1.7 August 2012 Scoping Session

TABLE 2-7
August 2012 Scoping Session

Project Name: Site 4			**Site Name:** Site 4	
Projected Date(s) of Sampling: Fall 2012			**Site Location:** CAX	
Project Manager: Stephanie Sawyer				
Date of Session: 8/21/12				
Scoping Session Purpose: Site 4 RI UFP-SAP Scoping Session				
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**
Sue Haug	RPM	USEPA Region 3		
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Scott Park	RPM	NAVFAC Mid-Atlantic	(757)-341-0481	scott.park@navy.mil
Marlene Ivester	AM	CH2M HILL	(757) 671-1634	marlene.ivester@ch2m.com
Stephanie Sawyer	Deputy AM/PM	CH2M HILL	(757) 671-6273	stephanie.sawyer@ch2m.com

Comments/Decisions:

The team held a conference call to discuss some of the outstanding EPA comments on this SAP. In order to address EPA BTAG Comment 2 (*The response indicates that one additional surface and subsurface sediment*

sample is needed to determine if site related contaminants from Site 4 are migrating into Youth Pond. Without an understanding of the spatial variability of sediment concentrations in Youth Pond, one sediment sample is insufficient to make this determination. Either additional samples should be collected as part of this investigation or the investigation of this pathway should be deferred to the study of Youth Pond), Stephanie proposed removing the proposed sediment samples from within Youth Pond from the Site 4 SAP. Instead, these samples will be included in the Youth Pond investigation SAP. *The Team agreed*.

2.2 Conceptual Site Model

The conceptual site model (CSM) for Site 4 is based on data evaluated in the SI. Due to the close proximity of Site 4 and AOC 3 to each other and Upstream Pond, the CAX Partnering Team agreed on September 14, 2011 that Site 4 and AOC 3 will be combined into one site, a newly defined Site 4 (**Figure 2**). The areas distinguishing the former Site 4 and former AOC 3 are referenced as Burial Investigation Areas 2 and 1, respectively. This CSM incorporates the site background and history, physical setting, distribution of contamination, release history, potential migration pathways, and the potential exposure pathways and receptors. The CSM figure for Site 4 is provided as **Figure 3**.

2.2.1 Site Background and History

CAX encompasses 2,300 acres east of Williamsburg, between Interstate 64 and the York River on the York-James Peninsula (**Figure 1**). CAX is located on the site of the former DuPont Company Penniman facility and is currently used to supply Atlantic Fleet ships and provide recreational opportunities to military and civilian personnel. The former Penniman facility was used as a powder and shell loading plant during World War I and was closed in 1918. Site 4, the Outdated Medical Supply Disposal Area (which includes CAD 11/12 Pond Bank), is approximately 4 acres in size and located west of D Street, between CAD buildings 11 and 12 (**Figure 2**).

Burial Investigation Area 1 (Previously Identified as AOC 3)

The history of Burial Investigation Area 1 is unknown. It was originally identified as a surface debris pile of metal banding, a few empty drums, and charred wood with approximate dimensions of 20 feet by 20 feet by 10 feet high, located in the southwest corner of Burial Investigation Area 1 and adjacent to the Upstream Pond. However, during development of the SI UFP-SAP (CH2M HILL, 2009), a review of historical aerial photographs was conducted and a photo taken in 1955 showed ground scarring that indicated the land had been disturbed. Since the potential for buried debris existed, test pits were excavated as part of the 2009 SI. Buried debris was encountered between the ground surface and 8 feet below ground surface (bgs) and included asphalt, bricks, concrete, metal, construction and wood debris, automotive parts, dark tar paper, shingles, and a 55-gallon drum. Additional buried debris may exist at depths greater than 8 feet bgs; however due to the depth of water encountered in test pits located closest to Upstream Pond, the vertical depth of debris could not be confirmed. The proximity and orientation of the ground scarring suggests that this disturbed area may have been related to operations at Building CAD 12, a storage warehouse.

In addition, the 2009 SI field activities included surface and subsurface soil sampling, temporary monitoring well installation activities, groundwater well development and sampling, temporary groundwater well abandonment activities, and surface water and sediment (surface and subsurface) sampling. Results from the SI indicated that buried debris exists; however, the extent had not been fully delineated. In addition, the results from the soil, groundwater, sediment, and surface water sampling activities indicated potential risk to human health and ecological receptors and an RI was recommended.

Burial Investigation Area 2 (Previously Identified as Site 4)

The Initial Assessment Study determined that in 1968/1969, out-of-date medical supplies, including intravenous (IV) injection sets with syringes wrapped in aluminum foil or plastic, empty IV bottles, numerous sharps, both metal and plastic, and 1-inch metal banding were disposed within Burial Investigation Area 2 on the bank of the Upstream Pond and covered with soil (C. C. Johnson & Associates, Inc. and CH2M HILL, 1984). After heavy rains, syringes and tubing were sometimes seen floating in Upstream Pond and Youth Pond located across D Street (C. C. Johnson & Associates, Inc. and CH2M HILL, 1984). As much as 7,000 cubic yards (cy) of material were

reported to have been disposed; however, in 2002, the volume of medical supplies, as well as overburden soil, was estimated at 2,100 cy (Baker, 2002).

During a site visit on May 4, 1998 with DEQ officials, packages of unused needles wrapped in aluminum foil were found at the northeast end of the site in a small drainage ditch near Upstream Pond. In May 1998, approximately 200 pounds of surface debris and 13 pounds of sharps (metal and plastic) were removed from the site. Surface debris removed included IV injection sets, many contained in aluminum or plastic bags, and small quantities (15 containers) of injectable drugs. The injectable drug containers contained either residue or small volumes (a few milliliters of liquid) and had either no labels or labels that were not legible. Additional surface debris, including metal banding, railroad ties, metal, corroded 55 gallon drums, and beverage containers, was observed at the site, but not removed.

In November 1999, soil samples were collected from the site, and sediment samples were collected from Upstream Pond. These samples were analyzed for Target Compound List (TCL) Organics, VOCs, semivolatile organic compounds (SVOCs), pesticides, and PCBs, Target Analyte List (TAL) metals, cyanide, and explosives. Results were summarized in the Final SI Report Site 4 and AOC 1 (Baker, 2001a) and were evaluated as part of the 2011 SI Report (CH2M HILL, 2011).

In November 2001, 14 test trenches (4-TT01 through 4-TT14) and six test holes (4TH01 through 4TH06) were excavated and examined to characterize and delineate the extent and types of buried waste. Based on the results of this investigation, the southern, eastern, and the south-western subsurface debris boundaries were delineated. Buried material was observed to be thickest in the eastern portion of the site where waste was encountered to 5 feet bgs. The volume of estimated buried material and overburden soil was then estimated at 2,100 cy. Surface debris consisting of railroad ties, metal, and various trash items was also encountered along the northern and western edges of this disposal area.

In 2005, a Screening Ecological Risk Assessment (SERA) was completed for soil, sediment and surface water to determine if potential risk to ecological receptors warranted either additional investigation beyond the conservative screening steps of the Ecological Risk Assessment (ERA) process, or the removal of sites from further ecological consideration. In addition, the SERA was completed to identify any data gaps or areas of uncertainty that would require the collection of additional data to support ERA evaluations beyond the screening level. Results of the SERA indicated that there are multiple COPCs in soil, sediment, and surface water including VOCs, SVOCs, pesticides, PCBs, and metals. Since multiple COPCs and complete exposure pathways were identified, the SERA recommended proceeding with Step 3a of the ERA process; however, additional data would need to be collected.

In 2009, SI field activities were conducted and included the excavation of test pits, surface and subsurface soil sampling, temporary groundwater well installation activities, groundwater well development and sampling, temporary groundwater well abandonment activities, and surface water and sediment (surface and subsurface) sampling. Results from the SI indicated that the extent of buried debris had been delineated; however, sampling activities indicated potential risk to human health and ecological receptors, and an RI was recommended further characterize the extent of contamination and quantify the risk to human health and ecological receptors.

2.2.2 Physical Setting

Site 4 is heavily vegetated with shrubs and trees. In general, the topography of Site 4 slopes to the northeast towards D Street (**Figure 2**). Surface water flows from the areas surrounding CAD 11 and 12 and nearby drainage channels into Upstream Pond. The surface water in Upstream Pond flows through a culvert under D Street and into Youth Pond. Surface water in Youth Pond then discharges through a culvert into the York River. The spatial relationship of Burial Investigation Area 1 and Burial Investigation Area 2, as well as the presumed directions of groundwater and surface water flow, are illustrated in the CSM (**Figure 3**).

Each burial investigation area is approximately 1 acre in size and is located within the Site 4 boundary. In general, soil at Burial Investigation Area 1 is predominately yellowish-brown sandy clay and clay underlain by greenish-grey silty sand. Soil at Burial Investigation Area 2 is predominately brown and gray silty sand (CH2M HILL, 2011). The

shallow aquifer underlying Site 4 is the Yorktown-Eastover Aquifer, and during the SI field activities, groundwater was encountered between approximately 1.5 and 11.5 feet bgs. Groundwater is estimated to flow north-northeast towards Upstream Pond.

While Site 4 is located within the restricted CAD area, access is not restricted to CAX visitors (e.g., civilian employees and military personnel) since the gate along D Street near CAD Building 11 is no longer locked on a regular basis. Future land use at Site 4 is not expected to change and will likely continue as a wooded area in the foreseeable future.

2.2.3 Distribution of Contamination

Two areas of buried debris were encountered at Site 4 (**Figure 2**). One area is located northwest and adjacent to Upstream Pond, within Burial Investigation Area 1, and consisted of asphalt, bricks, concrete, metal, construction and wood debris, automotive parts, dark tar paper, shingles, and a 55-gallon drum at depths between the ground surface and 8 feet bgs. Additional buried debris may exist at depths greater than 8 feet bgs; however due to the depth of water encountered in test pits located closest to Upstream Pond, the vertical depth of debris could not be confirmed. The second burial area, located south of Upstream Pond within the Burial Investigation Area 2, consisted of medical supplies, metal, and construction/debris. Buried debris was encountered from surface grade to a maximum depth of 7.5 feet bgs.

Based on the results of the 2009 SI, the following initial set of COPCs was identified (as indicated by exceedances of select screening criteria) at Site 4 (**Appendix B**):

- Surface soil: VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and metals
- Subsurface soil: VOCs, SVOCs, pesticides, PCBs, and metals
- Groundwater: VOCs, SVOCs, pesticides, metals, and dissolved metals
- Surface water: SVOCs (PAHs), metals, and dissolved metals
- Surface Sediment: VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and metals
- Subsurface Sediment: VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and metals

After further risk evaluation, it was determined that the primary COPCs that may pose risk to human health or ecological receptors included VOCs (groundwater only), PAHs, PCBs (soil and sediment only), and metals. However, additional data are required to adequately characterize the impacts from the known source areas to soil, sediment, and groundwater as described in **Section 2.3.3.**

2.2.4 Release History

Buried materials within the two buried debris areas and miscellaneous surface debris scattered throughout the site are the primary known and suspected sources of contamination at Site 4 (**Figure 2**).

2.2.5 Potential Migration Pathways

The principle contaminant release and transport mechanisms from source areas include leaks and deterioration of buried materials and leaching from soil to groundwater as a result of rainwater infiltration. Where contaminants are exposed at the ground surface, transport could also occur through surface water runoff; however, since the site is located in a low-lying area, the surface water runoff is expected to eventually infiltrate into the ground within the site boundary.

2.2.6 Potential Exposure and Receptor Pathways

Potential human receptors exposed to soil, surface water, sediment, and groundwater at Site 4 include:

- Current/Future industrial workers (soil and groundwater)
- Current/Future visitors/recreational user (soil, surface water, and sediment)
- Potential future construction workers (soil, sediment, surface water and groundwater)
- Future residents (soil and groundwater)

These potential receptors may be exposed to site-related contaminants through ingestion of, inhalation of, and dermal contact with soil; through ingestion of, inhalation of, and dermal contact with groundwater; through inhalation of indoor air (vapor intrusion) derived from groundwater; and through ingestion of and dermal contact with surface water and sediment.

Potential ecological receptors exposed to soil, surface water, and/or sediment at Site 4 include upper trophic level animals (i.e., birds and mammals), terrestrial organisms (i.e., soil invertebrates, reptiles, and amphibians), aquatic organisms (i.e., benthic and aquatic invertebrates, fish, reptiles, and amphibians), and terrestrial, wetland, and aquatic plants.

2.3 Data Quality Objectives/Systematic Planning Process Statements

2.3.1 Project Statement and Objectives

The objective of this RI is to collect additional data to supplement the current SI dataset in order to adequately characterize Site 4 and evaluate the potential risk to human health and ecological receptors. Field activities will include delineating the extent of buried debris within the vicinity of Burial Area 1, and collecting soil, sediment, groundwater and animal tissue samples. All data included in the 2009 SI (CH2M HILL, 2011) and collected as part of this RI, will be used to characterize the site and support an HHRA and a BERA.

2.3.2 Data Quality Objectives

Quantifiable analytical results will be the primary basis for project decisions. The limit of quantitation (LOQ), which is defined as the minimum concentration or quantity of a target analyte that can be reported with accurate quantitation, will be the metric to define whether an analytical result is quantifiable.

If the analysis of samples determines that analytes are undetected or if any detected analytes are below the Project Action Limits (PALs), then it will be assumed that the nature and concentrations of these constituents do not pose an unacceptable risk and no further action for them will be necessary.

If the analysis of samples determines that the analytes are detected above the project specific PALs then a quantitative Human Health Risk Assessment (HHRA) and ERA will be conducted to identify COPCs as follows:

Human Health Risk Decision Logic (Figure 4):

Results of the RI soil sampling will be combined with the soil sample data evaluated in the SI to determine if there may be unacceptable risks to potential human receptors:

- Soil concentrations will be compared to the adjusted residential soil RSLs (adjusted meaning that RSLs based on non-noncarcinogenic effects are divided by 10 to account for exposure to more than one constituent that affects the same target organ; RSLs based on carcinogenic endpoints are not adjusted). If the maximum detected concentration of a constituent exceeds the applicable RSL, the constituent will be identified as a COPC.
- If a constituent is identified as a COPC, human health risks will be evaluated for exposure to the COPCs indentified in soil for all potential human receptors (e.g., current trespassers/visitors, and current/future industrial workers, construction workers, residents, and trespassers/visitors). The 95 percent upper confidence limit (UCL) of the mean soil concentration will be used as the exposure concentration for the risk calculations. If all risks are within acceptable USEPA risk levels, no further action/assessment based on human health will be required for soil.
- If potentially unacceptable risks are identified associated with metals, the metals data will be compared to the base-specific soil background 95 percent upper tolerance limits (UTLs) to determine if the risks are associated with the site or background conditions. Surface soil will be compared to surface soil background 95 percent UTLs and subsurface soil will be compared to subsurface soil background 95 percent UTLs. If all risks are associated with background conditions, no further action/ assessment based on human health will be

required for soil. If risks are not associated with background conditions, the constituent will be identified as a contaminant of concern (COC).

- If the COC concentrations exceed the background 95 percent UTL, further evaluation will be conducted to consider whether the COC concentrations are consistent with background conditions or if they represent a release such that further action is warranted.

Results of the RI sediment sampling will be combined with the sediment sample data evaluated in the SI to determine if there may be unacceptable risks to potential human receptors:

- Analyte concentrations from RI and SI sediment sample data will be compared to ten times the adjusted residential soil RSLs (adjusted meaning that RSLs based on non-noncarcinogenic effects are divided by 10 to account for exposure to more than one constituent that affects the same target organ; RSLs based on carcinogenic endpoints are not adjusted). If the maximum detected concentration of a constituent exceeds the applicable RSL, the constituent will be identified as a COPC.
- If a constituent is identified as a COPC, human health risks will be evaluated for exposure to the COPCs indentified in sediment for current/future trespassers/visitors and current/future construction workers. The 95 percent UCL of the mean sediment concentration will be used as the exposure concentration for the risk calculations. If all risks are within acceptable USEPA risk levels, no further action/assessment based on human health will be required for sediment. If the risks are greater than acceptable USEPA risk levels, the constituent will be identified as a COC.

Results of the surface water sample data evaluated in the SI will be used to determine if there may be unacceptable risks to potential human receptors (no additional surface water samples will be collected during the RI sampling event):

- Contaminant concentrations from the SI surface water sample data will be compared to ten times the adjusted tap water RSLs (adjusted meaning that RSLs based on non-noncarcinogenic effects are divided by 10 to account for exposure to more than one constituent that affects the same target organ; RSLs based on carcinogenic endpoints are not adjusted). If the maximum detected concentration of a constituent exceeds the applicable RSL, the constituent will be identified as a COPC.
- If a constituent is identified as a COPC, human health risks will be evaluated for exposure to the COPCs indentified in surface water for current/future trespassers/visitors and current/future construction workers. The 95 percent UCL of the mean surface water concentration will be used as the exposure concentration for the risk calculations. If all risks are within acceptable USEPA risk levels, no further action/assessment based on human health will be required for surface water. If the risks are greater than acceptable USEPA risk levels, the constituent will be identified as a COPC.

Results of the RI groundwater sampling will be combined with the groundwater sample data from temporary wells evaluated in the SI to determine if there may be unacceptable risks to potential human receptors:

- Contaminant concentrations from monitoring wells and SI temporary monitoring wells sampling data will be compared to the adjusted tap water RSLs (adjusted meaning that RSLs based on non-noncarcinogenic effects are divided by 10 to account for exposure to more than one constituent that affects the same target organ; RSLs based on carcinogenic endpoints are not adjusted). If the maximum detected concentration of a constituent exceeds the applicable RSL, the constituent will be identified as a COPC.
- If a constituent is identified as a COPC, human health risks will be evaluated for exposure to the COPCs indentified in groundwater for future industrial workers, residents, and construction workers. The mean groundwater concentration from the wells from the most contaminated portion of the groundwater plume (if a plume is identified) will be used as the exposure concentration for the risk calculations. If all risks are within acceptable USEPA risk levels, no further action/assessment based on human health will be required for groundwater.

- If potentially unacceptable risks are identified associated with metals, the metals data will be compared to the base-specific groundwater background 95 percent UTLs (specifically the Yorktown-Eastover background 95 percent UTL) to determine if the risks are associated with the site or background conditions. If all risks are associated with background conditions, no further action/assessment based on human health will be required for groundwater. If risks are not associated with base background 95 percent UTLs, the constituent will be identified as a contaminant of concern (COC).
- If the COC concentrations exceed the background 95 percent UTL, further evaluation will be conducted to consider whether the COC concentrations are consistent with background conditions or if they represent a release such that further action is warranted.

Ecological Risk Decision Logic

Results of the soil analytical sampling will be evaluated as follows to determine if potential risks to terrestrial receptors may be occurring (**Figure 4**):

- Contaminant concentrations from each site soil sample (with a sample depth of less than 2 feet) will be compared to literature-based soil screening values for plants and/or soil invertebrates. Mean soil concentrations will also be compared with soil screening values (samples may be partitioned by spatial area when calculating means). If the mean concentration equals or exceeds soil screening values, then the chemical will be considered a COPC. For chemicals whose maximum HQ equals or exceeds one but whose mean HQ is less than one (and which equal or exceed background, if available), the magnitude of the maximum hazard quotient (HQ), the frequency of detection, the frequency of exceedance, and the spatial distribution of exceedances will be used as lines of evidence to determine if specific constituents warrant retention as soil COPCs and to account for possible spatially-limited areas of contamination. The uncertainties associated with this evaluation will be discussed in the ERA portion of the RI report.
- If the results of the quantitative ERA determines that there is unacceptable potential risk, the COPCs will be compared to the base-specific soil background 95 percent UTLs to determine if the detected concentrations are consistent with base background concentrations. Surface soil will be compared to surface soil background 95 percent UTLs and subsurface soil will be compared to subsurface soil background 95 percent UTLs. If the COPCs do not exceed the background 95 percent UTLs, then no further action for the COPCs will be necessary.
- COC concentrations exceed the background 95 percent UTL, further evaluation will be conducted to consider whether the COC concentrations are consistent with background conditions or if they represent a release such hat further action is warranted.

Results of the earthworm tissue sampling will be evaluated as follows to determine if there is an unacceptable risk posed to invertivorous wildlife:

- Maximum, 95% UCL, and mean site concentrations (for bioaccumulative chemicals [USEPA, 2000]; non-bioaccumulative chemicals will not be evaluated in the food web models) will be entered into the food web models used in the 2009 SI in place of the modeled estimates. The same decision criteria used in the 2009 SI will apply; that is, if the Maximum Acceptable Toxicant Concentration (MATC)-based HQ exceeds one, based upon the mean concentration, potential risks are considered unacceptable.

Results of the sediment analytical sampling will be evaluated as follows to determine if potential risks to aquatic receptors may be occurring:

- Contaminant concentrations from each site sediment sample will be compared to literature-based freshwater sediment screening values. Mean sediment concentrations will also be compared with screening values (samples may be partitioned by spatial area when calculating means).
- Site sediment concentrations will be compared to reference sediment concentrations collected as part of the RI.

- If the mean concentration equals or exceeds sediment screening values, and the maximum concentration equals or exceeds reference concentrations, then the chemical will be considered a COPC. For chemicals whose maximum HQ exceeds one but whose mean HQ is less than one, the magnitude of the maximum HQ, the frequency of detection, the frequency of exceedance, and the spatial distribution of exceedances will be used as lines of evidence to determine if specific constituents warrant retention as sediment COPCs and to account for possible spatially-limited areas of contamination. The uncertainties associated with this evaluation will be discussed in the ERA portion of the RI report.

Results of the sediment toxicity testing will be evaluated as follows to determine if significant toxicity to benthic invertebrates is occurring:

- Results for each site sample will be statistically compared (for all test endpoints) with each reference sample. A statistically significant reduced response relative to the reference samples will constitute an impact. If there are conflicting results for the reference comparisons, a weight-of-evidence evaluation (to be documented in the RI report) will be conducted to determine if the site sample is significantly impacted.
- If impacted samples are identified, statistical (correlation) analyses will be conducted in an attempt to determine the physical and/or chemical factors (if any) that are significantly correlated with the reduced endpoint responses. If the statistical analysis is inconclusive, a weight of evidence evaluation (to be documented in the RI report) will be used (encompassing all relevant endpoints) to determine overall potential impacts.

Results of the benthic community analysis will be evaluated as follows to determine if benthic communities are being adversely affected by sediment contaminants:

- The results of the taxonomic identification will be used to calculate values for a number of benthic metrics, such as number of taxa and total density, for each site and reference sample. The list of metrics will be determined once the data have been collected to ensure that they are appropriate to the resulting data set.
- The values for each benthic metric will be compared, statistically, between site and reference samples to determine if impacts are evident.
- If impacted samples are identified, statistical (correlation) analyses will be conducted in an attempt to determine the physical and/or chemical factors (if any) that are significantly correlated with the relevant benthic metrics. If the statistical analysis is inconclusive, a weight of evidence evaluation (to be documented in the RI report) will be used (encompassing all relevant endpoints) to determine overall potential impacts.

Results of the fish and frog tissue sampling will be evaluated as follows to determine if there is an unacceptable risk posed to piscivorous wildlife:

- Concentrations between site and reference samples will be statistically compared to determine if site concentrations are elevated relative to background.
- Maximum, 95% UCL, and mean site concentrations (for bioaccumulative chemicals [USEPA, 2000]; non-bioaccumulative chemicals will not be evaluated in the food web models) will be entered into the food web models used in the SI in place of the modeled estimates. The same decision criteria used in the SI will apply; that is, potential risks are considered unacceptable if the MATC-based HQ exceeds one based upon the mean concentration.
- In addition, fish tissue concentrations will be compared with literature-based tissue screening values, if available, for bioaccumulative chemicals. Detected chemicals for which a screening value is not available will be addressed in the uncertainty section of the ERA report if a surrogate value is also not available.

2.3.3 What are the environmental questions being answered?

The following environmental questions will be answered in the RI.

What is the extent of buried debris at the site?

The nature of buried debris is known based on the 40 test pits completed during the 2001 trenching investigation (Baker, 2002) and the 2009 SI (CH2M HILL, 2011). Buried material within the two burial investigation areas includes asphalt, bricks, concrete, medical supplies, metal, construction and wood debris, automotive parts, dark tar paper, shingles, and a 55-gallon drum. However, the lateral extent of Burial Area 1 requires further delineation.

The following work is proposed to answer this environmental question:

A minimum of two test pits will be excavated to delineate the lateral extent of buried debris within the vicinity of Burial Area 1. Due to the proximity of Burial Area 1 to Upstream Pond, the test pits will be installed on the southeast side of Upstream Pond (**Figure 5**). If buried debris is encountered in the test pits, additional test pits will be excavated in order to determine the extent of buried debris. In addition, if buried debris is encountered, two subsurface soil samples will be collected from below where the buried debris is the most extensive and analyzed for PAHs, PCBs, and inorganic constituents.

What is the nature and extent of contamination in soil?

There are 21 existing surface soil samples and 24 existing subsurface soil samples that were evaluated in the 2009 SI (CH2M HILL, 2011). These data will be used to determine the nature and extent of contamination at the site. However, additional soil data are necessary to adequately characterize this medium.

The following work is proposed to answer this environmental question:

Two additional surface (0 to 6 inches) and subsurface (6 to 24 inches) soil samples (**Figure 5**) will be collected from the southeast side of Upstream Pond (within the vicinity of the proposed test pits) and analyzed for PAHs, PCBs, and metals to supplement the existing soil data. In addition, these soil samples will be analyzed for TOC, pH, and grain size to assist in completing the BERA. Additional surface soil samples collected in support of the BERA (as discussed with the environmental question "*Do soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors*," below) will also be used to further characterize this medium.

What is the nature and extent of contamination in groundwater and the groundwater flow direction and velocity?

There are 10 existing groundwater samples that were evaluated in the 2009 SI (CH2M HILL, 2011). These data will be used to determine the nature and extent of contamination at the site. However, additional groundwater data are necessary to further characterize this medium.

The following work is proposed to answer this environmental question:

Six permanent monitoring wells (**Figure 5**) will be installed and groundwater samples will be collected and analyzed for VOCs, PAHs, and total/dissolved metals to supplement the existing groundwater data. Samples from the six monitoring wells be analyzed for natural attenuation parameters (wet chemistry parameters including nitrate, nitrite, sulfate, sulfide, alkalinity, methane, ethane, and ethene) to assist in determining the degradation and mobility of VOCs and metals. In addition, monitoring wells will be gauged and slug tests will be conducted in order to determine the groundwater flow direction and velocity.

What is the nature and extent of contamination in sediment and surface water within Upstream Pond?

There are 13 existing surface water, 17 surface sediment, and 17 subsurface sediment samples that were evaluated in the 2009 SI (CH2M HILL, 2011). These data will be used to determine the nature and extent of

contamination at the site for these media. Based on spatial coverage of the current data set, no additional sediment or surface water samples are necessary to adequately characterize these media.

The following work is proposed to answer this environmental question:

No work is proposed to directly answer this environmental question. However, since additional sediment samples will be collected to complete the BERA (as discussed for the environmental question "*Do soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors*," below), the results of those samples will be used in conjunction with the 2009 SI (CH2M HILL, 2011) data to evaluate the nature and extent of contamination at the site.

Do site media pose a potentially unacceptable risk to human health?

Soil (surface and subsurface), groundwater, sediment, and surface water data from the 2009 SI (CH2M HILL, 2011) were evaluated to determine if detected constituents could potentially pose a risk to human health. This evaluation was conducted to allow for a "look-ahead" to identify what the likely risk drivers would be at Site 4. Based on the results of this evaluation, PAHs, pesticides, PCBs, and metals were identified as constituents that could potentially pose a risk to human health in soil (surface and subsurface) and VOCs, PAHs, and metals were identified as constituents that could potentially pose a risk to human health in groundwater. In addition, select PAHs and select metals were identified as constituents that could potentially pose a risk to human health in surface water and PAHs, pesticides, PCBs, and metals were identified as constituents that could potentially pose a risk to human health in sediment (surface and subsurface). Based on spatial coverage of the current data set, no additional sampling (in addition to the sampling proposed in this UFP-SAP) is necessary to adequately assess the potential risk to human health.

The following work is proposed to answer this environmental question:

A baseline HHRA will be completed to determine if site contaminants potentially pose an unacceptable risk to human health. All existing site data and data collected as part of this RI will be evaluated in the baseline HHRA.

Is there any additional data that can be collected to refine the HHRA?

Results of the human health risk evaluation in the 2009 SI (CH2M HILL, 2011) indicated that exposure to chromium in soil (surface and subsurface) and groundwater may pose potential risk to human health. However, in performing the risk evaluation, it was assumed that all of the chromium detected in these media is in the hexavalent form, which is unlikely since chromium is generally found in natural soil in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. Therefore, chromium speciation data are needed to adequately assess the potential risk to human health due to exposure to soil and groundwater.

The following work is proposed to answer this environmental question:

Two surface soil samples (taken near SI locations CAS04-SS02 and CAA03-SS02) and two subsurface soil samples (taken near SI locations CAA03-SS02 and CAS04-SS01) will be collected from Site 4 (**Figure 5**) and analyzed for total and hexavalent chromium to generate an estimated proportion of chromium in trivalent versus hexavalent form that is representative of site data in order to refine the HHRA.

Do soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors?

Soil (surface and subsurface), sediment, and surface water data from the 2009 SI (CH2M HILL, 2011) were evaluated to determine if detected constituents could potentially pose a risk to ecological receptors. This evaluation was conducted to allow for a "look-ahead" to identify what the likely risk drivers would be at Site 4. Based on the results of this evaluation, SVOCs (primarily PAHs), pesticides, and select metals were identified as constituents that could potentially pose a risk to ecological receptors in surface soil, and pesticides and select metals were identified as constituents that could potentially pose a risk to ecological receptors in subsurface soil. In addition, select SVOCs (PAHs) and select metals were identified as constituents that could potentially pose a

risk to ecological receptors in surface water and SVOCs (primarily PAHs), pesticides, PCBs, and metals were identified as constituents that could potentially pose a risk to ecological receptors in sediment (surface and subsurface). However, additional soil and sediment data are necessary to complete a BERA and adequately assess the potential risk to ecological receptors. Based on spatial coverage of the current data set, no additional surface water sampling is necessary to adequately assess the potential risk to ecological receptors.

The following work is proposed to answer this environmental question:

The following data will be collected to complete a BERA and determine if soil, sediment, and/or surface water pose potentially unacceptable risk to ecological receptors:

- Six surface soil samples (**Figure 5**) will be collected within the vicinity of surface soil samples CAA03-SS06 and CAS004-4-HA06 and analyzed for PAHs, PCBs, metals, pH, TOC, and grain size. These samples will be collected to see if there has been any surface runoff migration from the areas of high contaminant concentrations and will be field determined and based on the location of the natural drainage ways in these areas.
- Eleven surface sediment samples from Upstream Pond and three surface sediment samples from an upgradient drainage channel (**Figure 5**) will be collected. These samples will be analyzed for PAHs, PCBs, metals, pH, TOC, grain size, and AVS/SEM. In addition, five surface and subsurface sediment and five surface water samples will be collected from a reference pond (anticipated to be Cheatham Pond [Figure 1], with the specific pond and sample locations to be determined based on the results of the biological survey [described in Section 3.2.12]). . These samples will be analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and metals. Sediment samples will also be analyzed for pH, TOC, grain size and AVS/SEM while surface water samples will be analyzed for hardness.
- Six surface sediment samples from Upstream Pond and two surface sediment samples from a reference pond (anticipated to be Cheatham Pond [Figure 1], with the specific pond and sample locations to be determined based on the results of the biological survey [described in Section 3.2.12]) will be evaluated for toxicity using laboratory-based 28-day sediment tests (endpoints of survival and growth) with the invertebrate *Hyalella azteca*. The SOP for this toxicity test is referenced in **Table 3-2**. Sulfide and ammonia will also be analyzed in sediment samples submitted for toxicity testing.
- Three earthworm tissue samples and up to seven whole-body composite fish tissue and seven frog tissue samples (up to five from the site area and two from the reference pond) will be collected and analyzed for dioxin-like PCBs and PCB homologues, metals, percent lipids, and percent moisture.

Is further action (that is, further investigation, removal, or remediation) warranted at this site based on the results of this study?

Further action may be recommended, based on the nature and extent of buried debris, findings of the HHRA and BERA, exceedances of groundwater MCLs, and the expected future use of the site.

2.3.4 What are the Project Action Limits?

The detected site soil, groundwater, surface water, sediment, and tissue data will be compared to the following PALs to identify COPCs (PAL values are included in **Appendix A**, **Tables A-1** through **A-15**):

1. Surface Soil: USEPA Adjusted Residential Soil RSLs and literature-based ecological screening values for plants and soil invertebrates.
2. Subsurface Soil: USEPA Adjusted Residential Soil RSLs and literature-based ecological screening values for plants and soil invertebrates (if less than 2 feet).
3. Sediment: USEPA Residential Soil RSLs multiplied by 10 to adjust soil RSL to sediment, Region 3 BTAG freshwater sediment screening values, and literature-based freshwater ecological screening values.

4. Surface Water: USEPA Tap Water RSLs multiplied by 10, Region 3 BTAG freshwater screening values, and literature-based freshwater ecological screening values.
5. Groundwater: USEPA Adjusted Tap-water RSLs and Federal Maximum Contaminant Levels (MCLs).
6. Animal Tissue: For earthworm and fish/frog tissue, maximum, 95% UCL, and mean site concentrations (for bioaccumulative chemicals [USEPA, 2000]; non-bioaccumulative chemicals will not be evaluated in the food web models) will be entered into the food web models used in the SI in place of the modeled estimates. The PALs provided in this SAP for tissue are targets for the laboratory to meet and are based upon back-calculated food web model values (HQ of 1 and the most conservative receptors and input parameters); fish/frog PALs also consider literature-based tissue effect levels. These latter values will be compared with the resulting fish/frog tissue data. Site concentrations for fish/frog tissue will also be compared with concentrations from reference areas.

Site concentrations for surface water, sediment, and tissue will also be compared with reference concentrations (see Section 3.2.12). The purpose of the reference site samples are to provide background concentrations for naturally occurring constituents (such as metals) and widely occurring anthropogenic constituents with a multitude of sources (e.g., PAHs and certain pesticides), and to provide comparative data for biological surveys and toxicity testing. Significant detections of constituents such as PCBs and explosives would preclude the use of an area as a suitable reference site. However, the reference pond sediment samples will not be formally compared to the PALs listed above. A quantitative HHRA (conducted in accordance with USEPA guidance and as described above in Section 2.3.2) and a BERA (through Step 7) will be conducted to identify the COPCs for each medium.

The COPC concentrations will also be compared to the background 95 percent UTLs (CH2M HILL, 2011), where available and applicable, to determine if the detected concentrations are consistent with the base background concentrations. If the COC concentrations equal or exceed the background 95 percent UTL, further evaluation will be conducted to consider whether the COC concentrations may be attributed to a release or may be associated with background conditions (such as comparing site data to the maximum base background concentrations).

PALs will be compared to laboratory-specific reporting limits in the Reference Limits and Evaluation Tables (**Appendix A**).

2.3.5 How will the data be used?

The findings of the test pits will be used to determine the extent of buried debris within the vicinity of Burial Area 1. This information will be used when determining possible future remedial options.

The lithologic data will be used to identify the aquifer encountered and potential geotechnical properties of soils. Groundwater data (i.e., water level data, hydraulic slug tests) will be used to determine the general groundwater conditions, including depth to water, rate of groundwater flow and direction of groundwater flow. This information will be incorporated into the CSM for the site and utilized in the discussion of contaminant fate and transport.

The existing and proposed soil, sediment, groundwater, surface water, and tissue sample concentrations will be used to determine the nature and extent of contamination, and will be used to appropriately assess human health (soil, groundwater, surface water, sediment) and ecological (soil, surface water, sediment, animal tissue) risks at the site. The HHRA will estimate the likelihood of adverse impacts to current and potential future users of the site based on the current and potential future use of the site. The BERA will estimate the likelihood of adverse impacts to ecological receptors that may use the site. Additional lines of evidence for the BERA will include the results of aquatic reconnaissance-level biological surveys (invertebrates, fish, amphibians) and sediment toxicity tests.

Wet chemistry soil data (TOC, pH and grain size) will be collected to further characterize the soil medium. Wet chemistry sediment data (AVS/SEM, TOC, pH, and grain size) will be collected to further characterize the sediment medium and assist in completing the BERA. Toxicity testing will include the monitoring of ammonia and sulfide concentrations in the water above the sediment; to assist in interpreting the results, sulfide and ammonia will be also be analyzed in-situ in sediment samples submitted for toxicity testing. Natural attenuation parameters (wet

chemistry parameters including nitrate, nitrite, sulfate, sulfide, alkalinity, methane, ethane, and ethane) will be collected to assist in determining the degradation and mobility of VOCs and metals.

One Toxicity Characteristic Leaching Procedure (TCLP) soil and one TCLP groundwater sample will be collected to characterize media for disposal purposes.

2.3.6 What types of data are needed?

Section 2.5 contains detailed information on the types of data needed for this project, including sample locations and sample depth intervals. In general, additional test pits and analytical soil, sediment, groundwater, and animal tissue sample data are required for this project to determine the nature and extent of contamination and to complete the HHRA and BERA. All analytical samples will be submitted to an offsite subcontracted laboratory for analysis. Refer to **Section 2.5** and **Section 3** for sample locations, numbers, rationale, and methodology. Sample locations are provided on **Figure 5**.

2.3.7 Are there any special data quality needs, field or laboratory, in order to support environmental decisions?

The data will be used in the HHRA and BERA to make further investigation/action decisions; therefore, the validator will qualify according to the Measurement Performance Criteria (MPC) outlined in **Section 2.4** for field QC samples and the Laboratory QC Samples Table in **Appendix A** for laboratory QC samples. These MPC are consistent with the Department of Defense (DoD) Quality Systems Manual (QSM) as applicable and laboratory in-house limits where the QSM does not apply.

The data collected from Site 4 will be validated internally by CH2M HILL. This process is outlined in **Section 2.3.9**.

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

Detailed information on where, when, and how the data will be collected is provided in **Section 3**. Data generated at the subcontract laboratory(s) will be reported in a data package equivalent to an USEPA Contract Laboratory Program (CLP) level IV deliverable. This data package includes a case narrative, all field sample results, QC forms, and raw data. An electronic data deliverable (EDD) will also be required.

2.3.9 How will the data be evaluated?

Data will undergo an evaluation for quality and completeness at the laboratory and will be validated by CH2M HILL data validators. Specific verification and validation steps are detailed in Table A-39, *Data Verification and Validation (Steps I and IIa/IIb) Process Table* (**Appendix A**). In general:

- Deviations from the SAP will be reviewed to assess whether CA is warranted and to assess impacts to the achievement of project objectives.
- To assess whether a sufficient quantity of acceptable data are available for decision-making, the data will be reconciled with MPC following validation and review of DQIs.
- For duplicate sample results, the most conservative value will be used for project decisions.
- Field and laboratory precision will be compared as Relative Percent Difference between the two results.
- For statistical comparisons in the BERA, non-detect values will be represented by a concentration equal to one-half the sample reporting limit.

2.3.10 How will the data usability be documented?

The PM, PC, and other team members will be responsible for compiling the data. The data will then be presented to the CAX Partnering Team who, as a whole, will evaluate the data usability according to project objectives. Any qualifications made to the data during data validation will be included for consideration; possible qualifications that may be applied to the data during validation are as follows:

- When major QC deficiencies are encountered, data will be qualified with an R and in most cases is not considered usable for project decisions. If R-qualified data are used in evaluations and, ultimately, project decisions, the rationale for their use will be included in the RI Report. The R-qualifier is defined as follows:
  - R = Rejected result. Result not reliable.
- For minor QC deficiencies that will not affect the usability of the data, data may be qualified as estimated with the following qualifiers: J, UJ, K, L, or UL. These qualifiers are defined as follows:
  - J = Analyte present. Reported value may or may not be accurate or precise.
  - UJ = Analyte not detected. Quantitation limit (QL) may be inaccurate or imprecise.
  - K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
  - L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.
  - UL = Analyte not detected. QL is probably higher.
- Additional qualifiers that may be applied to data by the validator are:
  - B = Not detected substantially above the level reported in laboratory or field blanks. This detection is attributed to blank contamination and is to be treated as a non-detect.
  - E = Interferences present which may cause the results to be biased high.
  - N = Tentative identification. The analyte is considered present, though special methods may be needed to confirm its presence or absence in future sampling efforts.
  - NJ = Qualitative identification is questionable due to poor resolution. Presumptively present at approximate quantity.
  - U = Not detected.

Data usability will be documented in data tables and discussed in the data quality evaluation, both of which will be provided as part of the RI report. Data tables will reflect the reported concentration of analytes, whether the analyte was detected, and what, if any, data qualifiers accompany the result. The data quality evaluation will discuss the use of specific data qualifiers and their impact on decision-making, the overall quality of the data set, and any data usability limitations determined by the CAX Partnering Team.

2.3.11 Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data will be collected as detailed in **Section 3**, and will be reviewed for quality and completeness as detailed in the Data Verification and Validation (Steps I and IIa/IIb) Process Table (**Table 2-7**). More information about data validation and usability is provided in **Section 2.3.10**.

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TABLE 2-8
Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data Review Input	Description	Responsible for Verification	Internal/ External[1]
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	FTL/CH2M HILL	Internal
Chains of Custody and Shipping Forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody will be initialed by the reviewer, a copy of the chains-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment. Chains-of-custody will also be reviewed for adherence to the SAP by the project chemist.	FTL/CH2M HILL PDM/CH2M HILL Project Chemist/CH2M HILL	Internal & External
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the PDM in the form of laboratory logins.	PDM/CH2M HILL	External
Documentation of Laboratory Method Deviations	Laboratory Method Deviations will be discussed and approved by the project chemist. Documentation will be incorporated into the case narrative which becomes part of the final hardcopy data package.	Project Chemist/CH2M HILL L	External
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check).	PDM/CH2M HILL	External
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process. This is verification that they were generated and applicable to the data packages.	Data Validator/CH2M HILL	External
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	Respective Laboratory Quality Assurance Officer (QAO)	Internal
Laboratory Data	The data will be verified for completeness by the PDM.	PDM/CH2M HILL	External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and CA forms will be reviewed internally to ensure that all appropriate CAs have been taken and that CA reports are attached. If CAs have not been taken, the site manager will be notified to ensure action is taken.	Project Manager/CH2M HILL Project Chemist/CH2M HILL	Internal
CA Reports	CA reports will be reviewed by the project chemist or project manager and placed into the project file for archival at project closeout.	Project Manager/CH2M HILL Project Chemist/CH2M HILL	External
Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods.	Project Chemist/CH2M HILL	External
Target Compound List and Target Analyte List	Ensure the laboratory reported all analytes from each analysis group.	Project Chemist/CH2M HILL	External

TABLE 2-8
Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data Review Input	Description	Responsible for Verification	Internal/ External[1]
Reporting Limits	Ensure the laboratory met the project-designated quantitation limits. If quantitation limits were not met, the reason will be determined and documented.	Project Chemist/CH2M HILL	External
Field SOPs	Ensure that all field SOPs were followed.	FTL/CH2M HILL	Internal
Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed.	Respective Laboratory QAO	Internal
Raw Data	10 percent review of raw data to confirm laboratory calculations.	Data Validator/CH2M HILL	External
Onsite Screening	All non-analytical field data will be reviewed against SAP requirements for completeness and accuracy based on the field calibration records.	FTL/CH2M HILL	Internal
Documentation of Method QC Results	Establish that all required QC samples were run.	Data Validator/CH2M HILL	External
Documentation of Field QC Sample Results	Establish that all required QC samples were run.	Project Chemist/CH2M HILL	Internal
DoD ELAP Evaluation	Ensure that each laboratory is DoD ELAP Certified for the analyses they are to perform. Ensure evaluation timeframe does not expire.	Project Chemist/CH2M HILL	External
Analytical data for VOCs, PAHs, PCBs, Metals (total and dissolved), Mercury (total and dissolved), and Hexavalent Chromium in all matrixes analyzed, e.g. groundwater, surface soil, subsurface soil, surface sediment, subsurface sediment, and/or tissue, as well as reference surface water and sediment (surface and subsurface).	Analytical methods and laboratory SOPs as presented in this SAP will be used to evaluate compliance against QA/QC criteria. Should adherence to QA/QC criteria yield deficiencies, data may be qualified. The data qualifiers used are those presented in Region III Modifications to the National Functional Guidelines for Organic Data Review (USEPA, September 1994) and in Region III Modifications to the Laboratory Data Validation Guidelines for Inorganic Data Review (USEPA, April 1993). National Functional Guidelines will not be used for data validation; however, the specific qualifiers listed therein may be applied to data should non-conformances against the QA/QC criteria as presented in this SAP be identified.	Data Validator/CH2M HILL	External
Analytical data for toxicity testing, wet chemistry, or grain-size in any matrixes analyzed, e.g. groundwater, surface soil, subsurface soil, surface sediment, and/or subsurface sediment.	Toxicity testing, wet chemistry and grain-size analytical data will not undergo third-party data validation, but are subject to all other data review protocols detailed above.	NA	NA

[1] Internal/external is with respect to the data generator.

2.4 Field Quality Control Samples

Field QC samples will be collected to assist in evaluating whether the results reported from the field effort meet the precision, accuracy, and representativeness requirements for this project. Presented in **Tables 2-9** through **2-20** below are details about the frequency at which each QC sample will be collected, what constitutes acceptable field QC results, and what aspect of data quality is indicated by the outcome of each QC sample.

TABLE 2-9
Measurement Performance Criteria Table for Field QC Samples

Matrix: Groundwater
Analytical Group: VOCs
Concentration Level: Medium

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria
Trip Blank	VOCs	1 per cooler sent to laboratory	Bias/Contamination	No target analytes detected > 1/2 LOQ
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	
Field Duplicate		1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Cooler Temperature Indicator		1 per cooler sent to laboratory	Representativeness	Temperature ≤ 6 degrees Celsius (°C)

TABLE 2-10
Measurement Performance Criteria Table for Field QC Samples

Matrix: Groundwater
Analytical Group: PAHs, Total Metals, including Mercury, Dissolved Metals, including Mercury
Concentration Level: Low/Medium

QC Sample	Analytical Group[1]	Frequency	DQIs	Measurement Performance Criteria
Field Duplicate	PAHs, Total Metals, including Mercury Dissolved Metals, including Mercury	1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	No target analytes detected > 1/2 LOQ
Cooler Temperature Indicator		1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

Notes:
[1] Field QA/QC as described in this table will be collected and analyzed for each of the analytical groups listed.

TABLE 2-11
Measurement Performance Criteria Table for Field QC Samples

Matrix: Groundwater
Analytical Group: Natural Attenuation Indicator Parameters (NAIPs)
Concentration Level: Low/Medium

QC Sample	Analytical Group1	Frequency	DQIs	Measurement Performance Criteria
Cooler Temperature Indicator	NAIPs	1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

Notes:
[1] Refer to *Reference Limits and Evaluation Tables* in **Appendix A** for the specific list of analytes in the NAIP analytical group.

TABLE 2-12
Measurement Performance Criteria Table for Field QC Samples

Matrix: Surface Soil, Subsurface Soil, Sediment[2]
Analytical Group: PAHs, PCBs, Metals, including Mercury, Hexavalent Chromium
Concentration Level: Medium/Low

QC Sample	Analytical Group[1]	Frequency[2]	DQIs	Measurement Performance Criteria
Field Duplicate	PAHs, PCBs, Metals, including Mercury Hexavalent Chromium	1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	No target analytes detected > 1/2 LOQ
Cooler Temperature Indicator		1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

Notes:
[1] Refer to the *Sample Details Table* in **Section 3** for details about which matrixes will be sampled for which analytical groups.
[2] Field QA/QC will be collected separately for each matrix listed.

TABLE 2-13
Measurement Performance Criteria Table for Field QC Samples

Matrix: Surface Soil, Subsurface Soil, and/or Sediment
Analytical Group: TOC, pH, sulfide, ammonia and/or AVS-SEM
Concentration Level: Low/Medium

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators	Measurement Performance Criteria
Cooler Temperature Indicator	TOC, pH, and/or AVS-SEM	1 per cooler to the laboratory	Representativeness	Temperature 6 °C

Notes:
[1] Refer to the *Sample Details Table* in **Section 3** for details about which matrixes will be sampled for which analytical groups.

TABLE 2-14
Measurement Performance Criteria Table for Field QC Samples

Matrix: Tissue
Analytical Group: PCB congeners, Metals
Concentration Level: Low / Medium

QC Sample	Analytical Group[1]	Frequency	DQIs	Measurement Performance Criteria
Cooler Temperature Indicator	PCB Congeners Metals	1 per cooler sent to laboratory	Representativeness	Temperature ≤ 6 degrees Celsius (°C)

Notes:
[1] Field QA/QC as described in this table will be collected and analyzed for each of the analytical groups listed.

TABLE 2-15
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Water
Analytical Group: VOCs
Concentration Level: Medium

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria
Trip Blank	VOCs	1 per cooler sent to laboratory	Bias/Contamination	No target analytes detected > 1/2 LOQ
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	
Field Duplicate		1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Cooler Temperature Indicator		1 per cooler sent to laboratory	Representativeness	Temperature ≤ 6 degrees Celsius (°C)

TABLE 2-16
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Water
Analytical Group: SVOCs, Pesticides, PCBs, Total Metals, Dissolved Metals, Explosives including Nitroguanidine
Concentration Level: Low/Medium

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria
Field Duplicate[1]	SVOCs, Pesticides, PCBs, Total Metals, Dissolved Metals, Explosives including Nitroguanidine	1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Equipment Blank[1]		1 per day of sampling, per type of equipment	Bias/Contamination	No target analytes detected > 1/2 LOQ
Cooler Temperature Indicator		1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

Notes:
[1] Field QA/QC will be collected and analyzed for each of the analytical groups listed.

TABLE 2-17
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Water
Analytical Group: Hardness
Concentration Level: Low/Medium

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria
Cooler Temperature Indicator	hardness	1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

TABLE 2-18
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: VOCs
Concentration Level: Medium

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria
Trip Blank	VOCs	1 per cooler sent to laboratory	Bias/Contamination	No target analytes detected > 1/2 LOQ
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	
Field Duplicate		1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Cooler Temperature Indicator		1 per cooler sent to laboratory	Representativeness	Temperature ≤ 6 degrees Celsius (°C)

TABLE 2-19
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: SVOCs, Pesticides, PCBs, Metals, Explosives including Nitroguanidine
Concentration Level: Medium/Low

QC Sample	Analytical Group[1]	Frequency	DQIs	Measurement Performance Criteria
Field Duplicate	SVOCs, Pesticides, PCBs, Metals, Explosives including Nitroguanidine	1 per 10 field samples of similar matrix	Precision	Relative Percent Difference (RPD) ≤ 30%
Equipment Blank		1 per day of sampling, per type of equipment	Bias/Contamination	No target analytes detected > 1/2 LOQ
Cooler Temperature Indicator		1 per cooler to the laboratory	Representativeness	Temperature ≤ 6 °C

Notes:
[1] Field QA/QC as described in this table will be collected and analyzed for each of the analytical groups listed.

TABLE 2-20
Measurement Performance Criteria Table for Field QC Samples

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: TOC, pH, and/or AVS-SEM
Concentration Level: Low/Medium

QC Sample	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria
Cooler Temperature Indicator	TOC, pH, and/or AVS-SEM	1 per cooler to the laboratory	Representativeness	Temperature 6 °C

2.5 Sampling Design and Rationale

The CAX Partnering Team met, as presented in **Section 2.1**, for several scoping sessions related to this investigation. During these meetings, the Team discussed and agreed to the proposed sampling rationale for Site 4. **Figure 5** presents the proposed sample locations for each medium to be evaluated, including the proposed new monitoring wells and test pit locations. Sample locations will ultimately be field-determined based on location-specific constraints, but will be in close proximity to the proposed sample locations.

The proposed sampling design and rational for Site 4 (including the reference pond samples) are included in **Table 2-20**:

QC samples will be collected as described in **Section 2.4**.

Each medium will be analyzed as outlined in **Section 3** and may include:

- Groundwater: VOCs, PAHs, total inorganic constituents, dissolved inorganic constituents, wet chemistry (nitrate, nitrite, sulfate, sulfide, alkalinity, ammonia, methane, ethane, ethane)
- Soil: PAHs, PCBs, total metals, hexavalent chromium, wet chemistry (TOC, pH, grain size)
- Sediment: PAHs, PCBs, total metals, 28-day amphipod sediment toxicity test (subset, plus ammonia and sulfide), wet chemistry (AVS/SEM, TOC, pH, grain size)
- Reference Pond sediment and surface water: VOCs, SVOCs, pesticides, PCBs, explosives, metals and wet chemistry (pH, TOC, grain size and AVS/SEM for sediment and hardness for surface water)
- Animal Tissue: PCBs, metals, percent lipids, and percent moisture

Analytical methods to be employed by the laboratory for each analyte are listed in **Appendix A** with their respective PALs.

Section 3 provides a detailed outline of the field methods to be performed.

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TABLE 2-20
Proposed Sampling Design and Rationale

Media	Sample Count		Analysis	Rationale
Surface Sediment	5	2	VOCs, SVOCs, pesticides, PCBs, explosives, metals, toxicity, pH, TOC, grain size, and AVS/SEM	collected to evaluate surface sediment conditions in an offsite reference pond; assist in completing the BERA (maximum sediment sample results will be compared to site sediment data to determine if a constituent is a COPC).
		3	VOCs, SVOCs, pesticides, PCBs, explosives, metals, pH, TOC, grain size, and AVS/SEM	collected to evaluate surface sediment conditions in an offsite reference pond; assist in completing the BERA (maximum sediment sample results will be compared to site sediment data to determine if a constituent is a COPC).
	11	5	PAHs, PCBs, metals, pH, TOC, grain size, and AVS/SEM	collected from two of the three ecologically relevant areas at Site 4 (depositional areas and open water) to assist in completing the BERA; assist in completing the HHRA
		6	PAHs, PCBs, metals, pH, TOC, grain size, AVS/SEM, toxicity, sulfide, and ammonia	collected from two of the three ecologically relevant areas at Site 4 (depositional areas and open water) to assist in completing the BERA; to determine if significant toxicity to benthic invertebrates is occurring
	3	-	PAHs, PCBs, metals, pH, TOC, grain size, and AVS/SEM	collected from one of the three ecologically relevant areas at Site 4 (drainage ways) to assist in completing the BERA; assist in completing the HHRA
Subsurface Sediment	5	-	VOCs, SVOCs, pesticides, PCBs, explosives, metals, pH, TOC, grain size, and AVS/SEM	collected to evaluate subsurface sediment conditions in an offsite reference pond; assist in completing the BERA (maximum sediment sample results will be compared to site sediment data to determine if a constituent is a COPC).
Surface Water	5	-	VOCs, SVOCs, pesticides, PCBs, explosives, metals, pH, and hardness	collected to evaluate surface water conditions in an offsite reference pond; assist in completing the BERA (maximum sediment sample results will be compared to site sediment data to determine if a constituent is a COPC).
Surface Soil	2	-	PAHs, PCBs, metals, pH, TOC, and grain size	collected to supplement the existing soil data in determining the extent of site related contamination; assist in completing the HHRA and BERA
	2	-	total and hexavalent chromium	collected to generate an estimated proportion of chromium in trivalent versus hexavalent form that is representative of site data in order to refine the HHRA
	6	-	PAHs, PCBs, metals, pH, TOC, and grain size	collected to see if there has been any surface runoff migration from the areas of high contaminant concentrations within natural drainage ways; assist in completing the HHRA and BERA

TABLE 2-20
Proposed Sampling Design and Rationale

Media	Sample Count		Analysis	Rationale
Subsurface Soil	2	-	PAHs, PCBs, metals, and pH	collected to supplement the existing soil data in determining the extent of site related contamination; assist in completing the HHRA and BERA
	2	-	PAHs, PCBs, and metals	will only be collected if buried debris is encountered to evaluate leaching potential of buried debris; assist in completing the HHRA and BERA (if collected)
	2	-	total and hexavalent chromium	collected to generate an estimated proportion of chromium in trivalent versus hexavalent form that is representative of site data in order to refine the HHRA
Tissue	13	5	dioxin-like PCBs and PCB homologues, metals, percent lipids, and percent moisture	collected to determine if there is an unacceptable risk posed to fish at Site 4; assist in completing the BERA
		5		collected to determine if there is an unacceptable risk posed to frogs at Site 4; assist in completing the BERA
		3		collected to determine if there is an unacceptable risk posed to earthworms at Site 4; assist in completing the BERA
	4	2		collected to determine if site frog tissue concentrations are elevated relative to background
		2		collected to determine if site frog tissue concentrations are elevated relative to background
Groundwater	6	-	VOCs, PAHs, metals, nitrate, nitrite, sulfate, sulfide, alkalinity, methane, ethane, and ethane	collected to characterize the nature and extent of contamination in groundwater; assist in determining the degradation and mobility of VOCs and metals

3 Field Project Implementation

The following sections provide a summary of field activities.

3.1 Project Logistics

In general, work will be performed in Level D personal protective equipment (PPE), which includes hard hat, safety glasses, safety-toed boots, hearing protection, and impermeable gloves. Criteria for upgrades to higher levels of PPE will be presented in the Health and Safety Plan (HSP), which will be prepared as a part of mobilization efforts and available to all field personnel during field activities. In addition, a photoionization detector (PID) will be used for monitoring sampling locations for VOCs as an H&S precaution which will be discussed in the HSP.

All field activities will be conducted during normal working hours, unless requested otherwise by the Navy. Following field activities, the site will be restored to original site conditions.

3.2 Field Project Tasks

Applicable Standard Operating Procedures (SOPs) for project tasks outlined in this section are listed in **Section 3.3**.

3.2.1 Utility Clearance

Utility clearances at Site 4 will be performed prior to the start of subsurface investigation activities. The CH2M HILL field staff will coordinate subsurface utility clearance with Miss Utility of Virginia (800-552-7001 or 811) and obtain available utility maps from CAX (Mr. James Michener at 757-636-4084). In addition, a third party utility clearance subcontractor will be procured by CH2M HILL to clearly mark the two test pit locations and all proposed sample locations. Proposed monitoring wells located within 5 feet of a marked utility will be relocated. If a monitoring well location needs to be relocated, the field team will use their best judgment in relocating the well and notify the PM of its new location.

3.2.2 Mobilization

Following approval of the SAP, CH2M HILL will begin mobilization activities. Before mobilization, all field team members will review this SAP and the project-specific HSP. A field team kickoff meeting will be held to ensure that personnel are familiar with the scope of field activities and discuss safety issues. Mobilization activities include coordination with base personnel and preparation of field equipment.

3.2.3 Vegetation Clearance

Site 4 is located in a wooded area and may require vegetation clearing to gain access. If required, prior to sampling activities, vegetation will be cleared to minimally impact the site. Trees less than 3 inches in diameter will be cut and/or low-hanging tree limbs will be removed. All cut vegetation debris shall remain on site. Cutting will be accomplished through either manual or mechanical methods. Selection of the appropriate land clearing strategy will be based on the type and density of vegetation, topography, drainage patterns, terrain and soil conditions, and the level of effort required to maintain environmental and natural resource protection.

3.2.4 Test Pitting

A minimum of two test pits will be excavated to delineate the horizontal and vertical extent of buried debris within the vicinity of Burial Area 1 (**Figure 5**). Due to the proximity of buried debris within Burial Area 1 to Upstream Pond, the test pits will be installed on the southeast side of Upstream Pond. Test pits will be excavated to a depth where native soil is encountered, as feasible. If buried debris is encountered in the test pits, additional test pits will be excavated in order to determine the extent of buried debris. In addition, if buried debris is encountered, two subsurface soil samples will be collected from the native soil, below where the buried debris is the most extensive and analyzed for site-related contaminants (PAHs, PCBs, and metals) as outlined in **Section 3.4**. The type of debris, depths, etc. will be recorded in accordance with the Preparing Field Log Books SOP.

3.2.5 Soil Sampling

Eleven surface (0 to 6 inches) and two subsurface (6 to 24 inches) soil samples will be collected using a stainless steel hand auger and analyzed for site-related contaminants (PAHs, PCBs, and metals), as outlined in **Section 3.4**. In addition, if buried debris is encountered within the test pits, two subsurface soil samples will be collected from native soil, below where the buried debris is the most extensive, and analyzed for site-related contaminants (PAHs, PCBs, and metals) as outlined in **Section 3.4**. Any relevant information pertaining to contamination or visual observations will be recorded in the sample log book. Samples will be homogenized prior to placement in the laboratory-prepared sample container. The SOPs to be used are referenced in **Section 3.3**.

3.2.6 Monitoring Well Installation

A total of six monitoring wells will be installed at Site 4. Prior to monitoring well installation, soil samples will be collected for lithologic characterization at each location in accordance with USCS standards and field screening will be conducted using a PID as the boreholes are advanced. Soil samples will be collected continuously from the ground surface to the final depth of the borehole using either direct push technology or split-spoon sampling.

Monitoring wells will be installed using a 4.25-inch inside diameter (ID) hollow stem auger drilling methods. Each monitoring well will be constructed of 2-inch ID Schedule-40 polyvinyl chloride (PVC) pipe and installed at a maximum depth of 20 feet. The monitoring well screens will be machine-slotted, 0.010-inch PVC.

A silica filter pack will be placed around the annular space of the well screen from the bottom of the boring extending to a depth of 2 feet above the top of the screen. A 2-foot bentonite layer will be placed above the top of the sand pack. After the bentonite has been hydrated, a cement –bentonite grout will be placed in the remaining annular space. The monitoring wells will be completed as a stick-up with a steel cover or flush mount, as appropriate. A locking watertight cap will be placed on the PVC pipe and the wells clearly marked.

3.2.7 Well Development

Following installation, each monitoring well will be developed by the drilling subcontractor using a submersible pump. Each monitoring well will be developed using a combination of surging and pumping throughout the well screen. During monitoring well development, CH2M HIILL will measure water quality parameters including pH, oxidation reduction potential (ORP), temperature, conductivity, turbidity, and dissolved oxygen (DO) with a Horiba U-22 water quality meter or similar water quality meter. The water quality parameters will be recorded in the field notebook approximately every five minutes. In addition, the water quality meter will be calibrated daily (at a minimum) and recorded in the field notebook. At least three well volumes of water will be removed, in addition to the amount of water added during the installation process. Development will continue until the water is relatively clear and free of sediment or until two hours of development have passed, whichever comes first. Development information, including turbidity, pH, specific conductivity, temperature, and gallons removed will be recorded in the field logbook.

3.2.8 Water-Level Survey

Following monitoring well installation and development, and prior to the start of groundwater sampling, the depth to groundwater, to the nearest 0.01 foot, will be measured from all monitoring wells. Measurements will be made from the lip of the PVC riser, which will be marked with an indelible marker. If during removal of the locking well cap, the well demonstrates signs of being under pressure (escaping air sounds, cap being pushed off by pressure), then the depth to water in that monitoring well will not be measured for a period of one hour in order to allow for the water level to equilibrate. Depth to water and time measured will be recorded in the field logbook.

3.2.9 Groundwater Sampling

Each newly- installed monitoring well will be sampled using a Monsoon pump (or similar pump) following low-flow sampling protocol and analyzed for VOCs and total/dissolved inorganic constituents, as outlined in **Section 3.4**. All groundwater samples will be collected by placing the sample tubing intake in the middle of the screen interval. Water quality parameters including pH, ORP, temperature, conductivity, turbidity, and DO will be

measured with a Horiba U-22 water quality meter or similar water quality meter. The water quality parameters will be recorded in the field notebook approximately every five minutes. In addition, the water quality meter will be calibrated daily (at a minimum) and recorded in the field notebook.

DO will be field-verified using CHEMetrics test kits. Sampling will begin when water quality parameters have stabilized over three consecutive readings when measurements agree as follows:

- pH within 0.1 pH units
- Conductivity within 3%
- DO within 10%
- ORP within 10 mV
- Turbidity measurement within 10% or is minimized to the extent practical for the well

If the recharge rate of the well is so low that the well goes dry despite a flow rate of 0.1 liter per minute (lpm), purging should stop and the well allowed to recharge. Sampling will be conducted once at least one well volume has been removed.

3.2.10 Slug Testing

Rising and falling head slug tests will be performed in all monitoring wells to evaluate aquifer hydraulic conductivity in the vicinity of the well. Slug tests will be performed after groundwater sampling using solid PVC slugs with clean bailer rope. To conduct the falling head test, the PVC slug will be quickly added to the well and the water level allowed to stabilize to within 90 percent of the original static water level. The rising head test will then be started by rapidly removing the PVC slug, which will cause a drop in the water level. A pressure transducer, such as a MiniTroll® transducer/data recorder capable of measuring to 0.01 foot, will be used along with an electronic recording device, such as an In-Situ Hermit™, to obtain water level readings during the slug testing activities. The transducer and recording device will be used to record changes in pressure associated with water-level recovery. A slug test will be considered complete when water levels have recovered to 90 percent of its pretest level.

3.2.11 Sediment Sampling

Sixteen surface (0 to 4 inches) sediment samples will be collected using a Ponar dredge or hand corer and analyzed as outlined in **Section 3.4**. Any relevant information pertaining to visual observations (color, texture, etc.) will be recorded in the sample log book. Applicable SOPs to be used are referenced in **Section 3.3**.

Sediment sampling locations associated with Site 4 will be selected in the field. In general, sample locations will be selected to reflect areas where contaminant impacts to the water bodies are most likely (depositional environments) and will be collected starting with downstream locations and working upstream. Because the depth of Upstream Pond is unknown, a Jon boat will be available to collect these samples; however, it may be accessible with waders.

Prior to sample collection, water quality data (pH, conductivity, turbidity, DO, temperature, salinity, and ORP) will be measured from the top, middle, and bottom of the water column (where applicable) using a Horiba U-22 water quality meter, or similar water quality meter. Sediment cores, approximately 12 inches in length, will be collected at each location using a sediment/sludge sampler and cores will be logged according to the USCS. Surface (0 to 4 inches below sediment surface) and/or subsurface (4 to 8 inches below sediment surface) samples will be collected and analyzed as outlined in **Section 3.4**. With the exception of AVS/SEM samples, sediment samples will be homogenized in stainless steel bowls prior to placement in laboratory-prepared sample containers. Samples collected for AVS/SEM analysis will placed directly into sample containers. For locations at which toxicity test samples are collected, the full volume of material for chemical, physical, and toxicity testing will be homogenized (except for the AVS/SEM component) prior to filling the respective sample containers. Following sample collection, horizontal coordinates of sample locations will be surveyed using a hand-held global positioning system (GPS) unit.

3.2.12 Aquatic Biological Surveys and Animal Tissue Sampling

A reconnaissance-level survey of fish and other aquatic organisms such as frogs/tadpoles will be conducted in Upstream Pond to determine the presence and type of community that exists within this water body. The results of this survey will be used to characterize the ecological receptors that are present and to guide the collection of animal tissue samples. In addition, qualitative surveys of benthic macroinvertebrates will also be conducted to characterize the type of community that is present. The organisms will be identified and enumerated in the field.

General methods for the fish and benthic invertebrate sampling are referenced in **Section 3.3**. Appropriate collection permits will be obtained prior to the start of sample collection.

Aquatic Animal Tissue Sampling

There are no known fish tissue data available for Upstream Pond but small fish were observed during the August 2011 site visit. The biological survey will be used to determine the nature of the fish population that may serve as a prey base for piscivorous birds and mammals.

Whole-body fish tissue samples of an appropriate size range for piscivorous wildlife (4 to 12 cm based upon the size range of possible receptors such as great blue heron, belted kingfisher, and mink) will be collected from Upstream Pond. The species to be targeted will be determined by the results of the biological survey and will be based upon abundance, trophic level, and life history. Other biota (frogs) will also be sampled depending upon the results of the biological surveys. Fish and frog samples will be collected using a combination of electro-shocking techniques, seines, or traps, depending upon the site conditions (e.g., water depth).

Up to five fish samples and up to five frog samples will be collected from Upstream Pond (10 total samples) for the BERA. The species and guild (e.g., bottom feeding fish, water column fish) to be sampled will be determined based upon the results of the biological survey. Two fish samples and two frog samples will be collected from reference pond (four total samples). Species will be selected to as closely match those collected from the site as possible.

The compositing of samples will be necessary to achieve the required tissue mass for analysis and to increase the representativeness of the sample. At least one of the ten samples from the pond will contain triple weight (for matrix spike [MS]/matrix spike duplicate [MSD]). Composite samples will be composed of the same species and age (size) group whenever possible. All samples will be analyzed as whole-body samples; ingesta will not be purged prior to analysis.

Information on species, number, size class (length and weight), location, and physical condition will be recorded for the fish (and frogs) captured. Any physical abnormalities will be noted. Sample stations will be mapped and information on habitat condition of each sample station will be recorded including water depth, substrate type, shoreline profile or vegetation, and degree of shading.

Analytes for fish/frog samples (whole-body) are included in **Section 3.4**.

Earthworm Tissue Sampling

Composite tissue samples of earthworms, if present, will be collected from three areas adjacent to the streams west of Upstream Pond (soil/sediment samples [surface only] will also be collected at these three areas (shown as sediment samples on **Figure 5**). Samples will be collected by digging up soil within a 3 by 3 foot area to a depth of 1 foot and either sieving the material through a soil sieve or sorting it by hand to pick out the worms. If earthworms are not found in the top 1 foot at the initial location sampled, areas in the immediate vicinity will be sampled in an attempt to obtain sufficient specimens. If the top 1 foot of soil do not yield specimens and the soil is not saturated, the 1 to 2 foot stratum may be sampled (depending upon conditions). If the earthworm samples are obtained from this deeper depth stratum, the associated soil sample will be collected from 0 to 2 feet (not 0 to 1 foot). If no earthworms are present or they are insufficiently abundant, no samples will be collected. If earthworms are not found, habitat conditions will be documented to possibly explain their absence. These data, plus the results of the soil sampling, will be used in the RI to determine if the lack of worms may be due to site-related contaminations.

Analytes for earthworm samples (whole-body) are included in **Section 3.4**.

Benthic Invertebrate Sampling

Invertebrates are not proposed for tissue analysis, just for a qualitative, reconnaissance-level evaluation of community characteristics (e.g., number and type of taxa, relative abundance). All 14 of the sediment locations in Upstream Pond will be sampled for benthic invertebrates, plus the 2 reference sediment locations. Deeper water areas will be sampled with a petite Ponar (6 x 6) dredge. Single grab samples will be collected at each station. The sample will be sieved through a U.S. Standard No. 30 mesh screen or screened wash bucket (500 µm opening size). Shallow vegetated areas will be sampled with a D-frame dip net (U.S. Standard No. 30 mesh or 500 µm sieve). The net will be swept in a standardized motion through rooted vegetation or representative habitat areas to collect a single composite invertebrate sample. Level-of-effort will be determined in the field but will be standardized among locations.

The contents of each sieved sample will be identified and enumerated in the field. Organisms will be identified to the lowest taxonomic level that is practical (order, family, genus and/or species) and enumerated. If a sample contains very large numbers (>250) of organisms, a 100-organism subsample (randomly selected) (Plafkin et al. 1989; Barbour et al., 1999) will be identified and the results extrapolated to the entire sample. Samples will not be preserved.

Basic water quality measurements (water temperature, DO, pH, ORP, specific conductance, salinity, and turbidity) will be collected at each of the 16 sampling stations just below the water surface, at mid-depth, and approximately 10 cm above the sediment substrate (depending upon total depth of the water column). Water depth will also be measured. Observations characterizing the substrate conditions, including color, odor, and relative organic content, as well as observation of other physical habitat conditions, will be conducted and noted in the field log book. Photographs will be taken of each sample area.

Other Observations

Observations of wildlife species (birds, mammals, reptiles, etc.) will be noted in the field log book.

Reference Area

The proposed reference area is Cheatham Pond. The Navy proposes that the suitability of Cheatham Pond as a reference area be evaluated as follows: (1) the site reconnaissance surveys at Site 4 (Upstream Pond), as well as at Youth Pond and Penniman Lake, will be conducted at the beginning of the sampling field event to characterize the physical characteristics of each water body; (2) a reconnaissance survey of Cheatham Pond will then be conducted to find specific areas that match, as closely as possible, the physical properties of each site water body (e.g., water depth, substrate type); (3) surface water and sediment samples (up to five samples of each medium as related to Site 4; additional reference samples will be included in the Youth Pond and Penniman Lake SAPs) will then be collected at the identified areas within Cheatham Pond and submitted for chemical analysis on a quick-turn basis; (4) while media and biological sampling of site water bodies is occurring, the unvalidated surface water and sediment data from Cheatham Pond will be reviewed (following a qualitative evaluation by a CH2M HILL chemist for critical quality issues) to determine if the sampling results preclude any of the specific areas in Cheatham Pond from being used as reference; the Pond Study data will also be considered during this process, which will be coordinated with the partnering team and technical support; and (5) biological data (tissue, invertebrates, and/or toxicity test samples) will be collected from the identified areas within Cheatham Pond that are deemed suitable.

3.2.13 Equipment Decontamination

All non-disposable sampling equipment will be decontaminated before and immediately after each use as described in the applicable SOPs referenced in **Section 3.3**. Equipment will be decontaminated with Liquinox® (or equivalent solution) and allowed to dry between each use. The water level indicator will be scrubbed with deionized water between each measurement. All decontamination liquids will be containerized and handled according to the investigation-derived waste (IDW) Handling section below. Disposable equipment (e.g., tubing for low-flow sampling, filters, paper towels, disposable PPE) will be disposed as solid waste.

Heavy equipment such as drill rig equipment (augers, rods or split spoons) will be steam-cleaned before use at each new monitoring well location. A decontamination pad will be set up onsite to prevent runoff of the decontamination water and to allow easy collection of decontamination fluids into a 55-gallon drum and treatment as IDW.

3.2.14 Investigation-derived Waste Handling

All IDW generated during this project is anticipated and assumed to be non-hazardous; however, it will be fully characterized in order to ensure it is transported and disposed of in accordance with all pertinent regulations.

The IDW generated during monitoring well installation and sampling will be soil cuttings, monitoring well development water, purge water, and solutions used to decontaminate non-disposable sampling equipment. Solid and aqueous IDW will be containerized separately in Department of Transportation-approved 55-gallon drums, which will be stored on site. Secondary containment for IDW storage will be large enough to contain 10% of the volume of containers or the volume of the largest container, whichever is greater. The IDW storage area will be covered with a tarp to minimize the drums to exposure and prevent rain water from accumulating in the secondary containment. It is anticipated that 20 drums of solid IDW and 15 drums of aqueous IDW will be generated.

Unless there is evidence of gross contamination, one composite soil sample and one composite groundwater sample will be collected for the purpose of IDW characterization, and will be analyzed for full TCLP, ignitability, corrosivity, and reactivity analyses. All drums will be removed from the site within 90 days of generation (with Navy approval).

Disposable equipment, including PPE and paper towels, will be disposed as solid waste.

3.2.15 Surveying

Following sample collection, soil sample locations will be marked in the field using pin flags with the sample station clearly labeled. All soil sample locations will be horizontally located, and all monitoring wells will be horizontally and vertically located by a Virginia licensed surveyor. The surveyor will provide coordinates of all horizontal points X, Y, to the nearest 0.5 feet and vertical point Z to the nearest 0.01 foot (0.1 foot for unpaved ground surface elevations).

3.2.16 Quality Control

QC samples will be collected as outlined in **Section 3.4**. Field and laboratory activities will be implemented following the applicable SOPs as referenced in **Section 3.3**.

3.3 Field SOPs Reference Table

Table 3-1 includes information regarding the SOPs for work that will be conducted as part of this SAP. SOPs are included as **Appendix C**.

TABLE 3-1
Field Standard Operating Procedures

SOP Reference Number	Title/Author	Revision Date or Version Number	Location of SOP (if not included in the SAP)	Any planned deviation for Project Work	Comments
001_BlankPrep	*Equipment Blank and Field Blank Preparation*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	N/A	N/A
002_COC	*Chain-of-Custody*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	N/A	N/A
003_Decon	*Decontamination of Personnel and Equipment*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Decontamination	N/A	N/A
004_DeconRig	*Decontamination of Drilling Rigs and Equipment*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Decontamination	N/A	N/A
005_DrumSamp	*Sampling Contents of Tanks and Drums*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Other	N/A	N/A
006_Disposal	*Disposal of Waste Fluids and Solids*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Decontamination	N/A	N/A
007_GPS	*Global Positioning System*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Other	N/A	N/A
008_HomoSamp	*Homogenization of Soil and Sediment Samples*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	N/A	N/A
009_Trench	*Trenching for Landfill Delineation*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\SOther	N/A	N/A
010_FieldLog	*Preparing Field Log Books*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Log Books	N/A	N/A
011_LowFlowSamp	*Low-Flow Groundwater Sampling from Monitoring Wells*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Groundwater Sampling	N/A	N/A
012_MiniRAE	*Mini RAE Photoionization Detector (PID)*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Health and Safety	N/A	N/A
013_MWInstall	*General Guidance for Monitoring Well Installation*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Hydrogeology	N/A	N/A
014_GWSamp	*Groundwater Sampling from Monitoring Wells*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Groundwater Sampling	N/A	N/A
015_InstallMWShallow	*Installation of Shallow Monitoring Wells*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Hydrogeology	N/A	N/A
016_SBLog	*Logging of Soil Borings*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Soil Sampling	N/A	N/A

TABLE 3-1
Field Standard Operating Procedures

SOP Reference Number	Title/Author	Revision Date or Version Number	Location of SOP (if not included in the SAP)	Any planned deviation for Project Work	Comments
017_SedSamp	*Sediment Sampling*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Surface-Water and Sediment Sampling	N/A	N/A
018_SWSamp	*Surface Water Sampling*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Surface-Water and Sediment Sampling	N/A	N/A
019_SoilSampShallow	*Shallow Soil Sampling*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Soil Sampling	N/A	N/A
020_Ship	*Packaging and Shipping Procedures for Low-Concentration Samples*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	N/A	N/A
021_SlugTest	*Aquifer Slug Testing*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Hydrogeology	N/A	N/A
022_SoilSamp	*Soil Sampling*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Soil Sampling	N/A	N/A
023_UtilLoc	*Locating and Clearing Underground Utilities*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Utility Location	N/A	N/A
024_VOC SampGW	*VOC Sampling-Water*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Sample Preparation and Handling	N/A	N/A
025_WaterLevel	*Water Level Measurements*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Hydrogeology	N/A	N/A
026_FieldParam	*Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, ORP, and Temperature Using a Water Quality Parameter Meter with Flow-through Cell*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Field Parameters	N/A	N/A
027_FishSampElectro	*Fish Community Sampling Using Electroshocking Methods*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Ecology	N/A	N/A
028_FishSampSeine	*Fish Community Sampling Using Seines*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Ecology	N/A	N/A
029_AqBenthicSamp	*Aquatic/Benthic Macroinvertebrate Sampling*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Ecology	N/A	N/A
030_TissSampPrep	*Tissue Sample Preparation*	8/2012	\\orion\proj\CLEANII\SOPS\1 - MASTER\Ecology	N/A	N/A

3.4 Sample Details Table

Details regarding sample nomenclature, sampling and analysis are provided in **Table 3-2 and Table 3-3**.

TABLE 3-2
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation Sampling
Summer 2012, tentative

Main Laboratory [6]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Hexavalent Chromium Laboratory
Columbia Analytical Services, Inc [6]
Toxicity Laboratory
Envirosystems, Inc. [6]
Other Laboratories[7]
TestAmerica, Inc. West Sacramento, Savannah, Burlington,

				Solid or Tissue Samples														Aqueous Samples											
			Analysis Group	**PAHs**	**PCBs (Aroclors)**	**PCB Congeners**	**Metals** (except Hg and CrVI)	**Mercury**	**Hexavalent Chromium**	**pH**	**TOC**	**Ammonia**	**Sulfide**	**AVS-SEM**	**Grain-Size**	**%moisture and % Lipids**	**Toxicity Testing**	**PCBs**	**Hexavalent Chromium**	**VOC**	**PAHs**	**Metals** (except Hg)	**Mercury**	**Filtered Metals** (except Hg)	**Filtered Mercury**	**Nitrate, Nitrite, Sulfate**	**Alkalinity**	**Sulfide**	**Methane, Ethane, Ethene**
			Analytical Method	SW-846 8270D-SIM	SW-846 8082A	EPA 1668A with 1668C limits	SW-846 6010C	SW-846 7471A	SW-846 7199	9045	Lloyd Kahn	350.2	SW-846 9034	832-R-91-100	ASTM D422	ASTM D2216 and Lab SOP	Hyalella azteca, 28-day	SW-846 8082A	SW-846 7199	SW-846 8260B	SW-846 8270D-SIM	SW-846 6010C	SW-846 7470A	SW-846 6010C	SW-846 7470A	EPA 300.0	SM2320B	SM4500S2` E	RSK-175
			Analytical Laboratory/ Analytical SOP Reference	Katahdin / CA-213	Katahdin / CA-329	TA-W.Sacramento / WS-ID-0013	Katahdin / CA-608	Katahdin / CA-611	CAS-Rochester / GEN-7199	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-770	TA-Savannah / SA-GE-085	Katahdin / CA-738	TA / BR-GT-006	Katahdin	Envirosystems / 1466-R09	Katahdin / CA-329	CAS-Rochester / GEN-7199	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-742	Katahdin / CA-739	Katahdin / CA-722	Katahdin / CA-336
			Data Package Turnaround Time:		28 calendar days																								
			Container Type/ minimum amount required	Solids: 1 of 8oz clear, wide-mouth soil jar / 64g Tissue for whole body analysis: plastic resealable bag 100g /100g Tissue for fillet analysis: plastic resalable bag 200g / 150g					1 of 4oz wide-mouth soil jar / 2.5g	1 of 4oz clear, wide-mouth soil jar				1 of 4oz clear, wide-mouth soil jar/ 1 g	1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	No additional Sample	2 of 1 gallon pail	2 of 1L amber / 1L	1 of 250mL HDPE / 10mL	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 150mL		1 of 125mL HDPE / 51mL		1 of 500mL HDPE / 250mL	2 of 40mL VOA vial / 40mL
			Preservative	Cool to 0-6 °C					Cool to 0-6 °C	Cool to 0-6 °C			Cool to 0-6 °C	Cool to 0-6°C, protect from oxygen	None	Cool to 0-6 °C	no headspace, cool to 0-6 °C	Cool to 0-6 °C	Cool to 0 - 6° C	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C	HNO3 to pH < 2, cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		1 mL of 2N ZnAc & NaOH, cool to 0-6 °C	2 drops 1:1 HCl, zero-headspace, cool to 0-6 °C
			Holding Time (Preparation/ Analysis)	14 days / 40 days		1 year if kept at -10°C	6 months	28 days	30 days until digestion	7 days	14 days	28 days	14 days	14 days	None	NA	8 weeks	7 days / 40 days	24 hours	14 days	7 days / 40 days	6 months	28 days	6 months	28 days	48 hours / 28 Days (Sulfate)	14 days	7 days	14 Days
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**																										
Groundwater Samples																													
GW	CAS04-GW05	CAS04-GW05-MMYY	NA																	X	X	X	X	X	X	X	X	X	X
	CAS04-GW06	CAS04-GW06-MMYY																		X	X	X	X	X	X	X	X	X	X
	CAS04-GW07	CAS04-GW07-MMYY																		X	X	X	X	X	X	X	X	X	X
	CAS04-GW08	CAS04-GW08-MMYY																		X	X	X	X	X	X	X	X	X	X
	CAS04-GW09	CAS04-GW09-MMYY																		X	X	X	X	X	X	X	X	X	X
	CAS04-GW10	CAS04-GW10-MMYY																		X	X	X	X	X	X	X	X	X	X
Groundwater QA/QC Samples																													
FD	CAS04-GW05	CAS04-GW05P-MMYY	NA																	X	X	X	X	X	X				
MS	CAS04-GW06	CAS04-GW06-MMYY-MS																		X	X	X	X	X	X				
MSD	CAS04-GW06	CAS04-GW06-MMYY-SD																		X	X	X	X	X	X				
EB	CAS04-QC	CAS04-EB-MMDDYY-GW																		X	X	X	X	X	X				
TB	CAS04-QC	CAS04-TB-MMDDYY																		X									
Soil Samples																													
SO	CAS04-SO06	CAS04-SS06-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO06	CAS04-SB06-0H02	6 - 24 inches	X	X		X	X		X																			
	CAS04-SO07	CAS04-SS07-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO07	CAS04-SB07-0H02	6 - 24 inches	X	X		X	X		X																			
	CAS04-SO08	CAS04-SS08-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO09	CAS04-SS09-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO10	CAS04-SS10-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO11	CAS04-SS11-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO12	CAS04-SS12-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO13	CAS04-SS13-MMYY	0 - 6 inches	X	X		X	X		X	X				X														
	CAS04-SO14	CAS04-SS14-MMYY	0 - 6 inches				X Chromium only		X																				
	CAS04-SO15	CAS04-SS15-MMYY	0 - 6 inches				X Chromium only		X																				
	CAS04-SO##	CAS04-SB##-0H02 [5]	6 - 24 inches	X	X		X	X																					
	CAS04-SO##	CAS04-SB##-0H02 [5]	6 - 24 inches	X	X		X	X																					

TABLE 3-2
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation Sampling
Summer 2012, tentative

Main Laboratory [6]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Hexavalent Chromium Laboratory
Columbia Analytical Services, Inc [6]
Toxicity Laboratory
Envirosystems, Inc. [6]
Other Laboratories [7]
TestAmerica, Inc. West Sacramento, Savannah, Burlington,

				Solid or Tissue Samples														Aqueous Samples											
			Analysis Group	**PAHs**	**PCBs (Aroclors)**	**PCB Congeners**	**Metals** (except Hg and CrVI)	**Mercury**	**Hexavalent Chromium**	**pH**	**TOC**	**Ammonia**	**Sulfide**	**AVS-SEM**	**Grain-Size**	**%moisture and % Lipids**	**Toxicity Testing**	**PCBs**	**Hexavalent Chromium**	**VOC**	**PAHs**	**Metals** (except Hg)	**Mercury**	**Filtered Metals** (except Hg)	**Filtered Mercury**	**Nitrate, Nitrite, Sulfate**	**Alkalinity**	**Sulfide**	**Methane, Ethane, Ethene**
			Analytical Method	SW-846 8270D-SIM	SW-846 8082A	EPA 1668A with 1668C limits	SW-846 6010C	SW-846 7471A	SW-846 7199	9045	Lloyd Kahn	350.2	SW-846 9034	832-R-91-100	ASTM D422	ASTM D2216 and Lab SOP	Hyalella azteca, 28-day	SW-846 8082A	SW-846 7199	SW-846 8260B	SW-846 8270D-SIM	SW-846 6010C	SW-846 7470A	SW-846 6010C	SW-846 7470A	EPA 300.0	SM2320B	SM4500S2- E	RSK-175
			Analytical Laboratory/ Analytical SOP Reference	Katahdin / CA-213	Katahdin / CA-329	TA-W.Sacramento / WS-ID-0013	Katahdin / CA-608	Katahdin / CA-611	CAS-Rochester / GEN-7199	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-770	TA-Savannah / SA-GE-085	Katahdin / CA-738	TA / BR-GT-006	Katahdin	Envirosystems / 1466-R09	Katahdin / CA-329	CAS-Rochester / GEN-7199	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-742	Katahdin / CA-739	Katahdin / CA-722	Katahdin / CA-336
			Data Package Turnaround Time:		28 calendar days																								
			Container Type/ minimum amount required	Solids: 1 of 8oz clear, wide-mouth soil jar / 64g Tissue for whole body analysis: plastic resealable bag 100g /100g Tissue for fillet analysis: plastic resalable bag 200g / 150g					1 of 4oz wide-mouth soil jar / 2.5g	1 of 4oz clear, wide-mouth soil jar			1 of 4oz clear, wide-mouth soil jar/ 1 g	1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	No additional Sample	2 of 1 gallon pail	2 of 1L amber / 1L	1 of 250mL HDPE / 10mL	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 150mL		1 of 125mL HDPE / 51mL		1 of 500mL HDPE / 250mL	2 of 40mL VOA vial / 40mL
			Preservative	Cool to 0-6 °C					Cool to 0-6 °C	Cool to 0-6 °C			Cool to 0-6 °C	Cool to 0-6°C, protect from oxygen	None	Cool to 0-6 °C	no headspace, cool to 0-6 °C	Cool to 0-6 °C	Cool to 0 - 6° C	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C	HNO3 to pH < 2, cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		1 mL of 2N ZnAc & NaOH, cool to 0-6 °C	2 drops 1:1 HCl, zero-headspace, cool to 0-6 °C
			Holding Time (Preparation/ Analysis)	14 days / 40 days		1 year if kept at -10°C	6 months	28 days	30 days until digestion	7 days	14 days	28 days	14 days	14 days	None	NA	8 weeks	7 days / 40 days	24 hours	14 days	7 days / 40 days	6 months	28 days	6 months	28 days	48 hours / 28 Days (Sulfate)	14 days	7 days	14 Days
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**																										
Soil QA/QC Samples																													
FD	CAS04-SO12	CAS04-SS12P-MMYY	0 - 6 inches	X	X		X	X																					
FD	CAS04-SO12	CAS04-SS14P-MMYY	0 - 6 inches				X Chromium only		X																				
FD	CAS04-SO06	CAS04-SB06P-0H02	6 - 24 inches	X	X		X	X																					
MS	CAS04-SO13	CAS04-SS13-MMYY-MS	0 - 6 inches	X	X		X	X																					
MSD	CAS04-SO13	CAS04-SS13-MMYY-SD	0 - 6 inches	X	X		X	X																					
MS	CAS04-SO15	CAS04-SS15-MMYY-MS	0 - 6 inches				X Chromium only		X																				
MSD	CAS04-SO15	CAS04-SS15-MMYY-SD	0 - 6 inches				X Chromium only		X																				
MS	CAS04-SO07	CAS04-SB07-0H02-MS	6 - 24 inches	X	X		X	X																					
MSD	CAS04-SO07	CAS04-SB07-0H02-MSD	6 - 24 inches	X	X		X	X																					
EB	CAS04-QC	CAS04-EB-MMDDYY-SO	NA															X	X		X	X	X						
Sediment Samples																													
SD	CAS04-SD10	CAS04-SD10-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD11	CAS04-SD11-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD12	CAS04-SD12-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD13	CAS04-SD13-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD14	CAS04-SD14-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD15	CAS04-SD15-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD16	CAS04-SD16-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD17	CAS04-SD17-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD18	CAS04-SD18-MMYY	0 - 4''	X	X		X	X		X	X			X	X														
	CAS04-SD19	CAS04-SD19-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD20	CAS04-SSD20-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD21	CAS04-SSD21-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD22	CAS04-SSD22-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD23	CAS04-SSD23-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD24	CAS04-SSD24-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD25	CAS04-SSD25-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												
	CAS04-SD26	CAS04-SSD26-MMYY	0 - 4''	X	X		X	X		X	X	X	X	X	X		X												

TABLE 3-2
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation Sampling
Summer 2012, tentative

Main Laboratory [6]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Hexavalent Chromium Laboratory
Columbia Analytical Services, Inc [6]
Toxicity Laboratory
Envirosystems, Inc. [6]
Other Laboratories [7]
TestAmerica, Inc. West Sacramento, Savannah, Burlington,

				Solid or Tissue Samples														Aqueous Samples											
			Analysis Group	**PAHs**	**PCBs (Aroclors)**	**PCB Congeners**	**Metals** (except Hg and CrVI)	**Mercury**	**Hexavalent Chromium**	**pH**	**TOC**	**Ammonia**	**Sulfide**	**AVS-SEM**	**Grain-Size**	**%moisture and % Lipids**	**Toxicity Testing**	**PCBs**	**Hexavalent Chromium**	**VOC**	**PAHs**	**Metals** (except Hg)	**Mercury**	**Filtered Metals** (except Hg)	**Filtered Mercury**	**Nitrate, Nitrite, Sulfate**	**Alkalinity**	**Sulfide**	**Methane, Ethane, Ethene**
			Analytical Method	SW-846 8270D-SIM	SW-846 8082A	EPA 1668A with 1668C limits	SW-846 6010C	SW-846 7471A	SW-846 7199	9045	Lloyd Kahn	350.2	SW-846 9034	832-R-91-100	ASTM D422	ASTM D2216 and Lab SOP	Hyalella azteca, 28-day	SW-846 8082A	SW-846 7199	SW-846 8260B	SW-846 8270D-SIM	SW-846 6010C	SW-846 7470A	SW-846 6010C	SW-846 7470A	EPA 300.0	SM2320B	SM4500S2- E	RSK-175
			Analytical Laboratory/ Analytical SOP Reference	Katahdin / CA-213	Katahdin / CA-329	TA-W.Sacramento / WS-ID-0013	Katahdin / CA-608	Katahdin / CA-611	CAS-Rochester / GEN-7199	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-770	TA-Savannah / SA-GE-085	Katahdin / CA-738	TA / BR-GT-006	Katahdin	Envirosystems / 1466-R09	Katahdin / CA-329	CAS-Rochester / GEN-7199	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-742	Katahdin / CA-739	Katahdin / CA-722	Katahdin / CA-336
			Data Package Turnaround Time:		28 calendar days																								
			Container Type/ minimum amount required	Solids: 1 of 8oz clear, wide-mouth soil jar / 64g Tissue for whole body analysis: plastic resealable bag 100g /100g Tissue for fillet analysis: plastic resalable bag 200g / 150g					1 of 4oz wide-mouth soil jar / 2.5g	1 of 4oz clear, wide-mouth soil jar			1 of 4oz clear, wide-mouth soil jar/ 1 g	1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	No additional Sample	2 of 1 gallon pail	2 of 1L amber / 1L	1 of 250mL HDPE / 10mL	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 150mL		1 of 125mL HDPE / 51mL		1 of 500mL HDPE / 250mL	2 of 40mL VOA vial / 40mL
			Preservative	Cool to 0-6 °C					Cool to 0-6 °C	Cool to 0-6 °C			Cool to 0-6 °C	Cool to 0-6°C, protect from oxygen	None	Cool to 0-6 °C	no headspace, cool to 0-6 °C	Cool to 0-6 °C	Cool to 0 - 6° C	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C	HNO3 to pH < 2, cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		1 mL of 2N ZnAc & NaOH, cool to 0-6 °C	2 drops 1:1 HCl, zero-headspace, cool to 0-6 °C
			Holding Time (Preparation/ Analysis)	14 days / 40 days		1 year if kept at -10°C	6 months	28 days	30 days until digestion	7 days	14 days	28 days	14 days	14 days	None	NA	8 weeks	7 days / 40 days	24 hours	14 days	7 days / 40 days	6 months	28 days	6 months	28 days	48 hours / 28 Days (Sulfate)	14 days	7 days	14 Days
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**																										
Sediment QA/QC Samples																													
FD	CAS04-SD10	CAS04-SD10P-MMYY	0 - 4''	X	X		X	X																					
MS	CAS04-SD11	CAS04-SD11-MMYY-MS	0 - 4''	X	X		X	X																					
MSD	CAS04-SD11	CAS04-SD11-MMYY-SD	0 - 4''	X	X		X	X																					
EB	CAS04-QC	CAS04-EB-MMDDYY-SD	NA															X			X	X	X						
Tissue Samples																													
Earthworm Tissue	CAS04-TS01	CAS04-TS01-MMYY	NA			X	X	X								X													
	CAS04-TS02	CAS04-TS02-MMYY	NA			X	X	X								X													
	CAS04-TS03	CAS04-TS03-MMYY	NA			X	X	X								X													
Frog Tissue	CAS04-TS04	CAS04-TS04-MMYY	NA			X	X	X								X													
	CAS04-TS05	CAS04-TS05-MMYY	NA			X	X	X								X													
	CAS04-TS06	CAS04-TS06-MMYY	NA			X	X	X								X													
	CAS04-TS07	CAS04-TS07-MMYY	NA			X	X	X								X													
	CAS04-TS08	CAS04-TS08-MMYY	NA			X	X	X								X													
	CAS04-TS09	CAS04-TS09-MMYY	NA			X	X	X								X													
	CAS04-TS10	CAS04-TS10-MMYY	NA			X	X	X								X													
Fish Tissue	CAS04-TS11	CAS04-TS11-MMYY	NA			X	X	X								X													
	CAS04-TS12	CAS04-TS12-MMYY	NA			X	X	X								X													
	CAS04-TS13	CAS04-TS13-MMYY	NA			X	X	X								X													
	CAS04-TS14	CAS04-TS14-MMYY	NA			X	X	X								X													
	CAS04-TS15	CAS04-TS15-MMYY	NA			X	X	X								X													
	CAS04-TS16	CAS04-TS16-MMYY	NA			X	X	X								X													
	CAS04-TS17	CAS04-TS17-MMYY	NA			X	X	X								X													
Tissue QA/QC Samples																													
MS	CAS04-TS10	CAS04-TS10-MMYY-MS	NA			X	X	X																					
MSD	CAS04-TS10	CAS04-TS10-MMYY-SD	NA			X	X	X																					
			Total Number of Samples to the Laboratory, not counting blanks:	**38**	**38**	**19**	**62**	**57**	**5**	**25**	**27**	**8**	**8**	**17**	**27**	**27**	**8**	**2**	**1**	**9**	**9**	**9**	**9**	**9**	**9**	**6**	**6**	**6**	**6**

TABLE 3-2
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation Sampling
Summer 2012, tentative

Main Laboratory [6]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Hexavalent Chromium Laboratory
Columbia Analytical Services, Inc [6]
Toxicity Laboratory
Envirosystems, Inc. [6]
Other Laboratories [7]
TestAmerica, Inc. West Sacramento, Savannah, Burlington,

				Solid or Tissue Samples													Aqueous Samples											
			Analysis Group	**PAHs**	**PCBs (Aroclors)**	**PCB Congeners**	**Metals** (except Hg and CrVI)	**Mercury**	**Hexavalent Chromium**	**pH**	**TOC**	**Ammonia**	**Sulfide**	**AVS-SEM**	**Grain-Size**	**%moisture and % Lipids**	**Toxicity Testing**	**PCBs**	**Hexavalent Chromium**	**VOC**	**PAHs**	**Metals** (except Hg)	**Mercury**	**Filtered Metals** (except Hg)	**Filtered Mercury**	**Nitrate, Nitrite, Sulfate**	**Alkalinity**	**Sulfide**	**Methane, Ethane, Ethene**
			Analytical Method	SW-846 8270D-SIM	SW-846 8082A	EPA 1668A with 1668C limits	SW-846 6010C	SW-846 7471A	SW-846 7199	9045	Lloyd Kahn	350.2	SW-846 9034	832-R-91-100	ASTM D422	ASTM D2216 and Lab SOP	Hyalella azteca, 28-day	SW-846 8082A	SW-846 7199	SW-846 8260B	SW-846 8270D-SIM	SW-846 6010C	SW-846 7470A	SW-846 6010C	SW-846 7470A	EPA 300.0	SM2320B	SM4500S2- E	RSK-175
			Analytical Laboratory/ Analytical SOP Reference	Katahdin / CA-213	Katahdin / CA-329	TA-W.Sacramento / WS-ID-0013	Katahdin / CA-608	Katahdin / CA-611	CAS-Rochester / GEN-7199	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-770	TA-Savannah / SA-GE-085	Katahdin / CA-738	TA / BR-GT-006	Katahdin	Envirosystems / 1466-R09	Katahdin / CA-329	CAS-Rochester / GEN-7199	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-742	Katahdin / CA-739	Katahdin / CA-722	Katahdin / CA-336
			Data Package Turnaround Time:		28 calendar days																							
			Container Type/ minimum amount required	Solids: 1 of 8oz clear, wide-mouth soil jar / 64g Tissue for whole body analysis: plastic resealable bag 100g /100g Tissue for fillet analysis: plastic resalable bag 200g / 150g					1 of 4oz wide-mouth soil jar / 2.5g	1 of 4oz clear, wide-mouth soil jar			1 of 4oz clear, wide-mouth soil jar/ 1 g	1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	No additional Sample	2 of 1 gallon pail	2 of 1L amber / 1L	1 of 250mL HDPE / 10mL	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 150mL		1 of 125mL HDPE / 51mL		1 of 500mL HDPE / 250mL	2 of 40mL VOA vial / 40mL
			Preservative	Cool to 0-6 °C					Cool to 0-6 °C	Cool to 0-6 °C			Cool to 0-6 °C	Cool to 0-6°C, protect from oxygen	None	Cool to 0-6 °C	no headspace, cool to 0-6 °C	Cool to 0-6 °C	Cool to 0 - 6° C	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C	HNO3 to pH < 2, cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		1 mL of 2N ZnAc & NaOH, cool to 0-6 °C	2 drops 1:1 HCl, zero-headspace, cool to 0-6 °C
			Holding Time (Preparation/ Analysis)	14 days / 40 days		1 year if kept at -10°C	6 months	28 days	30 days until digestion	7 days	14 days	28 days	14 days	14 days	None	NA	8 weeks	7 days / 40 days	24 hours	14 days	7 days / 40 days	6 months	28 days	6 months	28 days	48 hours / 28 Days (Sulfate)	14 days	7 days	14 Days
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**																									

Notes:

[1] For a complete reference of laboratory SOPs, see the Analytical SOP References Table.

[2] All samples will be reported with a level IV report within 28 calendar days of sample receipt.

[3] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared.

[4] Field QC counts may change depending on the duration of field event. Frequency of QA/QC sample collection is noted on the Measurement Performance Criteria Table in Section 2.4 of the UFP-SAP and is as follows :

Field Duplicate (FD) - One per 10 field samples

MS/MSD - One pair per 20 field samples of similar matrix (including field duplicates)

Equipment Blank (EB) - For disposable equipment, one per week of sampling; for decontaminated equipment, one per type of sampling equipment, per day of sampling

Field Blank (FB) - No field blanks will be collected for this project

[5] These are samples that will only be collected if buried debris is found, and may be collocated with SS08 and SS09. If SO## is colocated it will be SO08/SB08 and SO09/SB09. If not colocated the Station ID and Sample ID will be SO17/SB17 and SO18/SB18

[6] Additional laboratories receiving samples from the field are:

Hexavalent Chromium Laboratory	Toxicity Laboratory
Columbia Analytical Services, Inc	Envirosystems
1565 Jefferson Road, Building 300, Suite 360	1 Lafayette Road, Building 6
Rochester, NY 14623	Hampton, New Hampshire 03842
Deb Patton - 585-672-7473	Petra Karbe - (603) 926-3345

[7] Additional laboratories receiving samples from the main laboratory:

TestAmerica, Inc.	TestAmerica, Inc.	TestAmerica, Inc.
880 Riverside Parkway	30 Community Drive, Suite 11	5102 LaRoche Avenue
West Sacramento, CA 95605	South Burlington, VT 05403	Savannah, GA 31404
Karen Sellers – 916-373-5600	Jim Madison – 802-923-1028	Abbie Yant – 912-354-7858

TABLE 3-3
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation, Reference Sample Collection - October 2012, tentative

Main Laboratory[5]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Nitroguanidine Laboratory[5]
TestAmerica, Inc.
880 Riverside Parkway
West Sacramento, CA 95605
Karen Sellers - 916-373-5600

			Analysis Group	VOCs	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Explosives	Nitroguanidine	pH	TOC	AVS-SEM	Grain-Size	VOC	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Filtered Metals (except Hg)	Filtered Mercury	Explosives	Nitroguanidine	Hardness
			Analytical Method	SW-846 8260B	SW-846 8270D with PAHs by SIM	SW-846 8081B	SW-846 8082A	SW-846 6010C	SW-846 7471A	SW-846 9012B	SW-846 8330B	Lab SOP	9045	Lloyd Kahn	832-R-91-100	ASTM D422	SW-846 8260B	SW-846 8270D with PAHs by SIM	SW-846 8081B	SW-846 8082A	SW-846 6010C	SW-846 7470A	SW-846 9012B	SW-846 6010C	SW-846 7470A	SW-846 8330B	Lab SOP	SM 2340B
			Analytical Laboratory/ Analytical SOP Reference[1]	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-302	Katahdin / CA-329	Katahdin / CA-608	Katahdin / CA-611	Katahdin / CA-773	Katahdin / CA-402	TA / WS-LC-0010	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-738	TA / BR-GT-006	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-302	Katahdin / CA-329	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-773	Katahdin / CA-608	Katahdin / CA-615	Katahdin / 402	TA / WS-LC-0010	Katahdin / CA-608
			Data Package Turnaround Time:				7 calendar days, (10 calendar days for nitroguanidine)																					
			Container Type/ minimum amount required	Three 40-ml VOA vials, One 40-ml VOA vial, One 2-oz wide-mouth jar for percent moisture	4-ounce (oz) wide-mouth jar / 90g			8oz clear, wide-mouth soil jar / 44g			4-ounce (oz) wide-mouth jar / 10g	8-oz glass jar with teflon liner / 50g	1 of 4oz clear, wide-mouth soil jar			1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	2 of 1L amber / 1L	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 50mL	1 of 250mL HDPE / 150mL		2 of 1L amber / 500 mL	250mL amber / 10mL	1 of 250mL HDPE / 150mL
			Preservative	5 ml reagent water, cool to 4 ± 2o C, 5 ml methanol, Cool to 0-6 °C	Cool to 0-6 °C						Cool to 0-6 °C		Cool to 0-6 °C		Cool to 0-6°C, protect from oxygen	None	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C			HNO3 to pH < 2, cool to 0-6 °C		NaOH to pH > 12, (4±2) °C	HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C
			Holding Time[2] (Preparation/ Analysis)	48 hours	14 days / 40 days		14 days / 40 days	6 months	28 days	14 days	14 days / 40 days		7 days	14 days	14 days	None	14 days	7 days / 40 days			6 months	28 days	14 days	6 months	28 days	7 days / 40 days	47 days	6 months
Matrix	**Station ID**	**Sample ID**	**Sampling Depth**																									
Reference Surface Water Samples																												
SW	CAREFS04-SWSD01	CAREFS04-SW01-MMYY	at surface														X	X	X	X	X	X	X	X	X	X	X	X
	CAREFS04-SWSD02	CAREFS04-SW02-MMYY															X	X	X	X	X	X	X	X	X	X	X	X
		CAREFS04-SW02P-MMYY															X	X	X	X	X	X	X	X	X	X	X	
	CAREFS04-SWSD03	CAREFS04-SW03-MMYY															X	X	X	X	X	X	X	X	X	X	X	X
		CAREFS04-SW03-MMYY-MS															X	X	X	X	X	X	X	X	X	X	X	
		CAREFS04-SW03-MMYY-SD															X	X	X	X	X	X	X	X	X	X	X	
	CAREFS04-SWSD04	CAREFS04-SW04-MMYY															X	X	X	X	X	X	X	X	X	X	X	X
	CAREFS04-SWSD05	CAREFS04-SW05-MMYY															X	X	X	X	X	X	X	X	X	X	X	X
Reference Surface Sediment Samples																												
SD	CAREFS04-SWSD01	CAREFS04-SD01-MMYY	0-4" bgs	X	X	X	X	X	X	X	X	X	X	X	X	X												
		CAREFS04-SD01P-MMYY		X	X	X	X	X	X	X	X	X																
	CAREFS04-SWSD02	CAREFS04-SD02-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
	CAREFS04-SWSD03	CAREFS04-SD03-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
	CAREFS04-SWSD04	CAREFS04-SD04-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
		CAREFS04-SD04-MMYY-MS		X	X	X	X	X	X	X	X	X																
		CAREFS04-SD04-MMYY-SD		X	X	X	X	X	X	X	X	X																
	CAREFS04-SWSD05	CAREFS04-SD05-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
Reference Subsurface Sediment Samples																												
SSD	CAREFS04-SWSD01	CAREFS04-SSSD01-MMYY	4-8" bgs	X	X	X	X	X	X	X	X	X	X	X	X	X												
		CAREFS04-SSD01P-MMYY		X	X	X	X	X	X	X	X	X																
	CAREFS04-SWSD02	CAREFS04-SSD02-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
	CAREFS04-SWSD03	CAREFS04-SSD03-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
	CAREFS04-SWSD04	CAREFS04-SSD04-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												
		CAREFS04-SSD04-MMYY-MS		X	X	X	X	X	X	X	X	X																
		CAREFS04-SSD04-MMYY-SSD		X	X	X	X	X	X	X	X	X																
	CAREFS04-SWSD05	CAREFS04-SSD05-MMYY		X	X	X	X	X	X	X	X	X	X	X	X	X												

TABLE 3-3
Sample Details

CTO-WE04
Cheatham Annex Site 4 - Remedial Investigation,
Reference Sample Collection - October 2012, tentative

Main Laboratory[5]
Katahdin Analytical Services, Inc.
600 Technology Way
Scarborough, ME 04074
Jennifer Obrin - 207-874-2400

Nitroguanidine Laboratory[5]
TestAmerica, Inc.
880 Riverside Parkway
West Sacramento, CA 95605
Karen Sellers - 916-373-5600

Analysis Group	VOCs	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Explosives	Nitroguanidine	pH	TOC	AVS-SEM	Grain-Size	VOC	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Filtered Metals (except Hg)	Filtered Mercury	Explosives	Nitroguanidine	Hardness
Analytical Method	SW-846 8260B	SW-846 8270D with PAHs by SIM	SW-846 8081B	SW-846 8082A	SW-846 6010C	SW-846 7471A	SW-846 9012B	SW-846 8330B	Lab SOP	9045	Lloyd Kahn	832-R-91-100	ASTM D422	SW-846 8260B	SW-846 8270D with PAHs by SIM	SW-846 8081B	SW-846 8082A	SW-846 6010C	SW-846 7470A	SW-846 9012B	SW-846 6010C	SW-846 7470A	SW-846 8330B	Lab SOP	SM 2340B
Analytical Laboratory/ Analytical SOP Reference[1]	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-302	Katahdin / CA-329	Katahdin / CA-608	Katahdin / CA-611	Katahdin / CA-773	Katahdin / CA-402	TA / WS-LC-0010	Katahdin / CA-709	Katahdin / CA-741	Katahdin / CA-738	TA / BR-GT-006	Katahdin / CA-202	Katahdin / CA-213	Katahdin / CA-302	Katahdin / CA-329	Katahdin / CA-608	Katahdin / CA-615	Katahdin / CA-773	Katahdin / CA-608	Katahdin / CA-615	Katahdin / 402	TA / WS-LC-0010	Katahdin / CA-608
Data Package Turnaround Time:				7 calendar days, (10 calendar days for nitroguanidine)																					
Container Type/ minimum amount required	Three 40-ml VOA vials, One 40-ml VOA vial, One 2-oz wide-mouth jar for percent moisture	4-ounce (oz) wide-mouth jar / 90g			8oz clear, wide-mouth soil jar / 44g			4-ounce (oz) wide-mouth jar / 10g	8-oz glass jar with teflon liner / 50g	1 of 4oz clear, wide-mouth soil jar		1 of 4oz clear, wide-mouth soil jar	1 of 16oz soil jar	3 of 40mL VOA vial / 40mL	2 of 1L amber / 1L	2 of 1L amber / 1L	2 of 1L amber / 1L	1 of 250mL HDPE / 150mL		1 of 250mL HDPE / 50mL	1 of 250mL HDPE / 150mL		2 of 1L amber / 500 mL	250mL amber / 10mL	1 of 250mL HDPE / 150mL
Preservative	5 ml reagent water, cool to 4 ± 2o C, 5 ml methanol, Cool to 0-6 °C	Cool to 0-6 °C						Cool to 0-6 °C		Cool to 0-6 °C		Cool to 0-6°C, protect from oxygen	None	zero-headspace, HCl to pH < 2, cool to 0-6 °C	Cool to 0-6 °C			HNO3 to pH < 2, cool to 0-6 °C		NaOH to pH > 12, (4±2) °C	HNO3 to pH < 2, cool to 0-6 °C		Cool to 0-6 °C		HNO3 to pH < 2, cool to 0-6 °C
Holding Time[2] (Preparation/ Analysis)	48 hours	14 days / 40 days		14 days / 40 days	6 months	28 days	14 days	14 days / 40 days		7 days	14 days	14 days	None	14 days	7 days / 40 days			6 months	28 days	14 days	6 months	28 days	7 days / 40 days	47 days	6 months

Matrix	Station ID	Sample ID	Sampling Depth	VOCs	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Explosives	Nitroguanidine	pH	TOC	AVS-SEM	Grain-Size	VOC	SVOCs	Pesticides	PCBs	Metals (except Hg)	Mercury	Cyanide	Filtered Metals (except Hg)	Filtered Mercury	Explosives	Nitroguanidine	Hardness
Sampling Blanks[3]																												
EB	CAREFS04-QC	CAREFS04-EB-MMDDYY-SD	from SD equipment														X	X	X	X	X	X	X	X	X	X	X	
EB		CAREFS04-EB-MMDDYY-SW	from SW equipment														X	X	X	X	X	X	X			X	X	
TB		CAREFS04-TB0#-MMDDYY															X											

Notes:
[1] For a complete reference of laboratory SOPs, see the Analytical SOP References Table.
[2] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared.
[3] Field QC counts may change depending on the duration of field event. Frequency of QA/QC sample collection is noted on the Measurement Performance Criteria Table in Section 2.4 of the UFP-SAP and is as follows :
Field Duplicate (FD) - One per 10 field samples
MS/MSD - One pair per 20 field samples of similar matrix (including field duplicates)
Equipment Blank (EB) - For disposable equipment, one per week of sampling; for decontaminated equipment, one per type of sampling equipment, per day of sampling
Trip Blank (TB) - one per cooler to the lab containing samples for VOC analysis.
[5] Samples will be sent to Katahdin, with only samples for Nitroguanidine sent to TestAmerica.

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Figures

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\388429_SITE4_RI_UFPSAP\FIGURE 1 - WPNSTA BASE LOCATION MAP.MXD BHATHAWAY 8/29/2012 12:22:06 PM

Legend

Cheatham Annex Boundary

N
W E
S

0 1,000 2,000
Feet

Figure 1
Base Location Map
Site 4 Remedial Investigation UFP-SAP
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

Legend

- Outfall
- Culvert
- Drainage Channels
- Storm Water Line
- Site 4 Boundary
- Burial Investigation Areas
- Burial Areas
- Water Body

N
W E
S

0 100 200
Feet

Figure 2
Site Location and Boundary Map
Site 4 Remedial Investigation UFP-SAP
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

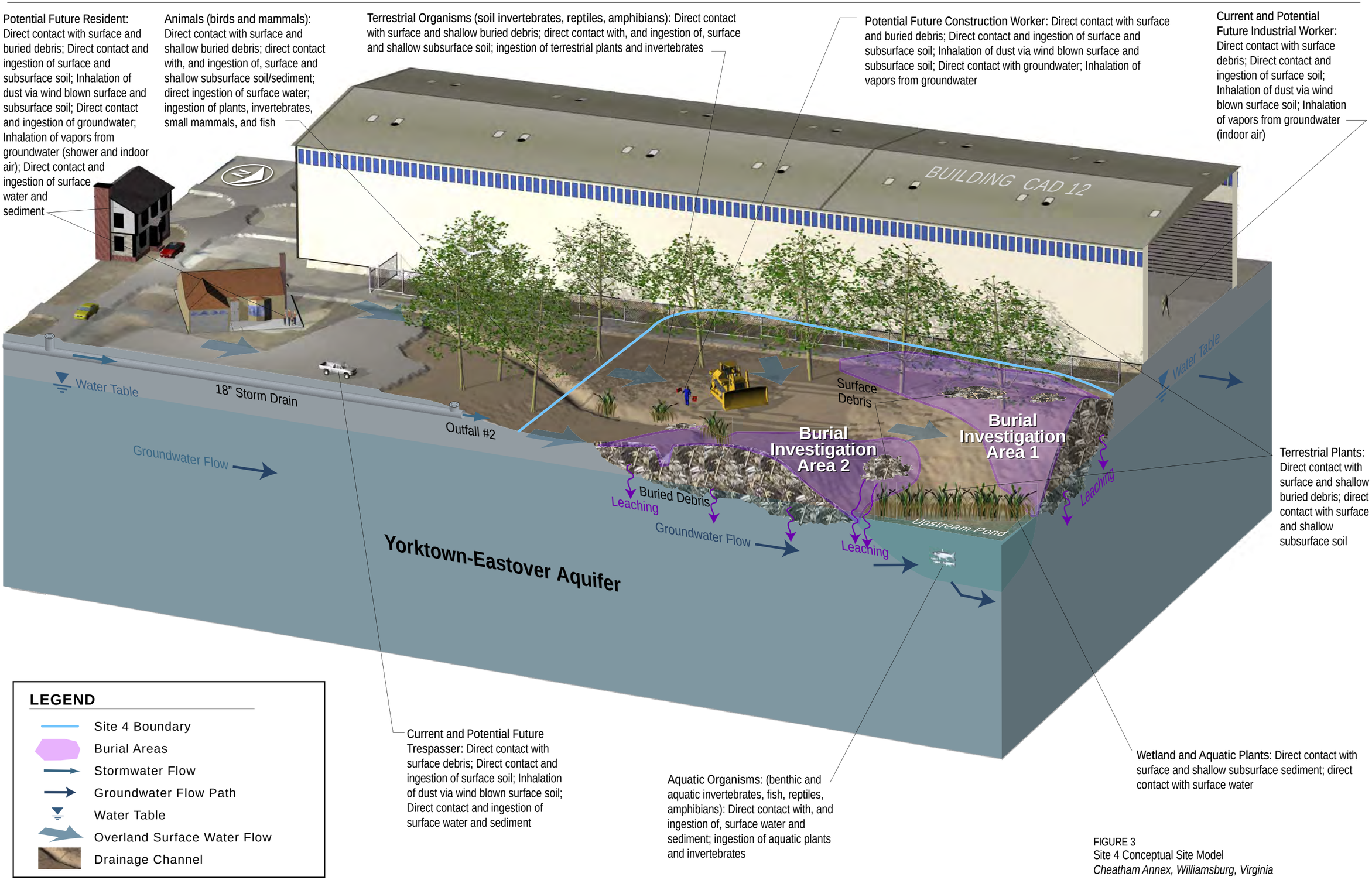

FIGURE 3
Site 4 Conceptual Site Model
Cheatham Annex, Williamsburg, Virginia

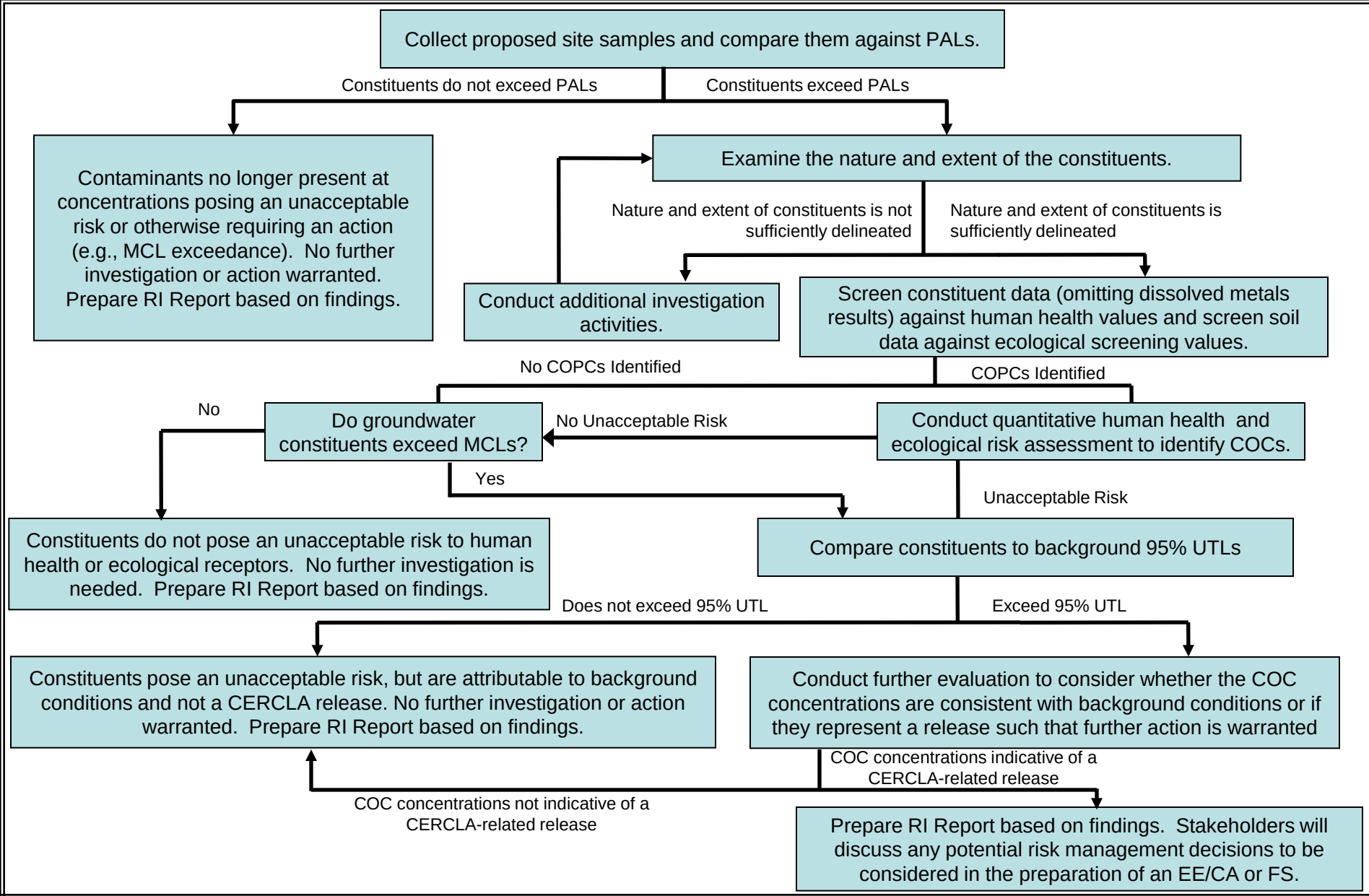

Figure 4
Site 4 Decision Tree
Sampling and Analysis Plan
Cheatham Annex
Williamsburg, Virginia

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\387443_AOC6_RI_UFPSAP\FIGURE 5 - PROPOSED RI SAMPLE LOCS.MXD BHATHAWAY 9/6/2012 12:14:17 PM

Legend

- Proposed Groundwater Sample Location
- Proposed Surface Sediment Samples
- Proposed Sediment/Toxicity Samples
- Proposed Surface Soil Samples
- Proposed Surface/Subsurface Soil Samples
- Proposed Surface Soil Samples for Hexavalent/Total Chromium
- New Proposed Subsurface Soil Samples for Total and Hexavalent Chromium Analysis
- Outfall
- Storm Water Line
- Culvert
- Drainage Channels
- Proposed Test Pit Locations
- Burial Investigation Areas
- Water Body
- Site 4 Boundary
- Burial Areas

N W E S

0 65 130 Feet

Figure 5
Proposed RI Sample Locations
Site 4 Remedial Investigation UFP-SAP
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

Appendix A
Laboratory Worksheets

Reference Limits and Evaluation Tables

Samples will be collected and analyzed for the analytical groups and methods detailed in **Table 3-2**, *Sample Details Table*. The PALs and laboratory reporting limits for each analyte from these samples are provided in *Reference Limits and Evaluation Tables* (Tables A-1 through A-24).

Typically laboratory control sample (LCS) or MS criteria limits are provided in *Laboratory QC Tables* (**TablesA-30** through **A-61**); however, in instances where these criteria vary by analyte within an analytical group, laboratory-specific LCS and MS/MSD recovery criteria are listed by analyte in **Tables A-1 through A-24**.

TABLE A-1
Reference Limits and Evaluation Table

Matrix: Surface Soil, Subsurface Soil
Analytical Group: PAHs

Analyte	CAS Number	Adjusted Residential Soil RSL (Nov2011)[1,3] (µg/kg)	Soil ESV[1,3,4] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[5]		
					LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
Naphthalene	91-20-3	3600	LMW	1800	20	10	2.6	54	94	30
2-Methylnaphthalene	91-57-6	31000	LMW	15500	20	10	2.2	75	132	30
Acenaphthylene	208-96-8	340000	LMW	170000	20	10	1.2	51	103	30
Acenaphthene	83-32-9	340000	LMW	170000	20	10	1.5	56	97	30
Fluorene	86-73-7	230000	LMW	115000	20	10	3.2	61	103	30
Phenanthrene	85-01-8	1700000	LMW	850000	20	10	1.8	58	122	30
Anthracene	120-12-7	1700000	LMW	850000	20	10	1.2	55	113	30
Fluoranthene	206-44-0	230000	LMW	115000	20	10	1.8	68	126	30
Pyrene	129-00-0	170000	HMW	85000	20	10	2.1	33	133	30
Benzo(a)anthracene	56-55-3	150	HMW	75	20	10	1.9	50	138	30
Chrysene	218-01-9	15000	HMW	7500	20	10	1.7	44	132	30
Benzo(b)fluoranthene	205-99-2	150	HMW	75	20	10	2.4	44	119	30
Benzo(k)fluoranthene	207-08-9	1500	HMW	750	20	10	3.1	40	120	30
Benzo(a)pyrene	50-32-8	15	HMW	7.5	20	10	3.3	52	113	30
Indeno(1,2,3-cd)pyrene	193-39-5	150	HMW	75	20	10	1.9	32	134	30
Dibenz(a,h)anthracene	53-70-3	15	HMW	7.5	20	10	1.8	30	134	30
Benzo(g,h,i)perylene	191-24-2	170000	HMW	85000	20	10	2	43	121	30

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] Site-Specific ESVs for PAHs are based on whether they are Low Molecular Weigh (LMW) or High Molecular Weight (HMW). The cumulative LMW ESV is 29,000 µg/kg and the cumulative HMW ESV is 18,000 µg/kg.
[5] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

TABLE A-2
Reference Limits and Evaluation Table

Matrix: Surface Soil, Subsurface Soil
Analytical Group: PCBs

Analyte	CAS Number	Adjusted Residential Soil RSL (Nov 2011)[1,3] (µg/kg)	Soil ESV[1,3] (µg/kg)	PQL Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
					LOQ	LOD	DL	LCL	UCL	%RPD
Aroclor-1016	12674-11-2	390	8,000	195	17	8.5	6	40	140	30
Aroclor-1221	11104-28-2	140	8,000	70	17	8.5	7.9	NA	NA	NA
Aroclor-1232	11141-16-5	140	8,000	70	17	10	9.3	NA	NA	NA
Aroclor-1242	53469-21-9	220	8,000	110	17	8.5	5.8	NA	NA	NA
Aroclor-1248	12672-29-6	220	8,000	110	17	8.5	6.1	NA	NA	NA
Aroclor-1254	11097-69-1	110	8,000	55	17	8.5	4.7	NA	NA	NA
Aroclor-1260	11096-82-5	220	8,000	110	17	8.5	6	60	130	30

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.
NA indicates that criteria is not applicable.

TABLE A-3
Reference Limits and Evaluation Table

Matrix: Surface Soil, Subsurface Soil
Analytical Group: Metals

Analyte4	CAS Number	Adjusted Residential Soil RSL (Nov2011)[1,3] (mg/kg)	Soil ESV[1,3] (mg/kg)	CAX Surface Soil Background[1] (mg/kg)	CAX Subsurface Soil Background[1] (mg/kg)	PQL Goal[2] (mg/kg)	Laboratory-Specific (mg/kg)		
							LOQ	LOD	DL
Aluminum	7429-90-5	7700	pH < 5.5	12200	13000	3850	30	10	0.71
Antimony	7440-36-0	3.1	78	11	NC	1.55	0.8	0.5	0.07
Arsenic	7440-38-2	0.39	18	6.36	5.54	0.195	0.8	0.5	0.068
Barium	7440-39-3	1500	330	52.9	84.5	26.45	0.5	0.3	0.026
Beryllium	7440-41-7	16	40	0.587	0.52	0.26	0.5	0.05	0.0068
Cadmium	7440-43-9	7	32	1.5	NC	0.75	1	0.3	0.01
Calcium	7440-70-2	NC	NC	2290	2380	1145	10	8	1.8
Chromium	7440-47-3	0.29	64	18.2	33.7	0.145	1.5	0.4	0.03
Cobalt	7440-48-4	2.3	13	9.93	5.18	1.15	3	0.4	0.03
Copper	7440-50-8	310	70	4.25	3.17	1.585	2.5	1	0.16
Iron	7439-89-6	5500	5 < pH > 8	19900	32000	2750	10	8	1.4
Lead	7439-92-1	400	120	17.4	8.79	4.395	0.5	0.4	0.09
Magnesium	7439-95-4	NC	NC	1070	1120	535	10	8	0.68
Manganese	7439-96-5	180	220	324	176	88	0.5	0.4	0.16
Mercury	7439-97-6	2.3	0.1	0.111	0.14	0.05	0.033	0.017	0.0052
Nickel	7440-02-0	150	38	9.52	17.6	4.76	4	0.4	0.04
Potassium	7440-09-7	NC	NC	708	901	354	100	50	2.9
Selenium	7782-49-2	39	0.52	0.51	0.64	0.255	1	0.7	0.17
Silver	7440-22-4	39	560	2.1	1.1	0.55	1.5	0.4	0.03
Sodium	7440-23-5	NC	NC	521	811	260.5	100	50	1.5
Thallium	7440-28-0	0.078	1	NC	NC	0.039	1.5	0.5	0.09
Vanadium	7440-62-2	39	130	27.9	48.3	13.95	2.5	0.4	0.04
Zinc	7440-66-6	2300	120	26.5	28	13.25	2.5	1	0.17
Chromium VI (Hexavalent)[4]	18540-29-9	0.29	NC	NC	NC	0.145	0.4	0.2	0.065

Notes:

[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.

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

[3] PALs and PQL Goals assume dry weight basis.

[4] Not all soils will be analyzed for the full list of metals. Refer to Sample Details Table in **Section 3** to see which samples will be analyzed for only chromium, and which will be analyzed for hexavalent chromium.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-4
Reference Limits and Evaluation Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Reference Surface Sediment, Reference Subsurface Sediment[1]

Analytical Group: Wet Chemistry

Analyte	CAS Number	Units	Laboratory-Specific		
			LOQ	LOD	DL
Acid volatile sulfide[2]	ACIDSO2	UMOL_G	0.10	0.05	0.037
Cadmium[2]	7440-43-9	UMOL_G	0.0018	0.00053	0.000011
Copper[2]	7440-50-8	UMOL_G	0.0079	0.0031	0.0013
Lead[2]	7439-92-1	UMOL_G	0.00048	0.00039	0.00030
Mercury[2]	7439-97-6	UMOL_G	0.00002	0.00001	0.000007
Nickel[2]	7440-02-0	UMOL_G	0.01363	0.0014	0.00037
Silver[2]	7440-22-4	UMOL_G	0.0028	0.00074	0.00007
Zinc[2]	7440-66-6	UMOL_G	0.0076	0.0061	0.0047
TOC[3]	TOC	MG_KG	400	200	99.1
pH[4]	PH	MG_KG	NA	NA	NA
Ammonia[5]	7664-41-7	MG_KG	5	2.5	0.44
Sulfide[5]	18496-25-8	MG_KG	60	60	NA

Notes:

There are no action limits for wet chemistry analytes; AVS/SEM is applicable to sediments only.

[1] Refer to the **Section 2.3.6** for specifics about which wet chemistry analytes will be reported for each matrix.

[2] The ratio of AVS/SEM will be used evaluate the potential bioavailability of certain metals in sediment.

[3] TOC data in sediment will be used to adjust equilibrium partitioning-based ecological screening values and to evaluate habitat conditions.

[4] Data for pH in soil will be used as the ecological screening value for certain metals (aluminum and iron).

[5] Data for ammonia and sulfide in sediment samples will be used as part of the evaluation of the *Hyalella azteca* toxicity testing results. Reference surface and subsurface sediment samples will not be tested for ammonia or sulfide.

TABLE A-5
Reference Limits and Evaluation Table

Matrix: Surface Soil, Sediment, Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: Grain-size[1]

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

Notes:

There are no action limits, laboratory reporting limits, or LCS recovery limits for grain-size analytes.

[1] Grain-size data will be used to characterize sediment and soil conditions in terms of habitat for certain invertebrates, and to compare site to reference habitat conditions.

TABLE A-6
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: PAHs

Analyte	CAS Number	Adjusted Residential Soil RSL x10 (Nov 2011)[1,3] (µg/kg)	Freshwater Sediment ESV[1,3] (µg/kg)	BTAG Value (µg/kg)	PQL Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits4		
						LOQ	LOD	DL	LCL	UCL	%RPD
Naphthalene	91-20-3	36000	176	176	88	20	10	2.6	54	94	30
2-Methylnaphthalene	91-57-6	310000	NC	20.2	155000	20	10	2.2	75	132	30
Acenaphthylene	208-96-8	3400000	160	5.9	80	20	10	1.2	51	103	30
Acenaphthene	83-32-9	3400000	290	6.7	145	20	10	1.5	56	97	30
Fluorene	86-73-7	2300000	77.4	77.4	38.7	20	10	3.2	61	103	30
Phenanthrene	85-01-8	17000000	204	204	102	20	10	1.8	58	122	30
Anthracene	120-12-7	17000000	57.2	57.2	28.6	20	10	1.2	55	113	30
Fluoranthene	206-44-0	2300000	423	423	211.5	20	10	1.8	68	126	30
Pyrene	129-00-0	1700000	195	195	97.5	20	10	2.1	33	133	30
Benzo(a)anthracene	56-55-3	1500	108	108	54	20	10	1.9	50	138	30
Chrysene	218-01-9	150000	166	166	83	20	10	1.7	44	132	30
Benzo(b)fluoranthene	205-99-2	1500	240	27.2	120	20	10	2.4	44	119	30
Benzo(k)fluoranthene	207-08-9	15000	240	240	120	20	10	3.1	40	120	30
Benzo(a)pyrene	50-32-8	150	150	150	75	20	10	3.3	52	113	30
Indeno(1,2,3-cd)pyrene	193-39-5	1500	200	17	100	20	10	1.9	32	134	30
Dibenz(a,h)anthracene	53-70-3	150	33	33	16.5	20	10	1.8	30	134	30
Benzo(g,h,i)perylene	191-24-2	1700000	170	170	85	20	10	2	43	121	30

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.
NC indicates that there is no criterion for an analyte.

TABLE A-7
Reference Limits and Evaluation Table

Matrix: Sediment, Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: PCBs

Analyte	CAS Number	Adjusted Residential Soil RSL x10 (Nov 2011)[1,3] (µg/kg)	Freshwater Sediment ESV[1,3] (µg/kg)	BTAG Value (µg/kg)	PQL Goal[2] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
						LOQ	LOD	DL	LCL	UCL	%RPD
Aroclor-1016	12674-11-2	3900	59.8	59.8	29.9	17	8.5	6	40	140	30
Aroclor-1221	11104-28-2	1400	59.8	59.8	29.9	17	8.5	7.9	NA	NA	NA
Aroclor-1232	11141-16-5	1400	59.8	59.8	29.9	17	10	9.3	NA	NA	NA
Aroclor-1242	53469-21-9	2200	59.8	59.8	29.9	17	8.5	5.8	NA	NA	NA
Aroclor-1248	12672-29-6	2200	59.8	59.8	29.9	17	8.5	6.1	NA	NA	NA
Aroclor-1254	11097-69-1	1100	59.8	59.8	29.9	17	8.5	4.7	NA	NA	NA
Aroclor-1260	11096-82-5	2200	59.8	59.8	29.9	17	8.5	6	60	130	30

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

TABLE A-8
Reference Limits and Evaluation Table

Matrix: Sediment, Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: Metals

Analyte	CAS Number	Adjusted Residential Soil RSL x10 (Nov 2011)[1,3] (mg/kg)	Freshwater Sediment ESV[1,3] (mg/kg)	BTAG Value (µg/kg)	PQL Goal[2] (mg/kg)	Laboratory-Specific (mg/kg)		
						LOQ	LOD	DL
Aluminum	7429-90-5	77000	25,500	NC	12750	30	10	0.71
Antimony	7440-36-0	31	3	2	1.5	0.8	0.5	0.07
Arsenic	7440-38-2	3.9	9.79	9.8	1.95	0.8	0.5	0.068
Barium	7440-39-3	15000	20	NC	10	0.5	0.3	0.026
Beryllium	7440-41-7	160	NC	NC	80	0.5	0.05	0.0068
Cadmium	7440-43-9	70	0.99	0.99	0.495	1	0.3	0.01
Calcium	7440-70-2	NC	NC	NC	Lab LOD	10	8	1.8
Chromium	7440-47-3	2.9	43.4	43.4	1.45	1.5	0.4	0.03
Cobalt	7440-48-4	23	50	50	11.5	3	0.4	0.03
Copper	7440-50-8	3100	31.6	31.6	15.8	2.5	1	0.16
Iron	7439-89-6	55000	20,000	20,000	10000	10	8	1.4
Lead	7439-92-1	4000	35.8	35.8	17.9	0.5	0.4	0.09
Magnesium	7439-95-4	NC	NC	NC	Lab LOD	10	8	0.68
Manganese	7439-96-5	1800	460	460	230	0.5	0.4	0.16
Mercury	7439-97-6	23	0.18	0.18	0.09	0.033	0.017	0.0052
Nickel	7440-02-0	1500	22.7	22.7	11.35	4	0.4	0.04
Potassium	7440-09-7	NC	NC	NC	Lab LOD	100	50	2.9
Selenium	7782-49-2	390	2	2	1	1	0.7	0.17
Silver	7440-22-4	390	1	1	0.5	1.5	0.4	0.03
Sodium	7440-23-5	NC	NC	NC	Lab LOD	100	50	1.5
Thallium	7440-28-0	0.78	NC	NC	0.39	1.5	0.5	0.09
Vanadium	7440-62-2	390	NC	NC	195	2.5	0.4	0.04
Zinc	7440-66-6	23000	121	121	60.5	2.5	1	0.17
Cyanide[4]	57-12-5	1600	NC	TBD	800	0.5	0.4	0.222

Notes:

[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] PALs and PQL Goals assume dry weight basis.

[4] Cyanide will only be analyzed in Reference Sediment samples (surface and subsurface).

NC indicates that there is no criterion for an analyte.

TABLE A-9
Reference Limits and Evaluation Table

Matrix: Groundwater, Reference Surface Water

Analytical Group: VOCs

Analyte	CAS Number	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg /L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits3		
					LOQ	LOD	DL	LCL	UCL	%RPD
Dichlorodifluoromethane (Freon-12)	75-71-8	19	NC	9.5	2	1	0.24	30	155	20
Chloromethane	74-87-3	19	NC	9.5	2	1	0.36	40	125	20
Vinyl chloride	75-01-4	0.015	2	0.0075	2	1	0.25	50	145	20
Bromomethane	74-83-9	0.7	NC	0.35	2	1	0.49	30	145	20
Chloroethane	75-00-3	2100	NC	1050	2	1	0.55	60	135	20
Trichlorofluoromethane (Freon-11)	75-69-4	110	NC	55	2	1	0.24	60	145	20
1,1-Dichloroethene	75-35-4	26	7	3.5	1	0.5	0.35	70	130	20
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	76-13-1	5300	NC	2650	1	0.5	0.31	73	126	20
Acetone	67-64-1	1200	NC	600	5	2.5	2.21	40	140	20
Carbon disulfide	75-15-0	72	NC	36	1	0.5	0.25	35	160	20
Methyl acetate	79-20-9	1600	NC	800	1	0.75	0.53	70	132	20
Methylene chloride	75-09-2	4.7	5	2.35	5	2.5	1.13	55	140	20
trans-1,2-Dichloroethene	156-60-5	8.6	100	4.3	1	0.5	0.25	60	140	20
Methyl-tert-butyl ether (MTBE)	1634-04-4	12	NC	6	1	0.5	0.36	65	125	20
1,1-Dichloroethane	75-34-3	2.4	NC	1.2	1	0.5	0.21	70	135	20
cis-1,2-Dichloroethene	156-59-2	2.8	70	1.4	1	0.5	0.21	70	125	20
2-Butanone	78-93-3	490	NC	245	5	2.5	1.31	30	150	20
Chloroform	67-66-3	0.19	80	0.095	1	0.5	0.32	65	135	20
1,1,1-Trichloroethane	71-55-6	750	200	100	1	0.5	0.2	65	130	20
Cyclohexane	110-82-7	1300	NC	650	1	0.5	0.31	71	133	20
Carbon tetrachloride	56-23-5	0.39	5	0.195	1	0.5	0.22	65	140	20
Benzene	71-43-2	0.39	5	0.195	1	0.5	0.26	80	120	20
1,2-Dichloroethane	107-06-2	0.15	5	0.075	1	0.5	0.2	70	130	20
Trichloroethene	79-01-6	0.26	5	0.13	1	0.5	0.28	70	125	20
Methylcyclohexane	108-87-2	NC	NC	Lab LOD	1	0.5	0.3	73	125	20
1,2-Dichloropropane	78-87-5	0.38	5	0.19	1	0.5	0.25	75	125	20
Bromodichloromethane	75-27-4	0.12	80	0.06	1	0.5	0.33	75	120	20
cis-1,3-Dichloropropene	10061-01-5	0.41	NC	0.205	1	0.5	0.19	70	130	20

TABLE A-9
Reference Limits and Evaluation Table

Matrix: Groundwater, Reference Surface Water

Analytical Group: VOCs

Analyte	CAS Number	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg /L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits3		
					LOQ	LOD	DL	LCL	UCL	%RPD
4-Methyl-2-pentanone	108-10-1	100	NC	50	5	2.5	1.32	60	135	20
Toluene	108-88-3	86	1000	43	1	0.5	0.27	75	120	20
trans-1,3-Dichloropropene	10061-02-6	0.41	NC	0.205	1	0.5	0.2	55	140	20
1,1,2-Trichloroethane	79-00-5	0.041	5	0.0205	1	0.5	0.33	75	125	20
Tetrachloroethene[4]	127-18-4	4.1	5	2.1	1	0.5	0.4	45	150	20
2-Hexanone	591-78-6	3.4	NC	1.7	5	2.5	1.7	55	130	20
Dibromochloromethane	124-48-1	0.15	80	0.075	1	0.5	0.3	60	135	20
1,2-Dibromoethane	106-93-4	0.0065	0.05	0.00325	1	0.5	0.22	80	120	20
Chlorobenzene	108-90-7	7.2	100	3.6	1	0.5	0.22	80	120	20
Ethylbenzene	100-41-4	1.3	700	0.65	1	0.5	0.21	75	125	20
Xylene (total)	1330-20-7	19	10000	9.5	3	1.5	0.25	89	116	20
Styrene	100-42-5	110	100	50	1	0.5	0.23	65	135	20
Bromoform	75-25-2	7.9	80	3.95	1	0.5	0.23	70	130	20
Isopropylbenzene	98-82-8	39	NC	19.5	1	0.5	0.23	75	125	20
1,1,2,2-Tetrachloroethane	79-34-5	0.066	NC	0.033	1	0.5	0.38	65	130	20
1,3-Dichlorobenzene	541-73-1	NC	NC	Lab LOD	1	0.5	0.26	75	125	20
1,4-Dichlorobenzene	106-46-7	0.42	75	0.21	1	0.5	0.24	75	125	20
1,2-Dichlorobenzene	95-50-1	28	600	14	1	0.5	0.15	70	120	20
1,2-Dibromo-3-chloropropane	96-12-8	0.00032	0.2	0.00016	1	0.75	0.5	50	130	20
1,2,4-Trichlorobenzene	120-82-1	0.39	70	0.195	1	0.5	0.37	65	135	20

Notes:

[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

4 The value shown in the RSL column for Tetrachloroethane is based on the IRIS assessment for this analyte released on 2/24/2012.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-10
Reference Limits and Evaluation Table

Matrix: Groundwater, Reference Surface Water

Analytical Group: PAHs

Analyte	CAS Number	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
					LOQ	LOD	DL	LCL	UCL	%RPD
Naphthalene	91-20-3	0.14	NC	0.07	0.2	0.1	0.064	46	84	30
2-Methylnaphthalene	91-57-6	2.7	NC	1.35	0.2	0.1	0.077	51	114	30
Acenaphthylene	208-96-8	40	NC	20	0.2	0.1	0.054	55	105	30
Acenaphthene	83-32-9	40	NC	20	0.2	0.1	0.064	53	90	30
Fluorene	86-73-7	22	NC	11	0.2	0.1	0.061	53	95	30
Phenanthrene	85-01-8	130	NC	65	0.2	0.1	0.051	73	100	30
Anthracene	120-12-7	130	NC	65	0.2	0.1	0.044	70	95	30
Fluoranthene	206-44-0	63	NC	31.5	0.2	0.1	0.073	81	109	30
Pyrene	129-00-0	8.7	NC	4.35	0.2	0.1	0.059	71	104	30
Benzo(a)anthracene	56-55-3	0.029	NC	0.0145	0.2	0.1	0.046	70	110	30
Chrysene	218-01-9	2.9	NC	1.45	0.2	0.1	0.036	70	95	30
Benzo(b)fluoranthene	205-99-2	0.029	NC	0.0145	0.2	0.1	0.089	67	102	30
Benzo(k)fluoranthene	207-08-9	0.29	NC	0.145	0.2	0.1	0.049	68	103	30
Benzo(a)pyrene	50-32-8	0.0029	0.2	0.00145	0.2	0.1	0.066	63	98	30
Indeno(1,2,3-cd)pyrene	193-39-5	0.029	NC	0.0145	0.2	0.1	0.052	61	112	30
Dibenz(a,h)anthracene	53-70-3	0.0029	NC	0.00145	0.2	0.1	0.07	66	108	30
Benzo(g,h,i)perylene	191-24-2	8.7	NC	4.35	0.2	0.1	0.065	62	106	30

Notes:

[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix. The RSL values presented in this table were issues in November 2011, when data is evaluated, the most current RSL values will be used.

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

[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-11
Reference Limits and Evaluation Table

Matrix: Groundwater, Reference Surface Water

Analytical Group: Total and Dissolved Metals

Analyte	CAS Number	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)		
					LOQ	LOD	DL
Aluminum	7429-90-5	1600	NC	800	300	100	15
Antimony	7440-36-0	0.6	6	0.3	8	5	1.3
Arsenic	7440-38-2	0.045	10	0.0225	8	5	1.4
Barium	7440-39-3	290	2000	145	5	3	0.2
Beryllium	7440-41-7	1.6	4	0.8	5	0.5	0.1
Cadmium	7440-43-9	0.69	5	0.345	5	3	0.049
Calcium	7440-70-2	NC	NC	Lab LOD	100	80	11
Chromium	7440-47-3	0.031	100	0.0155	10	4	0.36
Cobalt	7440-48-4	0.47	NC	0.235	10	4	0.2
Copper	7440-50-8	62	1300	31	25	10	0.63
Iron	7439-89-6	1100	NC	550	100	80	5.4
Lead	7439-92-1	15	15	7.5	5	4	1.1
Magnesium	7439-95-4	NC	NC	Lab LOD	100	80	7.8
Manganese	7439-96-5	32	NC	16	5	4	1.1
Mercury	7439-97-6	0.43	2	0.215	0.2	0.1	0.013
Nickel	7440-02-0	30	NC	15	10	4	0.28
Potassium	7440-09-7	NC	NC	Lab LOD	1000	500	41
Selenium	7782-49-2	7.8	50	3.9	10	7	2.4
Silver	7440-22-4	7.1	NC	3.55	10	4	0.27
Sodium	7440-23-5	NC	NC	Lab LOD	1000	500	24
Thallium	7440-28-0	0.016	2	0.008	15	5	1.07
Vanadium	7440-62-2	7.8	NC	3.9	10	4	0.23
Zinc	7440-66-6	470	NC	235	20	10	0.73
Cyanide[3]	57-12-5	31	NC	15	10	8	3.6

Notes:

[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix. There are not PALs for reference surface water samples, these comparison criteria are provided for reference only.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] Cyanide will only be collected for unfiltered (total) reference surface water samples.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-12
Reference Limits and Evaluation Table

Matrix: Groundwater

Analytical Group: Wet Chemistry

Analyte	CAS Number	Laboratory-Specific (µg/L)		
		LOQ	LOD	DL
Methane[1]	74-82-8	10	5	0.68
Ethane[2]	74-84-0	10	5	0.58
Ethene[2]	74-85-1	10	5	0.69
Alkalinity[3]	471-34-1	5000	4000	230
Nitrate[4]	14797-55-8	50	25	12
Nitrite[4]	14797-65-0	50	25	10
Sulfate[5]	14808-79-8	1000	500	90
Sulfide[5]	18496-25-8	1000	800	690

Notes:

There are no action limits for wet chemistry analytes.

[1] Methane results are used to determine the oxidation of an aquifer. Once most or all oxygen is consumed, methanogenic microorganisms can thrive, and methane is produced. Detections of methane are generally consistent with an Eh of less than -100 mV.

[2] Ethane and ethene results are used to determine how much degradation of chlorinated ethenes has occurred in groundwater at a site. Typically, the presence of these compounds indicates complete degradation of PCE, TCE, or DCE.

[3] Alkalinity is a measure of the buffering capacity of an aquifer. It gives us an idea of how resistant an aquifer will be to attempts to change pH. This is important when evaluating the potential for implementation of treatment technologies which may be pH sensitive (like chemical oxidation) or which may be likely to change pH (like the addition of some organic substrates).

[4] Nitrate and nitrite results are generally used to help determine the oxidation state of an aquifer. Once some dissolved oxygen is depleted in an aquifer, other oxidized compounds are converted to their reduced equivalents to provide oxygen to organisms. The presence of nitrite or absence of nitrate indicates that aquifer conditions are reduced enough to have reduced nitrate. This is generally consistent with an Eh value of between 600 and 800 millivolts (mV).

[5] Sulfate and sulfide results are also used to help determine the oxidation state of an aquifer. Typically, once nitrate, manganese, and iron have been reduced, sulfate is reduced to sulfide. The presence or sulfide or absence (or low levels of sulfate), typically indicate an Eh of approximately 0 to -300 mV.

TABLE A-13
Reference Limits and Evaluation Table
Matrix: Tissue
Analytical Group: PCB Congeners and homologues

Analyte	CAS Number	Earthworm PAL[1,3] (pg/g WET)	Fish/Frog PAL[1,3] (pg/g WET)	Project QL Goal[2] (pg/g)	Laboratory-Specific (pg/g)			LCS, MS, and MSD %R and %RPD Limits[6]		
					LOQ	LOD	DL	LCL	UCL	%RPD
Total Monochlorobiphenyls	TOTALMONOCB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Dichlorobiphenyls	TOTALDICB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Trichlorobiphenyls	TOTALTRICB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Tetrachlorobiphenyls	TOTALTETRACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Pentachlorobiphenyls	TOTALPENTACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Hexachlorobiphenyls	TOTALHEXACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Heptachlorobiphenyls	TOTALHEPTACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Octachlorobiphenyls	TOTALOCTACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Total Nonachlorobiphenyls	TOTALNONACB	PCB Total	PCB Total	Lab LOD	20	NA	NA	NA	NA	NA
Decachlorobiphenyl (209)	2051-24-3	PCB Total	PCB Total	Lab LOD	20	NA	NA	60	135	20
3,3',4,4'-Tetrachlorobiphenyl (77)	32598-13-3	NA	NA	Lab LOD	2	1	EDL	60	135	20
3,4,4',5-Tetrachlorobiphenyl (81)	70362-50-4			Lab LOD	2	1	EDL	60	135	20
2,3,3',4,4'-Pentachlorobiphenyl (105)	32598-14-4			Lab LOD	2	1	EDL	60	135	20
2,3,4,4',5-Pentachlorobiphenyl (114)	74472-37-0			Lab LOD	2	1	EDL	60	135	20
2,3',4,4',5-Pentachlorobiphenyl (118)	31508-00-6			Lab LOD	2	1	EDL	60	135	20
2,3',4,4',5'-Pentachlorobiphenyl (123)	65510-44-3			Lab LOD	2	1	EDL	60	135	20
3,3',4,4',5-Pentachlorobiphenyl (126)	57465-28-8			Lab LOD	2	1	EDL	60	135	20
2,3,3',4,4',5-Hexachlorobiphenyl (156)[4]	38380-08-4			Lab LOD	4	1	EDL	60	135	20
2,3,3',4,4',5'-Hexachlorobiphenyl (157)[4]	69782-90-7									
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	52663-72-6			Lab LOD	2	1	EDL	60	135	20
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	32774-16-6			Lab LOD	2	1	EDL	60	135	20
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	39635-31-9			Lab LOD	2	1	EDL	60	135	20
Toxic Equivalents (Total TEQ)[5]	TOTALTEQ	6.08E-02	3.80E-01	0.0304	0.26	0.13	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	180000	720000	90000	NA	NA	NA	NA	NA	NA

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix. For PCB Congener and homologue analysis, there are PALs for Total TEQ and Total PCBs, but not for individual congeners or homologue groups.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] For ecological risk assessment tissue samples will be evaluated on a wet weight basis. The laboratory will report values on an as-received basis.
[4] PCB congeners 156 and 157 coelute and will be reported as a single analyte "Congeners (156/157)" with contractor specific identifier "156&157."
[5] Total TEQ is the summation of detected concentrations multiplied by their respective Toxicity Equivalency Factors (TEFs). Therefore, the laboratory limits depend on how many, and which, of the 12 dioxin-like congeners are detected. The laboratory limits shown in this table assume detection of all 12 dioxin-like congeners.
[6] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used. Isomers in the homologue groups must meet the ongoing limits specified in EPA method 1668C.
NA indicates that there is no criterion applicable.

TABLE A-14
Reference Limits and Evaluation Table

Matrix: Tissue

Analytical Group: Metals

Analyte	CAS Number	Earthworm PAL (mg/kg WET)	Earthworm PAL (mg/kg DRY)	Fish/Frog PAL (mg/kg WET)	Fish/Frog PAL (mg/kg DRY)	PQL Goal[2] (mg/kg)	Laboratory-Specific (mg/kg)		
							LOQ	LOD	DL
Aluminum	7429-90-5	NC	NC	NC	NC	Lab LOD	30	10	0.71
Antimony	7440-36-0	NC	NC	NC	NC	Lab LOD	0.8	0.5	0.07
Arsenic	7440-38-2	0.22	1.39	1.80	7.20	0.11	0.8	0.5	0.068
Barium	7440-39-3	NC	NC	NC	NC	Lab LOD	0.5	0.3	0.026
Beryllium	7440-41-7	NC	NC	NC	NC	Lab LOD	0.5	0.05	0.0068
Cadmium	7440-43-9	1.35	8.46	0.45	1.79	0.22	1	0.3	0.01
Calcium	7440-70-2	NC	NC	NC	NC	Lab LOD	10	8	1.8
Chromium	7440-47-3	2.96	18.5	0.42	1.67	0.21	1.5	0.4	0.03
Cobalt	7440-48-4	NC	NC	NC	NC	Lab LOD	3	0.4	0.03
Copper	7440-50-8	94.3	589	3.40	13.6	1.70	2.5	1	0.16
Iron	7439-89-6	NC	NC	NC	NC	Lab LOD	10	8	1.4
Lead	7439-92-1	8.45	52.8	2.89	11.6	1.44	0.5	0.4	0.09
Magnesium	7439-95-4	NC	NC	NC	NC	Lab LOD	10	8	0.68
Manganese	7439-96-5	NC	NC	NC	NC	Lab LOD	0.5	0.4	0.16
Mercury	7439-97-6	0.040	0.248	0.032	0.128	0.02	0.033	0.017	0.0052
Nickel	7440-02-0	52.2	326	0.82	3.28	0.41	4	0.4	0.04
Potassium	7440-09-7	NC	NC	NC	NC	Lab LOD	100	50	2.9
Selenium	7782-49-2	0.22	1.37	1.00	4.00	0.11	1	0.7	0.17
Silver	7440-22-4	0.82	5.10	0.06	0.24	0.03	1.5	0.4	0.03
Sodium	7440-23-5	NC	NC	NC	NC	Lab LOD	100	50	1.5
Thallium	7440-28-0	NC	NC	NC	NC	Lab LOD	1.5	0.5	0.09
Vanadium	7440-62-2	NC	NC	NC	NC	Lab LOD	2.5	0.4	0.04
Zinc	7440-66-6	39.0	244	2.87	11.5	1.43	2.5	1	0.17

Notes:
[1] Refer to **Section 2.3.2** for a detailed discussion on the development of PALs, and refer to **Section 2.3.4** for specific identification of PALs by matrix.
[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.
NC indicates that there is no criterion for an analyte.
Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-15
Reference Limits and Evaluation Table

Matrix: Tissue

Analytical Group: Wet Chemistry

Analyte	CAS Number	Laboratory-Specific (µg/L)		
		LOQ	LOD	DL
Lipids (%)	LIPIDS	NA	NA	NA
% Moisture	%MOIST	NA	NA	NA

Notes:

There are no action limits for wet chemistry analytes.

TABLE A-16
Reference Limits and Evaluation Table

Matrix: Reference Surface Water

Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
						LOQ	LOD	DL	LCL	UCL	%RPD
1,1-Biphenyl	92-52-4	Full scan	0.083	NC	0.0415	10.0	7.5	2.69	**51**	**105**	30
2,2'-Oxybis(1-chloropropane)	108-60-1	Full scan	0.31	NC	0.155	10.0	7.5	2.06	25	130	30
2,4,5-Trichlorophenol	95-95-4	Full scan	89	NC	44.5	25.0	18.75	3.63	50	110	30
2,4,6-Trichlorophenol	88-06-2	Full scan	0.9	NC	0.45	10.0	7.5	2.74	50	115	30
2,4-Dichlorophenol	120-83-2	Full scan	3.5	NC	1.75	10.0	7.5	3.04	50	105	30
2,4-Dimethylphenol	105-67-9	Full scan	27	NC	13.5	10.0	7.5	4.42	30	110	30
2,4-Dinitrophenol	51-28-5	Full scan	3	NC	1.5	25	18.75	1.21	15	140	30
2,4-Dinitrotoluene	121-14-2	Full scan	0.2	NC	0.1	10.0	7.5	2.16	50	120	30
2,6-Dinitrotoluene	606-20-2	Full scan	1.5	NC	0.75	10.0	7.5	1.98	50	115	30
2-Chloronaphthalene	91-58-7	Full scan	55	NC	27.5	10.0	7.5	2.85	50	105	30
2-Chlorophenol	95-57-8	Full scan	7.1	NC	3.55	10.0	7.5	3.15	30	105	30
2-Methylphenol	95-48-7	Full scan	72	NC	36	10.0	7.5	3.83	40	110	30
2-Nitroaniline	88-74-4	Full scan	15	NC	7.5	25.0	18.75	1.77	50	115	30
2-Nitrophenol	88-75-5	Full scan	7.1	NC	3.55	10.0	7.5	2.67	40	115	30
3,3'-Dichlorobenzidine	91-94-1	Full scan	0.11	NC	0.055	10.0	7.5	1.09	20	110	30
3-Nitroaniline	99-09-2	Full scan	NC	NC	Lab LOD	25.0	18.75	1.49	20	125	30
4,6-Dinitro-2-methylphenol	534-52-1	Full scan	0.12	NC	0.06	25.0	18.75	2.01	40	130	30
4-Bromophenyl-phenylether	101-55-3	Full scan	NC	NC	Lab LOD	10.0	7.5	1.86	50	115	30
4-Chloro-3-methylphenol	59-50-7	Full scan	110	NC	55	10.0	7.5	3.56	45	110	30
4-Chloroaniline	106-47-8	Full scan	0.32	NC	0.16	10.0	7.5	1.91	15	110	30
4-Chlorophenyl-phenylether	7005-72-3	Full scan	2.7	NC	1.35	10.0	7.5	2.16	50	110	30
4-Methylphenol	106-44-5	Full scan	7.2	NC	3.6	10.0	7.5	5.59	30	110	30
4-Nitroaniline	100-01-6	Full scan	3.3	NC	1.65	25.0	18.75	1.61	35	120	30
4-Nitrophenol	100-02-7	Full scan	0.12	NC	0.06	25.0	18.75	1.79	0	125	30
Acetophenone	98-86-2	Full scan	150	NC	75	10.0	7.5	3.93	**49**	**102**	30
Atrazine	1912-24-9	Full scan	0.26	3	0.13	10.0	7.5	3.33	**83**	**153**	30

TABLE A-16
Reference Limits and Evaluation Table

Matrix: Reference Surface Water
Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
						LOQ	LOD	DL	LCL	UCL	%RPD
Benzaldehyde	100-52-7	Full scan	150	NC	75	10.0	7.5	0.96	**10**	**189**	30
bis(2-Chloroethoxy)methane	111-91-1	Full scan	4.7	NC	2.35	10.0	7.5	2.01	45	105	30
bis(2-Chloroethyl)ether	111-44-4	Full scan	0.012	NC	0.006	10.0	7.5	2.14	35	110	30
bis(2-Ethylhexyl)phthalate	117-81-7	Full scan	0.071	6	0.0355	10.0	7.5	1.78	40	125	30
Butylbenzylphthalate	85-68-7	Full scan	14	NC	7	10.0	7.5	1.85	45	115	30
Caprolactam	105-60-2	Full scan	770	NC	385	10.0	7.5	0.4	**10**	**86**	30
Carbazole	86-74-8	Full scan	NC	NC	0	10.0	7.5	2.1	50	115	30
Dibenzofuran	132-64-9	Full scan	0.58	NC	0.29	10.0	7.5	1.58	55	105	30
Diethylphthalate	84-66-2	Full scan	1100	NC	550	10.0	7.5	2.03	40	120	30
Dimethyl phthalate	131-11-3	Full scan	NC	NC	0	10.00	7.5	2.01	25	125	30
Di-n-butylphthalate	84-74-2	Full scan	67	NC	33.5	10.0	7.5	2.483	55	115	30
Di-n-octylphthalate	117-84-0	Full scan	0.071	NC	0.0355	10.0	7.5	1.78	35	135	30
Hexachlorobenzene	118-74-1	Full scan	0.042	1	0.021	10.0	7.5	2.07	50	110	30
Hexachlorobutadiene	87-68-3	Full scan	0.26	NC	0.13	10.0	7.5	1.8	25	105	30
Hexachlorocyclopentadiene	77-47-4	Full scan	2.2	50	1.1	10.0	7.5	1.17	**23**	**70**	30
Hexachloroethane	67-72-1	Full scan	0.51	NC	0.255	10.0	7.5	2.29	30	100	30
Isophorone	78-59-1	Full scan	67	NC	33.5	10.0	7.5	1.74	50	110	30
Nitrobenzene	98-95-3	Full scan	0.12	NC	0.06	10.0	7.5	3.06	45	110	30
n-Nitroso-di-n-propylamine	621-64-7	Full scan	0.0093	NC	0.00465	10.0	7.5	1.9	35	130	30
n-Nitrosodiphenylamine	86-30-6	Full scan	10	NC	5	10.0	7.5	3.68	50	110	30
Pentachlorophenol	87-86-5	Full scan	0.17	1	0.085	25.0	18.75	2.28	40	115	30
Phenol	108-95-2	Full scan	450	NC	225	10.0	7.5	1.82	0	115	30
2,3,4,6-Tetrachlorophenol	58-90-2	Full scan	17	NC	8.5	10.0	7.5	2.68	**49**	**119**	30
1,2,4,5-Tetrachlorobenzene	95-94-3	Full scan	0.12	NC	0.06	10.0	7.5	1.75	**30**	**150**	30
Naphthalene	91-20-3	SIM	0.14	NC	0.07	0.2	0.1	0.064	46	84	30
2-Methylnaphthalene	91-57-6	SIM	2.7	NC	1.35	0.2	0.1	0.077	51	114	30
Acenaphthylene	208-96-8	SIM	40	NC	20	0.2	0.1	0.054	55	105	30

TABLE A-16
Reference Limits and Evaluation Table

Matrix: Reference Surface Water
Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Tapwater RSL[1] (Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
						LOQ	LOD	DL	LCL	UCL	%RPD
Acenaphthene	83-32-9	SIM	40	NC	20	0.2	0.1	0.064	53	90	30
Fluorene	86-73-7	SIM	22	NC	11	0.2	0.1	0.061	53	95	30
Phenanthrene	85-01-8	SIM	130	NC	65	0.2	0.1	0.051	73	100	30
Anthracene	120-12-7	SIM	130	NC	65	0.2	0.1	0.044	70	95	30
Fluoranthene	206-44-0	SIM	63	NC	31.5	0.2	0.1	0.073	81	109	30
Pyrene	129-00-0	SIM	8.7	NC	4.35	0.2	0.1	0.059	71	104	30
Benzo(a)anthracene	56-55-3	SIM	0.029	NC	0.0145	0.2	0.1	0.046	70	110	30
Chrysene	218-01-9	SIM	2.9	NC	1.45	0.2	0.1	0.036	70	95	30
Benzo(b)fluoranthene	205-99-2	SIM	0.029	NC	0.0145	0.2	0.1	0.089	67	102	30
Benzo(k)fluoranthene	207-08-9	SIM	0.29	NC	0.145	0.2	0.1	0.049	68	103	30
Benzo(a)pyrene	50-32-8	SIM	0.0029	0.2	0.00145	0.2	0.1	0.066	63	98	30
Indeno(1,2,3-cd)pyrene	193-39-5	SIM	0.029	NC	0.0145	0.2	0.1	0.052	61	112	30
Dibenz(a,h)anthracene	53-70-3	SIM	0.0029	NC	0.00145	0.2	0.1	0.07	66	108	30
Benzo(g,h,i)perylene	191-24-2	SIM	8.7	NC	4.35	0.2	0.1	0.065	62	106	30

Notes:
[1] There are no PALs for reference samples. Criteria are shown for reference only.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where in-house limits are used.
NC indicates that there is no criterion for an analyte.
Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-17
Reference Limits and Evaluation Table

Matrix: Reference Surface Water

Analytical Group: Pesticides

Analyte	CAS Number	Adjusted Tapwater RSL[1](Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
					LOQ	LOD	DL	LCL	UCL	%RPD
alpha-BHC	319-84-6	0.0062	NC	0.0031	0.05	0.025	0.0069	60	130	30
beta-BHC	319-85-7	0.022	NC	0.011	0.05	0.025	0.0063	65	125	30
delta-BHC	319-86-8	0.022	NC	0.011	0.05	0.025	0.013	45	135	30
gamma-BHC (Lindane)	58-89-9	0.036	0.2	0.018	0.05	0.025	0.0072	25	135	30
Heptachlor	76-44-8	0.0018	0.4	0.0009	0.05	0.025	0.0080	40	130	30
Aldrin	309-00-2	0.00021	NC	0.000105	0.05	0.025	0.0074	25	140	30
Heptachlor epoxide	1024-57-3	0.0033	0.2	0.00165	0.05	0.025	0.0074	60	130	30
Endosulfan I	959-98-8	7.8	NC	3.9	0.05	0.025	0.0064	50	110	30
Dieldrin	60-57-1	0.0015	NC	0.00075	0.10	0.050	0.0065	60	130	30
4,4'-DDE	72-55-9	0.2	NC	0.1	0.10	0.050	0.0049	35	140	30
Endrin	72-20-8	0.17	2	0.085	0.10	0.050	0.0084	55	135	30
Endosulfan II	33213-65-9	7.8	NC	3.9	0.10	0.050	0.0057	30	130	30
4,4'-DDD	72-54-8	0.28	NC	0.14	0.10	0.050	0.0090	25	150	30
Endosulfan sulfate	1031-07-8	7.8	NC	3.9	0.10	0.050	0.0067	55	135	30
4,4'-DDT	50-29-3	0.2	NC	0.1	0.10	0.050	0.0089	45	140	30
Methoxychlor	72-43-5	2.7	40	1.35	0.50	0.25	0.0084	55	150	30
Endrin ketone	53494-70-5	0.17	2	0.085	0.10	0.050	0.0078	75	125	30
Endrin aldehyde	7421-93-4	0.17	2	0.085	0.10	0.050	0.0062	55	135	30
alpha-Chlordane	5103-71-9	0.19	NC	0.095	0.05	0.025	0.0076	65	125	30
gamma-Chlordane	5103-74-2	0.19	NC	0.095	0.05	0.025	0.0060	60	125	30
Toxaphene	8001-35-2	0.013	3	0.0065	1.0	0.50	0.17	**32**	**110**	30

Notes:

[1] There are no PALs for reference samples. Criteria are shown for reference only.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where in-house limits are used.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-18
Reference Limits and Evaluation Table

Matrix: Reference Surface Water

Analytical Group: PCBs

Analyte	CAS Number	Adjusted Tapwater RSL[1](Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
					LOQ	LOD	DL	LCL	UCL	%RPD
Aroclor-1016	12674-11-2	0.11	0.5	0.055	0.5	0.25	0.15	25	145	≤ 30 %
Aroclor-1221	11104-28-2	0.0043	0.5	0.00215	0.5	0.25	0.2	NA	NA	N/A
Aroclor-1232	11141-16-5	0.0043	0.5	0.00215	0.5	0.25	0.089	NA	NA	N/A
Aroclor-1242	53469-21-9	0.034	0.5	0.017	0.5	0.25	0.18	NA	NA	N/A
Aroclor-1248	12672-29-6	0.034	0.5	0.017	0.5	0.25	0.2	NA	NA	N/A
Aroclor-1254	11097-69-1	0.031	0.5	0.0155	0.5	0.25	0.082	NA	NA	N/A
Aroclor-1260	11096-82-5	0.034	0.5	0.017	0.5	0.25	0.17	30	145	≤ 30 %

Notes:

[1] There are no PALs for reference samples. Criteria are shown for reference only.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where in-house limits are used.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-19
Reference Limits and Evaluation Table

Matrix: Reference Surface Water

Analytical Group: Explosives

Analyte	CAS Number	Adjusted Tapwater RSL[1](Nov 2011) (µg/L)	MCL[1] (µg/L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
					LOQ	LOD	DL	LCL	UCL	%RPD
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	46	NC	23	0.25	0.125	0.040	65	140	20
1,3-Dinitrobenzene (1,3-DNB)	99-65-0	0.15	NC	0.075	0.25	0.125	0.045	45	160	20
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	0.76	NC	0.38	0.25	0.125	0.064	50	145	20
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	0.2	NC	0.1	0.25	0.125	0.052	60	135	20
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	1.5	NC	0.75	0.25	0.125	0.056	60	135	20
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	3	NC	1.5	0.25	0.125	0.038	50	155	20
2-Nitrotoluene (2-NT)	88-72-2	0.27	NC	0.135	0.25	0.125	0.071	45	135	20
3,5-Dinitroaniline	618-87-1	NC	NC	0	0.25	0.125	0.070	**30**	**150**	20
3-Nitrotoluene (3-NT)	99-08-1	0.13	NC	0.065	0.25	0.125	0.063	50	130	20
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	3	NC	1.5	0.25	0.125	0.053	55	155	20
4-Nitrotoluene (4-NT)	99-99-0	3.7	NC	1.85	0.25	0.125	0.060	50	130	20
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	0.61	NC	0.305	0.25	0.125	0.046	50	160	20
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	6.3	NC	3.15	0.25	0.125	0.060	20	175	20
Nitrobenzene (NB)	98-95-3	0.12	NC	0.06	0.25	0.125	0.071	50	140	20
Nitroglycerin	55-63-0	0.15	NC	0.075	4.0	2.0	0.67	**30**	**150**	20
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	78	NC	39	0.25	0.125	0.043	80	115	20
Pentaerythritol tetranitrate (PETN)	14797-73-0	1.1	NC	0.55	4.0	2.0	0.58	**30**	**150**	20
Nitroguanidine	556-88-7	160	NC	80	20	6	2.4	**73**	**117**	**15**

Notes:

[1] There are no PALs for reference samples. Criteria are shown for reference only.

[2] PQL goals are equal to half of the minimum applicable PAL or the laboratory LOD if no PALs exist.

[3] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where in-house limits are used.

NC indicates that there is no criterion for an analyte.

Shading indicates instances where the PAL is lower than the LOD. Non-detects will not be treated as exceedances, though they will be reported at a value greater than the PAL.

TABLE A-20
Reference Limits and Evaluation Table

Matrix: Reference Surface Water

Analytical Group: Wet Chemistry

Analyte	CAS Number	Laboratory-Specific (µg/L)		
		LOQ	LOD	DL
Hardness	HARDNESS	2000	2000	2000

Notes:

There are no action limits for wet chemistry analytes.

TABLE A-21
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: VOCs

Analyte	CAS Number	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011)[1,3] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
				LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
Dichlorodifluoromethane (Freon-12)	75-71-8	94000	47000	10	5	0.92	35	135	30
Chloromethane	74-87-3	120000	60000	10	5	1.4	50	130	30
Vinyl chloride	75-01-4	600	300	10	5	0.87	60	125	30
Bromomethane	74-83-9	7300	3650	10	5	1.1	30	160	30
Chloroethane	75-00-3	2100000	1050000	10	5	1.3	40	155	30
Trichlorofluoromethane (Freon-11)	75-69-4	790000	395000	10	5	0.91	25	185	30
1,1-Dichloroethene	75-35-4	240000	120000	5.0	2.5	0.93	65	135	30
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	76-13-1	910000	455000	5.0	2.5	0.90	**67**	**135**	30
Acetone	67-64-1	61000000	30500000	25	12.5	5.1	20	160	30
Carbon disulfide	75-15-0	740000	370000	5.0	2.5	0.78	45	160	30
Methyl acetate	79-20-9	29000000	14500000	5.0	3	2.7	**72**	**133**	30
Methylene chloride	75-09-2	110000	55000	25	12.5	7.9	55	140	30
trans-1,2-Dichloroethene	156-60-5	150000	75000	5.0	2.5	0.71	65	135	30
Methyl-tert-butyl ether (MTBE)	1634-04-4	430000	215000	5.0	2.5	1.1	**81**	**125**	30
1,1-Dichloroethane	75-34-3	33000	16500	5.0	2.5	1.7	75	125	30
cis-1,2-Dichloroethene	156-59-2	160000	80000	5.0	2.5	0.91	65	125	30
2-Butanone	78-93-3	28000000	14000000	25	12.5	5.9	30	160	30
Chloroform	67-66-3	2900	1450	5.0	2.5	0.35	70	125	30
1,1,1-Trichloroethane	71-55-6	640000	320000	5.0	2.5	0.42	70	135	30
Cyclohexane	110-82-7	120000	60000	5.0	2.5	1.4	**75**	**128**	30
Carbon tetrachloride	56-23-5	6100	3050	5.0	2.5	1.3	65	135	30
Benzene	71-43-2	11000	5500	5.0	2.5	0.92	75	125	30
1,2-Dichloroethane	107-06-2	4300	2150	5.0	2.5	1.0	70	135	30
Trichloroethene	79-01-6	4400	2200	5.0	2.5	0.59	75	125	30
Methylcyclohexane	108-87-2	NC	Lab LOD	5.0	2.5	0.96	**71**	**127**	30
1,2-Dichloropropane	78-87-5	9400	4700	5.0	2.5	1.4	70	120	30
Bromodichloromethane	75-27-4	2700	1350	5.0	2.5	0.60	70	130	30
cis-1,3-Dichloropropene	10061-01-5	17000	8500	5.0	2.5	0.72	70	125	30
4-Methyl-2-pentanone	108-10-1	3400000	1700000	25.0	12.5	5.9	45	145	30
Toluene	108-88-3	820000	410000	5.0	2.5	1.4	70	125	30
trans-1,3-Dichloropropene	10061-02-6	17000	8500	5.0	2.5	0.86	65	125	30

TABLE A-21
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: VOCs

Analyte	CAS Number	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011)[1,3] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
				LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
1,1,2-Trichloroethane	79-00-5	1600	800	5.0	2.5	0.97	60	125	30
Tetrachloroethene[4]	127-18-4	5500	2750	5.0	2.5	1.2	65	140	30
2-Hexanone	591-78-6	210000	105000	25	12.5	4.8	45	145	30
Dibromochloromethane	124-48-1	6800	3400	5.0	2.5	1.0	65	130	30
1,2-Dibromoethane	106-93-4	340	170	5.0	2.5	1.2	70	125	30
Chlorobenzene	108-90-7	290000	145000	5.0	2.5	0.51	75	125	30
Ethylbenzene	100-41-4	54000	27000	5.0	2.5	0.65	75	125	30
Xylene (total)	1330-20-7	260000	130000	15	7.5	1.3	**81**	**114**	30
Styrene	100-42-5	870000	435000	5.0	2.5	0.51	75	125	30
Bromoform	75-25-2	620000	310000	5.0	2.5	0.70	55	135	30
Isopropylbenzene	98-82-8	270000	135000	5.0	2.5	0.92	75	130	30
1,1,2,2-Tetrachloroethane	79-34-5	5600	2800	5.0	2.5	0.84	55	130	30
1,3-Dichlorobenzene	541-73-1	NC	Lab LOD	5.0	2.5	0.62	70	125	30
1,4-Dichlorobenzene	106-46-7	24000	12000	5.0	2.5	0.44	70	125	30
1,2-Dichlorobenzene	95-50-1	380000	190000	5.0	2.5	0.78	75	120	30
1,2-Dibromo-3-chloropropane	96-12-8	54	27	5.0	2.5	1.50	40	135	30
1,2,4-Trichlorobenzene	120-82-1	62000	31000	5.0	2.5	0.79	65	130	30
1,2,3-Trichlorobenzene	87-61-6	49000	24500	5.0	2.5	0.55	**82**	**116**	30

Notes:
[1] There are no PALs for reference samples. Criteria are shown for reference only.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

TABLE A-22
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011)[1,3] (µg/kg)	Freshwater Sediment ESV[1,3, 4] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[5]		
						LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
1,1-Biphenyl	92-52-4	Full scan	51000	NC	25500	330	248	73	**50**	**113**	30
2,2'-Oxybis(1-chloropropane)	108-60-1	Full scan	46000	NC	23000	330	248	89	20	115	30
2,4,5-Trichlorophenol	95-95-4	Full scan	6100000	NC	3050000	820	615	155	50	110	30
2,4,6-Trichlorophenol	88-06-2	Full scan	61000	NC	30500	330	248	155	45	110	30
2,4-Dichlorophenol	120-83-2	Full scan	180000	NC	90000	330	248	150	45	110	30
2,4-Dimethylphenol	105-67-9	Full scan	1200000	NC	600000	330	248	165	30	105	30
2,4-Dinitrophenol	51-28-5	Full scan	120000	NC	60000	820	615	377	15	130	30
2,4-Dinitrotoluene	121-14-2	Full scan	16000	NC	8000	330	248	85	50	115	30
2,6-Dinitrotoluene	606-20-2	Full scan	61000	NC	30500	330	248	79	50	110	30
2-Chloronaphthalene	91-58-7	Full scan	180000	NC	90000	330	248	87	45	105	30
2-Chlorophenol	95-57-8	Full scan	390000	NC	195000	330	248	164	45	105	30
2-Methylphenol	95-48-7	Full scan	3100000	NC	1550000	330	248	200	40	105	30
2-Nitroaniline	88-74-4	Full scan	610000	NC	305000	820	615	75	45	120	30
2-Nitrophenol	88-75-5	Full scan	390000	NC	195000	330	248	167	10	110	30
3,3'-Dichlorobenzidine	91-94-1	Full scan	11000	NC	5500	330	248	114	10	130	30
3-Nitroaniline	99-09-2	Full scan	NC	NC	Lab LOD	820	615	94	25	110	30
4,6-Dinitro-2-methylphenol	534-52-1	Full scan	4900	NC	2450	820	615	337	30	135	30
4-Bromophenyl-phenylether	101-55-3	Full scan	NC	NC	Lab LOD	330	248	85	45	115	30
4-Chloro-3-methylphenol	59-50-7	Full scan	6100000	NC	3050000	330	248	166	45	115	30
4-Chloroaniline	106-47-8	Full scan	24000	NC	12000	330	248	119	10	100	30
4-Chlorophenyl-phenylether	7005-72-3	Full scan	310000	NC	155000	330	248	78	45	110	30
4-Methylphenol	106-44-5	Full scan	310000	NC	155000	330	248	187	40	105	30
4-Nitroaniline	100-01-6	Full scan	240000	NC	120000	820	615	134	35	115	30
4-Nitrophenol	100-02-7	Full scan	48000	NC	24000	820	615	309	15	140	30
Acetophenone	98-86-2	Full scan	2500000	NC	1250000	330	248	178	**59**	**102**	30

TABLE A-22
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011)[1,3] (µg/kg)	Freshwater Sediment ESV[1,3, 4] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[5]		
						LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
Atrazine	1912-24-9	Full scan	21000	NC	10500	330	248	91	**55**	**135**	30
Benzaldehyde	100-52-7	Full scan	1200000	NC	600000	330	248	120	**10**	**123**	30
bis(2-Chloroethoxy)methane	111-91-1	Full scan	180000	NC	90000	330	248	81	45	110	30
bis(2-Chloroethyl)ether	111-44-4	Full scan	2100	NC	1050	330	248	96	40	105	30
bis(2-Ethylhexyl)phthalate	117-81-7	Full scan	350000	750	375	330	248	98	45	125	30
Butylbenzylphthalate	85-68-7	Full scan	2600000	NC	1300000	330	248	93	50	125	30
Caprolactam	105-60-2	Full scan	31000000	NC	15500000	330	248	144	**30**	**140**	30
Carbazole	86-74-8	Full scan	NC	NC	Lab LOD	330	248	111	45	115	30
Dibenzofuran	132-64-9	Full scan	78000	5100	2550	330	248	79	50	105	30
Diethylphthalate	84-66-2	Full scan	49000000	630	315	330	248	80	50	115	30
Dimethyl phthalate	131-11-3	Full scan	NC	NC	Lab LOD	330	248	78	50	110	30
Di-n-butylphthalate	84-74-2	Full scan	6100000	110	55	330	248	101	55	110	30
Di-n-octylphthalate	117-84-0	Full scan	350000	NC	175000	330	248	211	40	130	30
Hexachlorobenzene	118-74-1	Full scan	3000	20	10	330	248	82	45	120	30
Hexachlorobutadiene	87-68-3	Full scan	61000	NC	30500	330	248	83	40	115	30
Hexachlorocyclopentadiene	77-47-4	Full scan	370000	NC	185000	330	248	82	**23**	**107**	30
Hexachloroethane	67-72-1	Full scan	43000	NC	21500	330	248	96	35	110	30
Isophorone	78-59-1	Full scan	5100000	NC	2550000	330	248	75	45	110	30
Nitrobenzene	98-95-3	Full scan	48000	NC	24000	330	248	91	40	115	30
n-Nitroso-di-n-propylamine	621-64-7	Full scan	690	NC	345	330	248	83	40	115	30
n-Nitrosodiphenylamine	86-30-6	Full scan	990000	NC	495000	330	248	219	50	115	30
Pentachlorophenol	87-86-5	Full scan	8900	NC	4450	820	615	237	25	120	30
Phenol	108-95-2	Full scan	18000000	48	24	330	248	156	40	100	30
2,3,4,6-Tetrachlorophenol	58-90-2	Full scan	NC	NC	Lab LOD	330	248	140	**58**	**93**	30

TABLE A-22
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: SVOCs

Analyte	CAS Number	Full Scan or SIM	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011)[1,3] (µg/kg)	Freshwater Sediment ESV[1,3, 4] (µg/kg)	Project Quantitation Limit (PQL) Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[5]		
						LOQ	Limit of Detection (LOD)	Detection Limit (DL)	LCL	UCL	%RPD
1,2,4,5-Tetrachlorobenzene	95-94-3	Full scan	18000	NC	9000	330	248	135	**30**	**150**	30
Naphthalene	91-20-3	SIM	36000	176	88	20	10	2.6	54	94	30
2-Methylnaphthalene	91-57-6	SIM	310000	NC	155000	20	10	2.2	75	132	30
Acenaphthylene	208-96-8	SIM	3400000	160	80	20	10	1.2	51	103	30
Acenaphthene	83-32-9	SIM	3400000	290	145	20	10	1.5	56	97	30
Fluorene	86-73-7	SIM	2300000	77.4	38.7	20	10	3.2	61	103	30
Phenanthrene	85-01-8	SIM	17000000	204	102	20	10	1.8	58	122	30
Anthracene	120-12-7	SIM	17000000	57.2	28.6	20	10	1.2	55	113	30
Fluoranthene	206-44-0	SIM	2300000	423	211.5	20	10	1.8	68	126	30
Pyrene	129-00-0	SIM	1700000	195	97.5	20	10	2.1	33	133	30
Benzo(a)anthracene	56-55-3	SIM	1500	108	54	20	10	1.9	50	138	30
Chrysene	218-01-9	SIM	150000	166	83	20	10	1.7	44	132	30
Benzo(b)fluoranthene	205-99-2	SIM	1500	240	120	20	10	2.4	44	119	30
Benzo(k)fluoranthene	207-08-9	SIM	15000	240	120	20	10	3.1	40	120	30
Benzo(a)pyrene	50-32-8	SIM	150	150	75	20	10	3.3	52	113	30
Indeno(1,2,3-cd)pyrene	193-39-5	SIM	1500	200	100	20	10	1.9	32	134	30
Dibenz(a,h)anthracene	53-70-3	SIM	150	33	16.5	20	10	1.8	30	134	30
Benzo(g,h,i)perylene	191-24-2	SIM	1700000	170	85	20	10	2	43	121	30

Notes:
[1] There are no PALs for reference samples. Criteria are shown for reference only.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] Site-Specific ESVs for PAHs are based on whether they are Low Molecular Weigh (LMW) or High Molecular Weight (HMW). The cumulative LMW ESV is 29,000 µg/kg and the cumulative HMW ESV is 18,000 µg/kg.
[5] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where in-house limits are used.

TABLE A-23
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment

Analytical Group: Pesticides

Analyte	CAS Number	Adjusted Residential Soil RSL x 10 for Sediment (Nov 2011) (µg/kg)	Freshwater Sediment ESV (µg/kg)	PQL Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
					LOQ	LOD	DL	LCL	UCL	%RPD
alpha-BHC	319-84-6	770	6	3	1.7	0.85	0.34	60	125	
beta-BHC	319-85-7	2700	5	2.5	1.7	0.85	0.33	60	125	
delta-BHC	319-86-8	2700	3	1.5	1.7	0.85	0.32	55	130	
gamma-BHC (Lindane)	58-89-9	5200	2.37	1.185	1.7	0.85	0.27	60	125	
Heptachlor	76-44-8	290	NC	145	1.7	0.85	0.29	50	140	
Aldrin	309-00-2	290	2	1	1.7	0.85	0.28	45	140	
Heptachlor epoxide	1024-57-3	530	2.47	1.235	1.7	0.85	0.22	65	130	
Endosulfan I	959-98-8	370000	NC	185000	1.7	0.85	0.24	15	135	
Dieldrin	60-57-1	300	1.9	0.95	3.3	1.65	0.22	65	125	
4,4'-DDE	72-55-9	14000	3.16	1.58	3.3	1.65	0.19	70	125	
Endrin	72-20-8	18000	2.22	1.11	3.3	1.65	0.85	60	135	30
Endosulfan II	33213-65-9	370000	NC	185000	3.3	1.65	0.34	35	140	
4,4'-DDD	72-54-8	20000	4.88	2.44	3.3	1.65	0.2	30	135	
Endosulfan sulfate	1031-07-8	370000	NC	185000	3.3	1.65	0.58	60	135	
4,4'-DDT	50-29-3	17000	4.16	2.08	3.3	1.65	0.31	45	140	
Methoxychlor	72-43-5	310000	NC	155000	17	8.5	0.5	55	145	
Endrin ketone	53494-70-5	18000	2.22	1.11	3.3	1.65	0.4	65	135	
Endrin aldehyde	7421-93-4	18000	2.22	1.11	3.3	1.65	0.49	35	145	
alpha-Chlordane	5103-71-9	16000	3.24	1.62	1.7	0.85	0.21	65	120	
gamma-Chlordane	5103-74-2	16000	3.24	1.62	1.7	0.85	0.23	65	125	
Toxaphene	8001-35-2	4400	NC	2200	33	16	7	**30**	**122**	

Notes:

[1] There are no PALs for reference samples. Criteria are shown for reference only.

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

[3] PALs and PQL Goals assume dry weight basis.

[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

NA indicates that criteria is not applicable.

TABLE A-24
Reference Limits and Evaluation Table

Matrix: Reference Surface Sediment, Reference Subsurface Sediment
Analytical Group: Explosives

Analyte	CAS Number	Adjusted Residential Soil RSL (Nov 2011)[1,3] (µg/kg)	PQL Goal[2,3] (µg/kg)	Laboratory-Specific (µg/kg)			LCS, MS, and MSD %R Limits[4]		
				LOQ	LOD	DL	LCL	UCL	%RPD
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	2200000	1100000	100	50	6.7	75	125	20
1,3-Dinitrobenzene (1,3-DNB)	99-65-0	6100	3050	100	50	6.2	80	125	20
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	36000	18000	100	50	6.7	55	140	20
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	16000	8000	100	50	15	80	125	20
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	61000	30500	100	50	27	80	120	20
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	150000	75000	100	50	21	80	125	20
2-Nitrotoluene (2-NT)	88-72-2	29000	14500	100	50	12	80	125	20
3,5-Dinitroaniline	618-87-1	NC	Lab LOD	100	50	3.5	**30**	**150**	20
3-Nitrotoluene (3-NT)	99-08-1	6100	3050	100	50	7.9	75	120	20
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	150000	75000	100	50	17	80	125	20
4-Nitrotoluene (4-NT)	99-99-0	240000	120000	100	50	27	75	125	20
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	56000	28000	100	50	6.8	70	135	20
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	240000	120000	100	50	5.4	10	150	20
Nitrobenzene (NB)	98-95-3	48000	24000	100	50	22	75	125	20
Nitroglycerin	55-63-0	6100000	3050000	800	400	124	**30**	**150**	20
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	3800000	1900000	100	50	8.6	75	125	20
Pentaerythritol tetranitrate (PETN)	14797-73-0	2200000	1100000	800	400	108	**30**	**150**	20
Nitroguanidine	556-88-7	6100	3050	250	40	20	**72**	**121**	**20**

Notes:
[1] There are no PALs for reference samples. Criteria are shown for reference only.
[2] PQL goals are equal to half of the minimum applicable PAL.
[3] PALs and PQL Goals assume dry weight basis.
[4] DoD QSM v.4.1 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.
NA indicates that criteria is not applicable.

Analytical SOP References Table

Information regarding the laboratory SOPs and to be used for the handling and analysis of samples is provided in Analytical SOP References Tables, **Tables A-25** through **A-29**.

TABLE A-25
Analytical SOP References Table

Laboratory Name and Address: Katahdin Analytical Services, Inc. 600 Technology Way, Scarborough, ME 04074

Point of Contact: Jennifer Obrin, Laboratory PM

Phone Number: (207) 874-2400

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-101	*Equipment Maintenance, 09/11, Revision 10.*	09/11	N/A	N/A	Various	None	N
CA-202	*Analysis of VOAs by Purge and Trap GC/MS: SW-846 Method 8260, 05/11, Revision 12.*	05/11	Definitive	GW/VOC	GC/MS	None	N
CA-213	*Analysis of Semivolatile Organic Compounds By: SW 846 Method 8270 – Modified For Selected Ion Monitoring (SIM), 05/11, Revision 9.*	05/11	Definitive	GW, SS, SB, SD/PAH	GC/MS	None	N
CA-329	*Analysis Of PCBs As Total Arochlors By Gas Chromatography/Electron Capture Detector (GC/ECD): SW-846 Method 8082, 07/11, Revision 12.*	07/11	Definitive	SS, SB, SD, TS/PCB	GC/ECD	None	N
CA-336	*Dissolved Gas Analysis In Water Samples Using GC Headspace Equilibration Technique EPA SOP RSK-175, 07/11, Revision 5.*	07/11	Definitive	GW/MEE	GC/Headspace	None	N
CA-500	*Preparation Of Sediment/Soil Samples By Sonication Using Method 3550 For Subsequent Pesticides/PCBs Analysis, 08/10, Revision 7.*	08/10	Definitive	SS, SB, SD/PCB	Sonication	None	N
CA-502	*Preparation Of Aqueous Samples For Extractable Semivolatile Analysis, 10/09, Revision 6.*	11/10	Definitive	GW/AH	Separatory Funnel, CLLE	None	N
CA-512	*Preparation Of Sediment/Soil Samples By Sonication Using Method 3550 For Subsequent Extractable Semi-Volatiles Analysis, 08/10, Revision 8.*	08/10	Definitive	SS, SB, SD/PAH	Sonication	None	N
CA-515	*Preparation of Aqueous Samples for Pesticides/PCBs Analysis, 08/10, Revision 7.*	09/11	Definitive	aqueous blank/PCB	Separatory Funnel, CLLE	None	N
CA-524	*Preparation Of Sediment/Soil Samples By Soxhlet Extraction Using Method 3540 For Pesticide/PCB Analysis, 08/10, Revision 7.*	08/10	Definitive	SS, SB, SD/PCB	Soxhlet	None	N

TABLE A-25
Analytical SOP References Table

Laboratory Name and Address: Katahdin Analytical Services, Inc. 600 Technology Way, Scarborough, ME 04074

Point of Contact: Jennifer Obrin, Laboratory PM

Phone Number: (207) 874-2400

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-526	*Preparation Of Sediment/Soil Samples By Soxhlet Extraction Using Method 3540 For Subsequent Extractable Semivolatile Analysis, 08/10, Revision 7.*	08/10	Definitive	SS, SB, SD/PAH	Soxhlet	None	N
CA-537	*Preparation of Sediment/Soil and Tissue Samples by Accelerated Solvent Extraction Using Method 3545 for Subsequent Extractable Pesticide and PCB Analysis, 12/10, Revision 3.*	12/10	Definitive	SS, SB, SD/PCB	ASE	None	N
CA-604	*Acid Digestion of Aqueous Samples By EPA Method 3010 for ICP Analysis of Total or Dissolved Metals, 04/10, Revision 5.*	05/11	Definitive	GW/METAL, FMETAL	Block Digester	None	N
CA-605	*Acid Digestion Of Solid Samples By USEPA Method 3050 For Metals Analysis By ICP-AES And GFAA, 09/10, Revision 5.*	09/10	Definitive	SS, SB, SD, TS/METAL	Block Digester	None	N
CA-608	*Trace Metals Analysis By ICP-AES Using EPA Method 6010, 09/11, Revision 12.*	09/11	Definitive	GW, SS, SB, SD, TS/METAL, FMETAL	ICP	PDS CA	N
CA-611	*Digestion And Analysis Of Solid Samples For Mercury By USEPA Method 7471, 12/10, Revision 8.*	12/10	Definitive	SS, SB, SD, TS/METAL	Mercury Analyzer	None	N
CA-615	*Digestion And Analysis Of Aqueous Samples For Mercury By USEPA Method 7470, 05/11, Revision 6.*	05/11	Definitive	GW/METAL, FMETAL	Mercury Analyzer	None	N
CA-709	*pH Concentration Measurements In Soil Matrices – SW 846 Method 9045, 06/10, Revision 8.*	06/10	Definitive	SS, SB, SD/WCHEM	pH Meter	None	N
CA-722	*Titrimetric Determination of Sulfide Using EPA Method 376.1,SM4500-S2- F, SW846 9034 and SW846 7.3.4, 06/10, Revision 4.*	06/10	Definitive	GW/WCHEM	Buret	None	N
CA-738	*Determination of Acid Volatile Sulfide and Simultaneously Extractable Metals in Sediments, 06/10, Revision 2.*	06/10	Definitive	SD/WCHEM	Spectrophotometer/ ICP	None	N
CA-739	*Titrimetric Determination of Total Alkalinity by EPA Method 310.1 and SM 2320 B using the Mettler Dl25 Autotitrator, and Calculation of the Component Forms of Alkalinity by SM 4500–CO_2 D, 06/10, Revision 8.*	06/10	Definitive	GW/WCHEM	Autotitrator	None	N
CA-741	*Determination of Total Organic Carbon in Solids using the EPA Region II Lloyd Kahn Method, 06/10, Revision 4.*	06/10	Definitive	SS, SD/WCHEM	TOC Analyzer	None	N
CA-742	*Anions by Ion Chromatography (IC) – Method 300.0, 10/10, Revision 8.*	10/10	Definitive	GW/WCHEM	IC	MS CA	N

TABLE A-25
Analytical SOP References Table

Laboratory Name and Address: Katahdin Analytical Services, Inc. 600 Technology Way, Scarborough, ME 04074

Point of Contact: Jennifer Obrin, Laboratory PM

Phone Number: (207) 874-2400

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-770	*Colorimetric Analysis Of Ammonia-Nitrogen Using The Automated Konelab Multiwavelength Photometric Analyzer, Revision 2, 08/09.*	06/10	Definitive	SD/WCHEM	Konelab	None	N
SD-902	*Sample Receipt and Internal Control, 09/10, Revision 9.*	09/10	N/A	Various	Not applicable	None	N
SD-903	*Sample Disposal, 05/09, Revision 4.*	10/10	N/A	Various	Not applicable	None	N
CA-226	Analysis of SVOAs by Capillary Column GC/MS: SW-846 Method 8270D, 01/12 Revision 3.		Definitive	Water and Sediment / SVOCs	GC/MS	None	N
CA-302	Analysis of Pesticides by Gas Chromatography/Electron Capture Detector (GC/ECD): SW-846 Method 8081. 06/11, Revision 12.	2/12/2012	Definitive	Water and Sediment / Pesticides	Gas Chromatography (GC)/ Electron Capture Detector (ECD)	None	N
CA-402	Determination Of Nitroaromatics And Nitramines By HPLC Method 8330, 01/12, Revision 6		Definitive	Water and Sediment / Explosives	HPLC	None	N
CA-548	Preparation Of Aqueous And Solid Samples For Explosive Analysis By Method 8330, 02/12, Revision 0.		Definitive	Water and Sediment / Explosives	Not applicable (extraction)	None	N
CA-549	Preparation of Sediment/Soil Samples by Microwave Using Method 3546 for Subsequent Diesel Range Organics (DRO), Total Petroleum Hydrocarbons (TPH), Pesticides, PCBs, or Semi-Volatiles Analysis, 03/12, Revision 0.		Definitive	Sediment / Pesticides and PCBs	Not applicable (extraction)	None	N
CA-773	Colorimetric Analysis Of Total And Ammenable Cyanide Using The Automated Konelab Multiwavelength Photometric Analyzer, July, 2011, Rev. 5	March, 2012	Definitive	SB, SD, GW, AQ / METAL (CN)	Konelab	None	No

Notes:

DoD Environmental Laboratory Accreditation Program (ELAP) certification is required for this work. Katahdin Analytical Services, Inc. meets these requirements, their DoD ELAP certification expires 11/4/2012. A copy of the current DoD ELAP Accreditation letter is included in Appendix D.

TABLE A-26
Analytical SOP References Table

Laboratory Name and Address: TestAmerica, 880 Riverside Parkway, West Sacramento CA 95605

Point of Contact: Karen Sellers

Phone Number: (916) 374-4442

Lab SOP Number	Title, Revision Date, and/or Number	Date Last Reviewed if not Revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Variance to QSM	Modified for Project Work (Y/N)
WS-ID-0013	PCB Analysis by HRGC/HRMS (Revision 4.1 Effective 11/11/2011)		Definitive	Tissue PCBs	GC/HRMS	TestAmerica West Sacramento	Refer to "TestAmerica_1668-DOD QSM Exceptions"	N
WS-QA-0003	Sample Receipt Procedures (revision 11.5 Effective 11/18/2011)		NA	NA	NA	TestAmerica West Sacramento	none	N
WS-LC-0010	Determination of Nitroguanidine based on Method 8330, SW-846. Revision 3.3, reviewed 8/26/2011	In review	Definitive	Solid and Aqueous, Nitroguanidine	LC/MS	TestAmerica West Sacramento	None	N

Notes:

DoD ELAP certification is required for this work. TestAmerica West Sacramento meets these requirements, their DoD ELAP certification expires inJanuary 31, 2014. A copy of the current DoD ELAP letter is included in Appendix D. The contractor is in communication with the laboratory concerning their DoD ELAP Certification, and laboratory certification will be current at the time of sampling.

TABLE A-27
Analytical SOP References Table

Laboratory Name and Address: Columbia Analytical Services, Inc. 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Point of Contact: Deb Patton, Laboratory PM

Phone Number: 585-672-7473

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
GEN-7199	*Hexavalent Chromium by Ion Chromatography, Rev. 3, 1/13/11*	1/13/11	Definitive	Groundwater, Surface Soil, Subsurface Soil/hexavalent chromium	IC	None	N
GEN-3060	*Alkaline Digestion for Hexavalent Chromium in Soil, Rev. 2, 1/6/11*	1/6/11	Prep	Surface Soil, Subsurface Soil/hexavalent chromium	Prep	None	N
SMO-GEN	*Sample Receiving, Revision 6, 10/22/10*	10/22/10	NA	NA	NA	None	N
SMO-SPLDIS	*Sample Disposal, Revision 4, 8/10/09*	10/6/2011	NA	NA	NA	None	N

Notes:

DoD ELAP certification is required for this work. Columbia Analytical Services, Inc. meets these requirements, their DoD ELAP certification was issued April 7th, 2012. A copy of the current DoD ELAP letter is included in **Appendix D**. The contractor is in communication with the laboratory concerning their DoD ELAP Certification, and laboratory certification will be current at the time of sampling.

TABLE A-28
Analytical SOP References Table

Laboratory Name and Address: TestAmerica, Inc. 30 Community Drive, Suite 11, South Burlington, VT 05403

Point of Contact: James Madison

Phone Number: 802-923-1028

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
BR-GT-006	*Particle Size Analysis, Revision 6, 3/17/10*	3/7/2010	screening	Surface Soil, Sediment/Grain-size	sieve	None	N
BR-SM-001	*Sample Management, 9/27/10, Revision 10*	9/27/2010	NA	NA	NA	None	N

Notes:

No certification is required for grain-size analysis because it provides geo-technical data that is to be used as screening data.

TABLE A-29
Analytical SOP References Table

Laboratory Name and Address: TestAmerica, 5102 LaRoche Avenue, Savannah, GA 31404

Point of Contact: Abbie Yant

Phone Number: (912) 354-7858

Lab SOP Number	Title, Revision Date, and Number	Date reviewed if not revised	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
SA-CU-01	Sample Receipt Procedures rev8A	02/03/12	N/A	N/A	N/A	N/A	N/A
SA-GE-085	Sulfide: Titrimetric Preparation and Analysis (Total and Acid Soluble) rev7	06/09/11	D	Sulfide	Buret	None	N

Notes:

No certification is required for sulfide analysis because data is considered for screening purposes. However, TestAmerica Savannah holds DoD ELAP certification for this method, which is valid through 2/28/2013. A copy of the current DoD ELAP letter is included in Appendix D.

Laboratory QC Samples Table

Laboratories analyzing samples in support of this work will perform laboratory QC samples at the frequency required by the DoD QSM 4.1. Details regarding each laboratory QC sample are provided in *Laboratory QC Samples Tables*, **Tables A-30 through A-61**.

TABLE A-30
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: VOCs
Analytical Method/SOP Reference: SW-846 8260B/CA-202

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Laboratory Control Sample	One per preparatory batch.	Refer to **Tables A-1** in **Appendix A**. Limits are as per DoD QSM v. 4.1. In-house statistical laboratory limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific data quality objectives (DQOs). Contact the client as to additional measures to be taken.	Analyst, Supervisor	Accuracy/Bias	

TABLE A-30 (CONTINUED)
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: VOCs
Analytical Method/SOP Reference: SW-846 8260B/CA-202

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and 30% RPD between MS and MSD.	Same as MS.	Analyst, Supervisor	Accuracy/Bias, Precision	
Internal Standards Verification	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst, Supervisor	Accuracy	
Surrogates	4 Per Sample	1,2-Dichloroethane-d4: 70-120%R 4-Bromofluorobenzene: 75-120%R Dibromofluoromethane: 85-115%R Toluene-d8: 85-120%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Supervisor	Accuracy/Bias	

TABLE A-31
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment
Analytical Group: PAHs
Analytical Method/SOP Reference: SW-846 8270C SIM/CA-213

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as SOP QC Acceptance Limits.
Laboratory Control Sample	One per preparatory batch.	Refer to Tables **A-1** in **Appendix A**. In-house statistical laboratory limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and ≤30% for RPD between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Internal Standards Verification	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.		Accuracy	

TABLE A-31 (CONTINUED)
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment
Analytical Group: PAHs
Analytical Method/SOP Reference: SW-846 8270C SIM/CA-213

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Surrogates	3 per sample for SW-846 8270D SIM	2-Methylnaphthalene-d10: 19-94%R Fluorene-d10: 20-96%R Pyrene-d10:31-128%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	

TABLE A-32
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: PAHs
Analytical Method/SOP Reference: SW-846 8270C SIM/CA-213

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Laboratory Control Sample	One per preparatory batch.	Refer to **Tables A-1** in **Appendix A**. In-house statistical laboratory limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and ≤30% for RPD between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Internal Standards Verification	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.		Accuracy	

TABLE A-32 (CONTINUED)
Laboratory QC Samples Table

Matrix: Groundwater

Analytical Group: PAHs

Analytical Method/SOP Reference: SW-846 8270C SIM/CA-213

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Surrogates	3 per sample for SW-846 8270D SIM	2-Methylnaphthalene-d10: 43-92%R Fluorene-d10: 29-101%R Pyrene-d10:53-166%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	

TABLE A-33
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Tissue
Analytical Group: PCBs
Analytical Method/SOP Reference: SW-846 8082A/CA-329

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). See Box D-1 of DoD QSM v 4.1.	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst	Accuracy/Bias, Contamination	Same as SOP QC Acceptance Limits.
Laboratory Control Sample	One per preparatory batch.	Refer to **Tables A-1** in **Appendix A**. Limits are as per DoD QSM v. 4.1. In-house statistical laboratory limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and RPD ≤30% between MS and MSD.	Same as MS		Accuracy/Bias, Precision	
Surrogates[1]	2 Per Sample	*TCMX: 56-115%* Decachlorobiphenyl: 60-125%	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	

TABLE A-33 (CONTINUED)
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Tissue

Analytical Group: PCBs

Analytical Method/SOP Reference: SW-846 8082A/CA-329

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

Notes:

[1] Italicized limits are in-house, DoD QSM v. 4.1 does not specify limits for this surrogate.

TABLE A-34
Laboratory QC Samples Table

Matrix: Aqueous Blanks
Analytical Group: PCBs
Analytical Method/SOP Reference: SW-846 8082A/CA-329

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). See Box D-1 of DoD QSM v 4.1.	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analytes(s) in all samples in the associated preparatory batch.	Analyst	Accuracy/Bias, Contamination	Same as Method/ SOP QC Acceptance Limits.
Laboratory Control Sample	One per preparatory batch.	Limits are as per DoD QSM v. 4.2. In-house statistical laboratory limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and RPD ≤30% between MS and MSD.	Same as MS		Accuracy/Bias, Precision	
Surrogates[1]	2 Per Sample	*TCMX: 62-111%* Decahlorobiphenyl: 40-135%	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

Notes:

[1] Italicized limits are in-house, DoD QSM v. 4.1 does not specify limits for this surrogate.

TABLE A-35
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Tissue
Analytical Group: Metals (except mercury and hexavalent chromium)
Analytical Method/SOP Reference: SW-846 6010C/CA-608

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		Accuracy/Bias, Contamination	
Interference Check Solutions (ICS)	At the beginning of an analytical run.	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spike analytes) ICS-AB: Within ±20% of true value.	Terminate analysis; locate and correct problem; reanalyze ICS; reanalyze all samples.		Accuracy/Bias	
Laboratory Control Sample	One per preparatory batch.	Recovery within 80-120%. Limits are as per DoD QSM v. 4.1.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	

TABLE A-35 (CONTINUED)
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Tissue

Analytical Group: Metals (except mercury and hexavalent chromium)

Analytical Method/SOP Reference: SW-846 6010C/CA-608

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional QC tests are required to evaluate matrix effects. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and RPD ≤20% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Serial Dilution	One per preparatory batch.	Five-fold dilution must agree within ±10% of the original measurement. Only applicable for samples with concentrations > 50X LOQ.	Perform post-digestion spike (PDS) addition.		Accuracy	
Post-digestion Spike (PDS)	When dilution test fails or analyte concentration in all samples < 50X LOD.	Recovery within 75-125%	Run all associated samples in the preparatory batch by method of standard additions (MSA). Or, for the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy	

TABLE A-36
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Metals (except mercury and hexavalent chromium)
Analytical Method/SOP Reference: SW-846 6010C/CA-608

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		Accuracy/Bias, Contamination	
Interference Check Solutions (ICS)	At the beginning of an analytical run.	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spike analytes) ICS-AB: Within ±20% of true value.	Terminate analysis; locate and correct problem; reanalyze ICS; reanalyze all samples.		Accuracy/Bias	
Laboratory Control Sample	One per preparatory batch.	Recovery within 80-120%. Limits are as per DoD QSM v. 4.1.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	

TABLE A-36 (CONTINUED)
Laboratory QC Samples Table

Matrix: Groundwater

Analytical Group: Metals (except mercury and hexavalent chromium)

Analytical Method/SOP Reference: SW-846 6010C/CA-608

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional QC tests are required to evaluate matrix effects. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and RPD ≤20% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Serial Dilution	One per preparatory batch.	Five-fold dilution must agree within ±10% of the original measurement. Only applicable for samples with concentrations > 50X LOQ.	Perform post-digestion spike (PDS) addition.		Accuracy	
Post-digestion Spike (PDS)	When dilution test fails or analyte concentration in all samples < 50X LOD.	Recovery within 75-125%	Run all associated samples in the preparatory batch by method of standard additions (MSA). Or, for the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.		Accuracy	

TABLE A-37
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil, Sediment, Tissue
Analytical Group: Metals (mercury)
Analytical Method/SOP Reference: SW-846 7471A/CA-611

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. See Box D-1 of DoD QSM v 4.1.	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		Accuracy/Bias, Contamination	
Laboratory Control Sample	One per preparatory batch.	Recovery within 80-120%. Limits are as per DoD QSM v. 4.1.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional QC tests are required to evaluate matrix effects.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and %RPD ≤ 20 between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	

TABLE A-38
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Total and Dissolved Metals (Mercury)
Analytical Method/SOP Reference: SW-846 7470A/CA-615

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. See Box D-1 of DoD QSM v 4.1.	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.2. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
Calibration Blank	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		Accuracy/Bias, Contamination	
Laboratory Control Sample	One per preparatory batch.	Recovery within 80-120%. Limits are as per DoD QSM v. 4.1.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to Appendix G of DoD QSM v. 4.2. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike	One per preparatory batch per matrix.	Same as LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional QC tests are required to evaluate matrix effects.		Accuracy/Bias	
Matrix Spike Duplicate	One per preparatory batch per matrix.	Same as MS and %RPD ≤ 20 between MS and MSD.	Same as MS		Accuracy/Bias, Precision	

TABLE A-39
Laboratory QC Samples Table

Matrix: Surface Soil, Subsurface Soil
Analytical Group: Metals (Hexavalent Chromium)
Analytical Method/SOP Reference: SW-846 7199/GEN-7199

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	1 per batch of 20 or fewer samples.	No target compounds should be >1/2 LOQ.	Reclean, reanalyze and/or qualify the data.	Analyst/Supervisor	Bias/Contamination	Same as QC Acceptance Limits.
LCS		80-120% of the true value.	Redigest if possible. If samples are out of holding time, redigest and report both sets of data. If insufficient sample is available to redigest, flag. If the LCS recoveries are high and the sample results are <LOQ, narrate.		Accuracy/Bias	
MS-soluble		75-125% of the true value.	Redigest entire batch unless spike is diluted out (sample result > 4x spike concentration). If redigest fails, contact client about possible matrix investigations. If samples are out of holding time, redigest and report both sets of data. If insufficient sample is available to redigest, flag. Flag results associated with out of control matrix spike.		Accuracy/Bias	
MS-insoluble						
DUP(or MSD)		If parent concentration is >4x the LOQ, RPD<20%; if the parent concentration is <4x the LOQ, duplicate is acceptable if the difference is not > +/- LOQ.	Reprep and reanalyze sample and duplicate unless obvious or historical interferences or lack of volume.		Precision	
Post Digestion Matrix Spike		85-115% of the true value.	If MS also failed, no action beyond CA for MS.		Bias	

TABLE A-40
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Total Metals and Dissolved Metals (Hexavalent Chromium)
Analytical Method/SOP Reference: SW-846 7199/GEN-7199

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	1 per batch of 20 or fewer samples.	No target compounds detected >1/2 LOQ.	Reclean, reanalyze and/or qualify the data.	Analyst/Supervisor	Bias/Contamination	Same as QC Acceptance Limits.
LCS		84-117% of the true value.	Evaluate, reanalyze batch if possible. If the LCS recoveries are high and the sample results are <QL narrate.		Accuracy/Bias	
MS		38-148% of the true value.	If LCS acceptable, may report with qualifier and note outliers in the case narrative.		Accuracy/ Bias	
Duplicate (or MSD)		If parent concentration is >4x the LOQ, RPD<20%; if the parent concentration is <4x the LOQ, duplicate is acceptable if the difference is not > +/- LOQ.	Repeat sample and duplicate unless obvious or historical interferences or lack of volume.		Precision	

TABLE A-41
Laboratory QC Samples Table

Matrix: Sediment
Analytical Group: AVS-SEM
Analytical Method/SOP Reference: USEPA 821/R-91-100/CA-738

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	No analyte detected >LOQ.	Investigate source of contamination. Reprep and analyze method blank and all samples processed with the contaminated blank.	Analyst, Department Manager	Bias/contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 80-120% of the true value.	Recalibrate and reanalyze sample batch.		Accuracy/bias	
MS	One for every set of 10 samples	Recovery within 75-125% of true value.	Qualify data.		Accuracy/bias	
Laboratory Duplicate	One per preparation batch.	RPD ≤ 20%.	If other lab QC meet criteria and matrix interference suspected, flag data. Otherwise, reanalyze.		Precision	

TABLE A-42
Laboratory QC Samples Table

Matrix: Surface Soil, Sediment
Analytical Group: TOC
Analytical Method/SOP Reference: Lloyd Kahn/CA-741

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	No analyte detected >LOQ.	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If 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, Department Manager	Bias/contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 80-120% of the true value.	Investigate source of problem. If the LCS recovery is high but the sample results are <PQL, narrate. Otherwise, reprep and reanalyze all associated samples.		Accuracy/bias	
MS	One MS per ten samples	Recovery within 75-125% of true value.	If LCS in criteria and matrix interference suspected, flag data. Otherwise, reanalyze		Accuracy/bias	
Laboratory Quadruplicate	One per preparation batch.	RPD ≤ 30%.	If other lab QC meet criteria and matrix interference suspected, flag data. Otherwise, reanalyze.			

TABLE A-43
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Dissolved Gases (Methane, Ethane, Ethene)
Analytical Method/SOP Reference: RSK-175/CA-336

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	Analyte concentration must be < ½ LOQ.	Investigate source of contamination. Evaluate the samples and associated QC: i.e. If the blank results are above the PQL, report samples results which are < PQL >10X the blank concentration. Otherwise, reprep a blank and the remaining samples.	Analyst, Department Manager	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 70-130% of true value.	If the LCS recovery is high but the sample results are < PQL, narrate. Otherwise, investigate the source of the problem, reanalyze the LCS and all associated samples. If issues persist, reprep.		Accuracy/Bias	
MS	One MS per 10 field samples.	Recovery within 70-130% of true value.	Evaluate the samples and associated QC. If an LCS was performed and acceptable, narrate. If the LCS recovery is high but the sample results are < PQL, narrate. Otherwise, reprep.		Accuracy/Bias	
Laboratory Duplicate	One per preparation batch.	RPD ≤ 30%.	Check calculations, Evaluate QC.		Precision	

TABLE A-44
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Ions (Nitrate, Nitrite, Sulfate)
Analytical Method/SOP Reference: E300.0/CA-742

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	Analyte concentration must be <½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater.	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Reprepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst, Department Manager	Contamination/Bias	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 90-110% of the true value.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.		Accuracy/Bias	
MS	One every set of 10 samples.	Recovery within 80-120% of the true value.	Evaluate the samples and associated QC: i.e., If the LCS results are acceptable, narrate.		Accuracy/Bias	
Laboratory Duplicate	One per preparation batch.	RPD ≤ 10%.	Correct problem and reanalyze sample and duplicate.		Precision	

TABLE A-45
Laboratory QC Samples Table

Matrix: Groundwater, Sediment
Analytical Group: Sulfide
Analytical Method/SOP Reference: SM4500S2- F/CA-722

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	Analyte concentration must be < ½ LOQ.	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 where possible or flag results with "b".	Analyst, Department Manager	Contamination/Bias	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 80-120% of the true value.	If the LCS fails repeat LCS determination. Restandardize sulfide, iodine, and/or thiosulfate and repeat LCS. Reprepare affected reagent or standard and repeat LCS.		Accuracy/Bias	
MS	One every set of 10 samples.	Recovery within 75-125% of true value.	Evaluate the samples and associated QC, i.e. if the LCS results are acceptable, narrate. Low recovery may be due to acid-insoluble sulfides.		Accuracy/Bias	
Laboratory Duplicate	One per batch of up to 20 samples.	RPD ≤ 20%.	If RPD is outside criteria report original result with notation or narration.		Precision	

TABLE A-46
Laboratory QC Samples Table

Matrix: Groundwater
Analytical Group: Alkalinity
Analytical Method/SOP Reference: SM2320B/CA-739

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	Analyte concentration must be < ½ LOQ.	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 blank that showed contamination.	Analyst, Department Manager	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 80-120% of the true value.	If the LCS fails high, report samples that are <PQL. Recalibrate and/or reanalyze other samples.		Accuracy/Bias	
MS	One MS per 10 field samples	Recovery within 75-125% of true value.	Evaluate the samples and associated QC, i.e. if the LCS results are acceptable, narrate. If both the LCS and MS are unacceptable reprep the samples and QC.		Accuracy/Bias	
Laboratory Duplicate	One per preparation batch.	RPD ≤ 20%.	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.		Precision	

TABLE A-47
Laboratory QC Samples Table

Matrix: Groundwater, Sediment
Analytical Group: Ammonia
Analytical Method/SOP Reference: E350.1/CA-770

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch.	Analyte concentration must be < ½ LOQ.	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 blank that showed contamination.	Analyst, Department Manager	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One per preparation batch.	Recovery within 90-110% of true value.	If the LCS fails high, report samples that are <PQL. Redistill, recalibrate and/or reanalyze other samples.		Accuracy/Bias	
MS	One MS per 10 field samples	Recovery within 75-125% of true value.	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 distillate with post-distillation spike to confirm matrix interference. Notate sample result in raw data if matrix interference confirmed.		Accuracy/Bias	
Laboratory Duplicate	One per preparation batch.	RPD ≤ 20%.	Investigate problem and reanalyze sample in duplicate. If RPD still >20, report original result with notation or narration.		Precision	

TABLE A-48
Laboratory QC Samples Table

Matrix: Tissue

Analytical Group: PCB Congeners and homologues

Analytical Method/SOP Reference: EPA Method 1668A / WS-ID-0013

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQIs	Measurement Performance Criteria
Method Blank	One per preparation batch	Project specific criteria, if available. Otherwise, no target analytes detected ≥ 1/2 LOQ or ≥ 20% of the associated regulatory limit or ≥ 5% of the sample result for the analyte, whichever is greater.	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements. "Totals" are not considered "target analytes" – no corrective action or flagging is necessary for "totals".	Analyst, Department Manager	Accuracy/Bias Contamination	Same as Method/SOP QC Acceptance Limits.
Internal Standard Spike	Every field sample, standard and QC sample	% recovery for each IS in the original sample (prior to dilutions) must be limits per method (within 25-150%R).	Correct problem, then reprep and reanalyze the samples with failed IS.		Precisions and Accuracy/Bias	
Laboratory Control Sample (LCS)	One per sample preparation batch	QSM or laboratory statistically derived control limits, refer to Table A-13.	Reanalyze LCS once. If acceptable, report. Otherwise, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.		Accuracy/Bias Contamination	
MS/MSD	One MS/MSD per analytical/preparation batch	QSM or laboratory statistically derived control limits (refer to Table A-13), RPD ≤ 20%.	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements.		Precision and Accuracy/Bias	

TABLE A-49
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: VOCs

Analytical Method/ SOP Reference: SW-846 8260B / 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 (MPC)
Method Blank	One per preparation batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, reanalyze samples. If acceptance criteria still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
Surrogate	Four per sample	Dibromofluoromethane: 67-118%R 1,2-Dichloroethane-d4: 55-148%R Toluene-d8: 85-115%R 4-Bromofluorobenzene: 85-120%R	For QC and field samples, correct problem then reprepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Laboratory Control Sample (LCS)	One per preparation batch.	Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/ Bias	
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per sample delivery group (SDG) or every 20 samples.	%R should be within the same limits as for the LCS. RPD should be ≤ 30%.	Corrective actions will not be taken for samples when recoveries are outside limits if likely due to matrix; otherwise contact client.		Precision/ Accuracy/ Bias	
Internal Standard	Four per sample: Pentafluorobenzene Chlorobenzene-d5 1,4-dichlorobenzene-d4 1,4-difluorobenzene	Retention times for internal standards must be ± 30 seconds and the responses within -50% to +100% of the ICAL midpoint standard.	Inspect mass spectrometer or gas chromatograph for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.		Accuracy/ Bias	

TABLE A-50
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: SVOC

Analytical Method/SOP Reference: SW-846 8270C full scan / CA-226

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, reanalyze samples. If acceptance criteria still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method / SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and ≤30% for RPD between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Internal Standard	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.		Accuracy	
Surrogates	6 per sample	2-Fluorobiphenyl: 45-105%R Terphenyl-D_{14}: 30-125%R 2,4,6-Tribromophenol: 35-125%R 2-Fluorophenol: 35-105%R Phenol-d_5/d_6: 40-100%R Nitrobenzene-d_5: 35-100%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	

TABLE A-51
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: Pesticides

Analytical Method/SOP Reference: SW-846 8081B / CA-303

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem, then reanalyze samples. If acceptance criteria is still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and RPD ≤30% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Surrogates	2 Per Sample	TCMX: 55-130%R Decahlorobiphenyl: 25-140%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

TABLE A-52
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: PCBs

Analytical Method/SOP Reference: SW-846 8082A / CA-329

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem, then reanalyze samples. If acceptance criteria is still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and RPD ≤30% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Surrogates[1]	2 Per Sample	*TCMX: 56-115%* Decahlorobiphenyl: 60-125%R	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

[1] Italicized limits are laboratory in-house limits, DoD QSM v. 4.1 does not specify limits for this surrogate.

TABLE A-53
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: METALs (cyanide)

Analytical Method/SOP Reference: SW-846 9012B/ WETS-27

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem; then repeat. If the method blank still fails; redigest and analyze all affected samples.	Analyst, Supervisor	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Precision and Accuracy/Bias	
MS		Same as LCS.	In absence of client specific requirements, flag the data.		Precision and Accuracy/Bias	
MSD		Same as LCS and refer to **Worksheet #15** for MS/MSD RPD.	In absence of client specific requirements, flag the data.		Precision and Accuracy/Bias	

TABLE A-54
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: Explosives

Analytical Method/SOP Reference: SW846 8330B / CA-402

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Investigate source of contamination. Evaluate the samples and associated QC: ie. 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	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
Surrogate	1per sample	1,2-dinitrobenzene: 30-150%R	For QC and field samples, correct problem then reprepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor, and Data Validator	Accuracy/Bias	
LCS	One per preparatory batch.	Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Laboratory Supervisor, and Data Validator	Precision/Accuracy/ Bias	
MS/MSD	One per SDG or every 20 samples.	%R should be within the same limits as for the LCS. RPD should be ≤ 30%.	Evaluate the samples and associated QC: ie. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Laboratory Supervisor, and Data Validator	Precision/Accuracy/ Bias	
Second Column Confirmation	All positive results must be confirmed.	Results between primary and second column must be RPD ≤ 40%.	None. Apply qualifier if RPD >40% and discuss in the case narrative. The higher of the two results will be reported unless matrix interference is apparent.	Analyst, Laboratory Department Manager, and Data Validator	Precision	

TABLE A-55
Laboratory QC Samples Table

Matrix: Sediment

Analytical Group: Explosives (nitroguanidine)

Analytical Method/SOP Reference: WS-LC-0010

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparation batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Analyst, Supervisor	Accuracy/Bias Contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One LCS per analytical/ preparation batch, spiked with all analytes to be reported.	Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Reanalyze LCS once. If acceptable, report. Otherwise, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Lab Manager / Analyst	Accuracy/Bias	
MS/MSD for all analytes	One MS/MSD pair per preparation batch	Same as LCS.	Examine the project specific DQOs. Evaluate the data, and re-prepare/reanalyze the native sample and MS/MSD pair as indicated.	Lab Manager / Analyst	Precision and Accuracy/Bias	
Confirmation Analysis	When target analytes detected on the primary column at concentrations > LOD.	Calibration and QC criteria the same as for initial/primary analsyis. Results between primary and secondary column RPD ≤ 40%	Evaluate data, then report with flag to denote RPD > 40%. Narrate obvious matrix issues.	Lab Manager / Analyst	Accuracy/Bias	

TABLE A-56
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: SVOC

Analytical Method/SOP Reference: SW-846 8270C full scan / CA-226

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, reanalyze samples. If acceptance criteria still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method / SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and ≤30% for RPD between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Internal Standard	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.		Accuracy	
Surrogates	6 per sample	2-Fluorobiphenyl: 50-110% Terphenyl-D_{14}: 50-135% 2,4,6-Tribromophenol: 40-125% 2-Fluorophenol: 35-105% Phenol-d_5/d_6: 20-110% Nitrobenzene-d_5: 40-110%	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	

TABLE A-57
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: Pesticides

Analytical Method/SOP Reference: SW-846 8081B / CA-303

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem, then reanalyze samples. If acceptance criteria is still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and RPD ≤30% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Surrogates	2 Per Sample	TCMX: 25-140% Decahlorobiphenyl: 30-135%	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

TABLE A-58
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: PCBs

Analytical Method/SOP Reference: SW-846 8082A / CA-329

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem, then reanalyze samples. If acceptance criteria is still not met, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Supervisor	Accuracy/Bias, Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Accuracy/Bias	
MS		Same as LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.		Accuracy/Bias	
MSD		Same as MS and RPD ≤30% between MS and MSD.	Same as MS.		Accuracy/Bias, Precision	
Surrogates[1]	2 Per Sample	*TCMX: 62-111%* Decahlorobiphenyl: 40-135%	For field and QC sample, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy/Bias	
Confirmation of positive results (second column or second detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA.		Accuracy	

[1] Italicized limits are laboratory in-house limits, DoD QSM v. 4.1 does not specify limits for this surrogate.

TABLE A-59
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: METALs (cyanide)

Analytical Method/SOP Reference: SW-846 9012B/ WETS-27

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Correct problem; then repeat. If the method blank still fails; redigest and analyze all affected samples.	Analyst	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
LCS		Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		Precision and Accuracy/Bias	
MS		Same as LCS.	In absence of client specific requirements, flag the data.		Precision and Accuracy/Bias	
MSD		Same as LCS and refer to **Worksheet #15** for MS/MSD RPD.	In absence of client specific requirements, flag the data.		Precision and Accuracy/Bias	

TABLE A-60
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: Explosives

Analytical Method/SOP Reference: SW846 8330B / CA-402

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per batch of 20 or less	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Investigate source of contamination. Evaluate the samples and associated QC: ie. 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	Bias/Contamination	Same as Method/SOP QC Acceptance Limits.
Surrogate	1 per sample	1,2-dinitrobenzene: 30-150%	For QC and field samples, correct problem then reprepare and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor, and Data Validator	Accuracy/Bias	
LCS	One per preparatory batch.	Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst, Laboratory Supervisor, and Data Validator	Precision/Accuracy/ Bias	
MS/MSD	One per SDG or every 20 samples.	%R should be within the same limits as for the LCS. RPD should be ≤ 30%.	Evaluate the samples and associated QC: ie. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, reprep the samples and QC.	Analyst, Laboratory Supervisor, and Data Validator	Precision/Accuracy/ Bias	
Second Column Confirmation	All positive results must be confirmed.	Results between primary and second column must be RPD ≤ 40%.	None. Apply qualifier if RPD >40% and discuss in the case narrative. The higher of the two results will be reported unless matrix interference is apparent.	Analyst, Laboratory Department Manager, and Data Validator	Precision	

TABLE A-61
Laboratory QC Samples Table

Matrix: Surface Water

Analytical Group: Explosives (nitroguanidine)

Analytical Method/SOP Reference: WS-LC-0010

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	MPC
Method Blank	One per preparation batch	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Analyst, Supervisor	Accuracy/Bias Contamination	Same as Method/SOP QC Acceptance Limits.
LCS	One LCS per analytical/preparation batch, spiked with all analytes to be reported.	Refer to **Worksheet #15**. In-house limits are provided when DoD QSM v. 4.1 does not specify.	Reanalyze LCS once. If acceptable, report. Otherwise, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Lab Manager / Analyst	Accuracy/Bias	
MS/MSD for all analytes	One MS/MSD pair per preparation batch	Same as LCS.	Examine the project specific DQOs. Evaluate the data, and re-prepare/reanalyze the native sample and MS/MSD pair as indicated.	Lab Manager / Analyst	Precision and Accuracy/Bias	
Confirmation Analysis	When target analytes detected on the primary column at concentrations > LOD.	Calibration and QC criteria the same as for initial/primary analsyis. Results between primary and secondary column RPD ≤ 40%	Evaluate data, then report with flag to denote RPD > 40%. Narrate obvious matrix issues.	Lab Manager / Analyst	Accuracy/Bias	

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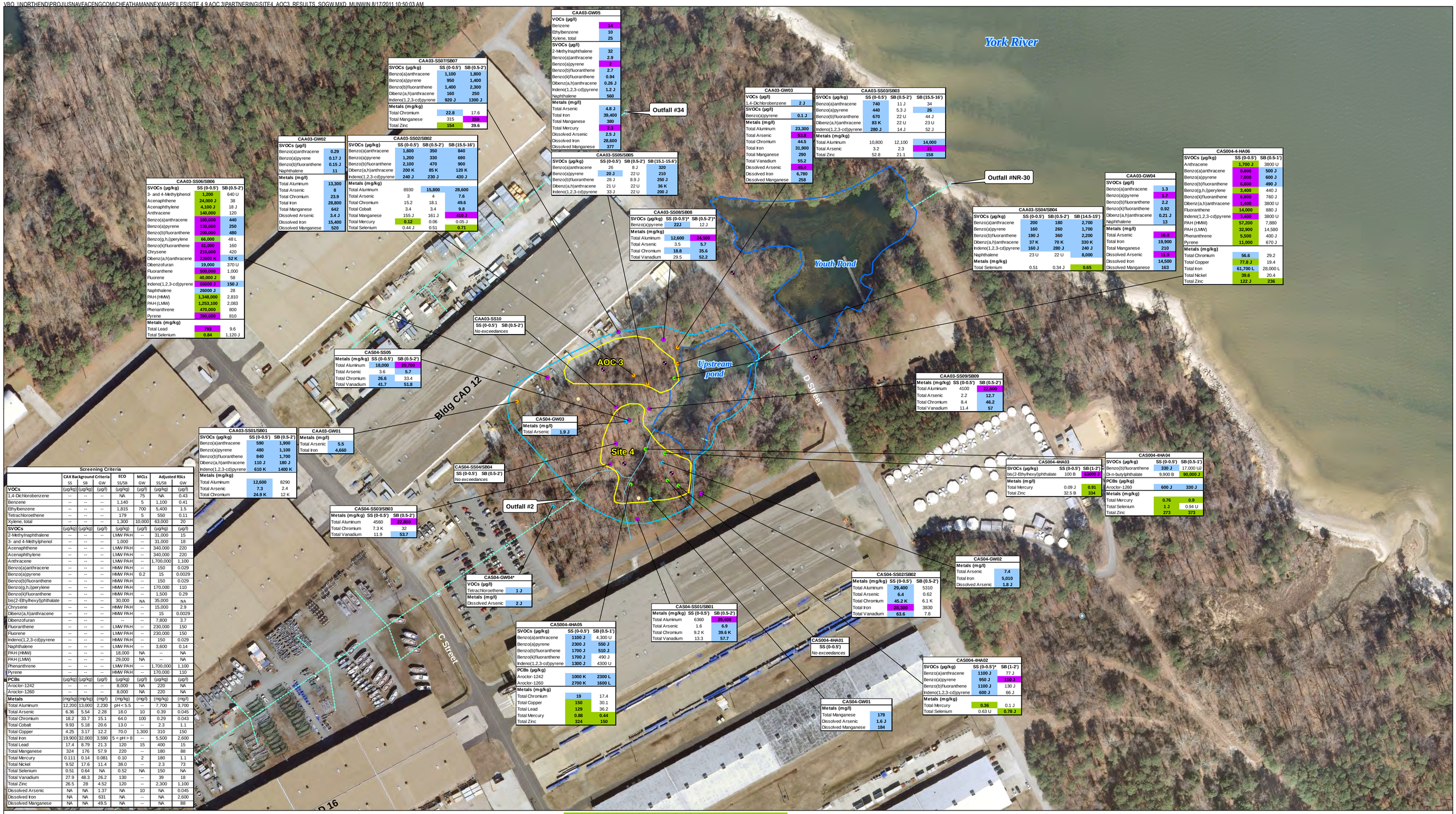
Appendix B
Site Inspection Exceedance Figures



CAA03-GW05

VOCs (µg/l)	
Benzene	14
Ethylbenzene	10
Xylene, total	25
SVOCs (µg/l)	
2-Methylnaphthalene	32
Benzo(a)anthracene	2.9
Benzo(a)pyrene	2
Benzo(b)fluoranthene	2.7
Benzo(k)fluoranthene	0.94
Dibenz(a,h)anthracene	0.26 J
Indeno(1,2,3-cd)pyrene	1.2 J
Naphthalene	560
Metals (m/g/l)	
Total Arsenic	4.8 J
Total Iron	39,400
Total Manganese	380
Total Mercury	2.3
Dissolved Arsenic	2.5 J
Dissolved Iron	28,600
Dissolved Manganese	377

CAA03-SS07/SB07

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')
Benzo(a)anthracene	1,100	1,800
Benzo(a)pyrene	950	1,400
Benzo(b)fluoranthene	1,400	2,300
Dibenz(a,h)anthracene	160	250
Indeno(1,2,3-cd)pyrene	920 J	1300 J
Metals (mg/kg)		
Total Chromium	22.8	17.6
Total Manganese	315	259
Total Zinc	154	39.6

CAA03-GW02

SVOCs (µg/l)	
Benzo(a)anthracene	0.29
Benzo(a)pyrene	0.17 J
Benzo(b)fluoranthene	0.15 J
Naphthalene	11
Metals (m/g/l)	
Total Aluminum	13,300
Total Arsenic	8
Total Chromium	23.9
Total Iron	28,800
Total Manganese	642
Dissolved Arsenic	3.4 J
Dissolved Iron	15,400
Dissolved Manganese	520

CAA03-SS02/SB02

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')	SB (15.5-16')
Benzo(a)anthracene	1,600	350	940
Benzo(a)pyrene	1,200	330	690
Benzo(b)fluoranthene	2,100	470	900
Dibenz(a,h)anthracene	200 K	85 K	120 K
Indeno(1,2,3-cd)pyrene	240 J	230 J	430 J
Metals (mg/kg)			
Total Aluminum	8930	15,800	28,600
Total Arsenic	3	4	7.6
Total Chromium	15.2	18.1	49.6
Total Cobalt	3.4	3.4	9.8
Total Manganese	155 J	161 J	410 J
Total Mercury	0.12	0.06	0.05 J
Total Selenium	0.44 J	0.51	0.71

CAA03-SS05/SB05

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')	SB (15.1-15.6')
Benzo(a)anthracene	26	8 J	320
Benzo(a)pyrene	20 J	22 U	210
Benzo(b)fluoranthene	28 J	8.9 J	250 J
Dibenz(a,h)anthracene	21 U	22 U	36 K
Indeno(1,2,3-cd)pyrene	33 J	22 U	200 J

CAA03-SS06/SB06

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')
3- and 4-Methylphenol	1,200	640 U
Acenaphthene	24,000 J	38
Acenaphthylene	4,100 J	18 J
Anthracene	140,000	120
Benzo(a)anthracene	180,000	440
Benzo(a)pyrene	130,000	250
Benzo(b)fluoranthene	200,000	480
Benzo(g,h,i)perylene	66,000	48 L
Benzo(k)fluoranthene	81,000	160
Chrysene	210,000	420
Dibenz(a,h)anthracene	22000 K	52 K
Dibenzofuran	19,000	370 U
Fluoranthene	500,000	1,000
Fluorene	40,000 J	58
Indeno(1,2,3-cd)pyrene	69000 J	150 J
Naphthalene	26000 J	28
PAH (HMW)	1,348,000	2,810
PAH (LMW)	1,253,100	2,083
Phenanthrene	470,000	800
Pyrene	390,000	810
Metals (mg/kg)		
Total Lead	793	9.6
Total Selenium	0.84	1.120 J

CAA03-SS10

SS (0-0.5')	SB (0.5-2')
No exceedances	

CAA03-SS08/SB08

SVOCs (µg/kg)	SS (0-0.5')*	SB (0.5-2')*
Benzo(a)pyrene	22J	12 J
Metals (m/g/kg)		
Total Aluminum	12,600	24,500
Total Arsenic	3.5	5.7
Total Chromium	18.8	35.6
Total Vanadium	29.5	52.2

CAA03-GW03

VOCs (µg/l)	
1,4-Dichlorobenzene	2 J
SVOCs (µg/l)	
Benzo(a)pyrene	0.1 J
Metals (m/g/l)	
Total Aluminum	23,300
Total Arsenic	53.8
Total Chromium	44.5
Total Iron	31,900
Total Manganese	290
Total Vanadium	55.2
Dissolved Arsenic	45.4
Dissolved Iron	6,780
Dissolved Manganese	258

CAA03-SS03/SB03

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')	SB (15.5-16')
Benzo(a)anthracene	740	11 J	34
Benzo(a)pyrene	440	5.3 J	26
Benzo(b)fluoranthene	670	22 U	44 J
Dibenz(a,h)anthracene	83 K	22 U	23 U
Indeno(1,2,3-cd)pyrene	280 J	14 J	52 J
Metals (m/g/kg)			
Total Aluminum	10,800	12,100	14,000
Total Arsenic	3.2	2.3	21
Total Zinc	52.8	21.1	158

CAA03-GW04

SVOCs (µg/l)	
Benzo(a)anthracene	1.3
Benzo(a)pyrene	1.7
Benzo(b)fluoranthene	2.2
Benzo(k)fluoranthene	0.92
Dibenz(a,h)anthracene	0.21 J
Naphthalene	13
Metals (mg/l)	
Total Arsenic	16.8
Total Iron	19,900
Total Manganese	210
Dissolved Arsenic	11.9
Dissolved Iron	14,500
Dissolved Manganese	163

CAS004-4-HA06

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-1')
Anthracene	1,700 J	3800 U
Benzo(a)anthracene	8,800	500 J
Benzo(a)pyrene	7,000	600 J
Benzo(b)fluoranthene	6,800	490 J
Benzo(g,h,i)perylene	3,400	440 J
Benzo(k)fluoranthene	6,800	760 J
Dibenz(a,h)anthracene	1,400	3800 U
Fluoranthene	14,000	880 J
Indeno(1,2,3-cd)pyrene	3,400	3800 U
PAH (HMW)	57,200	7,880
PAH (LMW)	32,900	14,580
Phenanthrene	5,500	400 J
Pyrene	11,000	670 J
Metals (mg/kg)		
Total Chromium	56.6	29.2
Total Copper	77.8 J	19.4
Total Iron	61,700 L	28,000 L
Total Nickel	39.6	20.4
Total Zinc	122 J	236

CAA03-SS04/SB04

SVOCs (µg/kg)	SS (0-0.5')	SB (1-2')
bis(2-Ethylhexyl)phthalate	100 B	63000 J
Metals (m/g/l)		
Total Mercury	0.09 J	0.91
Total Zinc	32.5 B	334

CAA03-SS04/SB04

SS (0-0.5')	SB (0.5-2')
No exceedances	

CAA03-SS09/SB09

Metals (mg/kg)	SS (0-0.5')	SB (0.5-2')
Total Aluminum	4100	22,600
Total Arsenic	2.2	12.7
Total Chromium	8.4	46.2
Total Vanadium	11.4	57

CAS004-SS05

Metals (mg/kg)	SS (0-0.5')	SB (0.5-2')
Total Aluminum	18,000	20,700
Total Arsenic	3.6	5.7
Total Chromium	26.6	33.4
Total Vanadium	41.7	51.8

CAA03-SS01/SB01

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-2')
Benzo(a)anthracene	590	1,900
Benzo(a)pyrene	480	1,100
Benzo(b)fluoranthene	840	1,700
Dibenz(a,h)anthracene	110 J	180 J
Indeno(1,2,3-cd)pyrene	610 K	1400 K
Metals (m/g/kg)		
Total Aluminum	12,600	8290
Total Arsenic	7.3	2.4
Total Chromium	24.9 K	12 K

CAA03-GW01

Metals (m/g/l)	
Total Arsenic	5.5
Total Iron	4,660

CAS04-GW03

Metals (m/g/l)	
Total Arsenic	1.9 J

CAS004-4HA03

SVOCs (µg/kg)	SS (0-0.5')	SB (1-2')
bis(2-Ethylhexyl)phthalate	100 B	63000 J
Metals (m/g/l)		
Total Mercury	0.09 J	0.91
Total Zinc	32.5 B	334

CAS004-4HA04

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-1')
Benzo(b)fluoranthene	330 J	17,000 UJ
Di-n-butylphthalate	9,900 B	90,000 J
PCBs (µg/kg)		
Aroclor-1260	600 J	330 J
Metals (m/g/kg)		
Total Mercury	0.76	0.9
Total Selenium	1 J	0.94 U
Total Zinc	273	373

CAS004-SS03/SB03

Metals (mg/kg)	SS (0-0.5')	SB (0.5-2')
Total Aluminum	4560	22,860
Total Chromium	7.3 K	32
Total Vanadium	11.9	53.7

CAS004-GW04*

VOCs (µg/l)	
Tetrachloroethene	1 J
Metals (m/g/l)	
Dissolved Arsenic	2 J

CAS004-SS02/SB02

Metals (mg/kg)	SS (0-0.5')	SB (0.5-2')
Total Aluminum	29,400	5310
Total Arsenic	6.4	0.62
Total Chromium	45.2 K	6.1 K
Total Iron	28,300	3830
Total Vanadium	63.6	7.8

CAS004-GW02

Metals (m/g/l)	
Total Arsenic	7.4
Total Iron	5,010
Dissolved Arsenic	1.8 J

CAS004-SS01/SB01

Metals (mg/kg)	SS (0-0.5')	SB (0.5-2')
Total Aluminum	6360	29,460
Total Arsenic	1.6	6.9
Total Chromium	9.2 K	39.6 K
Total Vanadium	13.3	57.7

CAS004-4HA05

SVOCs (µg/kg)	SS (0-0.5')	SB (0.5-1')
Benzo(a)anthracene	1100 J	4,300 U
Benzo(a)pyrene	2300 J	550 J
Benzo(b)fluoranthene	1700 J	510 J
Benzo(k)fluoranthene	1700 J	490 J
Indeno(1,2,3-cd)pyrene	1300 J	4300 U
PCBs (µg/kg)		
Aroclor-1242	1000 K	2300 L
Aroclor-1260	2700 K	1600 L
Metals (m/g/kg)		
Total Chromium	19	17.4
Total Copper	150	30.1
Total Lead	129	36.2
Total Mercury	0.88	0.44
Total Zinc	324	150

CAS004-4HA01

SS (0-0.5')
No exceedances

CAS004-4HA02

SVOCs (µg/kg)	SS (0-0.5')*	SB (1-2')
Benzo(a)anthracene	1100 J	77 J
Benzo(a)pyrene	950 J	110 J
Benzo(b)fluoranthene	1100 J	130 J
Indeno(1,2,3-cd)pyrene	600 J	66 J
Metals (m/g/kg)		
Total Mercury	0.36	0.1 J
Total Selenium	0.63 U	0.78 J

CAS004-GW01

Metals (m/g/l)	
Total Manganese	179
Dissolved Arsenic	1.6 J
Dissolved Manganese	184

Screening Criteria

	CAX Background Criteria			ECO	MCLs	Adjusted RSLs	
	SS	SB	GW	SS/SB	GW	SS/SB	GW
VOCs	(µg/kg)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)
1,4-Dichlorobenzene	--	--	--	NA	75	NA	0.43
Benzene	--	--	--	1,140	5	1,100	0.41
Ethylbenzene	--	--	--	1,815	700	5,400	1.5
Tetrachloroethene	--	--	--	179	5	550	0.11
Xylene, total	--	--	--	1,300	10,000	63,000	20
SVOCs	(µg/kg)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)
2-Methylnaphthalene	--	--	--	LMW PAH	--	31,000	15
3- and 4-Methylphenol	--	--	--	1,000	--	31,000	18
Acenaphthene	--	--	--	LMW PAH	--	340,000	220
Acenaphthylene	--	--	--	LMW PAH	--	340,000	220
Anthracene	--	--	--	LMW PAH	--	1,700,000	1,100
Benzo(a)anthracene	--	--	--	HMW PAH	--	150	0.029
Benzo(a)pyrene	--	--	--	HMW PAH	0.2	15	0.0029
Benzo(b)fluoranthene	--	--	--	HMW PAH	--	150	0.029
Benzo(g,h,i)perylene	--	--	--	HMW PAH	--	170,000	110
Benzo(k)fluoranthene	--	--	--	HMW PAH	--	1,500	0.29
bis(2-Ethylhexyl)phthalate	--	--	--	30,000	NA	35,000	NA
Chrysene	--	--	--	HMW PAH	--	15,000	2.9
Dibenz(a,h)anthracene	--	--	--	HMW PAH	--	15	0.0029
Dibenzofuran	--	--	--	--	--	7,800	3.7
Fluoranthene	--	--	--	LMW PAH	--	230,000	150
Fluorene	--	--	--	LMW PAH	--	230,000	150
Indeno(1,2,3-cd)pyrene	--	--	--	HMW PAH	--	150	0.029
Naphthalene	--	--	--	LMW PAH	--	3,600	0.14
PAH (HMW)	--	--	--	18,000	NA	--	NA
PAH (LMW)	--	--	--	29,000	NA	--	NA
Phenanthrene	--	--	--	LMW PAH	--	1,700,000	1,100
Pyrene	--	--	--	HMW PAH	--	170,000	110
PCBs	(µg/kg)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)	(µg/kg)	(µg/l)
Aroclor-1242	--	--	--	8,000	NA	220	NA
Aroclor-1260	--	--	--	8,000	NA	220	NA
Metals	(mg/kg)	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)
Total Aluminum	12,200	13,000	2,230	pH < 5.5	--	7,700	3,700
Total Arsenic	6.36	5.54	2.28	18.0	10	0.39	0.045
Total Chromium	18.2	33.7	15.1	64.0	100	0.29	0.043
Total Cobalt	9.93	5.18	20.6	13.0	--	2.3	1.1
Total Copper	4.25	3.17	12.2	70.0	1,300	310	150
Total Iron	19,900	32,000	3,590	5 < pH > 8	--	5,500	2,600
Total Lead	17.4	8.79	21.3	120	15	400	15
Total Manganese	324	176	57.9	220	--	180	88
Total Mercury	0.111	0.14	0.081	0.10	2	180	1.1
Total Nickel	9.52	17.6	11.4	38.0	--	2.3	73
Total Selenium	0.51	0.64	NA	0.52	NA	150	NA
Total Vanadium	27.9	48.3	26.2	130	--	39	18
Total Zinc	26.5	28	4.52	120	--	2,300	1,100
Dissolved Arsenic	NA	NA	1.37	NA	10	NA	0.045
Dissolved Iron	NA	NA	631	NA	--	NA	2,600
Dissolved Manganese	NA	NA	49.5	NA	--	NA	88

Legend

- Outfall
- Storm Water Line
- Culvert
- Drainage Channels
- Proposed Site 4 Study Area
- Site Boundary
- Water Body
- 2009 SI DPT Soil Sample/Well Point Groundwater Sample Location
- 2009 SI Soil Sample Location
- 2009 SI Well Point Groundwater Sample Location
- 1999 Soil Sample
- Proposed RI Groundwater Sample Location
- Proposed RI Soil Sample Location

Exceeds Background and Ecological Screening Criteria
Exceeds Background and RSL Criteria
Exceeds Background, RSL Criteria and Ecological Criteria (Soil) or MCL (Groundwater)

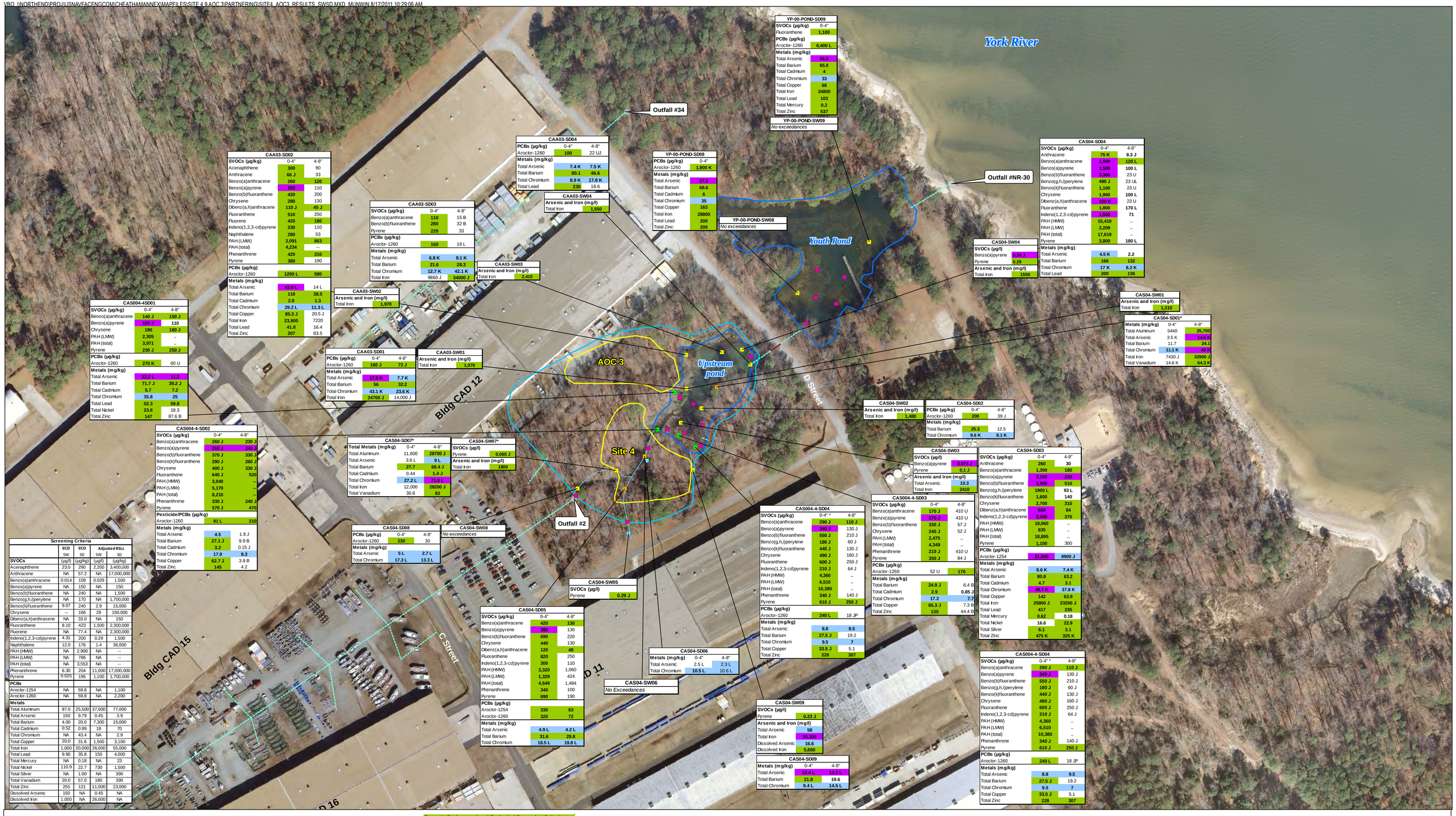
Adjusted Residential Soil RSLs screened against soil results
Adjusted Tapwater RSLs screened against groundwater results
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two
B - Analyte not detected above the level reported in blanks
GW - groundwater
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
mg/kg - milligrams per kilogram
mg/l - milligrams per liter
NA - not applicable
SS - surface soil
SB - subsurface soil
U - The material was analyzed for, but not detected
µg/kg - micrograms per kilogram
µg/l - micrograms per liter

N
W E
S

0 100 200 300 400 Feet

Site 4/AOC 3 Results
Soil and Groundwater
Cheatham Annex
Williamsburg, Virginia

CH2MHILL



YP-00-POND-SD09	
SVOCs (µg/kg)	0-4"
Fluoranthene	1,100
PCBs (µg/kg)	
Aroclor-1260	6,400 L
Metals (mg/kg)	
Total Arsenic	56.2
Total Barium	65.0
Total Cadmium	4
Total Chromium	33
Total Copper	68
Total Iron	34800
Total Lead	103
Total Mercury	0.2
Total Zinc	537

YP-00-POND-SW09
No exceedances

CAA03-SD04		
PCBs (µg/kg)	0-4"	4-8"
Aroclor-1260	100	22 UJ
Metals (mg/kg)		
Total Arsenic	7.4 K	7.5 K
Total Barium	80.1	46.6
Total Chromium	8.9 K	17.8 K
Total Lead	230	18.6

CAA03-SW04	
Arsenic and Iron (mg/l)	
Total Iron	1,550

YP-00-POND-SD08	
PCBs (µg/kg)	0-4"
Aroclor-1260	1,900 K
Metals (mg/kg)	
Total Arsenic	27.2
Total Barium	68.6
Total Cadmium	6
Total Chromium	35
Total Copper	163
Total Iron	28800
Total Lead	200
Total Zinc	200

YP-00-POND-SW08
No exceedances

CAA03-SD02		
SVOCs (µg/kg)	0-4"	4-8"
Acenaphthene	300	90
Anthracene	66 J	33
Benzo(a)anthracene	260	120
Benzo(a)pyrene	250	110
Benzo(b)fluoranthene	420	200
Chrysene	280	130
Dibenz(a,h)anthracene	110 J	45 J
Fluoranthene	510	250
Fluorene	420	180
Indeno(1,2,3-cd)pyrene	230	110
Naphthalene	280	53
PAH (LMW)	2,091	863
PAH (total)	4,234	--
Phenanthrene	420	210
Pyrene	380	190
PCBs (µg/kg)		
Aroclor-1260	1200 L	580
Metals (mg/kg)		
Total Arsenic	43.6 L	14 L
Total Barium	118	38.5
Total Cadmium	2.9	1.3
Total Chromium	29.2 L	11.3 L
Total Copper	85.3 J	20.5 J
Total Iron	23,900	7220
Total Lead	41.8	16.4
Total Zinc	207	83.5

CAA03-SD03		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	110	15 B
Benzo(b)fluoranthene	280	32 B
Pyrene	220	33
PCBs (µg/kg)		
Aroclor-1260	160	16 L
Metals (mg/kg)		
Total Arsenic	6.8 K	9.1 K
Total Barium	21.6	28.3
Total Chromium	12.7 K	42.1 K
Total Iron	9860 J	34000 J

CAA03-SW03	
Arsenic and Iron (mg/l)	
Total Iron	2,410

CAA03-SW02	
Arsenic and Iron (mg/l)	
Total Iron	1,870

CAA03-SD01		
PCBs (µg/kg)	0-4"	4-8"
Aroclor-1260	160 J	72 J
Metals (mg/kg)		
Total Arsenic	17.9 K	7.7 K
Total Barium	56	32.2
Total Chromium	43.1 K	23.6 K
Total Iron	24700 J	14,000 J

CAA03-SW01	
Arsenic and Iron (mg/l)	
Total Iron	1,070

CAS04-SD04		
SVOCs (µg/kg)	0-4"	4-8"
Anthracene	75 K	8.3 J
Benzo(a)anthracene	1,500	120 L
Benzo(a)pyrene	1,500	100 L
Benzo(b)fluoranthene	3,200	23 U
Benzo(g,h,i)perylene	490 J	23 UL
Benzo(k)fluoranthene	1,100	23 U
Chrysene	1,900	100 L
Dibenz(a,h)anthracene	320 K	23 U
Fluoranthene	1,800	170 L
Indeno(1,2,3-cd)pyrene	1,500	71
PAH (HMW)	15,410	--
PAH (LMW)	2,209	--
PAH (total)	17,619	--
Pyrene	3,800	180 L
Metals (mg/kg)		
Total Arsenic	4.5 K	2.2
Total Barium	166	132
Total Chromium	17 K	8.2 K
Total Lead	200	136

CAS04-SW04	
SVOCs (µg/l)	
Benzo(a)pyrene	0.24 J
Pyrene	0.29
Arsenic and Iron (mg/l)	
Total Iron	1550

CAS04-SW01	
Arsenic and Iron (mg/l)	
Total Iron	1,310

CAS04-SD01*		
Metals (mg/kg)	0-4"	4-8"
Total Aluminum	5440	25,700
Total Arsenic	3.5 K	14.6 K
Total Barium	11.7	24.1
Total Chromium	11.1 K	49 K
Total Iron	7430 J	32900 J
Total Vanadium	14.6 K	64.3 K

CAS004-4SD01		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	140 J	150 J
Benzo(a)pyrene	160 J	110
Chrysene	190	180 J
PAH (LMW)	2,305	--
PAH (total)	3,971	--
Pyrene	230 J	250 J
PCBs (µg/kg)		
Aroclor-1260	270 K	60 U
Metals (mg/kg)		
Total Arsenic	12.2 L	11.2
Total Barium	71.7 J	39.2 J
Total Cadmium	5.7	7.2
Total Chromium	35.8	25
Total Lead	52.3	58.8
Total Nickel	23.6	18.3
Total Zinc	147	87.6 B

CAS04-SW02	
Arsenic and Iron (mg/l)	
Total Iron	1,480

CAS04-SD02		
PCBs (µg/kg)	0-4"	4-8"
Aroclor-1260	200	39 J
Metals (mg/kg)		
Total Barium	25.3	12.5
Total Chromium	9.6 K	8.1 K

CAS004-4-SD02		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	260 J	230 J
Benzo(a)pyrene	260 J	240 J
Benzo(b)fluoranthene	370 J	330 J
Benzo(k)fluoranthene	290 J	280 J
Chrysene	400 J	330 J
Fluoranthene	640 J	520
PAH (HMW)	3,040	--
PAH (LMW)	5,170	--
PAH (total)	8,210	--
Phenanthrene	330 J	240 J
Pyrene	570 J	470
Pesticide/PCBs (µg/kg)		
Aroclor-1260	91 L	210
Metals (mg/kg)		
Total Arsenic	4.5	1.9 J
Total Barium	27.1 J	9.9 B
Total Cadmium	3.2	0.15 J
Total Chromium	17.9	9.3
Total Copper	62.7 J	3.8 B
Total Zinc	145	4.2

CAS04-SD07*		
Total Metals (mg/kg)	0-4"	4-8"
Total Aluminum	11,600	28700 J
Total Arsenic	3.6 L	9 L
Total Barium	27.7	68.4 J
Total Cadmium	0.44	1.4 J
Total Chromium	27.2 L	71.8 L
Total Iron	12,000	28200 J
Total Vanadium	30.6	82

CAS04-SW07*	
SVOCs (µg/l)	
Pyrene	0.065 J
Arsenic and Iron (mg/l)	
Total Iron	1800

CAS04-SW03	
SVOCs (µg/l)	
Benzo(a)pyrene	0.073 J
Pyrene	0.1 J
Arsenic and Iron (mg/l)	
Total Arsenic	10.3
Total Iron	2410

CAS04-SD03		
SVOCs (µg/kg)	0-4"	4-8"
Anthracene	260	30
Benzo(a)anthracene	1,300	180
Benzo(a)pyrene	2,100	220
Benzo(b)fluoranthene	3,900	510
Benzo(g,h,i)perylene	1900 L	93 L
Benzo(k)fluoranthene	1,600	140
Chrysene	2,700	310
Dibenz(a,h)anthracene	660	84
Indeno(1,2,3-cd)pyrene	2,800	370
PAH (HMW)	18,060	--
PAH (LMW)	835	--
PAH (total)	18,895	--
Pyrene	1,100	300
PCBs (µg/kg)		
Aroclor-1254	21,000	8900 J
Metals (mg/kg)		
Total Arsenic	8.6 K	7.4 K
Total Barium	80.8	63.2
Total Cadmium	4.7	3.1
Total Chromium	49.7 K	37.8 K
Total Copper	142	63.9
Total Iron	25800 J	23200 J
Total Lead	417	235
Total Mercury	0.62	0.18
Total Nickel	16.6	22.9
Total Silver	6.1	3.1
Total Zinc	475 K	325 K

CAS004-4-SD03		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	170 J	410 U
Benzo(a)pyrene	170 J	410 U
Benzo(b)fluoranthene	330 J	57 J
Chrysene	240 J	52 J
PAH (LMW)	2,475	--
PAH (total)	4,349	--
Phenanthrene	210 J	410 U
Pyrene	350 J	84 J
PCBs (µg/kg)		
Aroclor-1260	52 U	170
Metals (mg/kg)		
Total Barium	24.9 J	6.4 B
Total Cadmium	2.9	0.85 J
Total Chromium	17.2	7.7
Total Copper	65.3 J	7.3 B
Total Zinc	130	44.4 B

CAS004-4-SD04		
SVOCs (µg/kg)	0-4" *	4-8"
Benzo(a)anthracene	290 J	110 J
Benzo(a)pyrene	340 J	130 J
Benzo(b)fluoranthene	550 J	210 J
Benzo(g,h,i)perylene	180 J	60 J
Benzo(k)fluoranthene	440 J	130 J
Chrysene	490 J	160 J
Fluoranthene	600 J	250 J
Indeno(1,2,3-cd)pyrene	210 J	64 J
PAH (HMW)	4,360	--
PAH (LMW)	6,510	--
PAH (total)	10,380	--
Phenanthrene	340 J	140 J
Pyrene	610 J	250 J
PCBs (µg/kg)		
Aroclor-1260	240 L	18 JP
Metals (mg/kg)		
Total Arsenic	8.8	9.5
Total Barium	27.5 J	19.2
Total Chromium	9.5	7
Total Copper	33.5 J	5.1
Total Zinc	228	307

CAS004-4-SD04		
SVOCs (µg/kg)	0-4" *	4-8"
Benzo(a)anthracene	290 J	110 J
Benzo(a)pyrene	340 J	130 J
Benzo(b)fluoranthene	550 J	210 J
Benzo(g,h,i)perylene	180 J	60 J
Benzo(k)fluoranthene	440 J	130 J
Chrysene	490 J	160 J
Fluoranthene	600 J	250 J
Indeno(1,2,3-cd)pyrene	210 J	64 J
PAH (HMW)	4,360	--
PAH (LMW)	6,510	--
PAH (total)	10,380	--
Phenanthrene	340 J	140 J
Pyrene	610 J	250 J
PCBs (µg/kg)		
Aroclor-1260	240 L	18 JP
Metals (mg/kg)		
Total Arsenic	8.8	9.5
Total Barium	27.5 J	19.2
Total Chromium	9.5	7
Total Copper	33.5 J	5.1
Total Zinc	228	307

CAS04-SD08		
PCBs (µg/kg)	0-4"	4-8"
Aroclor-1260	230	30
Metals (mg/kg)		
Total Arsenic	5 L	2.7 L
Total Chromium	17.3 L	13.3 L

CAS04-SW08
No exceedances

CAS04-SW05	
SVOCs (µg/l)	
Pyrene	0.29 J

CAS04-SD05		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	420	130
Benzo(a)pyrene	380	130
Benzo(b)fluoranthene	690	220
Chrysene	440	130
Dibenz(a,h)anthracene	120	48
Fluoranthene	820	250
Indeno(1,2,3-cd)pyrene	300	110
PAH (HMW)	3,320	1,060
PAH (LMW)	1,329	424
PAH (total)	4,649	1,484
Phenanthrene	340	100
Pyrene	690	190
PCBs (µg/kg)		
Aroclor-1254	330	63
Aroclor-1260	320	72
Metals (mg/kg)		
Total Arsenic	4.9 L	4.2 L
Total Barium	31.6	29.8
Total Chromium	18.5 L	19.8 L

CAS04-SD06		
Metals (mg/kg)	0-4"	4-8"
Total Arsenic	2.5 L	2.3 L
Total Chromium	10.5 L	10.6 L

CAS04-SW06
No Exceedances

CAS04-SW09	
SVOCs (µg/l)	
Pyrene	0.23 J
Arsenic and Iron (mg/l)	
Total Arsenic	58
Total Iron	30,300
Dissolved Arsenic	16.6
Dissolved Iron	5,680

CAS04-SD09		
Metals (mg/kg)	0-4"	4-8"
Total Arsenic	10.4 L	13.2 L
Total Barium	21.8	19.6
Total Chromium	9.4 L	14.5 L

Screening Criteria				
	ECO	ECO	Adjusted RSLs	
	SW	SD	SW	SD
SVOCs	(µg/l)	(µg/kg)	(µg/l)	(µg/kg)
Acenaphthene	23.0	290	2,200	3,400,000
Anthracene	NA	57.2	NA	17,000,000
Benzo(a)anthracene	0.014	108	0.029	1,500
Benzo(a)pyrene	NA	150	NA	150
Benzo(b)fluoranthene	NA	240	NA	1,500
Benzo(g,h,i)perylene	NA	170	NA	1,700,000
Benzo(k)fluoranthene	9.07	240	2.9	15,000
Chrysene	--	166	29	150,000
Dibenz(a,h)anthracene	NA	33.0	NA	150
Fluoranthene	8.10	423	1,500	2,300,000
Fluorene	NA	77.4	NA	2,300,000
Indeno(1,2,3-cd)pyrene	4.31	200	0.29	1,500
Naphthalene	12.0	176	1.4	36,000
PAH (HMW)	NA	2,900	NA	--
PAH (LMW)	NA	786	NA	--
PAH (total)	NA	3,553	NA	--
Phenanthrene	6.30	204	11,000	17,000,000
Pyrene	0.025	195	1,100	1,700,000
PCBs				
Aroclor-1254	NA	59.8	NA	1,100
Aroclor-1260	NA	59.8	NA	2,200
Metals				
Total Aluminum	87.0	25,500	37,000	77,000
Total Arsenic	150	9.79	0.45	3.9
Total Barium	4.00	20.0	7,300	15,000
Total Cadmium	0.52	0.99	18	70
Total Chromium	NA	43.4	NA	2.9
Total Copper	20.0	31.6	1,500	3,100
Total Iron	1,000	20,000	26,000	55,000
Total Lead	9.90	35.8	150	4,000
Total Mercury	NA	0.18	NA	23
Total Nickel	110.9	22.7	730	1,500
Total Silver	NA	1.00	NA	390
Total Vanadium	20.0	57.0	180	390
Total Zinc	255	121	11,000	23,000
Dissolved Arsenic	150	NA	0.45	NA
Dissolved Iron	1,000	NA	26,000	NA

Legend

- Outfall
- Storm Water Line
- Culvert
- Drainage Channels
- Proposed Site 4 Study Area
- Site Boundary
- Water Body
- Surface Water Sample Location
- Sediment Sample Location
- Surface Water/Sediment Sample Location
- 1999 Sediment Sample Location
- Proposed RI Sediment Sample Location

Exceeds Background and Ecological Screening Criteria
Exceeds Background and RSL Criteria
Exceeds Background, RSL Criteria and Ecological Criteria

Adjusted Residential Soil RSLs X 10 screened against sediment results
Adjusted Tapwater RSLs X 10 screened against surface water results
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
mg/kg - milligrams per kilogram
mg/l - milligrams per liter
NA - not applicable
SD - sediment
SW - surface water
U - The material was analyzed for, but not detected
µg/kg - micrograms per kilogram

N
W E
S

0 100 200 300 400
Feet

Site 4/AOC 3 Results
Surface Water and Sediment
Cheatham Annex
Williamsburg, Virginia

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Appendix C
Field Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II or lab grade water)
- Millipore™ deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

A. Decontaminate all sampling equipment that has come in contact with sample according to SOP *Decontamination of Personnel and Equipment.*

B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used, remove the disposable tubing after sampling but before decon. When decon is complete, put a 3- to 5-foot segment of new tubing onto the pump to collect the equipment blank.

D. To collect a field blank, slowly pour ASTM Type II or lab grade water directly into sample containers.

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

F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II or lab grade water.

STANDARD OPERATING PROCEDURE

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water or lab-grade DI water)
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) Liquinox® (or Alconox®) and water solution
- Concentrated (V/V) pesticide grade isopropanol (DO NOT USE ACETONE)
- Large plastic pails or tubs for Liquinox® and water, scrub brushes, squirt bottles for Liquinox® solution, methanol and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Personal Protective Equipment as specified by the Health and Safety Plan
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. PERSONNEL DECONTAMINATION

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Liquinox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Liquinox® solution, remove, and discard into DOT-approved 55-gallon drum.

2. Wash outer gloves in Liquinox® solution, rinse, remove, and discard into DOT-approved 55-gallon drum.

3. Remove disposable coveralls ("Tyveks") and discard into DOT-approved 55-gallon drum.

4. Remove respirator (if worn).

5. Remove inner gloves and discard.

6. At the end of the work day, shower entire body, including hair, either at the work site or at home.

7. Sanitize respirator if worn.

B. SAMPLING EQUIPMENT DECONTAMINATION—GROUNDWATER SAMPLING PUMPS

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.

2. Spread plastic on the ground to keep equipment from touching the ground

3. Turn off pump after sampling. Remove pump from well and remove and dispose of tubing. Place pump in decontamination tube.

4. Turn pump back on and pump 1 gallon of Liquinox® solution through the sampling pump.

5. Rinse with 1 gallon of 10% isopropanol solution pumped through the pump. (DO NOT USE ACETONE).

6. Rinse with 1 gallon of tap water.

7. Rinse with 1 gallon of deionized water.

8. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.

9. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.

10. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in either DOT-approved 55-gallon drums or with solid waste in garbage bags, dependent on Facility/project requirements.

C. SAMPLING EQUIPMENT DECONTAMINATION—OTHER EQUIPMENT

Reusable sampling equipment is decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Before entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Liquinox® solution.
5. Rinse with potable water.
6. Rinse with distilled or potable water and isopropanol solution (DO NOT USE ACETONE).
7. Air dry.
8. Rinse with deionized water.
9. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
10. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
11. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums or with solid waste in garbage bags, dependent on Facility/project requirements.

D. HEALTH AND SAFETY MONITORING EQUIPMENT DECONTAMINATION

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Liquinox® solution, then a towel wet with methanol solution, and finally three times with a towel wet with distilled water. Dispose of all used paper towels in a DOT-approved 55-gallon drum or with solid waste in garbage bags, dependent on Facility/project requirements.

E. SAMPLE CONTAINER DECONTAMINATION

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Liquinox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.

2. Dispose of all used paper towels in a DOT-approved 55-gallon drum or with solid waste in garbage bags, dependent on Facility/project requirements.

F. HEAVY EQUIPMENT AND TOOLS

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Facility

2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of Liquinox®, methanol, and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

STANDARD OPERATING PROCEDURE

Decontamination of Drilling Rigs and Equipment

I. Purpose and Scope

The purpose of this guideline is to provide methods for the decontamination of drilling rigs, downhole drilling tools, and water-level measurement equipment. Personnel decontamination procedures are not addressed in this SOP; refer to the site safety plan and SOP *Decontamination of Personnel and Equipment*. Sample bottles will not be field decontaminated; instead they will be purchased with certification of laboratory sterilization.

II. Equipment and Materials

- Portable steam cleaner and related equipment
- Potable water
- Phosphate-free detergent such as Liquinox®
- Buckets
- Brushes
- Isopropanol, pesticide grade
- Personal Protective Equipment as specified by the Health and Safety Plan
- ASTM–Type II grade water or Lab Grade DI Water
- Aluminum foil

III. Procedures and Guidelines

A. Drilling Rigs and Monitoring Well Materials

Before the onset of drilling, after each borehole, before drilling through permanent isolation casing, and before leaving the site, heavy equipment and machinery will be decontaminated by steam cleaning at a designated area. The steam-cleaning area will be designed to contain decontamination wastes and waste waters and can be an HDPE-lined, bermed pad. A pumping system will be used to convey decontaminated water from the pad to drums.

Surface casings may be steam cleaned in the field if they are exposed to contamination at the site prior to use.

B. Downhole Drilling Tools

Downhole tools will be steam cleaned before the onset of drilling, prior to drilling through permanent isolation casing, between boreholes, and prior to leaving the site. This will include, but is not limited to, rods, split spoons or similar samplers, coring equipment, augers, and casing.

Before the use of a sampling device such as a split-spoon sampler for the collection of a soil sample for physical characterization, the sampler shall be cleaned by scrubbing with a detergent solution followed by a potable water rinse.

Before the use of a sampling device such as a split-spoon sampler for the collection of a soil sample for chemical analysis, the sampler shall be decontaminated following the procedures outlined in the following subsection.

C. Field Analytical Equipment

1. Water Level Indicators

   Water level indicators that consist of a probe that comes into contact with the groundwater must be decontaminated using the following steps:

   a. Rinse with tap water
   b. Rinse with de-ionized water
   c. Solvent rinse with isopropanol
   d. Rinse with de-ionized water

2. Probes

   Probes, for example, pH or specific ion electrodes, geophysical probes, or thermometers that would come in direct contact with the sample, will be decontaminated using the procedures specified above unless manufacturer's instructions indicate otherwise. For probes that make no direct contact, for example, OVM equipment, the probe will be wiped with clean paper-towels or cloth wetted with isopropanol.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- The effectiveness of field cleaning procedures may be monitored by rinsing decontaminated equipment with organic-free water and submitting the rinse water in standard sample containers for analysis.

STANDARD OPERATING PROCEDURE

Sampling Contents of Tanks and Drums

I. Scope and Application

This procedure provides an overview approach and guidelines for the routine sampling of drums and tanks. Its purpose is to describe standard procedures and precautions which are applied in sampling drums and tanks. Procedures for opening drums with the individual instruments are included in Attachment D.

The samples obtained may be used to obtain physical chemical or radiological data. The resulting data may be qualitative or quantitative in nature, and are appropriate for use in preliminary surveys as well as confirmatory sampling.

II. Summary of Methods

Drums are generally sampled by means of sampling tubes such as glass sample tubes or COLIWASA samplers. In either case, the sampling tube is manually inserted into the waste material. A sample of the drum contents is withdrawn by the sampling device. Should a drum contain bottom sludge, a glass tube will be used to retrieve a sample of this as well.

Storage tank and tank trailers, because of their greater depths, require sampling devices that can be lowered from the top, filled at a particular depth, then withdrawn. Such devices are a COLIWASA, a Kemmerer depth sampler, or a Bacon Bomb. Where samples of bottom sludge are desired, a gravity corer can be utilized. This heavy tube with a tapered nose piece will penetrate the sludge as it free falls through the tank.

III. Comments

The sampling of tanks, containers, and drums present unique problems not associated with environmental samples. Containers of this sort are generally closed except for small access ports, manways, or hatches on the larger vessels, or taps and bungs on smaller drums. The physical size, shape, construction material, and location of access limit the types of equipment and methods of collection that can be used.

When liquids are contained in sealed vessels, gas vapor pressure can build up, sludges can settle out, and density layerings (stratification) can develop. Bulging drums may be under pressure and extreme caution should be exercised. The potential exists for explosive reactions or the release of noxious gases when containers are opened. All vessels should be opened with extreme caution. Check the HSP for the level of personnel protection to be worn. A preliminary sampling of any headspace gases is warranted. As a minimum, a preliminary check with an

explosimeter and an organic vapor analyzer may be of aid in selecting a sampling method.

In most cases it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, a sample must be taken that represents the entire depth of the vessel.

IV. Required Equipment and Apparatus

A. **Health and safety equipment/materials**: As listed in the site safety plan.

B. **Sampling equipment**: COLIWASA, glass sample tubes, Kemmerer depth sampler, Bacon Bomb, gravity corer.

C. **Tools**: Rubber mallet, bung wrench, speed wrench with socket, etc., (all non-sparking), paint marker.

D. **Heavy equipment**: Backhoe equipped with explosion shield, drum grappler, and 3-foot copper-beryllium (non-sparking) spike with 6-inch collar (to puncture top of drums for sampling, if necessary).

E. **Sample Containers**: As specified in the field sampling plan.

V. Procedures

A. Drums

NOTE: DO NOT open more than one drum at a time. Each drum must be handled and sampled as a separate entity to reduce vapors in the sampling area.

1. Drums will be sampled on an area-by-area basis. Drums will be sampled after they have been placed in overpack drums but before they are transferred from the excavation to the onsite storage area.

2. Record, in logbook, all pertinent information from visual inspection of drum (e.g., physical condition, leaks, bulges, and labels). Label each drum with a unique identifying number.

3. If possible, stage drums for easy access.

4. If necessary, attach ground strap to drums and grounding point.

5. Remove any standing material (water, etc.) from container top.

6. Using non-sparking tools, carefully remove the bung or lid while monitoring air quality with appropriate instruments. If necessary (and as a last resort), the non-sparking spike affixed to the backhoe can also be used to puncture the drum for sampling. See Attachment D for method of drum opening. Record air-quality monitoring results.

7. When sampling a previously sealed vessel, a check should be made for the presence of bottom sludge. This is accomplished by measuring the depth to apparent bottom, then comparing it to the known interior depth.

8. Agitation to disrupt the layers and rehomogenize the sample is physically difficult and almost always undesirable. If the vessel is greater than 3 feet in depth (say, a 55-gallon drum), the appropriate sampling method is to slowly lower the sampling device (i.e., suction line of peristaltic pump, glass tube) in known increments of length. Discrete samples can be collected from various depths, then combined or analyzed separately. If the depth of the vessel is greater than the lift capacity of the pump, an at-depth water sampler, such as the Kemmerer or Bacon Bomb type, may be required.

9. Extract a representative sample from the drum using a glass rod, COLIWASA, Bacon Bomb, Kemmerer bottle, or gravity corer (See Attachments). Ensure that the entire depth of material is penetrated. Depending on the size of the opening of the drum, three to four takes should be collected from random locations across the drum surface, to ensure a representative sample. Any observed stratification must be recorded in logbook, including number and thickness of the layers and a conceptualized sketch.

10. Record a visual description of the sample (e.g., liquid, solid, color, viscosity, and percent layers).

11. When possible, sampling equipment (like glass tubes) should be expendable and be left inside the drum for disposal with drum contents, once sampling is completed.

12. Place lid, bung, cap, etc., back in place on drum. Tighten hand tight. If necessary, the sampling port can be sealed using a cork.

13. Wipe up spilled material with lab wipes. Wipe off sample containers.

14. Mark the drum with a unique sample identification number and date using a paint marker.

15. Samples will be handled as high hazard samples. Samples will be placed in containers defined according to the analytical needs, wiped clean, and then packed in paint cans for shipping. Packaging, labeling, and preparation for shipment procedures will follow procedures as specified in the field sampling plan.

B. Underground Storage Tanks

1. A sampling team of at least two people is required for sampling—one will collect samples, the other will relay required equipment and implements.

2. Sampling team will locate a sampling port on the tank. Personnel should be wearing appropriate protective clothing at this time and carrying sampling gear.

3. Do not attempt to climb down into tank. Sampling MUST BE accomplished from the top.

4. Collect a sample from the upper, middle, and lower section of the tank contents with one of the recommended sampling devices.

5. If compositing is necessary, ship samples to laboratory in separate containers for laboratory compositing.

6. Samples will be handled as hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

C. Tank Trailers or Above-Ground Storage Tanks

1. A sampling team of two is required. One will collect samples, the other will relay required equipment and implements.

2. Samples will be collected through the manhole (hatch) on top of the tanker or the fill port. Do not open valves at the bottom. Before opening the hatch, check for a pressure gauge or release valve. Open the release valve slowly to bring the tank to atmospheric pressure.

3. If tank pressure is too great, or venting releases large amounts of toxic gas, discontinue venting and sampling immediately. Measure vented gas with organic vapor analyzer and explosimeter.

4. If no release valve exists, slowly loosen hatch cover bolts to relieve pressure in the tank. (Again, stop if pressure is too great.)

5. Once pressure in tank has been relieved, open the hatch and withdraw sample using one of the recommended sampling devices.

6. Sample each trailer compartment.

7. If compositing is necessary, ship samples to laboratory in separate containers for laboratory compositing.

8. Samples will be handled as hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

D. Refer to Attachment B for procedures for sampling with appropriate devices as follows:

<u>Drum</u>

Glass tube — Procedure 1

COLIWASA	–	Procedure 2

<u>Storage Tank and Tank Trailer</u>

COLIWASA	–	Procedure 2
Bacon Bomb	–	Procedure 3
Gravity Corer (for bottom sludge)	–	Procedure 4

VI. Contamination Control

Sampling tools, instruments, and equipment will be protected from sources of contamination prior to use and decontaminated after use as specified in SOP *Decontamination of Personnel and Equipment*. Liquids and materials from decontamination operations will be handled in accordance with the waste management plan. Sample containers will be protected from sources of contamination. Sampling personnel shall wear chemical resistant gloves when handling any samples. Gloves will be decontaminated or disposed of between samples.

VIII. Attachments

A. Collection of Liquid-Containerized Wastes Using Glass Tubes

B. Sampling Containerized Wastes Using the Composite Liquid Waste Sample (COLIWASA)

C. Sampling Containerized Wastes Using the Bacon Bomb Sampler

D. Gravity Corer for sampling Sludges in Large Containers

E. Construction of a Typical COLIWASA

F. Drum Opening Techniques and Equipment

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X. Field Checklist

_____ Sampling Instruments

_____ Tools

_____ Rubber Mallet

_____ Logbook

_____ Safety Glasses or Monogoggles

_____ Safety Shoes

_____ Ice/Cooler, as required

_____ Custody Seals, as required

_____ Chain-of-Custody Forms

_____ Drum Labels, as required

_____ Paint Marker, if drum sampling

_____ Black Indelible Pen

_____ Monitoring Instruments

_____ Labels

_____ Sampling and Analysis Plan

_____ Health and Safety Plan

_____ Decontamination Equipment

_____ Lab Wipes

_____ Lab Spatulas or Stainless Steel Spoons

_____ Chemical Preservatives, as required

_____ Appropriate Containers for Waste and Equipment

_____ Duct Tape

_____ Plastic Sheeting

Attachment A Collection of Liquid-Containerized Wastes Using Glass Tubes

Discussion

Liquid samples from opened containers (i.e., 55-gallon drums) are collected using lengths of glass tubing. The glass tubes are normally 122 centimeters long and 6 to 16 millimeters inside diameter. Larger diameter tubes may be used for more viscous fluids if sampling with the small diameter tube is not adequate. The tubing is broken and discarded in the container after the sample has been collected, eliminating difficult cleanup and disposal problems. This method should not be attempted with less than a two-person sampling team.

Uses

This method provides for a quick, relatively inexpensive means of collecting concentrated containerized wastes. The major disadvantage is from potential sample loss that is especially prevalent when sampling low-viscosity fluids. Splashing can also be a problem and proper protective clothing should always be worn.

Note: A flexible tube with an aspirator attached is an alternative method to the glass tube, and allows various levels to be sampled discretely.

Procedures for Use

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 centimeters extend above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the tube with a safety-gloved thumb or a stopper.
5. Carefully remove the capped tube from the drum. If the tube has passed through more than one layer, the boundary should be apparent in the glass tube.
6. Insert the bottom, uncapped end into the sample container.
7. Partially release the thumb or stopper on the top of the tube and allow the sample to slowly flow into the sample container. If separation of phases is desired, cap off tube before the bottom phase has completely emptied. It may be advisable to have an extra container for "waste," so that the fluid on either side of the phase boundary can be directed into a separate container, allowing collection of pure phase liquids in the sample containers. The liquid remaining after the boundary fluid is removed is collected in yet a third container. NOTE: It is not necessary to put phases in separate containers if analysis of separate phases is not desired.
8. Repeat steps 2 through 6 if more volume is needed to fill the sample container.

9. Remove the tube from the sample container and replace the tube in the drum, breaking it, if necessary, in order to dispose of it in the drum.

Optional Method (if sample of bottom sludge is desired)

1. Remove the cover from the container opening.
2. Insert glass tubing slowly almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 cm extends above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Gently push the tube towards the bottom of the drum into the sludge layer. Do not force it.
5. Cap the top of the tube with a safety-gloved thumb or stopper.
6. Carefully remove the capped tube from the drum and insert the uncapped end into the sample container.
7. Release the thumb or stopper on the top of the tube and allow the sample container to fill to approximately 90 percent of its capacity. If necessary, the sludge plug in the bottom of the tube can be dislodged with the aid of the stainless steel laboratory spatula.
8. Repeat if more volume is needed to fill sample container and recap the tube.

Note:

1. If a reaction is observed when the glass tube is inserted (violent agitation, smoke, light, etc.), the investigators should leave the area immediately.
2. If the glass tube becomes cloudy or smoky after insertion into the drum, the presence of hydrofluoric acid maybe indicated, and a comparable length of rigid plastic tubing should be used to collect the sample.
3. When a solid is encountered in a drum (either layer or bottom sludge) the optional method described above may be used to collect a core of the material, or the material may be collected with a disposable scoop attached to a length of wooden or plastic rod.

Attachment B: Sampling Containerized Wastes using the Composite Liquid Waste Sampler (COLIWASA)

Discussion

The COLIWASA is a much-cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. The sampler is commercially available or can be easily fabricated from a variety of materials, including PVC, glass, or Teflon. In its usual configuration it consists of a 152 cm by 4 cm (inside diameter) section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. See Attachment E: Construction of a COLIWASA.

Uses

The COLIWASA is primarily used to sample containerized liquids. The PVC COLIWASA is reported to be able to sample most containerized liquid wastes except for those containing ketones, nitrobenzene, dimethylforamide, mesityloxide, and tetrahydrofuran. A glass COLIWASA is able to handle all wastes unable to be sampled with the plastic unit except strong alkali and hydrofluoric acid solutions. Due to the unknown nature of many containerized wastes, it would therefore be advisable to eliminate the use of PVC materials and use samplers composed of glass or Teflon.

The major drawback associated with using a COLIWASA is concern for decontamination and costs. The sampler is difficult, if not impossible, to decontaminate in the field, and its high cost in relation to alternative procedures (glass tubes) makes it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if present, to make sure the neoprene rubber stopper provides a tight closure.

2. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.

3. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.

4. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

5. Slowly withdraw the sampler from the waste container with one hand while wiping the sampler tube with a laboratory wipe with the other hand. A phase boundary, if present, can be observed through the tube.

6. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.

7. Unscrew the T-handle of the sampler and disengage the locking block.

Attachment C: Sampling Containerized Wastes using the Bacon Bomb Sampler

Discussion

The Bacon Bomb is designed for the withdrawal of samples from various levels within a storage tank. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable cover provides a point of attachment for the sample line and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber O-ring acting as the plunger-sealing surface. Stainless steel versions are also available. The volumemetric capacity is 8, 16, or 32 oz (237, 473, or 946 ml).

Uses

The Bacon Bomb is a heavy sampler suited best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sampler is needed, the stainless steel version would be used, or any of the samplers could be coated with Teflon.

Procedures for Use

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth.
3. Gradually lower the sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill for a sufficient length of time before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line, being careful not to pull up on the plunger line, thereby accidentally opening the bottom valve.
6. Wipe off the exterior of the sampler body.
7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.

Attachment D: Gravity Corer for Sampling Sludges in Large Containers

Discussion

A gravity corer is a metal tube with a replaceable tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration. Most corers are constructed of brass or steel and many can accept plastic liners and additional weights.

Uses

Corers are capable of collecting samples of most sludges and sediments. They collect essentially undisturbed samples that represent the strata profile that may develop in sediments and sludges during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 75 cm (30 in.) can be attained. Exercise care when using gravity corers in vessels or lagoons that have liners because penetration depths could exceed those of the substrate; this could result in damage to the liner material.

Procedures for Use

1. Attach a precleaned corer to the required length of sample line. Solid braided 5-mm (3/16-in.) nylon line is sufficient; however, 20-mm (3/4-in.) nylon is easier to grasp during hand hoisting. An additional weight can be attached to the outside of the corer if necessary.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through the liquid to the bottom.
4. Retrieve corer with a smooth, continuous, up-lifting motion. Do not bump corer because this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer into stainless steel or Teflon pan (preferred).
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or laboratory spatula.

Attachment E: Construction of a Typical COLIWASA

The sampling tube consists of a 1.52-m (5-ft) by 4.13-cm (1-5/8 in) I.D. translucent plastic pipe, usually polyvinyl chloride (PVC) or borosilicate glass plumbing tube. The closure-locking mechanism consists of a short-length, channeled aluminum bar attached to the sampler's stopper rod by an adjustable swivel. The aluminum bar serves both as a T-handle and lock for the samplers' closure system. When the sampler is in the open position, the handle is placed in the T-position and pushed down against the locking block. This manipulation pushes out the neoprene stopper and opens at the sampling tube. In the closed position, the handle is rotated until one leg of the T is squarely perpendicular against the locking block. This tightly seats the neoprene stopper against the bottom opening of he sampling tube and positively locks the sampler in the closed position. The closure tension can be adjusted by shortening or lengthening the stopper rod by screwing it in or out of the T-handle swivel. The closure system of the sampler consists of a sharply tapered neoprene stopper attached to a 0.95-cm (3/8-in) O.D. rod, usually PVC. The upper end of the stopper rod is connected to the swivel of the aluminum T-handle. The sharply tapered neoprene stopper can be fabricated according to specifications by plastic-products manufacturers at an extremely high price, or it can be made in-house by grinding down the inexpensive stopper with a shop grinder.

COLIWASA samplers are typically made out of plastic or glass. The plastic type consists of translucent plastic (usually PVC) sampling tube. The glass COLIWASA uses borosilicate glass plumbing pipe as the sampling tube and a Teflon plastic stopper rod. For purpose of multiphase sampling, clear plastic or glass is desirable in order to observe the profile of the multiphase liquid.

The sampler is assembled as follows:

a. Attach the swivel to the T-handle with the 3.18-cm (1-1/4 in) long bolt and secure with the 0.48-cm (3/16-in) National Coarse (NC) washer and lock nut.

b. Attach the PFTE stopper to one end of the stopper rod and secure with the 0.95-cm (3/8-in) washer and lock nut.

c. Install the stopper and stopper rod assembly in the sampling tube.

d. Secure the locking block sleeve on the block with glue or screw. This block can also be fashioned by shaping a solid plastic rod on a lathe to the required dimension.

e. Position the locking block on top of the sampling tube such that the sleeveless portion of the block fits inside the tube, the sleeve sits against the top end of the tube, and the upper end of the stopper rod slips though the center hole of the block.

f. Attach the upper end of the stopper rod to the swivel of the T-handle.

g. Place the sampler in the close position and adjust the tension on the stopper by screwing the T-handle in or out.

Attachment F: Drum Opening Techniques and Equipment [1]

I. Introduction

The opening of closed drums prior to sampling entails considerable risk if not done with the proper techniques, tools, and safety equipment. The potential for vapor exposure, skin exposure due to splash or spraying, or even explosion resulting from sparks produced by friction of the tools against the drum, necessitate caution when opening any closed container. Both manual drum opening and remote drum opening will be discussed in the following paragraphs. When drums are opened manually risks are greater than when opened remotely; for this reason, the remote opening of drums is advised whenever possible.

Prior to sampling, the drums should be staged to allow easy access. Also, any standing water or other material should be removed from the container top so that the representative nature of the sample is not compromised when the container is opened. There is also the possibility of encountering a water-reactive substance.

II. Manual Drum Opening

A. Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium (a non-sparking alloy formulated to reduce the likelihood of sparks). The use of bung wrenches marked "NON SPARKING" is encouraged. However, the use of a "NON SPARKING" wrench does not completely eliminate the possibility of spark being produced. Such a wrench only prevents a spark caused by wrench-to-bung friction, but it cannot prevent sparking between the threads on the drum and the bung.

A simple tool to use, the fitting on the bung wrench matching the bung to be removed is inserted into the bung and the tool is turned counterclockwise to remove the bung. Since the contents of some drums may be under pressure (especially, when the ambient temperature is high), the bung should be turned very slowly. If any hissing is heard, the person opening the drum should back off and wait for the hissing to stop. Since drums under pressure can spray out liquids when opened, the wearing of appropriate eye and skin protection in addition to respiratory protection is critical.

B. Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is

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[1] Taken from EPA Training Course: "Sampling for Hazardous Materials," U.S. Environmental Protection Agency, Office of Emergency and Remedial Response Support Division, March 24, 1987.

constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums (i.e., DOT Specification 17E and 17F drums); drums with removable heads must be opened by other means.

Drums are opened with a drum deheader by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote pressure release method prior to using the deheader.

C. Hand Pick or Spike

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike. These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available, whereas the spikes are generally uniquely fabricated 4- foot long poles with a pointed end. Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used for drum opening have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, “sprayers” may result and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

III. Remote Opening

A. Backhoe Spike

The most common means used to open drums remotely for sampling is the use of a metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personnel exposure.

Drums should be “staged,” or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike should be decontaminated after each drum is opened to prevent cross contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This, combined with the normal sampling safety gear, should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system. The hole in the drum can be sealed with a cork.

B. Hydraulic Devices

Recently, remotely operated hydraulic devices have been fabricated to open drums remotely. One such device is discussed here. This device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump that pressurizes oil through a length of hydraulic line. A piercing device with a metal point is attached to the end of this line and is pushed into the drum by the hydraulic pressure. The piercing device can be attached so that a hole for sampling can be made in either the side or the head/lid of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place, if desired, and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

C. Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely. A pneumatic bung remover consists of a compressed air supply (usually SCBA cylinders) that is controlled by a heavy-duty, 2-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill that is adapted to turn a bung fitting (preferably, a bronze-beryllium alloy) selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This attachment and removal procedure is time-consuming and is the major drawback of this device. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

IV. Summary

The opening of closed containers is one of the most hazardous site activities. Maximum efforts would be made to ensure the safety of the sampling team. Proper protective equipment and a general wariness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

STANDARD OPERATING PROCEDURE

Disposal of Waste Fluids and Solids

I. Purpose and Scope

This SOP describes the procedures used to dispose of hazardous fluid and solid materials generated as a result of the site operations. This SOP does not provide guidance on the details of Department of Transportation regulations pertaining to the transport of hazardous wastes; the appropriate Code of Federal Regulations (49 CFR 171 through 177) should be referenced. Also, the site investigation-derived waste management plan should be consulted for additional information and should take precedence over this SOP.

II. Equipment and Materials

A. Fluids

- DOT-approved 55-gallon steel drums or Baker® Tanks
- Tools for securing drum lids
- Funnel for transferring liquid into drum
- Labels
- Paint Pens
- Marking pen for appropriate labels
- Seals for 55-gallon steel drums

B. Solids

- DOT-approved 55-gallon steel drums or rolloffs
- Tools for securing drum lids
- Paint Pens
- Plastic sheets
- Labels
- Marking pen for appropriate labels

III. Procedures and Guidelines

A. Methodology

Clean, empty drums or rolloffs or Baker® Tanks will be brought to the site by the drilling subcontractor for soil and groundwater collection and storage. The empty drums will be located at the field staging area and moved to drilling locations as required. The drums will be filled with the drilling and well installation wastes, capped, sealed, and moved to the onsite drum storage area by the drilling subcontractor. The full drums will separate types of wastes by media. The drums will

be labeled as they are filled in the field and labels indicating that the contents are pending analysis affixed.

The drum contents will be sampled to determine the disposal requirements of the drilling wastes. The drum sampling will be accomplished through the collection and submittal of composite samples, one sample per 10 drums (check with disposal facility to determine sample frequency) containing the same media. Similar compositing will be performed in each rolloff to obtain a representative sample. The compositing of the sample will be accomplished by collecting a specific volume of the material in each drum into a large sample container. When samples from each of the drums being sampled in a single compositing are collected, the sample will be submitted for TCLP, ignitability, corrosivity, and reactivity analysis. The analysis will be used to determine if drilling wastes are covered by land disposal restrictions.

If rolloffs are used, compositing and sampling of soil will comply with applicable state and federal regulations.

B. Labels

Drums and other containers used for storing wastes from drilling operations will be labeled when accumulation in the container begins. Labels will include the following minimum information:

- Container number
- Container contents
- Origin (source area including individuals wells, piezometers, and soil borings)
- Date that accumulation began
- Date that accumulation ended
- Generator Contact Information
- When laboratory results are received, drum labels will be completed or revised to indicate the hazardous waste constituents in compliance with Title 40 of the Code of Federal Regulations, Part 262, Subpart C if the results indicate hazardous waste or labeled as non-hazardous if applicable.

C. Fluids

Drilling fluids generated during soil boring and groundwater discharged during development and purging of the monitoring wells will be collected in 55-gallon, closed-top drums. When a drum is filled, the bung will be secured tightly. Fluids may also be transferred to Baker® Tanks after being temporarily contained in drums to minimize the amount of drums used.

When development and purging is completed, the water will be tested for appropriate hazardous waste constituents. Compositing and sampling of fluids will comply with applicable state and federal regulations.

D. Solids

The soil cuttings from well and boring drilling will constitute a large portion of the solids to be disposed of.

The solid waste stream also will include plastic sheeting used for decontamination pads, Tyveks, disposable sampling materials, and any other disposable material used during the field operations that appears to be contaminated. These materials will be placed in designated drums.

E. Storage and Disposal

The wastes generated at the site at individual locations will be transported to the drum storage area by the drilling services subcontractor. Drums should be stored on pallets on plastic sheeting with a short berm wall (hay bales or 2 x 4 planks or equivalent) to capture small spills.

Waste solid materials that contain hazardous constituents will be disposed of at an offsite location in a manner consistent with applicable solid waste, hazardous waste, and water quality regulations. Transport and disposal will be performed by a commercial firm under subcontract.

The liquid wastes meeting acceptable levels of discharge contamination may be disposed of through the sanitary sewer system at the site. However, prior to disposal to the sanitary sewer system, approval and contract arrangements will be made with the appropriate authorities. Wastes exceeding acceptable levels for disposal through the sanitary sewer system will be disposed of through contract with a commercial transport and disposal firm.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- Check that representative samples of the containerized materials are obtained.
- Be sure that all state and federal regulations are considered when classifying waste for disposal.

STANDARD OPERATING PROCEDURE

Global Positioning System

I. Purpose

The procedure describes the calibration, operation, and functions associated with a Trimble® Pro XRS GPS Unit with a TSC-1 Asset Surveyor for datalogging. GPS signal information is differentially corrected to sub-meter accuracy on a continual basis using a second satellite signal broadcast from OmniSTAR satellite subscription service. The procedure applies to all field data collection activities.

II. Scope

This procedure provides information regarding the field operation and general maintenance of a Trimble® Pro XRS GPS Unit with a TSC-1 Asset Surveyor for datalogging. The information contained herein presents the operation procedures for this equipment. Review of the equipment's instruction manual is a necessity for more detailed descriptions pertaining to the operation and maintenance of the equipment.

III. Definitions

GPS: Global Positioning System - A system of 24 satellites developed and operated by the US DOD. Continuous 3D coordinate information is broadcast free of charge on a worldwide basis enabling precise positional location. Three standard categories of positional accuracy are generally used:

1. Uncorrected Signal - accuracy +/-10 meters - a single satellite transmission is used
2. Differentially Corrected Signal - accuracy +/- <1 meter - additional positional transmissions are recorded simultaneously and used to triangulate coordinate position.
3. Carrier Phase Signal- accuracy +/- <1 centimeter - requires a second receiver and additional software. Both receivers need to be equipped to receive Carrier Phase signals.

IV. Procedures and Guidelines

The procedure for calibration, operation, and maintenance of the GPS unit is outlined below. Daily calibration and battery recharging is typical operating procedure; frequencies other than daily shall be noted in the logbook and reason for increased frequency recorded. If using a different instrument, the operation manual supplied by the manufacturer should be consulted for instructions.

The procedures described below include additional features pre-programmed into the GPS datalogger to aid the data collection process.

A. Calibration

1. Check to ensure that the datalogger and antenna cables are properly connected to the receiver and that the batteries are securely connected.
2. Turn the datalogger unit on by pressing the green **On** key in the bottom left corner. The datalogger will perform a self-calibration. Wait to ensure that the antenna is receiving a sufficient number of satellite signals (usually a minimum of 3).
3. Once the datalogger receives a satellite signal then it is ready for operation.

B. Operations for surveying coordinates of a location

1. The datalogger and GPS receiver are ready for use after the initial self-calibration.
2. Field data may be immediately recorded in the datalogger.
3. The first screen view is the 'Main Menu'. Use the round keypad to select 'Data Collection' and press the **Enter** key.
4. Use the round keypad to select either 'Create new file' or 'Open existing file' and press the **Enter** key. It is not necessary to create a new file at each new location; however, it may be useful to create a new file at the beginning of each day.
5. If a new file is created then the GPS unit will automatically assign it a file name. The file name may be changed if desired. Press the enter key after the file name is assigned. If opening an existing file then use the round keypad to scroll through existing file names.
6. The next screen is 'Antenna options'. Press the **Enter** key to move to the next screen.
7. Select the type of activity to be performed. At the beginning of each day 'Sample Site Detail' should be completed. This allows the operator to enter each field team member, weather, objectives, health and safety meetings, etc. Once the 'Sample Site Detail' is completed then data entry activities may begin including well purging, water level elevations, and sample collection
8. The datalogger prompts the operator when a data field is required and by using the round key pad, numeric, alphanumeric, enter, and escape keys, the operator can perform electronic data capture on the GPS datalogger.
9. Once all information pertaining to an individual site has been recorded, press enter to complete data entry. If GPS signal is obstructed (tree canopy, building height, etc) user may choose to remain in same location until satellite transmission clears the obstruction. This usually takes only a few moments. Data may still be captured and recorded electronically even if GPS signal is insufficient for positioning.
10. To shut down, press the **Escape** key to return to the 'Main Menu'. The unit can be turned off by pressing the green key in the left hand corner. The datalogger should only be turned off when the 'Main Menu' screen is displayed.
11. All data from the datalogger should be downloaded into Trimble Pathfinder Office software on a PC a minimum of once daily. It is recommended that data is downloaded twice daily. Data may be viewed and mapped using Pathfinder Office or exported to

other software. Export file formats support standard ASCII text, generic database .dbf and most GIS and CAD software.

C. Operations for locating a point using coordinates/reacquiring a previously surveyed location

1. The datalogger and GPS receiver are ready for use after the initial self-calibration.
2. Use the Trimble Pathfinder software to load the data file containing the coordinates for each desired location ("programmed location").
3. The first screen view is the 'Main Menu'. Use the keypad to select 'Navigation' and press the **Enter** key.
4. Use the round keypad to select 'Open existing file' to open the file loaded in Step 2 above.
5. Select the location to be reacquired from the screen and press the enter key.
6. A circle with an arrow will appear. As you begin walking, the arrow will point in the direction of the programmed location. Walk in the direction indicated by the arrow.
7. Once you are within 10-feet of the location being reacquired, the GPS unit will display a circle (representing the programmed location) and an "X" (representing the GPS unit). Continue to walk in the direction of the circle until the "X" is centered in the circle. Once the "X" is centered, you are standing at the programmed location.
8. To shut down, press the **Escape** key to return to the 'Main Menu'. The unit can be turned off by pressing the green key in the left hand corner. The datalogger should only be turned off when the 'Main Menu' screen is displayed.

D. Preventive Maintenance

The antenna and datalogger are weatherproof. It is recommended that the receiver remain in the provided backpack carrier. Care should be taken not to crease, pinch or bend the antenna cable. Data should be downloaded from the datalogger a minimum of once daily, twice daily is preferred. At the end of each day the receiver batteries should be recharged. For technical assistance call the rental company through which you acquired the Trimble® unit. Guidance is also provided in the manual and at http://www.trimble.com.

STANDARD OPERATING PROCEDURE

Homogenization of Soil and Sediment Samples

I. Purpose

The homogenization of soil and sediment samples is performed to minimize any bias of sample representativeness introduced by the natural stratification of constituents within the sample.

II. Scope

Standard techniques for soil and sediment homogenization and equipment are provided in this SOP. These procedures do not apply to aliquots collected for VOCs or field GC screening; samples for these analyses should NOT be homogenized.

III. Equipment and Materials

Sample containers, stainless steel spoons or spatulas, and stainless steel pans.

IV. Procedures and Guidelines

Soil and sediment samples to be analyzed for semivolatiles, pesticides, PCBs, metals, cyanide, or field XRF screening should be homogenized in the field. After a sample is taken, a stainless steel spatula should be used to remove the sample from the split spoon or other sampling device. The sampler should not use fingers to do this, as gloves may introduce organic interferences into the sample.

Samples for VOCs should be taken immediately upon collection and should not be homogenized.

Prior to homogenizing the soil or sediment sample, any rocks, twigs, leaves, or other debris should be removed from the sample. The sample should be placed in a decontaminated stainless steel pan and thoroughly mixed using a stainless steel spoon. The soil or sediment material in the pan should be scraped from the sides, corners, and bottom, rolled into the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the pan. Each quarter of the sample should be mixed individually, and then rolled to the center of the pan and mixed with the entire sample again.

All stainless steel spoons, spatulas, and pans must be decontaminated following procedures specified in SOP *Decontamination of Personnel and Equipment* prior to homogenizing the sample. A composite equipment rinse blank of homogenization equipment should be taken each day it is used.

V. Attachments

None.

VI. Key Checks and Items

- Take VOC samples immediately and do not homogenize the soil.
- Homogenize soil for analyses other than VOCs in a clean, stainless steel bowl.

STANDARD OPERATING PROCEDURE

Trenching for Landfill Delineation

I. Purpose

To provide reference material and general guidance on test pitting using a backhoe during landfill boundary confirmation activities.

II. Equipment and Materials

- Backhoe
- Shovels, picks, scoops
- Camera, dry-erase board (or other erasable material)
- Plastic sheeting and stakes and/or sand bags to cover test pits and excavated soil
- Barricades to secure area around excavation
- Onsite decontamination pad
- Level D personnel protection equipment and onsite site safety officer

III. Procedures and Guidelines

General Considerations

Test pits will be excavated along the landfill boundary as indicated by the results of soil borings and/or geophysical surveys.

The onsite crew will photograph any significant features exposed by the test pit. Photographs will include a dry erase board (or other marker) marked with (at a minimum) test pit number, date and time of photograph, description of feature, and size scale (i.e., tape measurer). Other observations (including soil descriptions) will be recorded in the logbook.

Once test pitting is complete, the pits will be backfilled with the stockpiled soil and re-graded to mimic the original ground surface contour.

Trenching Activities

1. Establish work zone according to the site safety plan.

2. Calibrate all air quality monitoring instruments.

3. Using a clean backhoe (decontaminated following SOP *Decontamination of Personnel and Equipment*), begin excavating perpendicular to and just outside of the area defined as the landfill boundary during the geophysical survey. Carefully excavate towards

the boundary, recording all observations in the logbook, until buried material is encountered. Remove only enough soil to identify the landfill boundary.

4. Monitor the air quality in the breathing zone at 5-minute intervals during trenching activities to ensure the proper level of respiratory protection in being worn by all field team members.

5. Photograph and document the trenching activities as appropriate. Backfill and re-grade the test pit, discard plastic sheeting, decontaminate the backhoe, and set up at the next trenching location.

IV. Attachments

None.

V. Key Checks and Items

Staff will not enter the trench when it exceeds depth limitations specified by OSHA.

STANDARD OPERATING PROCEDURE

Preparing Field Log Books

I. Purpose

This SOP provides general guidelines for entering field data into log books during site investigation and remediation activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement for much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. PROCEDURES FOR COMPLETING FIELD LOG BOOKS

1. Field notes commonly are kept in bound, hard-cover logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.

2. On the inside cover of the log book the following information should be included:

   - Company name and address
   - Log-holders name if log book was assigned specifically to that person
   - Activity or location

- Project name
- Project manager's name
- Phone numbers of the company, supervisors, emergency response, etc.

3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."

4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.

5. Daily entries will be made chronologically.

6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.

7. Each page of the log book will have the date of the work and the note takers initials.

8. The final page of each day's notes will include the note-takers signature as well as the date.

9. Only information relevant to the subject project will be added to the log book.

10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. INFORMATION TO BE INCLUDED IN FIELD LOG BOOKS

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.

2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.

3. Scope: Describe the general scope of work to be performed each day.

4. Weather: Record the weather conditions and any significant changes in the weather during the day.

5. Tail Gate Safety Meetings: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified,

and corrective actions or adjustments made to address concerns/ problems, and other pertinent information.

6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.

7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.

8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.

9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.

10. Time: Keep a running time log explaining field activities as they occur chronologically throughout the day.

11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.

12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.

13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.

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

15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.

16. Any conditions that might adversely affect the work or any data obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).

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

- Description of the general sampling area – site name, buildings and streets in the area, etc.
- Station/Location identifier
- Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
- Sample matrix and type
- Sample date and time
- Sample identifier
- Draw a box around the sample ID so that it stands out in the field notes
- Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples
- Number and type of sample containers collected
- Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
- Parameters to be analyzed for, if appropriate
- Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. SUGGESTED FORMAT FOR RECORDING FIELD DATA

1. Use the left side border to record times and the remainder of the page to record information (see attached example).

2. Use tables to record sampling information and field data from multiple samples.

3. Sketch sampling locations and other pertinent information.

4. Sketch well construction diagrams.

V. Attachments

Example field notes.

STANDARD OPERATING PROCEDURE

Low-Flow Groundwater Sampling from Monitoring Wells – EPA Region I and III

I. Purpose and Scope

This SOP presents general guidelines for the collection of groundwater samples from monitoring wells using low-flow purging and sampling procedures. Operations manuals should be consulted for specific calibration and operating procedures.

II. Equipment and Materials

- Adjustable-rate positive-displacement pump, submersible pump, or peristaltic pump
- Horiba® U-22 or equivalent water quality meters to monitor pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature
- Flow-through cell with inlet/outlet ports for purged groundwater and watertight ports for each probe
- Generator or alternate power source depending on pump type
- Water-level indicator
- Disposable Teflon, Teflon-lined polyethylene tubing or polyethylene tubing for metals and other inorganics
- Plastic sheeting
- Well-construction information
- Calibrated container and stopwatch to determine flow rate
- Sample containers
- In-line disposable 0.45µm filters (QED® FF8100 or equivalent)
- Shipping supplies (labels, coolers, and ice)
- Field book

III. Procedures and Guidelines

A. Setup and Purging

1. Obtain information on well location, diameter(s), depth, and screen interval(s), and the method for disposal of purged water.
2. Calibrate instruments according to manufacturer's instructions.
3. The well number, site, date, and condition are recorded in the field logbook.

4. Plastic sheeting is placed on the ground, and the well is unlocked and opened. All decontaminated equipment to be used in sampling will be placed only on the plastic sheeting until after the sampling has been completed. To avoid cross-contamination, do not let any downhole equipment touch the ground.

5. All sampling equipment and any other equipment to be placed in the well is cleaned and decontaminated before sampling in accordance with SOP *Decontamination of Personnel and Equipment*.

6. Water level measurements are collected in accordance with the *Water Level Measurements* SOP. **Do not measure the depth to the bottom of the well at this time**; this reduces the possibility that any accumulated sediment in the well will be disturbed. Obtain depth to bottom information from well construction log.

7. Attach and secure the tubing to the low-flow pump. Lower the pump slowly into the well and set it at approximately the middle of the screen. Place the pump intake in the middle of the saturated screen length and should be at least two feet above the bottom of the well to avoid mobilization of any sediment present in the bottom.

8. Insert the measurement probes into the flow-through cell. The purged groundwater is directed through the cell, allowing measurements to be collected before the water contacts the atmosphere.

9. If using a generator, locate it 30 feet downwind from the well to avoid exhaust fumes contaminating the samples.

10. Start purging the well at 0.2 to 0.5 liters per minute. Avoid surging. Purging rates for more transmissive formations could be started at 0.5-liter to 1 liter per minute. The initial field parameters of pH, specific conductance, dissolved oxygen, ORP, turbidity, and temperature of water are measured and recorded in the field logbook.

11. The water level should be monitored during purging, and, ideally, the purge rate should equal the well recharge rate so that there is little or no drawdown in the well (i.e., less than 0.3-foot). The water level should stabilize for the specific purge rate. There should be at least 1 foot of water over the pump intake so there is no risk of the pump suction being broken, or entrainment of air in the sample. Record adjustments in the purge rate and changes in depth to water in the logbook. Purge rates should, if needed, be decreased to the minimum capabilities of the pump (0.1- to 0.2-liter per minute) to avoid affecting well drawdown.

12. During purging, the field parameters are measured frequently (every 5 minutes) until the parameters have stabilized. Field parameters are considered stable when measurements meet the following criteria:

    - pH: within 0.1 pH units

- Specific conductance: within 3 percent
- Dissolved oxygen: within 10 percent
- Turbidity: within 10 percent for values greater than 5 NTU; if 3 turbidity values are less than 5 NTU, consider the values as stabilized
- ORP: within 10 mV
- Temperature: within 3 percent

B. Sample Collection

Once purging is complete the well is ready to sample. The elapsed time between completion of purging and collection of the groundwater sample should be minimized. Typically, the sample is collected immediately after the well has been purged, but this is also dependent on well recovery.

Samples will be placed in sample containers that have been cleaned to laboratory standards and are preserved in accordance with the analytical method. The containers are typically pre-preserved, if required.

VOC samples are normally collected first and directly into pre-preserved sample containers.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that ¼ or 3/8 inch inside diameter tubing be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, collect non-VOC dissolved gasses samples first, then increase flow rate slightly until water completely fills the tubing and collect the VOC/dissolved gases samples. Record new flow rate and drawdown depth.

The steps to be followed for sample collection are as follows:

1. The cap is removed from the sample bottle, and the bottle is tilted slightly.
2. The sample is slowly poured from the bailer or discharged from the pump so that it runs down the inside of the sample bottle with a minimum of splashing. The pumping rate should be reduced to approximately 100 ml per minute when sampling VOCs.
3. Inorganics, including metals, may be collected and preserved in the filtered form as well as the unfiltered form. Disposable in-line filters (0.45 micron filter), connected to the end of the sample tubing,, are typically used for field filtration. Samples are field filtered as the water is being placed into the sample container. If a bailer is used, filtration may be driven by a peristaltic pump.

4. Adequate space is left in the bottle to allow for expansion, except for VOC vials, which are filled to the top with a positive meniscus.

5. The bottle is capped and clearly labeled.

6. Samples are placed in appropriate containers and, if necessary, packed with ice in coolers as soon as practical.

7. Nondedicated equipment is cleaned and decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP.

The following information, at a minimum, will be recorded in the log book:

1. Sample identification (site name, location, and project number; sample name/number and location; sample type and matrix; time and date; sampler's identity)

2. Sample source and source description

3. Field observations and measurements (appearance, volatile screening, field chemistry, sampling method), volume of water purged prior to sampling, number of well volumes purged, and field parameter measurements

4. Sample disposition (preservative; laboratory name, date and time sent; laboratory sample number, chain-of-custody number, sample bottle lot number)

5. Additional remarks

C. Additional remarks

1. If the well goes dry during purging, wait until it recovers sufficiently to remove the required volumes to sample all parameters. It may be necessary to return periodically to the well but a particular sample (e.g., large amber bottles for semivolatile analysis) should be filled at one time rather than over the course of two or more visits to the well.

2. Disposable tubing is disposed of with PPE and other site trash.

IV. Attachments

White paper on reasons and rationale for low-flow sampling.

V. Key Checks and Preventative Maintenance

- The drawdown in the well should be minimized as much as possible (preferably no more than 0.5-foot to 1 foot) so that natural groundwater-flow conditions are maintained as closely as possible.

- The highest purging rate should not exceed 1 liter per minute. This is to keep the drawdown minimized.

- Stirring up of sediment in the well should be avoided so that turbidity containing adsorbed chemicals is not suspended in the well and taken in by the pump.
- Overheating of the pump should be avoided to minimize the potential for losing VOCs through volatilization.
- Keep the working space clean with plastic sheeting and good housekeeping.
- Maintain field equipment in accordance with the manufacturer's recommendations. This will include, but is not limited to:
    - Inspect sampling pump regularly and replace as warranted
    - Inspect quick-connects regularly and replace as warranted
    - Verify battery charge, calibration, and proper working order of field measurement equipment prior to initial mobilization and daily during field efforts

Attachment to the SOP on Low-Flow Sampling Groundwater Sampling from Monitoring Wells

White Paper on Low-Flow Sampling

EPA recommends low-flow sampling as a means of collecting groundwater samples in a way that minimizes the disturbance to the natural groundwater flow system and minimizes the introduction of contamination into the samples from extraneous sources. The following are details about these issues.

When a pump removes groundwater from the well at the same rate that groundwater enters the well through the screen, the natural groundwater-flow system around the well experiences a minimum of disturbance. Some disturbance is bound to occur because you are causing groundwater to flow to the well in a radial fashion that otherwise would have flowed past it. However, the resulting low-flow sample provides the most-representative indication we can get of groundwater quality in the immediate vicinity of the well.

Normally, when a well is pumped at an excessive rate that drops the water level in the well below the water level in the aquifer, the water cascades down the inside of the well screen when it enters the well. The turbulence from this cascading causes gases such as oxygen and carbon dioxide to mix with the water in concentrations that are not representative of the native groundwater and are higher than expected. This causes geochemical changes in the nature of the water that can change the concentrations of some analytes, particularly metals, in the groundwater sample, not mention it's effect on the dissolved oxygen levels that then will be measured in the flow-through cell. Such turbulence also may cause lower-than-expected concentrations of volatile organic compounds due to volatilization.

For wells in which the water level is above the top of the screen, the water up in the riser is out of the natural circulation of the groundwater and, therefore, can become stagnant. This stagnant water is no longer representative of natural groundwater quality because its pH, dissolved-oxygen content, and other geochemical characteristics change as it contacts the air in the riser. If we minimize the drawdown in the well when we pump, then we minimize the amount of this stagnant water that is brought down into the well screen and potentially into the pump. As a result, a more-representative sample is obtained.

Typically, wells contain some sediment in the bottom of the well, either as a residue from development that has settled out of the water column or that has sifted through the sand pack and screen since the well was installed. This sediment commonly has adsorbed on it such analytes as metals, SVOCs, and dioxins that normally would not be dissolved in the groundwater. If these sediments are picked up in the groundwater when the well is disturbed by excessive pumping, they can:

- Make filtering the samples for metals analysis more difficult
- Add unreasonably to the measured concentration of SVOCs and other organic compounds

The SOP for low-flow sampling has been modified recently and should be consulted for additional information about low-flow sampling and ways of dealing with wells in which the water level cannot be maintained at a constant level.

STANDARD OPERATING PROCEDURE

Mini RAE Photoionization Detector (PID)

I. Purpose

The purpose of this SOP is to provide general reference information for using the Mini RAE PID in the field. Calibration and operation, along with field maintenance, will be included in this SOP.

II. Scope

This procedure provides information on the field operation and general maintenance of the Mini RAE PID. Review of the information contained herein will ensure that this type of field monitoring equipment will be properly utilized. Review of the owner's instruction manuals is a necessity for more detailed descriptions.

III. Definitions

Volatile Organic Compound (VOC) – Expresses the VOC concentration in ppm

ppm - parts per million: parts of vapor or gas per million parts of air by volume.

IV. Procedures

The Mini RAE utilizes the principle of a detecting sensor. The PID operates on the principle that most organic compounds and some inorganic compounds are ionized when they are bombarded by high-energy ultraviolet light. These compounds absorb the energy of the light, which excites the molecules and results in a loss of electron and the formation of a positively charged ion. The number of ions formed and the ion current produced is directly proportional to mass and concentration. The amount of energy required to displace an electron is called photo ionization potential (PIP). The air sample is drawn into a UV lamp using a pump or a fan. The energy of the lamp determines whether a particular chemical will be ionized. Each chemical compound has a unique ionizing potential. When the UV light energy is greater than the ionization potential of the chemical, ionization will occur. When the sample is ionized, the electrical signal is displayed on an analog or digital output. Although the output does not distinguish between chemicals, it does detect an increase in the ion current. If only one chemical is present in the air, it is possible to use PIDs quantitatively. Chemical structure and lamp intensity affects the sensitivity of the instrument to a given contaminant. All PID readings are relative to the calibration gas, usually isobutylene. It is important to calibrate the PID in the same temperature and elevation that the equipment will be used, and to determine the background concentrations in the field before taking measurements. For

environments where background readings are high, factory zero calibration gas should be used.

Note: For volatile and semi-volatile compounds, knowing the PIP is critical in determining the appropriate instrument to use when organic vapor screening. Consult the QAPP and manufacturer's manual to determine that the proper instrument has been selected for the contaminate vapors of interest. If an expected compound at a site has a PIP less than 11.7 eV, it is possible to use a PID. If the ionization potential is greater than 11.7eV, an FID is required.

The following subsections will discuss Mini RAE calibration, operation, and maintenance. These sections, however, do not take the place of the instruction manual.

A. Calibration

Start up Instrument

- Press **Mode** button
- Observe displays:

On!……..

Version X.XX

Model Number SN XXXX

Date Time Temp

- After the monitor is turned on and it runs through the startup menus, the display will read "Ready". Press the **[Y/+]** key to start the pump.
- The pump will start, the seconds will count down to zero, and the instrument will be ready for use

Calibration Check and Adjustment

Allow instrument to warm up for 15 minutes.

- Depress the **[N/-]** key first, then while depressing the **[N/-]**, depress the **[Mode]** key also and depress both keys for 5 seconds.
- Display will read:

Calibrate Monitor?

- Press the **[Y/+]** key
- Display will read:

```
Fresh Air
Calibration?
```

- Perform the Fresh Air Calibration in an area free of any detectable vapor near your work zone.
- Press the **[Y/+]** key
- Display will read:

```
Zero….
In progress…
```

```
Wait…
```

```
Update data…
```

```
Zeroed…
```

```
Reading = X.X ppm
```

- Press any key and the display will go back to:

```
Fresh Air
Calibration?
```

- Press the **[N/+]** key
- Display will read:

```
Span/Cal?
```

- Press the **[Y/+]** key
- Display will read:

```
Isobutylene = 100 ppm
```

```
Apply Gas Now!
```

- Press the **[Y/+]** key
- Apply calibration gas – use either HAZCO Services Part Number R-SGRAE4 or Rae Systems Part Number 008-3002 – using a .5 LPM regulator and direct tubing.

```
Wait…30
```

- The display will count down showing the number of remaining seconds:

```
Reading = 100
```

Update data, span cal done. Turn off gas!

- Calibration readings between 99 and 102 ppm are within the acceptable range.
- Display will read:

Span/Cal?

- **CALIBRATION IS COMPLETE!**
- Press any key to return to operational mode.

B. Operation

Due to the Mini RAE having many functions in terms of operation, it is recommended that you follow the operational procedures as outlined in the instruction manual from pages 2-5 to 2-14.

C. Site Maintenance

After each use, the meter should be recharged and the outside of the instruments should be wiped clean with a soft cloth.

D. Scheduled Maintenance

Function	Frequency
Check alarm and settings	Monthly/before each use
Clean screens and gaskets around sensors	Monthly
Replace sensors	Biannually or when calibration is unsuccessful

V. Quality Assurance Records

Quality assurance records will be maintained for each air monitoring event. The following information shall be recorded in the field logbook.

- Identification - Site name, date, location, CTO number, activity monitored, (surface water sampling, soil sampling, etc), serial number, time, resulting concentration, comments and identity of air monitoring personnel.
- Field observations - Appearance of sampled media (if definable).
- Additional remarks (e.g, Mini RAE had wide range fluctuations during air monitoring activities.)

VI. References

Mini RAE 2000 Portable VOC PGM-7600, RAE Systems, Revision E, May 2005.

STANDARD OPERATING PROCEDURE

General Guidance for Monitoring Well Installation

I. Purpose

To provide site personnel with a review of the well installation procedures that will be performed. These procedures are to be considered general guidelines only and are in no way intended to supplement or replace the contractual specifications in the driller's subcontract.

II. Scope

Monitoring well installations are planned for shallow and/or deep unconsolidated aquifers and/or for bedrock aquifers. The SOPs *Installation of Shallow Monitoring Wells, Installation of Surface-Cased Monitoring Wells, Installation of Bedrock Monitoring Wells,* and *Installation of Monitoring Wells Using Sonic Drilling* provide more specifics.

III. Equipment and Materials

1. Drilling rig (hollow stem auger, sonic, air hammer, air rotary, or mud rotary)
2. Well-construction materials (i.e., surface casing, screens, riser, casing, caps, bottom plugs, centering guides, sand, bentonite, grout, and surface-finish materials)
3. Development equipment

IV. Procedures and Guidelines

1. Wells will be installed in accordance with standard EPA procedures. Note that USEPA Region III requires any well penetrating a confining layer to be double-cased.
2. The threaded connections will be water-tight.
3. Well screens generally will be constructed of 10-slot or 20-slot Schedule 40 PVC and will be 5 to 10 feet in length depending on saturated thickness of unconsolidated sediments. The exact slot size and length will be determined by the field team supervisor. Stainless steel may be required under certain contaminant conditions.
4. Stick-up wells will be surrounded by four concrete-filled guard posts at least 2 inches in diameter.

5. A record of the finished well construction will be compiled.

6. All soils and liquids generated during well installations will be drummed for proper disposal.

Monitoring Well Installation

- 2″ monitoring wells in unconsolidated materials will be installed in at least 6-inch-diameter boreholes to accommodate well completion materials in designated locations.

- All monitoring wells penetrating a confining layer will be surface-cased from the ground surface to approximately 5 feet into the confining layer. Exceptions to this may be allowed under certain circumstances (e.g., evidence of significant natural gaps in the confining layer).

- Monitoring wells in unconsolidated materials will be constructed of 2-inch-diameter, factory manufactured, flush-jointed, Schedule 40 PVC (or stainless steel) screen with threaded bottom plug and riser.

- Screens will be filter packed with a properly sized and graded, thoroughly washed, sound, durable, well-rounded basalt or siliceous sand. When using hollow-stem augers, the filter pack will be installed by slowly pouring the sand into the annular space while simultaneously raising the augers and using a weighted tape to sound for the sand surface. For rotary-drilled wells, the height of the sand pack also will be sounded with a weighted tape.

- The primary filter sand pack (typically Morie #00 or DSI #1 for a 10-slot screen) will extend from 1 to 2 feet below the base to 2 feet above the top of the screen; filter pack will be allowed to settle before final measurement is taken. For wells deeper than 30 feet, the filter pack will be placed using a tremie pipe and flowing water.

- A secondary filter sand pack (typically a fine sand seal) 1-foot thick may be placed above the primary sand pack.

- Annular well seals will consist of 2 feet of pelletized, chip, or granular bentonite clay placed above the filter pack. If necessary the pellets will be hydrated using potable water. For wells installed using hollow-stem augers, the bentonite will be poured into the annular space while slowly raising the augers and sounding for the top of the bentonite with a weighted tape. A high-solids bentonite slurry using powdered bentonite introduced with a side-discharging tremie pipe will be used for the bentonite seals in wells greater than 30 feet deep. For rotary-drilled wells, the height of the well seal also will be sounded with a weighted tape. High-solids slurries will have solids content of at least 20 percent.

- The top of the annular seal will be measured after the bentonite seal has been allowed to hydrate and before the grout is applied. The seal will be allowed to hydrate for at least 30 minutes before work in the well continues.

- The annular space above the bentonite seal will be filled to grade with a bentonite-cement slurry grout mixture.
- The grout mixture consists of 6 to 8 gallons of water per 94-pound bag of Portland cement; 3 to 6 pounds of bentonite added per bag of cement to reduce shrinkage.
- The grout mix will be carefully applied to avoid disturbing the bentonite seal; the method of grout placement must force grout from the top of the bentonite seal to ground surface.
- After allowing the grout to settle and set up overnight, additional grout will be added to maintain grade.
- A protective steel casing equipped with keyed alike locking caps will be grouted in place for each new well; the casing will extend at least 2 feet above grade and 3 feet below grade, and will be painted a bright color.

Well Development

- New monitoring wells will be developed after the well has been completely installed and the grout has hardened (at least 24 hours)
- The well will be developed by surging and pumping.
- Equipment placed in the well will be decontaminated before use.
- If information is available, begin developing in the least-contaminated well first.
- Development will include surging the well by either abruptly stopping flow and allowing water in the well column to fall back into the well or through the use of a surge block that is slightly smaller in diameter than the well casing inner diameter.
- Pipes and pumps must not be fitted with foot valves or other devices that might inhibit the return flow of water to the well.
- Surging should continue throughout the development process.
- The air-lift method may be used to pump materials out of the well. The air compressor will be fitted with filters to remove all oil and the air lift hose used will be made of inert materials.
- Well development will continue until the water produced is free of turbidity, sand, and silt. A Horiba-U22 meter, YSI meter with separate Hanna turbidity meter, or equivalent should be used to determine when the turbidity is low and parameters have stabilized.
- Development water will be considered hazardous and placed in sealed 55-gallon U.S. DOT approved steel drums. CH2M HILL will label and date the drums as pending analysis, and transport the drums to a designated site for storage.

V. Attachments

None.

VI. Key Check and Items

- Ensure that all equipment is properly decontaminated as needed.
- Only new, sealed materials (e.g., screens, risers, and sand) will be used in constructing the well.
- Care shall be taken when making downhole measurements to ensure that proper heights of sand, seal, and grout are achieved.

STANDARD OPERATING PROCEDURE

Groundwater Sampling from Monitoring Wells – EPA Region I and III

I. Purpose and Scope

This procedure presents general guidelines for collecting groundwater samples from monitoring wells. The procedure does not address purging and sampling using "low-flow" techniques (see SOP *Low-Flow Groundwater Sampling from Monitoring Wells – EPA Region I and III)*. Operations manuals should be consulted for specific calibration and operating procedures.

II. Equipment and Materials

- Peristaltic pump, pneumatic bladder pump, or electric submersible pump, pump shroud, tubing, support cables, air compressor, control box, and power supply
- Water quality meter, such as Horiba® U-22 or a combination of equivalent devices for monitoring pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature
- Flow through cell with inlet/outlet ports for purged groundwater and watertight ports for each water quality probe
- Disposable 0.45µm filters (QED® FF8100 or equivalent), if applicable
- Bailer (Teflon or stainless steel) and nylon cord, if applicable

Note: bailers and peristaltic pumps should only be used when site access or other limitations prevent the use of sampling pumps

III. Procedures and Guidelines

A. Setup and Purging

1. Obtain information on well location, diameter(s), depth, and screened interval(s), and the method for disposal of purged water.
2. A pump will be used for well purging if the well yield is adequate; otherwise, a bailer may be used depending on project requirements.
3. Sampling equipment is cleaned and decontaminated prior to sampling in accordance with SOP *Decontamination of Personnel and Equipment*.

4. Instruments are calibrated according to manufacturer's instructions.

5. The well number, site, date, and condition are recorded in the field logbook.

6. Plastic sheeting is placed on the ground, and the well is unlocked and opened.

7. Water level measurements are collected in accordance with the *Water Level Measurement* SOP.

8. The volume (v) of water in a well casing is calculated as follows:

$$v = 7.48(\pi r^2 h)$$

where: $\pi = 3.14$
v=volume of water in well (gallons)
r = Radius of the well (feet)
h = height of water in well (feet)

The volume of water in common well casing diameters may be calculated as follows:

2-inch diameter well:
0.163 gal/ft x ___ (linear feet of water) = gallons

4-inch diameter well:
0.653 gal/ft x ___ (linear feet of water) = gallons

6-inch diameter well:
1.469 gal/ft x ___ (linear feet of water) = gallons

9. Attach tubing, support cable or rope, and air line (if applicable) to the pump. The support line should bear the weight of the pump. Set pump in the well at the desired sampling interval, typically mid-screen, and begin purging. If a bailer is being used, it is removed from its protective covering and attached to a cord compatible with constituents.

10. If a RediFlo or other similar electric submersible pump is to be used in a large diameter well (greater than 4 inches), a pump shroud should be used to direct the flow of water across the pump motor. Failure to use a shroud in this situation can lead to overheating of the motor and loss of volatiles from the pump discharge.

11. If a bailer is being used, it should be removed from its protective covering and attached to a cord compatible with the site contaminants. The bailer should be lowered into the top of the water column, allowed to fill, and removed. It is critical that bailers be slowly and gently immersed into the top of the water column, particularly during final stages of purging, to minimize turbidity and disturbance of volatile organic constituents. The use of bailers for purging and sampling is

discouraged because the correct technique is highly operator dependent and improper use may result in an unrepresentative sample.

12. Field parameters including pH, ORP, turbidity, dissolved oxygen, specific conductance, and temperature are measured and recorded in the field logbook. The water quality probes are inserted into a flow-through cell. The purged groundwater is directed through the cell by connecting the pump discharge tubing to the bottom port on the flow through cell, allowing measurements to be collected before the water contacts the atmosphere.

13. During purging, the water quality parameters are measured at least once for each well volume. A minimum of three well volumes must be purged (up to 5 well volumes may be purged if water quality parameters do not stabilize) prior to sampling. In nonproductive wells, if the well is purged dry, it is <u>not necessary to remove a minimum of three well volumes</u>; however, the well should be allowed to recover sufficiently to allow collection of all samples.

14. Three to five well volumes are purged (more may be purged if parameters do not stabilize). Purging is stopped when field parameters have stabilized over three consecutive well volumes. Field Water quality parameters are considered stable when pH measurements agree within 0.1 units, specific conductance measurements agree within 3 percent, ORP measurements agree within 10 mV, dissolved oxygen measurements agree within 10 percent, and turbidity measurements agree within 10 percent or are as low as practicable given sampling conditions.

B. Sample Collection

Once purging is complete the well is ready to sample. The elapsed time between completion of purging and collection of the groundwater sample should be minimized. Typically, the sample is collected immediately after the well has been purged, but this is also dependent on well recovery.

Samples will be placed in sample containers that have been cleaned to laboratory standards and are preserved in accordance with the analytical method. The containers are typically pre-preserved, if required.

The steps to be followed for sample collection are as follows:

1. The cap is removed from the sample bottle, and the bottle is tilted slightly.

2. The sample is slowly poured from the bailer or discharged from the pump so that it runs down the inside of the sample bottle with a minimum of disturbance. The pumping rate should be reduced to approximately 100 ml per minute when sampling VOCs.

3. Inorganics, including metals, may be collected and preserved in the filtered form as well as the unfiltered form. Disposable in-line filters

(0.45 micron filter), connected to the end of the sample tubing,, are typically used for field filtration. Samples are field filtered as the water is being placed into the sample container. If a bailer is used, filtration may be driven by a peristaltic pump.

4. Adequate space is left in the bottle to allow for expansion, except for VOC vials, which are filled to the top with a positive meniscus.

5. The bottle is capped and clearly labeled.

6. Samples are placed in appropriate containers and, if necessary, packed with ice in coolers as soon as practical.

7. If the sample tubing or bailer is dedicated, it is returned to the well and the well is capped and locked. Nondedicated equipment is cleaned and decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP.

The following information, at a minimum, will be recorded in the log book:

1. Sample identification (site name, location, and project number; sample name/number and location; sample type and matrix; time and date; sampler's identity)

2. Sample source and source description

3. Field observations and measurements (appearance, volatile screening, field chemistry, sampling method), volume of water purged prior to sampling, number of well volumes purged, and field parameter measurements

4. Sample disposition (preservative; laboratory name, date and time sent; laboratory sample number, chain-of-custody number, sample bottle lot number)

Additional remarks

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- Use of peristaltic pumps and bailers should be avoided, if possible.
- Allow the field parameters to stabilize within the specified criteria as much as possible.
- Fill bottles for VOC samples first.
- Be sure the sample identification is properly specified.

- Maintain field equipment in accordance with the manufacturer's recommendations. This may include, but is not limited to:
  - Inspect sampling pump regularly and replace as warranted
  - Bring supplies for replacing the bladder and "O" rings if using a positive-displacement bladder pump
  - Inspect tubing regularly and replace as warranted
  - Inspect air/sample line quick-connects regularly and replace as warranted
  - Verify battery charge, calibration, and proper working order of field measurement equipment prior to initial mobilization and daily during field efforts

STANDARD OPERATING PROCEDURE

Installation of Shallow Monitoring Wells

I. Purpose and Scope

The purpose of this guideline is to describe methods for drilling and installation of shallow monitoring wells and piezometers in unconsolidated or poorly consolidated materials using hollow stem augers, air rotary, or mud rotary. Installing monitoring wells in unconsolidated materials using sonic drilling is discussed in SOP *Installation of Monitoring Wells Using Sonic Drilling.* Methods for drilling and installing bedrock monitoring wells and deep, surface-cased wells in unconsolidated materials are presented in SOPs *Installation of Bedrock Monitoring Wells* and *Installation of Surface-Cased Monitoring Wells,* respectively.

II. Equipment and Materials

Drilling

- Drilling rig (hollow stem auger, air rotary or mud rotary) and associated tools and equipment

Well Riser/Screen and Associated Materials

- Polyvinyl chloride (PVC), Schedule 40, minimum 2-inch ID, flush-threaded riser; alternatively, stainless-steel riser
- PVC, Schedule 40, minimum 2-inch ID, flush-threaded, factory slotted screen; alternatively, stainless-steel screen
- PVC bottom cap, threaded to match the well screen; alternatively, stainless steel
- PVC or stainless-steel centering guides (if used)
- Above-grade well completion: PVC well cap, threaded or push-on type, vented
- Flush-mount well completion: PVC well cap, locking, leak-proof seal
- Stainless steel to be used as appropriate

Sand

- Clean silica sand, provided in factory-sealed bags, well-rounded, containing no organic material, anhydrite, gypsum, mica, or calcareous material; primary (coarse – e.g., Morie #1) filter pack, and secondary (fine sand seal) filter pack. Grain size determined based on sediments observed during drilling.

Bentonite

- Pure, additive-free bentonite pellets or chips
- Pure, additive-free powdered bentonite
- Coated bentonite pellets; coating must biodegrade within 7 days
- Cement-Bentonite Grout: proportion of 6 to 8 gallons of water per 94-pound bag of Portland cement; 3 to 6 pounds of bentonite added per bag of cement to reduce shrinkage.

Protective Casing

- Above-grade well completion: 6-inch minimum ID black iron steel pipe with locking cover, diameter at least 2 inches greater than the well casing, painted with epoxy paint for rust protection; heavy duty lock; protective posts if appropriate
- Flush-mount well completion: Morrison 9-inch or 12-inch 519 manhole cover, or equivalent; rubber seal to prevent leakage; locking cover inside of road box

Well Development

- Surge block
- Well-development pump and associated equipment
- Calibrated meters to ensure pH, temperature, specific conductance, ORP, and dissolved oxygen of development water
- Containers (e.g., DOT-approved 55-gallon drums) for water produced from well.

III. Procedures and Guidelines

A. Drilling Method

Typically, continuous-flight hollow-stem augers with a minimum 4.25-inch inside diameter (ID) will be used to drill shallow monitoring well boreholes for 2-inch diameter monitoring wells. Alternatively, air or mud rotary may be used.

The bit of the auger is placed at the ground surface and then turned with the drilling rig. To collect split spoon samples, the auger is advanced to the top of the sampling depth, and the split-spoon sample is collected from below the auger head. The split spoon is advanced through repeated blows from a 140- or 300-pound hammer dropped from a height of 30 inches. Thin-walled tube samplers are advanced by pressing down on the rods with the weight of the drilling rig. Split-spoon samples may be collected at selected intervals for chemical analysis and/or lithologic classification. Soil sampling procedures are detailed in SOPs *Soil Boring Sampling – Split Spoons* and *Soil Sampling*.

The use of water to assist in hollow-stem auger drilling for monitoring well installation will be avoided, unless required for such conditions as running sands.

Hollow-stem augers, drilling bits, rods, split-spoon samplers, and other downhole drilling tools will be properly decontaminated prior to the initiation of drilling activities and between each borehole location. Split-spoon samplers and other downhole soil sampling equipment will also be properly decontaminated before and after each use. SOP *Decontamination of Drill Rigs and Equipment* details proper decontamination procedures.

Drill cuttings and decontamination fluids generated during well drilling activities will be contained according to the procedures detailed in the SOP *Disposal of Waste Fluids and Solids* and the Investigation Derived Waste Management Plan (IDWMP).

Air or mud rotary drilling may be used instead of hollow-stem augers. The use of added mud should be kept to a minimum.

B. Monitoring-Well Installation

Shallow monitoring wells will be constructed inside the hollow-stem augers, once the borehole has been advanced to the desired depth, or in the mudded borehole once the drilling rods have been withdrawn. If the borehole has been drilled to a depth greater than that at which the well is to be set, the borehole will be backfilled with bentonite pellets or chips or a bentonite-cement slurry to a depth approximately 1 foot below the intended well depth. Approximately 1 foot of clean sand will be placed on top of the bentonite to return the borehole to the proper depth for well installation.

The appropriate lengths of well screen, nominally 10 feet (with bottom cap), and casing will be joined watertight and lowered inside the augers to the bottom of the borehole. Centering guides, if used, will be placed at the bottom of the screen and above the interval in which the bentonite seal is placed.

Selection of the filter pack and well screen intervals for the shallow monitoring wells shall be made in the field.

A primary sand pack consisting of clean Morie No. 00 (or DSI No.1) silica sand for 10-slot screen and Morie No. 01 (or DSI No.2) for 20-slot screen silica sand will be placed around the well screen. The sand will be placed into the borehole at a uniform rate, in a manner that will allow even placement of the sand pack. The augers will be raised gradually during sand pack installation to avoid caving of the borehole wall; at no time will the augers be raised higher than the top of the sand pack during installation. During placement of the sand, the position of the top of the sand will be continuously sounded. The primary sand pack will be extended from the bottom of the borehole to a minimum height of 2 feet above the top of the well screen. A secondary, finer-grained (fine sand seal), sand pack will be installed for a minimum of 1 foot above the coarse sand pack. Heights of the coarse and fine sand packs

and bentonite seal may be modified in the field to account for a shallow water table and a small saturated thickness of the surficial aquifer.

A bentonite seal at least 2 feet thick will be placed above the sand pack. The seal will be placed into the borehole in a manner that will prevent bridging. The position of the top of the bentonite seal will be verified using a weighted tape measure. If all or a portion of the bentonite seal is above the water table, clean water will be added to hydrate the bentonite. A hydration period of at least 30 minutes will be required following installation of the bentonite seal.

Above the bentonite seal, an annular seal of cement-bentonite grout will be placed. The cement-bentonite grout will be installed continuously in one operation from the bottom of the space to be grouted to the ground surface through a tremie pipe. The tremie pipe must be plugged at the bottom and have small openings along the sides of the bottom 1-foot length of pipe. This will allow the grout to diffuse laterally into the borehole and not disturb the bentonite pellet seal.

C. Well Completion

For monitoring wells that will be completed above-grade, a locking steel protective casing set in a concrete pad will be installed. The steel protective casing will extend at least 3 feet into the ground and 2 feet above ground but should not penetrate the bentonite seal. The concrete pad will be square, approximately 2 feet per side (unless otherwise specified in the project plans), and poured into wooden forms. The concrete will be sloped away from the protective casing.

Guard posts may be installed in high-traffic areas for additional protection. Four steel guard posts will be installed around the protective casing Guard posts would be concrete-filled, at least 2 inches in diameter, and would extend at least 2 feet into the ground and 3 feet above the ground. The protective casing and guard posts will be painted with an epoxy paint to prevent rust.

For monitoring wells with flush-mount completions, Morrison 9-inch or 12-inch 519 manhole cover or equivalent, with a rubber-sealed cover and drain will be installed. The top of the manhole cover will be positioned approximately 1 inch above grade. A square concrete pad, approximately 2 feet per side (unless otherwise specified in the project plans), will be installed as a concrete collar surrounding the road box cover, and will slope uniformly downward to the adjacent grade. The road box and installation thereof will be of sufficient strength to withstand normal vehicular traffic.

Concrete pads installed at all wells will be a minimum of 6 inches below grade. The concrete pad will be 12 inches thick at the center and taper to 6-inch thick at the edge. The surface of the pad should slope away from the protective casing to prevent water from pooling around the casing. Protective casing, guard posts, and flush mounts will be installed into this concrete.

Each well will be properly labeled on the exterior of the locking cap or protective casing with a metal stamp indicating the permanent well number.

D. Well Development

Well development will be accomplished using a combination of surging throughout the well screen and pumping, until the physical and chemical parameters of the discharge water that are measured in the field have stabilized and the turbidity of the discharge water is substantially reduced. Fine-grained materials in the surficial aquifer at the site may not allow low turbidity results to be achieved.

The surging apparatus will include a surge block. Well development will begin by surging the well screen, starting at the bottom of the screen and proceeding upwards, throughout the screened zone. Following surging, the well will be pumped to remove the fine materials that have been drawn into the well. During pumping, measurements of pH, temperature, and specific conductance will be recorded.

Development will continue by alternately surging and pumping until the discharge water is free from sand and silt, the turbidity is substantially reduced, and the pH, temperature, and specific conductance have stabilized at regional background levels, based on historical data. Development will continue for a minimum of 30 minutes and until the water removed from the well is as clear of turbidity as practicable.

Well development equipment will be decontaminated prior to initial use and after the development of each well. Decontamination procedures are detailed in SOP *Decontamination of Personnel and Equipment*. Water generated during well development will be contained and managed as detailed in the SOP *Disposal of Waste Fluids and Solids* and the Investigation Derived Waste Management Plan.

IV. Attachments

Schematic diagram of shallow monitoring-well construction (MWSingleDiag.xls)

STANDARD OPERATING PROCEDURE

Logging of Soil Borings

I. Purpose and Scope

This SOP provides guidance to obtain accurate and consistent descriptions of soil characteristics during soil-sampling operations. The characterization is based on visual examination and manual tests, not on laboratory determinations.

II. Equipment and Materials

- Indelible pens
- Tape measure or ruler
- Field logbook
- Spatula
- HCL, 10 percent solution
- Squirt bottle with water
- Rock- or soil-color chart (e.g., Munsell)
- Grain-size chart
- Hand lens
- Unified Soil Classification System (USCS) index charts and tables to help with soil classification (attached)

III. Procedures and Guidelines

This section covers several aspects of soil characterization: instructions for completing the CH2M HILL soil boring log Form D1586 (attached), field classification of soil, and standard penetration test procedures.

A. Instructions for Completing Soil Boring Logs

Soil boring logs will be completed in the field log books or on separate soil boring log sheets. Information collected will be consistent with that required for Form D1586 (attached), a standard CH2M HILL form (attached), or an equivalent form that supplies the same information.

The information collected in the field to perform the soil characterization is described below.

Field personnel should review completed logs for accuracy, clarity, and thoroughness of detail. Samples also should be checked to see that information is correctly recorded on both jar lids and labels and on the log sheets.

B. Heading Information

Boring/Well Number. Enter the boring/well number. A numbering system should be chosen that does not conflict with information recorded for previous exploratory work done at the site. Number the sheets consecutively for each boring.

Location. If station, coordinates, mileposts, or similar project layout information is available, indicate the position of the boring to that system using modifiers such as "approximate" or "estimated" as appropriate.

Elevation. Elevation will be determined at the conclusion of field activities through a survey.

Drilling Contractor. Enter the name of the drilling company and the city and state where the company is based.

Drilling Method and Equipment. Identify the bit size and type, drilling fluid (if used), and method of drilling (e.g., rotary, hollow-stem auger). Information on the drilling equipment (e.g., CME 55, Mobile B61) also is noted.

Water Level and Date. Enter the depth below ground surface to the apparent water level in the borehole. The information should be recorded as a comment. If free water is not encountered during drilling or cannot be detected because of the drilling method, this information should be noted. Record date and time of day (for tides, river stage) of each water level measurement.

Date of Start and Finish. Enter the dates the boring was begun and completed. Time of day should be added if several borings are performed on the same day.

Logger. Enter the first and last name.

C. Technical Data

Depth Below Surface. Use a depth scale that is appropriate for the sample spacing and for the complexity of subsurface conditions.

Sample Interval. Note the depth at the top and bottom of the sample interval.

Sample Type and Number. Enter the sample type and number. SS-1 = split spoon, first sample. Number samples consecutively regardless of type. Enter a sample number even if no material was recovered in the sampler.

Sample Recovery. Enter the length to the nearest 0.1-foot of soil sample recovered from the sampler. Often, there will be some wash or caved material above the sample; do not include the wash material in the measurement. Record soil recovery in feet.

Standard Penetration Test Results. In this column, enter the number of blows required for each 6 inches of sampler penetration and the "N" value, which is the sum of the blows in the middle two 6-inch penetration intervals. A typical standard penetration test involving successive blow counts of 2, 3, 4, and 5 is recorded as 2-3-4-5 and (7). The standard penetration test is terminated if the sampler encounters refusal. Refusal is a penetration of less than 6 inches with a blow count of 50. A

partial penetration of 50 blows for 4 inches is recorded as 50/4 inches. Penetration by the weight of the slide hammer only is recorded as "WOH."

Samples should be collected using a 140-pound hammer and 2-inch diameter split spoons. Samples may be collected using direct push sampling equipment. However, blow counts will not be available. A pocket penetrometer may be used instead to determine relative soil density of fine grained materials (silts and clays).

Sample also may be collected using a 300-pound hammer or 3-inch-diameter split-spoon samples at the site. However, use of either of these sample collection devices invalidates standard penetration test results and should be noted in the comments section of the log. The 300-pound hammer should only be used for collection of 3-inch-diameter split-spoon samples. Blow counts should be recorded for collection of samples using either a 3-inch split-spoon, or a 300-pound hammer. An "N" value need not be calculated.

Soil Description. The soil classification should follow the format described in the "Field Classification of Soil" subsection below.

Comments. Include all pertinent observations (changes in drilling fluid color, rod drops, drilling chatter, rod bounce as in driving on a cobble, damaged Shelby tubes, and equipment malfunctions). In addition, note if casing was used, the sizes and depths installed, and if drilling fluid was added or changed. You should instruct the driller to alert you to any significant changes in drilling (changes in material, occurrence of boulders, and loss of drilling fluid). Such information should be attributed to the driller and recorded in this column.

Specific information might include the following:

- The date and the time drilling began and ended each day
- The depth and size of casing and the method of installation
- The date, time, and depth of water level measurements
- Depth of rod chatter
- Depth and percentage of drilling fluid loss
- Depth of hole caving or heaving
- Depth of change in material
- Health and safety monitoring data
- Drilling interval through a boulder

D. Field Classification of Soil

This section presents the format for the field classification of soil. In general, the approach and format for classifying soils should conform to ASTM D 2488, Visual-Manual Procedure for Description and Identification of Soils (attached).

The Unified Soil Classification System is based on numerical values of certain soil properties that are measured by laboratory tests. It is possible, however, to estimate these values in the field with reasonable accuracy using visual-manual procedures (ASTM D 2488). In addition, some elements of a complete soil

description, such as the presence of cobbles or boulders, changes in strata, and the relative proportions of soil types in a bedded deposit, can be obtained only in the field.

Soil descriptions should be precise and comprehensive without being verbose. The correct overall impression of the soil should not be distorted by excessive emphasis on insignificant details. In general, similarities rather than differences between consecutive samples should be stressed.

Soil descriptions must be recorded for every soil sample collected. The format and order for soil descriptions should be as follows:

1. Soil name (synonymous with ASTM D 2488 Group Name) with appropriate modifiers. Soil name should be in all capitals in the log, for example "POORLY-GRADED SAND."
2. Group symbol, in parentheses, for example, "(SP)."
3. Color, using Munsell color designation
4. Moisture content
5. Relative density or consistency
6. Soil structure, mineralogy, or other descriptors

This order follows, in general, the format described in ASTM D 2488.

E. Soil Name

The basic name of a soil should be the ASTM D 2488 Group Name on the basis of visual estimates of gradation and plasticity. The soil name should be capitalized.

Examples of acceptable soil names are illustrated by the following descriptions:

- A soil sample is visually estimated to contain 15 percent gravel, 55 percent sand, and 30 percent fines (passing No. 200 sieve). The fines are estimated as either low or highly plastic silt. This visual classification is SILTY SAND WITH GRAVEL, with a Group Symbol of (SM).
- Another soil sample has the following visual estimate: 10 percent gravel, 30 percent sand, and 60 percent fines (passing the No. 200 sieve). The fines are estimated as low plastic silt. This visual classification is SANDY SILT. The gravel portion is not included in the soil name because the gravel portion was estimated as less than 15 percent. The Group Symbol is (ML).

The gradation of coarse-grained soil (more than 50 percent retained on No. 200 sieve) is included in the specific soil name in accordance with ASTM D 2488. There is no need to further document the gradation. However, the maximum size and angularity or roundness of gravel and sand-sized particles should be recorded. For fine-grained soil (50 percent or more passing the No. 200 sieve), the name is modified by the appropriate plasticity/elasticity term in accordance with ASTM D 2488.

Interlayered soil should each be described starting with the predominant type. An introductory name, such as "Interlayered Sand and Silt," should be used. In addition, the relative proportion of each soil type should be indicated (see Table 1 for example).

Where helpful, the evaluation of plasticity/elasticity can be justified by describing results from any of the visual-manual procedures for identifying fine-grained soils, such as reaction to shaking, toughness of a soil thread, or dry strength as described in ASTM D 2488.

F. Group Symbol

The appropriate group symbol from ASTM D 2488 must be given after each soil name. The group symbol should be placed in parentheses to indicate that the classification has been estimated.

In accordance with ASTM D 2488, dual symbols (e.g., GP-GM or SW-SC) can be used to indicate that a soil is estimated to have about 10 percent fines. Borderline symbols (e.g., GM/SM or SW/SP) can be used to indicate that a soil sample has been identified as having properties that do not distinctly place the soil into a specific group. Generally, the group name assigned to a soil with a borderline symbol should be the group name for the first symbol. The use of a borderline symbol should not be used indiscriminately. Every effort should be made to first place the soil into a single group.

G. Color

The color of a soil must be given. The color description should be based on the Munsell system. The color name and the hue, value, and chroma should be given.

H. Moisture Content

The degree of moisture present in a soil sample should be defined as dry, moist, or wet. Moisture content can be estimated from the criteria listed on Table 2.

I. Relative Density or Consistency

Relative density of a coarse-grained (cohesionless) soil is based on N-values (ASTM D 1586 [attached]). If the presence of large gravel, disturbance of the sample, or non-standard sample collection makes determination of the in situ relative density or consistency difficult, then this item should be left out of the description and explained in the Comments column of the soil boring log.

Consistency of fine-grained (cohesive) soil is properly based on results of pocket penetrometer or torvane results. In the absence of this information, consistency can be estimated from N-values. Relationships for determining relative density or consistency of soil samples are given in Tables 3 and 4.

J. Soil Structure, Mineralogy, and Other Descriptors

Discontinuities and inclusions are important and should be described. Such features include joints or fissures, slickensides, bedding or laminations, veins, root holes, and wood debris.

Significant mineralogical information such as cementation, abundant mica, or unusual mineralogy should be described.

Other descriptors may include particle size range or percentages, particle angularity or shape, maximum particle size, hardness of large particles, plasticity of fines, dry strength, dilatancy, toughness, reaction to HCl, and staining, as well as other information such as organic debris, odor, or presence of free product.

K. Equipment and Calibration

Before starting the testing, the equipment should be inspected for compliance with the requirements of ASTM D 1586. The split-barrel sampler should measure 2-inch or 3-inch O.D., and should have a split tube at least 18 inches long. The minimum size sampler rod allowed is "A" rod (1-5/8-inch O.D.). A stiffer rod, such as an "N" rod (2-5/8-inch O.D.), is required for depths greater than 50 feet. The drive weight assembly should consist of a 140-pound or 300-pound hammer weight, a drive head, and a hammer guide that permits a free fall of 30 inches.

IV. Attachments

Soil Boring Log (Sample Soil Boring Log.xls)

CH2M HILL Form D1586 and a completed example (Soil_Log_Examp.pdf)

ASTM D 2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)* (ASTM D2488.pdf)

ASTM 1586 *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils* (ASTM D1586.pdf)

Tables 1 through 4 (Tables 1-4.pdf)

V. Key Checks and Preventive Maintenance

- Check entries to the soil-boring log and field logbook in the field; because the samples will be disposed of at the end of fieldwork, confirmation and corrections cannot be made later.
- Check that sample numbers and intervals are properly specified.
- Check that drilling and sampling equipment is decontaminated using the procedures defined in SOP *Decontamination of Drilling Rigs and Equipment*.

STANDARD OPERATING PROCEDURE

Sediment Sampling

I. Purpose

These general outlines describe the collection and handling of sediment samples during field operations.

II. Scope

The sediment sampling procedures generally describe the equipment and techniques needed to collect representative sediment samples. Operators manual, if available, should be consulted for specific details

III. Equipment and Materials

- Sample collection device (hand corer, scoop, dredge, grab sampler, or other suitable device)
- Stainless steel spoon or spatula or plastic disposable scoop for media transfer
- Measuring tape
- Log book
- Personal protection equipment (rubber or latex gloves, boots, hip waders, etc.)
- Materials for classifying soils, particularly the percentage of fines
- Sample jars, including jars for Total Organic Carbon and pH, as appropriate

IV. Procedures and Guidelines

1. Field personnel will start downstream and work upstream to prevent contamination of unsampled areas. In surface water bodies that are tidally influenced, sampling will be performed at low tide and under low flow conditions to minimize the dilution of possible contaminants. Sediment sampling activities will not occur immediately after periods of heavy rainfall.
2. Make a sketch of the sample area that shows important nearby river features and permanent structures that can be used to locate the sample points on a map. Whenever possible, include measured distances from such identifying features. Also include depth and width of waterway, rate of flow, type and consistency of sediment, and point and depth of sample removal (along shore, mid-channel, etc).

3. Note in the field book any possible outside sources of contamination; for example, the outlet to a drainage culvert in the water body near your sampling location.

4. Transfer sample into appropriate sample jars with a stainless steel utensil or plastic disposable scoop. Be especially careful to avoid the loss of the very fine clay/silt particles when collecting the sample. The fine particles have a higher adsorption capacity than larger particles. Minimize the amount of water that is collected within the sample matrix. Decant the water off of the sample slowly and carefully to maximize retention of the very fine particles. The sampler's fingers should never touch the sediment since gloves may introduce organic interference into the sample. Classify the soil type of the sample using the Unified Soil Classification System, noting particularly the percentage of silt and clay.

5. Samples for volatile organics should immediately be placed in jars. Rocks and other debris should be removed before placement in jars.

6. For channel sampling, be on the alert for submerged hazards (rocks, tree roots, drop-offs, loss silt and muck) which can make wading difficult.

7. Sample sediment for TOC and pH also, to give context to organic and inorganic data during the risk assessment.

8. Follow the site safety plan designed for the specific nature of the site's sampling activities and locations.

9. Decontaminate all sampling implements and protective clothing according to prescribed procedures.

V. Attachments

None.

VI. Key Checks and Items

- Start downstream, work upstream.
- Log exact locations using permanent features.
- Beware of hidden hazards.

STANDARD OPERATING PROCEDURE

Surface Water Sampling

I. Purpose and Scope

This procedure presents the techniques used in collecting surface water samples. Materials, equipment, and procedures may vary; refer to the Field Sampling Plan and operators manuals for specific details.

II. Materials and Equipment

Materials and equipment vary depending on type of sampling; the Field Sampling Plan should be consulted for project-specific details. Typical equipment required includes:

- Open tube sampler
- Dip sampler
- Weighted bottle sampler
- Hand pump
- Kemmerer or Van Dorn sampler
- Depth-integrating sampler
- Peristaltic pump
- Sample containers
- Meters for specific conductance, temperature, pH, and dissolved oxygen

III. Procedures and Guidelines

Before surface water samples are taken, all sampler assemblies and sample containers are cleaned and decontaminated as described in SOP *Decontamination of Personnel and Equipment*. Surface water samples collected from water bodies tidally influenced should be collected at low tide and under low flow conditions to minimize the dilution of potential contaminants. Methods for surface water sample collection are described below.

A. Manual Sampling

Surface water samples are collected manually by submerging a clean glass, stainless steel, or Teflon container into the water body. Samples may be collected at depth with a covered bottle that can be removed with a tripline. The most common sampler types are beakers, sealable bottles and jars, pond samplers, peristaltic pumps, and weighted bottle samplers. Pond samplers have a fixed or telescoping pole attached to the sample container. Weighted bottle samplers are lowered below water surface, where the attached bottle is opened, allowed to fill, and pulled out of the water. When retrieved, the bottle is tightly capped and removed from the

sampler assembly. Specific types of weighted bottle samplers include Kemmerer or Van Dorn and are acceptable in most instances.

A sample is taken with the following specific steps:

1. The location and desired depth for water sampling are selected.
2. The sample site is approached from downstream in a manner that avoids disturbance of bottom sediments as much as possible. The sample bottle is gently submerged with the mouth pointed upstream and the bottle tilted slightly downstream. Bubbles and floating materials should be prevented from entering the bottle. If using a Peristaltic pump, lower the tubing into the water to the desired depth.
3. For weighted bottle samplers, the assembly is slowly lowered to the desired depth. The bottle stopper is unseated with a sharp tug and the bottle is allowed to fill until bubbles stop rising to the surface.
4. When the bottle is full, it is gently removed from the water. If sample transfer is required, it should be performed at this time.
5. Measure dissolved oxygen, specific conductance, temperature, and pH at the sampling location.

IV. Attachments

None.

V. Key Checks and Items

- Start downstream, work upstream
- Log exact locations using permanent features
- Beware of hidden hazards

STANDARD OPERATING PROCEDURE

Shallow Soil Sampling

I. Purpose

To provide general guidelines for the collection and handling of surface soil samples during field operations.

II. Scope

The method described for surface soil sampling is applicable for loosely packed earth and is used to collect disturbed-soil samples.

III. Equipment and Materials

- Sample jars.
- A hand auger or other device that can be used to remove the soil from the ground. Only stainless steel, Teflon, or glass materials should be used. The only exception is split spoons, which are most commonly available in carbon steel; these are acceptable for use only if they are not rusty.
- A stainless steel spatula or disposable plastic scoop should be used to remove material from the sampling device.
- Unpainted wooden stakes or pin flags
- Fiberglass measuring tape (at least 200 feet in length)
- GPS Unit (if available)

IV. Procedures and Guidelines

A. Wear protective gear, as specified in the Health and Safety Plan.

B. To locate samples, identify the correct location using the pin flags or stakes. Proceed to collect a sample from the undisturbed soil adjacent to the marker following steps C and D. If markers are not present, the following procedures will be used.

1. For samples on a grid:

a. Use measuring tape to locate each sampling point on the first grid line as prescribed in the sampling plan. As each point is located, drive a numbered stake in the ground and record its location on the site map and in the logbook.

b. Proceed to sample the points on the grid line.

c. Measure to location where next grid line is to start and stake first sample. For subsequent samples on the line take two orthogonal measurements: one to the previous grid line, and one to the previous sample on the same grid line.

d. Proceed to sample the points on the grid line as described in Section C below.

e. Repeat 1c and 1d above until all samples are collected from the area.

f. Or, a GPS unit can be used to identify each location based on map coordinated, if available.

2. For non-grid samples:

a. Use steel measuring tape to position sampling point at location described in the sampling plan by taking two measurements from fixed landmarks (e.g., corner of house and fence post).

b. Note measurements, landmarks, and sampling point on a sketch in the field notebook, and on a site location map.

c. Proceed to sample as described in Section C below.

d. Repeat 2a through 2c above until all samples are collected from the area.

e. Or, a GPS unit can be used to identify each location based on map coordinated, if available.

C. To the extent possible, differentiate between fill and natural soil. If both are encountered at a boring location, sample both as prescribed in the field sampling plan. Do not locate samples in debris, tree roots, or standing water. In residential areas, do not sample in areas where residents' activities may impact the sample (e.g., barbecue areas, beneath eaves of roofs, driveways, garbage areas). If an obstacle prevents sampling at a measured grid point, move as close as possible, but up to a distance of one half the grid spacing in any direction to locate an appropriate sample. If an appropriate location cannot be found, consult with the Field Team Leader (FTL). If the FTL concurs, the sampling point will be deleted from the program. The FTL will contact the CH2M HILL project manager (PM) immediately. The PM and Navy Technical Representative (NTR) will discuss whether the point should be deleted from the program. If it is deleted, the PM will follow-up with the NTR in writing.

D. To collect samples:

1. Use a decontaminated stainless steel scoop/trowel or disposable plastic scoop to scrape away surficial organic material (grass, leaves, etc.) adjacent to

the stake. New disposable scoops or trowels may also be used to reduce the need for equipment blanks.

2. If sampling:

   a. Surface soil: Obtain soil sample by scooping soil using the augering scoop/trowel, starting from the surface and digging down to a depth of about 6 inches, or the depth specified in the workplan.

   b. Subsurface soil: Obtain the subsurface soil sample using an auger down to the depths prescribed in the field sampling plan.

3. Take a photo ionization detector (PID) reading of the sampled soil if organics are anticipated to be present and record the response in the field notebook. Also record lithologic description and any pertinent observations (such as discoloration) in the logbook.

4. Empty the contents of the scoop/trowel into a decontaminated stainless steel pan or dedicated sealable bag.

5. Repeat this procedure until sufficient soil is collected to meet volume requirements.

6. For TCL VOC and field GC aliquots, fill sample jars directly with the trowel or scoop or specialized sampling equipment (i.e. Encore® or Terra Core® sampler) and cap immediately upon filling. DO NOT HOMOGENIZE.

7. For TCL pesticides/PCBs and SVOCs, TAL metals, and field XRF aliquots, homogenize cuttings in the pan using a decontaminated stainless steel utensil in accordance with SOP *Decontamination of Drilling Rigs and Equipment*.

8. Transfer sample for analysis into appropriate containers with a decontaminated utensil.

9. Backfill the hole with soil removed from the borehole. To the extent possible, replace topsoil and grass and attempt to return appearance of sampling area to its pre-sampled condition. For samples in non-residential, unmowed areas, mark the sample number on the stake and leave stake in place. In mowed areas, remove stake.

V. Attachments

None.

VI. Key Checks and Items

- Use phthalate-free latex or surgical gloves and other personal protective equipment.
- Transfer volatiles first, avoid mixing.
- Decontaminate utensils before reuse, or use dedicated, disposable utensils.

STANDARD OPERATING PROCEDURE

Packaging and Shipping Procedures for Low-Concentration Samples

I. Purpose and Scope

The purpose of this guideline is to describe the packaging and shipping of low-concentration samples of various media to a laboratory for analysis.

II. Scope

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

If the site is known to have produced high-concentration samples in the past or the sampler suspects that high concentrations of contaminants might be present in the samples, then the sampler should conservatively assume that the samples cannot be classified as low-concentration. Samples that are anticipated to have medium to high concentrations of constituents should be packaged and shipped accordingly.

If warranted, procedures for dangerous-goods shipping may be implemented. Dangerous goods and hazardous materials pose an unreasonable risk to health, safety, or property during transportation without special handling. As a result only employees who are trained under CH2M HILL Dangerous Goods Shipping course may ship or transport dangerous goods. Employees should utilize the HAZMAT ShipRight tool on the Virtual Office and/or contact a designated CH2M HILL HazMat advisor with questions.

III. Equipment and Materials

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

IV. Procedures and Guidelines

Low-Concentration Samples

A. Prepare coolers for shipment:

- Tape drains shut.
- Affix "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of each cooler.
- Place mailing label with laboratory address on top of coolers.
- Fill bottom of coolers with about 3 inches of vermiculite or absorbent pads.

B. Arrange decontaminated sample containers in groups by sample number. Consolidate VOC samples into one cooler to minimize the need for trip blanks.

C. Affix appropriate adhesive sample labels to each container. Protect with clear label protection tape.

D. Seal each sample bottle within a separate ziplock plastic bag or bubble wrap, if available. Tape the bag around bottle. Sample label should be visible through the bag.

E. Arrange sample bottles in coolers so that they do not touch.

F. If ice is required to preserve the samples, cubes should be repackaged in zip-lock bags and placed on and around the containers.

G. Fill remaining spaces with vermiculite or absorbent pads.

H. Complete and sign chain-of-custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express or the courier.

J Close lid and latch.

K. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.

L. Tape cooler shut on both ends, making several complete revolutions with strapping tape. Cover custody seals with tape to avoid seals being able to be peeled from the cooler.

M. Relinquish to Federal Express or to a courier arranged with the laboratory. Place airbill receipt inside the mailing envelope and send to the sample documentation coordinator along with the other documentation.

Medium- and High-Concentration Samples:

Medium- and high-concentration samples are packaged using the same techniques used to package low-concentration samples, with potential additional restrictions. If applicable, the sample handler must refer to instructions associated with the shipping of dangerous goods for the necessary procedures for shipping by Federal Express or other overnight carrier. If warranted, procedures for dangerous-goods shipping may be implemented. Dangerous goods and hazardous materials pose an unreasonable risk to health, safety, or property during transportation without special handling. As a result only employees who are trained under CH2M HILL Dangerous Goods Shipping course may ship or transport dangerous goods. Employees should utilize the HAZMAT ShipRight tool on the Virtual Office and/or contact a designated CH2M HILL HazMat advisor with questions.

V. Attachments

None.

VI. Key Checks and Items

- Be sure laboratory address is correct on the mailing label
- Pack sample bottles carefully, with adequate vermiculite or other packaging and without allowing bottles to touch
- Be sure there is adequate ice
- Include chain-of-custody form
- Include custody seals

STANDARD OPERATING PROCEDURE

Aquifer Slug Testing

I. Purpose and Scope

The purpose of this procedure is to outline the equipment and methods that will be used to perform variable-head tests ("slug" tests) on piezometers and monitoring wells. The guidance covers use of both air and solid displacement methods.

II. Equipment and Materials

- In-Situ data loggers or equivalent
- Well-testing assembly
  - packer
  - fittings for pressure transducers
  - fittings for air supply
  - release valve
- Compressed air
- Computer and associated equipment
- Solid displacement device with rope

III. Procedures and Guidelines

The tests to be performed are rising head tests. The tests are accomplished by lowering the head of water in the well and monitoring the recovery of the water level to the static water level. The water level will be lowered by one of two methods. One method is the use of an air displacement device. Alternatively, a solid displacement device removed from the well will be used.

The air displacement apparatus consists of a packer assembly, fittings to accommodate transducers and air pressurization, and a pressure-release valve. The packer is lowered into the upper portion of the monitoring well, secured in place and inflated, providing a seal between the apparatus and the inside of the well. Two fittings are provided for pressure transducers: one transducer is fed through the inside of the device and positioned below the water surface and the other is inserted to measure the air pressure inside the assembly. A third fitting is connected to the pressurized air supply, a compressed air tank.

The datalogger will be programmed to display the air pressure in units of head, the head measured by the submerged transducer, and the difference between the two. The difference between the two pressure transducers is the height of the water column on the submerged transducer. The readings are recorded in a field notebook, and then the assembly is pressurized. The air pressure applied will be equivalent to 3 to 7 feet

of head. The pressures are allowed to stabilize. The pressure of the air should not lower the water level to below the base of the bentonite seal installed in the well.

Each test is started by releasing the air pressure inside the assembly and allowing the water level to rise to the static water level. When the datalogger perceives a change in water level in the well above a preset trigger amount, it automatically begins to record the water levels and elapsed time. Each test will be terminated when the water level has recovered to at least 90 percent of the original equilibrium level before pressurization. Note that the test method cannot be used if the well is screened across or near the water table.

An alternate method of lowering the water level is to use a solid displacement device. A single transducer will be installed in the well below the water table. A weighted solid displacement device is added to the well and the water level allowed to stabilize at the original static water level. The test is started by rapidly removing the displacement device, which causes a drop in the water level. The data logger begins recording the water level and elapsed time when the preset trigger amount is reached. Readings are taken as above, and the test stopped when the well has recovered to 90 percent of the original level.

At least two valid tests will be performed in each well. Additional tests will be required if there is some evidence that any of the tests were unacceptable.

At the end of each test, the test results will be transferred to a laptop and the data downloaded and checked for preliminary completeness.

IV. Attachments

None.

V. Key Checks and Preventive Maintenance

- Check that the packer assembly is in good condition and not leaking. Provide a repair kit including tape and clamps. Take additional packer assembly and other spare parts.
- Check the batteries for the datalogger and computer. Check that the computer disks containing the programs for the datalogger are packed.
- Check the datalogger calculation of the well hydraulic conductivity at the end of each test to determine if these are consistent with expectations.

STANDARD OPERATING PROCEDURE

Soil Sampling

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for obtaining samples of surface and subsurface soils using hand and drilling-rig mounted equipment.

II. Equipment and Materials

- Stainless-steel trowel, shovel, scoop, coring device, hand auger, or other appropriate hand tool
- Stainless-steel, split-spoon samplers
- Thin-walled sampling tubes
- Drilling rig or soil-coring rig
- Stainless-steel pan/bowl or disposable sealable bags
- Sample bottles

III. Procedures and Guidelines

Before sampling begins, equipment will be decontaminated using the procedures described in SOP *Decontamination of Drilling Rigs and Equipment*. The sampling point is located and recorded in the field logbook. Debris should be cleared from the sampling location.

A. Surface and Shallow Subsurface Sampling

A shovel, post-hole digger, or other tool can be used to remove soil to a point just above the interval to be sampled. A decontaminated sampling tool will be used to collect the sample when the desired sampling depth has been reached. Soil for semivolatile organic and inorganic analyses is placed in the bowl and mixed; soil for volatile organic analysis is not mixed or composited but is placed directly into the appropriate sample bottles. A stainless-steel or dedicated wooden tongue depressor is used to transfer the sample from the bowl to the container.

The soils removed from the borehole should be visually described in the field log book, including approximated depths.

When sampling is completed, photo-ionization device (PID) readings should be taken directly above the hole, and the hole is then backfilled.

More details are provided in the SOP *Shallow Soil Sampling.*

B. Split-Spoon Sampling

Using a drilling rig, a hole is advanced to the desired depth. For split-spoon sampling, the samples are then collected following the ASTM D 1586 standard (attached). The sampler is lowered into the hole and driven to a depth equal to the total length of the sampler; typically this is 24 inches. The sampler is driven in 6-inch increments using a 140-pound weight ("hammer") dropped from a height of 30 inches. The number of hammer blows for each 6-inch interval is counted and recorded. To obtain enough volume of sample for subsequent laboratory analysis, use of a 3-inch ID sampler may be required. Blow counts obtained with a 3-inch ID spoon would not conform to ASTM D 1586 and would therefore not be used for geotechnical evaluations.

Once retrieved from the hole, the sampler is carefully split open. Care should be taken not to allow material in the sampler to fall out of the open end of the sampler. To collect the sample, the surface of the sample should be removed with a clean tool and disposed of. Samples collected for volatiles analysis should be placed directly into the sample containers from the desired depth in the split spoon. Material for samples for all other parameters should be removed to a decontaminated stainless steel tray or disposable sealable bag. The sample for semivolatile organic and inorganic analyses should be homogenized in the field by breaking the sample into small pieces and removing gravel. The homogenized sample should be placed in the sample containers. If sample volume requirements are not met by a single sample collection, additional sample volume may be obtained by collecting a sample from below the sample and compositing the sample for non-volatile parameters only.

Split-spoon samples also will be collected using a tripod rig. When using a tripod rig the soil samples are collected using an assembly similar to that used by the drilling rig.

C. Thin-Walled Tube Sampling

Undisturbed fine grained samples may be collected for analysis for geotechnical parameters such as vertical hydraulic conductivity. These samples will be collected using thin-walled sampling tubes (sometimes called Shelby tubes) according to ASTM D 1587 (attached). Tubes will be 24- to 36 inches long and 3- to 4-inches in diameter, depending upon the quantity of sample required. Undisturbed samples will be obtained by smoothly pressing the sampling tube through the interval to be sampled using the weight of the drilling rig. Jerking the sample should be avoided. Once the sample is brought to the surface, the ends will be sealed with bees wax and then sealed with end caps and heavy tape. The sample designation, data and time of sampling, and the up direction will be noted on the sampling tube. The tube shall be kept upright as much as possible and will be protected from freezing, which could disrupt the undisturbed nature of the sample. Samples for geochemical analysis normally are not collected from thin-walled tube samples.

IV. Attachments

ASTM D 1586 *Standard Penetration Test Method for Penetration Test and Split-Barrel Sampling of Soils* (ASTM D1586.pdf)

ASTM D 1587 *Standard Practice for Thin-Walled Tube Sampling of Soils* (ASTM D1587.pdf)

V. Key Checks and Preventative Maintenance

- Check that decontamination of equipment is thorough.
- Check that sample collection is swift to avoid loss of volatile organics during sampling.

Standard Operating Procedure

Locating and Clearing Underground Utilities

I. Purpose

The purpose of this SOP is to provide general guidelines and specific procedures that must be followed on Navy CLEAN projects for locating underground utilities and clearing dig locations in order to maximize our ability to avoid hitting underground utilities and to minimize liabilities to CH2M HILL and its subcontractors and health and safety risks to our project staff.

This SOP shall be used by Activity Managers and Project Managers to, in-turn, develop Activity-specific and project-specific utility location procedures. The activity and project-specific procedures will become part of work plans and project instructions and will be used to prepare scopes of work (SOWs) for the procurement of utility location subcontractors to meet the needs of individual projects.

This SOP also identifies the types of utility locating services that are available from subcontractors and the various tools that are used to locate utilities, and discusses when each type of service and tool may or may not be applicable.

II. Scope

Depending on the Navy/Marine Activity we typically find ourselves in one of two scenarios:

Scenario 1

The Activity provides utility locating (or dig clearance) services through the public works department or similar organization, or has a contract with an outside utility clearance service. Some of these services are provided in the form of dig permits which are required before you can dig or drill. In other cases no official permit is required and the process is somewhat vague.

Scenario 2

The Activity does not get involved in any utility locating processes aside from possibly providing the most recent utility maps, and relies on CH2M HILL to clear the dig locations.

Table 1 provides an up to date summary of which scenarios apply to the various primary Activities served under the Navy CLEAN program.

Scenario 1 is preferred because under this scenario the Navy tends to assume the responsibility if the location is improperly cleared, a utility is struck, and property damage results. However, our experience has been that the clearance services provided

by the Navy do not meet the standards that we consider to be adequate, in that they often simply rely on available base maps to mark utilities and do not verify locations using field geophysics. And if they do use locating tools, they do not provide adequate documentation or marking to confirm that a location has been cleared. So while the Navy's process may protect us from liability for property damage, it does not adequately protect our staff and subcontractors from health risks nor does it compensate us for down time, should a utility be hit.

Therefore, regardless of what services the Navy provides, in most cases we still need to supplement this effort with clearance services from our own third party utility location subcontractor following the procedures and guideline outlined in Section IV of this SOP. The cost implications of providing this service will range from $500 to several $1,000 depending on the size of the project.

The scope of services that we ask our subcontractors to provide can involve utility marking/mapping or the clearing of individual dig locations. In the former we ask our subs to mark all utilities within a "site" and often ask them to prepare a map based on their work. In the later, we ask them to clear (identify if there are any utilities within) a certain radius of a proposed dig/drill location.

The appropriate requested scope of services for a project will depend on the project. Clearing individual boreholes is often less expensive and allows the sub to concentrate their efforts on a limited area. However if the scope of the investigation is fluid (all borehole locations are not predetermined) it may be best to mark and map an entire site or keep the subcontractor on call.

Clearance of individual dig locations should be done to a minimum 20 foot radius around the location.

An example SOW for a utility subcontractor procurement is provided in Attachment A.

III. Services and Equipment

This section provides a general description of the services available to help us locate subsurface utilities and describes the types of equipment that these services may (or may not) use to perform their work. It identifies the capabilities of each type of equipment to help the PM specify what they should require from our utility location subs.

Services

The services that are available to us for identifying and marking underground utilities are:

- The local public/private utility-run service such as Miss Utility
- Utility location subcontractors (hired by us)

Attachment B provides a detailed description of each type of organization. It also provides contact numbers and web sites for the various Miss-Utility-type organizations in the areas where we do work for the Navy and contacts and services provided by several subcontractors that we have used or spoken to in the past.

Equipment

Attachment C provides a summary of the various types of equipment used for subsurface utility location. It describes the capabilities and limitations of each in order to help the PM determine if the equipment being used by a subcontractor is adequate.

It is important to make the potential subcontractors aware of the possible types of utilities (and utility materials) that are at the site, and to have them explain in their bid what types of equipment they will use to locate utilities /clear dig locations, and what the limitations of these equipment are.

A list of in-house experts that can be used to help you evaluate bids or answer questions you may have is provided in **Appendix C.**

IV. Procedures and Guidelines

This section presents specific procedures to be followed for the utility location work to be conducted by CH2M HILL and our subcontractors. In addition, a PM will have to follow the procedures required by the Activity to obtain their approvals, clearances and dig permits where necessary. These "dig permit" requirements vary by Activity and must be added to the project-specific SOP, or project instructions. It is preferable that the Activity perform their clearance processes before we follow up with our clearance work.

Activity Notification and Dig Permit Procedures

Identify Activity-specific permit and/or procedural requirements for excavation and drilling activities. Contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Activity Specific: To be provided by Activity or Project Manager

CH2M HILL Utility Clearance Procedures

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted by CH2M HILL as a follow-up to the services provided by the Navy. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor (subcontracted to CH2M HILL) to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include (these are further described in Attachment C):

- **Ground Penetrating Radar (GPR),** which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF),** involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be

detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.

- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors**, are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers,** are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

The following procedures shall be used to identify and mark underground utilities during subsurface construction activities on the project:

- Contact utility companies or the state/regional utility protection service (such as Miss Utility) at least two (2) working days prior to intrusive activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation: this is a law. These services will only mark the location of public-utility-owned lines and not Navy-owned utilities. In many cases there will not be any public-utility-owned lines on the Activity. There may also be Base-access issues to overcome.
- Procure and schedule the independent survey.
- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project site, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions. ***The types of utilities must be provided to the bidding subcontractors in the SOW and procedures to be used must be specified by the bidder in their bid. It is extremely helpful to provide the sub with utility maps, with the caveat that all utilities are not necessarily depicted.***
- The survey subcontractor shall employ the same geophysical techniques used to identify the buried utilities, to survey the proposed path of subsurface investigation/construction work to confirm no buried utilities are present.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances provided by both the "Miss Utility" service and the CH2M HILL-subcontracted service are to be in writing, signed by the party conducting the clearance. The Miss Utility service will have standard notification forms/letters which typically simply state that they have been to the site and have done their work. The CH2M HILL subcontractor shall be required to fill out the form provided in Attachment D (this can be modified for a particular project) indicating that each dig/drill location has been addressed. ***This documentation requirement (with a copy of the form) needs to be provided in the subcontractor SOW.***

- Marking shall be done using the color coding presented in Attachment E. The type of material used for marking must be approved by the Activity prior to marking. Some base commanders have particular issues with persistent spray paint on their sidewalks and streets. ***Any particular marking requirements need to be provided in the subcontractor SOW.***
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Perform a field check prior to drilling/digging (preferably while the utility location sub is still at the site) to see if field utility markings coincide with locations on utility maps. Look for fire hydrants, valves, manholes, light poles, lighted signs, etc to see if they coincide with utilities identified by the subcontractor.
- Underground utility locations must be physically verified (or dig locations must be physically cleared) by hand digging using wood or fiberglass-handled tools, air knifing, or by some other acceptable means approved by CH2M HILL, when the dig location (e.g. mechanical drilling, excavating) is expected to be within 5 feet of a marked underground system. Hand clearance shall be done to a depth of four feet unless a utility cross-section is available that indicates the utility is at a greater depth. In that event, the hand clearance shall proceed until the documented depth of the utility is reached.
- Conduct a site briefing for employees at the start of the intrusive work regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

IV. Attachments

A- Example SOW for Utility Location Subcontractor Procurement
B - Services Available for Identifying and Marking Underground Utilities
C – Equipment Used for Identifying Underground Utilities
D – Utility Clearance Documentation Form
E – Utility Marking Color Codes

Attachment A – Example SOW for Subcontracting Underground Utilities Locating Services

CTO-XXX

Scope of Work

Subsurface Utility Locating

Site XX

Navy Activity

City, State

A licensed and insured utility locator will be subcontracted to identify and mark out subsurface utilities for an environmental investigation/remediation project at Site XX of <<insert name of base, city, and state>>. The subcontractor will need to be available beginning at <<insert time>> on <<insert date>>. It is estimated that the work can be completed within XX days.

Proposed Scope of Work

The subcontractor will identify and mark all subsurface utilities (CHOOSE 1) that lie within a radius of 20 feet of each of XX sampling locations at Site XX shown on the attached Figure 1; (OR) that lie within the bounds of Site XX as delineated on the attached Figure 1. (If multiple sites are to be cleared, provide maps of each site with sample locations or clearance boundaries clearly delineated and a scale provided.)

Utilities will be identified using all reasonably available as-built drawings, electronic locating devices, and any other means necessary to maintain the safety of drilling and sampling personnel and the protection of the base infrastructure. The location of utilities identified from as-built drawings or other maps must be verified in the field prior to marking.

Base utility drawings for the Site(s) (CHOOSE 1) can be found at <<insert specific department and address or phone number on the base>> and should be reviewed by the subcontractor and referenced as part of the utility locating. (OR), will be provided to the subcontractor by CH2M HILL upon the award of the subcontract. (OR), are not available. Utility drawings shall not be considered definitive and must be field verified.

Field verification will include detection using nonintrusive subsurface detection equipment (magnetometers, GPR, etc) as well as opening manhole covers to verify pipe directions. As part of the bid, the Subcontractor shall provide a list of the various subsurface investigation tools they propose to have available and use at the site and what the limitations are of each tool.

A CH2M HILL representative shall be present to coordinate utility clearance activities and identify points and features to be cleared.

Field Marking and Documentation

All utilities located within **(CHOOSE 1)** ***a 20-ft radius of the XX proposed soil boring locations*** **(OR)** ***within the boundary of the site(s)*** as identified on the attached figure(s) will be marked using **paint** ***(some Bases such as the WNY may have restrictions on the use of permanent paint)*** and/or pin flags color coded to indicate electricity, gas, water, steam, telephone, TV cable, fiber optic, sewer, etc. The color coding shall match the industry standard as described on the attached form. In addition, the ***Buried Utility Location Tracking Form*** (attached) will be completed by the Subcontractor based upon what is identified in the field during the utility locating and submitted back to CH2M HILL (field staff or project manager) within 24 hours of completing the utility locating activities.

(OPTIONAL) ***The subcontractor shall also provide a map (or hand sketch) of the identified utilities to the Engineer within XX days of field demobilization. The map shall include coordinates or ties from fixed surface features to each identified subsurface utility.***

Bid Sheet/Payment Units

The subcontractor will bid on a time and materials basis for time spent on site and researching utility maps. Mobilization (including daily travel to the site) should be bid as a lump sum, as well as the preparation of the AHA and any required mapping. The per diem line item should be used if the field crew will require overnight accommodations at the project site.

Health and Safety Requirements

The utility locating subcontractor is to provide and assume responsibility for an adequate corporate Health and Safety Plan for onsite personnel. Standard personal safety equipment including: hard hat, safety glasses, steel-toed boots, gloves are recommended for all project activities. Specific health and safety requirements will be established by the Subcontractor for each project. The health and safety requirements will be subject to the review of CH2M HILL.

The subcontractor shall also prepare and provide to the Engineer, at least 48 hours prior to mobilization, an acceptable Activity Hazard Analysis (AHA) using the attached AHA form or similar.

It is also required that all subcontractor personnel who will be on site attend the daily 15-minute health and safety tailgate meeting at the start of each day in the field.

Subcontractor personnel showing indications of being under the influence of alcohol or illegal drugs will be sent off the job site and their employers will be notified. Subcontractor personnel under the influence of prescription or over-the-counter medication that may impair their ability to operate equipment will not be permitted to do so. It is expected that the subcontractor will assign them other work and provide a capable replacement (if necessary) to operate the equipment to continue work.

Security

The work will be performed on US Navy property. CH2M HILL will identify the Subcontractor personnel who will perform the work to the appropriate Navy facility point-of-contact, and will identify the Navy point-of-contact to the Subcontractor crew. The Subcontractor bears final responsibility for coordinating access of his personnel onto Navy property to perform required work. This responsibility includes arranging logistics and providing to CH2M HILL, in advance or at time of entry as specified, any required identification information for the Subcontractor personnel. Specifically, the following information should be submitted with the bid package for all personnel that will perform the work in question (this information is required to obtain a base pass):

- Name
- Birth Place
- Birth Date
- Social Security Number
- Drivers License State and Number
- Citizenship

Please be advised that no weapons, alcohol, or drugs will be permitted on the Navy facility at any time. If any such items are found, they will be confiscated, and the Subcontractor will be dismissed.

Quality Assurance

The Subcontractor will be licensed and insured to operate in the State of <<state>> and will comply with all applicable federal, state, county and local laws and regulations. The subcontractor will maintain, calibrate, and operate all electronic locating instruments in accordance with the manufacturer's recommendations. Additionally, the Subcontractor shall make all reasonable efforts to review as-built engineering drawings maintained by Base personnel, and shall notify the CH2M HILL Project Manager in writing (email is acceptable) whenever such documentation was not available or could not be reviewed.

Subcontractor Standby Time

At certain periods during the utility locating activities, the Subcontractor's personnel may be asked to stop work and standby when work may normally occur. During such times, the Subcontractor will cease activities until directed by the CH2M HILL representative to resume operations. Subcontractor standby time also will include potential delays caused by the CH2M HILL representative not arriving at the site by the agreed-upon meeting time for start of the work day. Standby will be paid to the

Subcontractor at the hourly rate specified in the Subcontractor's Bid Form attached to these specifications.

Cumulative Subcontractor standby will be accrued in increments no shorter than 15 minutes (i.e., an individual standby episode of less than 15 minutes is not chargeable).

During periods for which standby time is paid, the surveying equipment will not be demobilized and the team will remain at the site. At the conclusion of each day, the daily logs for the Subcontractor and CH2M HILL representative will indicate the amount of standby time incurred by the Subcontractor, if any. Payment will be made only for standby time recorded on CH2M HILL's daily logs.

Down Time

Should equipment furnished by the Subcontractor malfunction, preventing the effective and efficient prosecution of the work, or inclement weather conditions prevent safe and effective work from occurring, down time will be indicated in the Subcontractor's and CH2M Hill representative's daily logs. No payment will be made for down time.

Schedule

It is anticipated that the subsurface utility locating activities will occur on <<insert date>>. It is estimated that the above scope will be completed within XXX days.

Attachment B - Services Available for Identifying and Marking Underground Utilities

The services that are available to us for identifying and marking underground utilities are:

- The Activity's PWC (or similar organization)
- The local public/private utility -run service such as Miss Utility
- Utility location subcontractors (hired by CH2M HILL)

Each are discussed below.

Navy Public Works Department

A Public Works Department (PWD) is usually present at each Activity. The PWD is responsible for maintaining the public works at the base including management of utilities. In many cases, the PWD has a written permit process in place to identify and mark-out the locations of Navy-owned utilities [Note: The PWD is usually NOT responsible for the locations/mark-outs of non-Navy owned, public utilities (e.g., Washington Gas, Virginia Power, municipal water and sewer, etc.). Therefore, it is likely that we will have to contact other organizations besides the PWD in order to identify non-Navy owned, public utilities].

At some Activities, there may not be a PWD, the PWD may not have a written permit process in place, or the PWD may not take responsibility for utility locating and mark-outs. In these cases, the PWD should still be contacted since it is likely that they will have the best understanding of the utility locations at the Activity (i.e., engineering drawings, institutional knowledge, etc.). Subsequently, the PWD should be brought into a cooperative arrangement (if possible) with the other services employed in utility locating and mark-out in order to have the most comprehensive assessment performed.

At all Activities we should have a contact (name and phone number), and preferably an established relationship, with PWD, either directly or through the NAVFAC Atlantic, Midlant, or Washington NTR or Activity Environmental Office that we can work with and contact in the event of problems.

Miss Utility or "One Call" Services for Public Utility Mark-outs

Miss Utility or "One Call" service centers are information exchange centers for excavators, contractors and property owners planning any kind of excavation or digging. The "One Call" center notifies participating public utilities of the upcoming excavation work so they can locate and mark their underground utilities in advance to prevent possible damage to underground utility lines, injury, property damage and service outages. In some instances, such with southeastern Virginia bases, the Navy has entered into agreement with Ms. Utilities and is part of the response process for Miss

Utilities. Generally, a minimum of 48 hours is required for the public utility mark-outs to be performed. The "One Call" services are free to the public. Note that the "One Call" centers only coordinate with participating public utilities. There may be some public utilities that do NOT participate in the "One Call" center which may need to be contacted separately. For example, in Washington, DC, the Miss Utility "One Call" center does not locate and mark public sewer and water lines. Therefore, the municipal water and sewer authority must be contacted separately to have the sewer and water lines marked out. The AM should contact the appropriate one-call center to determine their scope of services.

For the Mid-Atlantic region, the following "One Call" service centers are available.

Name	Phone	Website	Comments
Miss Utility of DELMARVA	800-257-7777	www.missutility.net	Public utility mark-outs in Delaware, Maryland, Washington, DC, and Northern Virginia
Miss Utility of Southern Virginia (One Call)	800-552-7001	not available	Public utility mark-outs in Southern Virginia
Miss Utility of Virginia	800-257-7777 800-552-7007	www.missutilityofvirginia.com	General information on public utility mark-outs in Virginia, with links to Miss Utility of DELMARVA and Miss Utility of Southern Virginia (One Call)
Miss Utility of West Virginia, Inc	800-245-4848	none	Call to determine what utilities they work with in West Virginia
North Carolina One Call Center	800-632-4949	www.ncocc.org/ncocc/default.htm	Public Utility Markouts in North Carolina

Private Subcontractors

1. Utility-locating support is required at some level for most all CH2M HILL field projects in "clearing" proposed subsurface boring locations on the project site. Utility location and sample clearance can include a comprehensive effort of GIS map interpretation, professional land surveying, field locating, and geophysical surveying. Since we can usually provide our own GIS-related services for projects and our professional land surveying services are normally procured separately, utility-locating subcontractors will normally only be required for some level of geophysical surveying support in the field. This level of geophysical surveying support can range widely from a simple electromagnetic (EM) survey over a known utility line, to a blind geophysical effort, including a ground-penetrating radar (GPR) survey and/or a comprehensive EM survey to delineate and characterize all unknown subsurface anomalies.

   The level of service required from the subcontractor will vary depending on the nature of the site. At sites where utility locations are well defined on the maps and recent construction is limited, CH2M HILL may be confident with a limited effort from a traditional utility-locating subcontractor providing a simple EM survey. At

sites where utility locations are not well defined, where recent constructions may have altered utility locations, or the nature of the site makes utility location difficult, CH2M HILL will require the services of a comprehensive geophysical surveying subcontractor, with a wide range of GPR and EM services available for use on an "as-needed" basis. Typical costs for geophysical surveying subcontractors will range from approximately $200 per day for a simple EM effort (usually one crew member and one instrument) to approximately $1,500 per day for a comprehensive geophysical surveying effort (usually a two-person crew and multiple instruments). Comprehensive geophysical surveying efforts may also include field data interpretation (and subsequent report preparation) and non-destructive excavation to field-verify utility depths and locations.

The following table provides a list of recommended geophysical surveying support subcontractors that can be used for utility-locating services:

Company Name and Address	Contact Name and Phone Number	Equipment[1]					Other Services[2]		
		1	2	3	4	5	A	B	C
US Radar, Inc.* PO Box 319 Matawan, NJ 07747	Ron LaBarca 732-566-2035			4					
Utilities Search, Inc.*	Jim Davis 703-369-5758	4				4	4	4	4
So Deep, Inc.* 8397 Euclid Avenue Manassas Park, VA 20111	703-361-6005	4					4	4	4
Accurate Locating, Inc. 1327 Ashton Rd., Suite 101 Hanover, MD 21076	Ken Shipley 410-850-0280	4	4						
NAEVA Geophysics, Inc. P.O. Box 7325 Charlottesville, VA 22906	Alan Mazurowski 434-978-3187	4	4	4	4	4	4	4	4
Earth Resources Technology. Inc. 8106 Stayton Rd. Jessup, MD 20794	Peter Li 240-554-0161	4	4	4	4	4	4	4	
Geophex, Ltd 605 Mercury Street Raleigh, NC 27603	I. J. Won 919-839-8515	4	4	4	4	4	4	4	4

Notes:

*Companies denoted with an asterisk have demonstrated reluctance to assume responsibility for damage to underground utilities or an inability to accommodate the insurance requirements that CH2M HILL requests for this type of work at many Navy sites.

[1]Equipment types are:

1. Simple electromagnetic instruments, usually hand-held
2. Other, more innovative, electromagnetic instruments, including larger instruments for more area coverage
3. Ground-penetrating radar systems of all kinds
4. Audio-frequency detectors of all kinds
5. Radio-frequency detectors of all kinds

[2]Other services include:

A. Data interpretation and/or report preparation to provide a permanent record of the geophysical survey results and a professional interpretation of the findings, including expected accuracy and precision.
B. Non-destructive excavation to field-verify the depths, locations, and types of subsurface utilities.
C. Concrete/asphalt coring and pavement/surface restoration.

Attachment C – Equipment Used for Identifying Underground Utilities

This attachment provides a summary of the various types of equipment used for subsurface utility location. It describes the capabilities and limitations of each in order to help the AM and PM determine if the equipment being proposed by a subcontractor or Navy is adequate. A list of in-house experts that can be used to answer questions you may have is provided below.

CH2M HILL In-house Utility Location Experts

Tamir Klaff/WDC

Home Office Phone – 703-669-9611

Electromagnetic Induction (EMI) Methods

EMI instruments, in general, induce an electromagnetic field into the ground (the primary field) and then record the response (the secondary field), if any. Lateral changes in subsurface conductivity, such as caused by the presence of buried metal or by significant soil variations, cause changes in the secondary field recorded by the instrument and thus enable detection and mapping of the subsurface features. It should be noted that EMI only works for electrically conductive materials--plastic or PVC pipes are generally not detected with EMI. Water and gas lines are commonly plastic, although most new lines include a copper "locator" strip on the top of the PVC to allow for detection with EMI.

EMI technology encompasses a wide range of instruments, each with inherent strengths and weaknesses for particular applications. One major division of EMI is between "time-domain" and "frequency-domain" instruments that differ in the aspect of the secondary field they detect. Another difference in EMI instruments is the operating frequency they use to transmit the primary field. Audio- and radio-frequencies are often used for utility detection, although other frequencies are also used. Consideration of the type of utility expected, surface features that could interfere with detection, and the "congestion" of utilities in an area, should be made when choosing a particular EMI instrument for a particular site.

One common EMI tool used for utility location is a handheld unit that can be used to quickly scan an area for utilities and allows for marking locations in "real time". This method is most commonly used by "dig-safe" contractors marking out known utilities prior to excavation. It should be noted that this method works best when a signal (the primary field) can be placed directly onto the line (i.e., by clamping or otherwise connecting to the end of the line visible at the surface, or for larger utilities such as sewers, by running a transmitter through the utility). These types of tools also have a limited capability to scan an area for unknown utilities. Usually this requires having enough area to separate a hand held transmitter at least a hundred feet from the

receiver. Whether hunting for unknown, or confirming known, utilities, this method will only detect continuous lengths of metallic conductors.

In addition to the handheld EMI units, larger, more powerful EMI tools are available that provide more comprehensive detection and mapping of subsurface features. Generally, data with these methods are collected on a regular grid in the investigation area, and are then analyzed to locate linear anomalies that can be interpreted as utilities. These methods will usually detect *all* subsurface metal (above a minimum size), including pieces of abandoned utilities. In addition, in some situations, backfill can be detected against native soils giving information on trenching and possible utility location. Drawbacks to these methods are that the secondary signals from utilities are often swamped (i.e., undetectable) close to buildings and other cultural features, and that the subsurface at heavily built-up sites may be too complicated to confidently interpret completely.

Hand-held metal detectors (treasure-finders) are usually based on EMI technology. They can be used to locate shallow buried metal associated with utilities (e.g., junctions, manholes, metallic locators). Advantages of these tools is the ease of use and real-time marking of anomalies. Drawbacks include limited depths of investigations and no data storage capacity.

Ground Penetrating Radar (GPR)

GPR systems transmit radio and microwave frequency (e.g., 80 megaHertz to 1,000 megaHertz) waves into the ground and then record reflections of those waves coming back to the surface. Reflections of the radar waves typically occur at lithologic changes, subsurface discontinuities, and subsurface structures. Plastic and PVC pipes can sometimes be detected in GPR data, especially if they are shallow, large, and full of a contrasting material such as air in a wet soil, or water in a dry soil. GPR data are usually collected in regular patterns over an area and then analyzed for linear anomalies that can be interpreted as utilities. GPR is usually very accurate in x-y location of utilities, and can be calibrated at a site to give very accurate depth information as well. A significant drawback to GPR is that depth of investigation is highly dependant on background soil conductivity, and it will not work on all sites. It is not uncommon to get only 1-2 feet of penetration with the signal in damp, clayey environments. Another drawback to GPR is that sites containing significant fill material (e.g., concrete rubble, scrap metal, garbage) will result in complicated anomalies that are difficult or impossible to interpret.

Magnetic Field Methods

Magnetic field methods rely on detecting changes to the earth's magnetic field caused by ferrous metal objects. This method is usually more sensitive to magnetic metal (i.e., deeper detection) than EMI methods. A drawback to this method is it is more susceptible to being swamped by surface features such as fences and cars. In addition, procedures must usually be implemented that account for natural variations in the earth's background field as it changes throughout the day. One common use of the method is to measure and analyze the gradient of the magnetic field, which eliminates most of the drawbacks to the method. It should be noted this method only detects

ferrous metal, primarily iron and steel for utility location applications. Some utility detector combine magnetic and EMI methods into a single hand-held unit.

Optical Methods

Down the hole cameras may be useful in visually reviewing a pipe for empty conduits and/or vaults.

Attachment D – Utility Clearance Documentation Form

Attachment E – Utility Marking Color Codes

The following is the standard color code used by industry to mark various types of utilities and other features at a construction site.

White – Proposed excavations and borings

Pink – Temporary survey markings

Red – Electrical power lines, cables, conduits and lighting cables

Yellow – Gas, oil, steam, petroleum or gaseous materials

Orange – Communication, alarm or signal lines, cables, or conduits

Blue – Potable water

Purple – Reclaimed water, irrigation and slurry lines

Green – Sewer and storm drain lines

STANDARD OPERATING PROCEDURE

VOC Sampling-Water

I. Purpose

To provide general guidelines for sampling aqueous volatile organic compounds.

II. Scope

Standard techniques for collecting representative samples are summarized. Site-specific details are discussed in the Field Sampling Plan.

III. Equipment and Materials

- Sample vials pre-preserved at laboratory with hydrochloric acid (HCl)
- Surgical or latex gloves

IV. Procedures and Guidelines

1. Sample VOCs before sampling other analyte groups.

2. When sampling for VOCs, especially residential wells, evaluate the area around the sampling point for possible sources of air contamination by VOCs. Products that may give off VOCs and possibly contaminate a sample include perfumes and cosmetics, skin applied pharmaceuticals, automotive products (gasoline, starting fluid, windshield deicers, carburetor cleaners, etc.) and household paint products (paint strippers, thinners, turpentine, etc.).

3. Keep the caps off the sample vials for as short a time as possible.

4. Wear clean latex or surgical gloves.

5. Fill the sample vial immediately, allowing the water stream to strike the inner wall of the vial to minimize formation of air bubbles. DO NOT RINSE THE SAMPLE VIALS BEFORE FILLING.

6. Fill the sample vial with a minimum of turbulence, until the water forms a positive meniscus at the brim.

7. Replace the cap by gently setting it on the water meniscus. Tighten firmly, but DO NOT OVERTIGHTEN.

8. Invert the vial and tap it lightly. If you see air bubbles in the sample, do not add more sample. Use another vial to collect another sample. Repeat if necessary until you obtain a proper sample.

V. Attachments

None.

VI. Key Checks and Items

- Check for possible sources of contamination.
- Fill slowly, with as little turbulence as possible.
- Check for air bubbles.

STANDARD OPERATING PROCEDURE

Water-Level Measurements

I. Purpose and Scope

The purpose of this procedure is to provide a guideline for the measurement of the depth to groundwater in piezometers and monitoring wells, even where a second phase of floating liquid (e.g., gasoline) is encountered, and on staff gages in surface-water bodies. This SOP includes guidelines for discrete measurements of static water levels and does not cover the use of continuously recording loggers (see SOP *Use of Data Loggers and Pressure Transducers)*.

II. Equipment and Materials

- Electronic water-level meter (Solinst® or equivalent) with a minimum 100-foot tape; the tape should have graduations in increments of 0.01 feet or less
- Interface probe (Solinst® Model 122 Interface Meter or equivalent)

III. Procedures and Guidelines

Verify that the unit is turned on and functioning properly. Slowly lower the probe on its cable into the piezometer or well until the probe just contacts the water surface; the unit will respond with a tone or light signal. Note the depth from a reference point indicated on the piezometer or well riser. Typically this is the top of the PVC casing. If no reference is clearly visible, measure the depth to water from the northern edge of the PVC casing. If access to the top of the PVC casing is difficult, sight across the top of the locking casing adjacent to the measuring point, recording the position of the cable when the probe is at the water surface.

Measure the distance from this point to the closest interval marker on the tape, and record the water level reading in the logbook. Water levels will be measured to the nearest 0.01-foot. Also when specified in the project plans, measure and record the depth of the piezometer or well. The depth of the piezometer or well may be measured using the water-level probe with the instrument turned off.

Free product light or dense nonaqueous phase liquid may be present in the piezometer or well. If the presence of free product is suspected, the thickness of the product should be determined using appropriate equipment (e.g., Solinst® Model 122 Interface Meter). The depth to water also is determined with this equipment and the water-level meter should not be used in the piezometer or well as long as product is present. Typically, a constant sound is emitted from the device when free product is encountered and an alternating on/off beep sound is emitted when water is encountered.

The apparent elevation of the water level in the well or piezometer is determined by measuring both the apparent depth to water and the thickness of free product. The corrected water-level elevation is calculated by the following equation:

$$WL_c = Wl_a + (\text{Free-product thickness} \times 0.80)$$

Where WL_c = Corrected water-level elevation

Wl_a = Apparent water-level elevation

0.80 = Typical value for the density of petroleum hydrocarbon products.

If free product is detected on the surface of the water in the piezometer or well, the value of sampling should be reconsidered because of the potential for contaminating the sampling equipment.

Staff gages may be installed in some surface-water bodies. These facilities typically are constructed by attaching a calibrated, marked staff gage to a wood or metal post, driving the post into the bottom of the surface-water body, and surveying the elevation of the top of the post to a resolution or 0.01-foot. The elevation of the water in the surface-water body then can be determined by reading off the distance the water level is from the top of the post. A shield or other protection may be needed to calm the fluctuations in water level if the gage is installed at a location exposed to wind or wave.

IV. Attachments

None.

V. Key Checks

- Before each use, verify that the battery is charged by pressing the test button on the water-level meter.
- Verify that the unit is operating correctly by testing the probe in distilled or de-ionized water. Leave the unit turned off when not in use.

STANDARD OPERATING PROCEDURE

Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, ORP, and Temperature Using a Horiba or YSI Water Quality Parameter Meter with Flow-through Cell

I. Purpose and Scope

The purpose of this procedure is to provide a general guideline for using a water quality parameter meter (e.g., Horiba® or YSI) for field measurements of pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature of aqueous samples. The YSI instrument does not measure turbidity. A separate turbidity meter (i.e., Hanna Turbidity Meter) will need to be used in conjunction with the YSI meter. The operator's manual should be consulted for detailed operating procedures.

II. Equipment and Materials

- Water Quality Parameter Meter such as a Horiba® Water Quality Monitoring System or YSI with flow-though cell
- Auto-Calibration Standard Solution (provided by rental company)
- Distilled water in squirt bottle

III. Procedures and Guidelines

A. Parameters and Specifications:

Parameter	Range of measurement	Accuracy
pH	0 to 14 pH units	+/- 0.1 pH units
Specific conductance	0 to 9.99 S/m	+/- 3 % full scale
Turbidity	0 to 800 NTU	+/- 5 % full scale
Dissolved oxygen	0 to 19.99 mg/l	+/- 0.2 mg/l
Temperature	0 to 55 ^{o}C	+/- 1.0 ^{o}C
ORP	-999 to +999 mV	+/- 15 mV
Salinity	0 to 4 %	+/- 0.3 %

B. Calibration:

Prior to each day's use, clean the probe and flow-through cell using deionized water and calibrate using the Standard Solution.

Horiba Calibration procedure:

1. Fill a calibration beaker with standard solution to the recommended fill line.
2. Insert the probe into the beaker. All the parameter sensors will now be immersed in the standard solution except the D.O. sensor; the D.O. calibration is done using atmospheric air.
3. Turn power on and allow some time for the machine to warm-up prior to starting the calibration. When the initial readings appear to stabilize the instrument is ready to calibrate.
4. Press CAL key to put the unit in the calibration mode.
5. Press the ENT key to start automatic calibration. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one by one: pH, COND, TURB, and DO. When the calibration is complete, the readout will briefly show END. The instrument is now calibrated.
6. If the unit is calibrated properly the instrument readings, while immersed in the standard solution, will match the standard solution values provided on the solution container. The typical standard solution values are: pH = 4.0 +/- 3%, conductivity 4.49 mS/cm +/- 3%, and turbidity = 0 NTU +/- 3%.
7. Record the calibration data (e.g. time, instrument ID, solution lot number and expiration date, final calibrated readings, and solution temperature in the field logbook.

YSI Calibration procedure:

1. Press the **On/off** key to display the run screen
2. Press the **Escape** key to display the main menu screen
3. Use the arrow keys to highlight the **Calibrate**
4. Press the **Enter** key. The Calibrate screen is displayed
5. Choose the parameter to calibrate

A. Conductivity Calibration:

This procedure calibrates specific conductance (recommended), conductivity and salinity. Calibrating any one option automatically calibrates the other two.

1) Use the arrow keys to highlight the **Conductivity** selection
2) Press **Enter**. The Conductivity Calibration Selection Screen is displayed.
3) Use the arrow keys to highlight the Specific Conductance selection.
4) Press **Enter**. The Conductivity Calibration Entry Screen is displayed.

5) Place the correct amount of conductivity standard (see Instrument Manual) into a clean, dry or pre-rinsed transport/calibration cup.
6) Carefully immerse the sensor end of the probe module into the solution.
7) Gently rotate and/or move the probe module up and down to remove any bubbles from the conductivity cell.

   NOTE: The sensor must be completely immersed past its vent hole. Using the recommended volumes from the Instrument Manual Calibration Volumes should ensure that the vent hole is covered.
8) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.

   NOTE: Do not over tighten as this could cause damage to the threaded portions.
9) Use the keypad to enter the calibration value of the standard you are using.

   NOTE: Be sure to enter the value in **mS/cm at 25°C**.
10) Press **Enter**. The Conductivity Calibration Screen is displayed.
11) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
12) Observe the reading under Specific Conductance. When the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
13) Press **Enter**. This returns you to the Conductivity Calibrate Selection Screen
14) Press **Escape** to return to the calibrate menu.
15) Rinse the probe module and sensors in tap or purified water and dry.

B. Dissolved Oxygen Calibration:

This procedure calibrates dissolved oxygen. Calibrating any one option (% or mg/L) automatically calibrates the other.

1) Go to the calibrate screen as described in Section

   NOTE: The instrument must be on for at least 20 minutes to polarize the DO sensor before calibrating.
2) Use the arrow keys to highlight the **Dissolved Oxygen** selection.
3) Press **Enter**. The dissolved oxygen calibration screen is displayed.
4) DO calibration in mg/L is carried out in a water sample which has a known concentration of dissolved oxygen (usually determined by a Winkler titration).
5) Use the arrow keys to highlight the **DO mg/L** selection.
6) Press **Enter**. The DO mg/L Entry Screen is displayed.
7) Place the probe module in water with a known DO concentration.

   NOTE: Be sure to completely immerse all the sensors.
8) Use the keypad to enter the known DO concentration of the water.
9) Press **Enter**. The Dissolved Oxygen mg/L Calibration Screen is displayed.
10) Stir the water with a stir bar, or by rapidly moving the probe module, to provide fresh sample to the DO sensor.
11) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.

12) Observe the DO mg/L reading, when the reading is stable (shows no significant change for approximately 30 seconds), press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
13) Press **Enter**. This returns you to the DO calibration screen.
14) Press **Escape** to return to the calibrate menu.
15) Rinse the probe module and sensors in tap or purified water and dry.

C. pH Calibration:

1) Go to the calibrate screen.
2) Use the arrow keys to highlight the **pH** selection.
3) Press **Enter**. The pH calibration screen is displayed.
   - Select the **1-point** option only if you are adjusting a previous calibration. If a 2-point or 3-point calibration has been performed previously, you can adjust the calibration by carrying out a one point calibration. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select only one pH buffer.
   - Select the **2-point** option to calibrate the pH sensor using only two calibration standards. Use this option if the media being monitored is known to be either basic or acidic. For example, if the pH of a pond is known to vary between 5.5 and 7, a two-point calibration with pH 7 and pH 4 buffers is sufficient. A three point calibration with an additional pH 10 buffer will not increase the accuracy of this measurement since the pH is not within this higher range.
   - Select the **3-point** option to calibrate the pH sensor using three calibration solutions. In this procedure, the pH sensor is calibrated with a pH 7 buffer and two additional buffers. The 3-point calibration method assures maximum accuracy when the pH of the media to be monitored cannot be anticipated. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select a third pH buffer.
4) Use the arrow keys to highlight the **2-point** selection.
5) Press **Enter**. The pH Entry Screen is displayed.
6) Place the correct amount of pH buffer into a clean, dry or pre-rinsed transport/calibration cup.

   NOTE: For maximum accuracy, the pH buffers you choose should be within the same pH range as the water you are preparing to sample.

   NOTE: Before proceeding, ensure that the sensor is as dry as possible. Ideally, rinse the pH sensor with a small amount of buffer that can be discarded. Be certain that you avoid cross-contamination of buffers with other solutions.
7) Carefully immerse the sensor end of the probe module into the solution.
8) Gently rotate and/or move the probe module up and down to remove any bubbles from the pH sensor.

   NOTE: The sensor must be completely immersed. Using the recommended volumes from Table 6.1 Calibration Volumes, should ensure that the sensor is covered.
9) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.

NOTE: Do not over tighten as this could cause damage to the threaded portions.

10) Use the keypad to enter the calibration value of the buffer you are using **at the current temperature**.

    NOTE: pH vs. temperature values are printed on the labels of all YSI pH buffers.

11) Press **Enter**. The pH calibration screen is displayed.
12) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
13) Observe the reading under pH, when the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
14) Press **Enter**. This returns you to the Specified pH Calibration Screen.
15) Rinse the probe module, transport/calibration cup and sensors in tap or purified water and dry.
16) Repeat steps 6 through 13 above using a second pH buffer.
17) Press **Enter**. This returns you to the pH Calibration Screen.
18) Press **Escape** to return to the calibrate menu.
19) Rinse the probe module and sensors in tap or purified water and dry.

D. ORP Calibration:

1) Go to the calibrate screen.
2) Use the arrow keys to highlight the **ORP** selection.
3) Press **Enter**. The ORP calibration screen is displayed.
4) Place the correct amount of a known ORP solution into a clean, dry or pre-rinsed transport/calibration cup.

    NOTE: Before proceeding, ensure that the sensor is as dry as possible. Ideally, rinse the ORP sensor with a small amount of solution that can be discarded. Be certain that you avoid cross-contamination with other solutions.

5) Carefully immerse the sensor end of the probe module into the solution.
6) Gently rotate and/or move the probe module up and down to remove any bubbles from the ORP sensor.

    NOTE: The sensor must be completely immersed.

7) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.
8) Use the keypad to enter the correct value of the calibration solution you are using at the current temperature.
9) Press **Enter**. The ORP calibration screen is displayed.
10) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
11) Observe the reading under ORP, when the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
12) Press **Enter**. This returns you to the Calibrate Screen.
13) Rinse the probe module and sensors in tap or purified water and dry.

Record the calibration data (e.g. time, instrument ID, solution lot number and expiration date, final calibrated readings, and solution temperature in the field logbook.

C. Sample Measurement:

Horiba measurement procedure:

As water passes through the flow-through the flow cell, press MEAS to obtain reading; record data in a field notebook.

YSI measurement procedure:

As water passes through the flow-through the flow cell, the readings are displayed for each parameter. Record the water quality parameter data in a field notebook. In addition, the data is recorded in the YSI and can be downloaded to a computer following completion of the sampling event.

IV. Key Checks and Preventive Maintenance

- Calibrate meter
- Clean probe with deionized water when done
- Refer to operations manual for recommended maintenance and troubleshooting
- Check batteries, and have a replacement set on hand
- Due to the importance of obtaining these parameters, the field team should have a spare unit readily available in case of an equipment malfunction.

V. References

YSI 556 Multi Probe System Operator Manual

STANDARD OPERATING PROCEDURE

Fish Sampling Using Electroshocking Techniques

I. Purpose

To provide a general guideline for conducting fish community surveys using electroshocking equipment.

II. Scope

A standard fish survey method is provided using electroshocking methods. Site-specific details are discussed in related sections of the Field Sampling Plan.

III. Equipment and Materials

- Field log book
- Data sheets
- Backpack electroshocker
- Boat-mounted electroshocker
- Seines
- Hip boots or chest waders
- Outer and inner rubber gloves
- Plastic bottles or containers
- Measuring board
- Cooler/Ice
- Water buckets
- Site Health and Safety Plan
- Instrument operation manuals
- Gasoline
- Formalin solution
- Waterproof labels
- Fish taxonomy keys

IV. Procedures and Guidelines

1. Fish in ponds, impoundments, lakes, and navigable streams/rivers should be collected with a boat-mounted electrofishing unit.

2. Fish in wetlands and wadable streams should be collected with a backpack electrofishing unit.

3. Sample intervals to be conducted at sample station should consist of approximately 30 minutes of shocking time or until no new fish species are collected in 10 minutes of shocking. Actual shocking time is to be recorded for each sample.

4. Fish will be collected with a long-handled dip net and placed in to a live well (tank) or bucket. Any fish not being kept for chemical analytical tissue samples, will be returned to the water As soon as possible

5. Information on species, size class, location and physical condition will be recorded for each fish captured. Record the proportion of individuals as hybrids and the proportion of individuals with DELTs (deformities, erosion [fins], lesions or tumors), other signs of disease, skeletal anomalies, and any other pertinent information on a field data sheet.

6. If too difficult to identify the specimen, or specimen are too numerous for effective field processing, preserve them for later processing (10% Formalin or 95% ethanol), and transport them to the office or laboratory for taxonomic work and measurements.

7. Sampling equipment including the fish measuring board will be cleaned and rinsed between each sample station.

8. Sample stations will be mapped and information on habitat condition of each sample station will be recorded including water depth, substrate type, shoreline profile or vegetation and degree of shading.

9. Photographs of sample stations in ponds, wetlands and creek habitats should be taken to supplement written descriptions.

V. Attachments

None

VI. Key Checks and Items

- Follow recommended safety precautions in operating the fish electroshocking equipment.
- Clean sample equipment between sample stations.

STANDARD OPERATING PROCEDURE

Fish Sampling Using Seines

I. Purpose

The purpose of this SOP is to provide general reference information and technical guidance on the procedure to sample and characterize fish communities using seining procedures. The collected samples provide information used in the determination of population statistics of the fish community and can be used to collect fish samples for chemical analysis of tissues. This information will be used in the assessment of risks to human health and the environment.

II. Scope

This guideline provides information on proper sampling equipment and techniques for the collection of fish in shallow streams, ponds, and near shore areas of lakes, impoundments, bays, estuaries, and ocean shoreline. This technique is more suited for use in smooth bottomed, low-sloped areas.

This procedure is not very effective when the seine is pulled over weeds and other obstructions as they may tend to roll up, and allow the fish to pass under the seine.

Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques. The technique described should be followed whenever applicable, noting that site-specific conditions or project-specific plans may require adjustments in methods.

III. Equipment and Materials

- Seine
- Fish Measuring Board
- 0-16 oz scale, 1-4 lb scale, 1-15 lb scale
- Appropriate sampling keys for species to be sampled, and any required instruments to aid in the identification
- Live Well (large tub) with overflow pipe to outside of boat
- Field sampling data sheets
- Glass jars for storage of fish
- Preservative (10% formalin or 95% ethanol)
- Black Permanent Marker
- Camera
- Required Personal Protective Equipment
- Portable Air Pumps

IV. Procedures

The primary considerations for collecting fish for population studies include identifying sampling locations, proper sampling techniques for the haul seine and proper documentation of samples. Detailed procedures for conducting fish populations utilizing the haul seine are described in the sections to follow.

A. Preliminary Activities

Apply-for- and receive applicable scientific collection permits as required by the state agencies with purview over the project site. Contact local fish & game and/or law enforcement officials and inform them of your activities.

Collect and determine all information pertinent to the fish sampling project, including water depth, station locations, nearby boat access locations, known sediment contamination, tidal variation, any waterway obstructions or inconsistencies (e.g. shallow or grassy areas, low structures, pipe crossings), any other biological studies previously conducted on or near the site, species used locally for human consumption and the degree of such consumption species most likely present, and the most appropriate sampling method for the species of interest that is permitted by law.

Before sampling occurs, conduct a site reconnaissance using a site map. The objective of this exercise is to categorize habitats, and map dividing lines and descriptors identifying the various types of habitats available. Make notations on the map depicting the abiotic characteristics of the reach including features such as substrate, water depth, channel shape, degree of bank erosion, piers, boat traffic, commercial trawling, potting activities, and relative current velocity and direction. Also make notations on the site map to show biotic characteristics of the reach including fish species observed, evidence of fisherman use, and aquatic and riparian vegetation including wetlands. In addition, identify station locations at this point, along with the total area to be sampled. Choose the station locations, where possible, to represent ecologically similar aquatic environments.

Ensure adequate number of sample collection jars and volume of preservative needed.

Set up a live well (e.g., large cooler, 50-gallon container) with site water.

B. Operating Procedure

Determine the area to be sampled, and mark it with flagging, if possible. Stretch the seine across the area to be sampled, with a minimum of one field personnel on either side of the seine. Ensure that the weighted side of the seine is at the bottom. Best results are achieved when the water level is no deeper than two thirds the height of the slack net.

Rapidly walk through the water at the same speed, while keeping a constant distance apart. If sampling in a stream, walk upstream against the current. As the end of the sampling area approaches, Pull the seine rapidly toward the shore, and lift the weighted end out of the water. Place the collected fish into the live wells.

If other field personnel are present, have them walk towards the seine to chase the fish in that direction. In addition, have them help to lift the seine when the sampling effort is complete.

Conduct sampling in areas that will ensure adequate qualitative and/or quantitative representation of the fish community, whichever is necessary. These areas should include riffles/runs, shorelines, snags, natural fish holding areas, vegetation beds and other habitats.

At the end of a sampling reach, identify, measure, weigh and release the specimens. Record the proportion of individuals as hybrids and the proportion of individuals with DELTs (deformities, erosion [fins], lesions or tumors), other signs of disease, skeletal anomalies, and any other pertinent information on a field data sheet.

To the extent possible, process all species in the field and return them to the water alive. If too difficult to identify the specimen, or specimen are too numerous for effective field processing, preserve them for later processing (10% Formalin or 95% ethanol), and transport them to the office or laboratory for taxonomic work and measurements.

At a minimum, preserve one representative fish from each species as a voucher specimen. Record the station location, date sampled, and species name on the label.

The following information will be recorded in the Field Logbook:

- Sample identification (site name, location, project no.; sample name/number and location; sample type and matrix; time and date; sampler's identity).
- Field observations and measurements (sample setting, appearance of substrate, sampling method, and photograph descriptions).
- Additional remarks, as appropriate.

Record all observations in the Field Logbook as described in SOP F202. Complete field sheets for the collected samples.

V. References

Brower, 1977. James E. Brower and H. Jerrold Zar. *Field and Laboratory Methods for General Ecology*. Wm. C. Brown Company Publishers. 1977.

Ricker, 1971. Ricker, W.E. *Methods for Assessment of Fish Production in Fresh Waters*. International Biological Programme Handbook No. 3. 1971.

U.S. EPA, 1987. U.S. Environmental Protection Agency. *A Compendium of Superfund Field Operations Methods*. Office of Emergency and Remedial Response, Office of Waste Programs Enforcement. December 1987.

U.S. EPA, 1989. Warren-Hicks, William, Parkhurst, Benjamin R., Baker, Samuel S. Jr. *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference*. U.S. EPA, Environmental Research Laboratory, Corvallis, OR 97333. March 1989.

STANDARD OPERATING PROCEDURE

Aquatic Macroinvertebrate Sampling

I. Purpose

To provide general guidelines for collecting and handling benthic macroinvertebrate samples.

II. Scope

This benthic macroinvertebrate sampling procedure is applicable to collecting representative samples using a D-net (wadable streams/rivers or littoral zones of lakes/ponds) and a Ponar or Ekman grab sampler (lakes/ponds). Site-specific details are discussed in related sections of the field sampling plan.

III. Equipment and Materials

- Stainless steel Ekman or Ponar grab sampler
- Rope
- U.S. Standard No. 30 mesh screen or screened wash bucket (500 um opening size)
- D-frame net (U.S. Standard No. 30 mesh, or 500 um sieve)
- Appropriate field instruments (typically thermometer, pH, oxygen meter)
- Logbook and waterproof, permanent marker
- Personal protection equipment (latex or nitrile gloves, boots, hip waders, etc.)
- Samples containers with labels
- Squirt (rinse) bottles
- Forceps
- 95% ethanol
- Paper towel or Kimwipes
- Data sheets
- Cooler
- Water buckets
- Brushes
- Large wash tub
- Site Health and Safety Plan
- Metered line
- Boat (as necessary)

IV. Procedures and Guidelines

1) Identify appropriate sample station locations in ponds, lakes, wetlands, rivers and/or estuaries, and map these locations.

2) Collect basic water quality measurements at surface and approximately 10 cm above substrate (e.g., temperature, dissolved oxygen and pH).

3) Conduct field sampling activities starting from downstream locations, when sampling in lotic (flowing) systems.

4) Select the appropriate sampling device (i.e. petite Ponar, Ekman, D-frame net, etc.) and collect the number of replicate samples at each station specified in the Project Instructions/Work Plan:

   a) Littoral zone areas of steams, ponds, lakes or wetland habitats may be sampled with a D-frame dip net (U.S. Standard No. 30 mesh, or 500 um sieve). Sweep the net in a standardized motion through rooted vegetation or representative habitat areas to collect a single composite invertebrate sample.

   b) Deeper water areas, with soft substrates may be sampled with an Ekman or Ponar grab sampler. Lower grab sampler at a steady rate until contacting the sediment surface, attempting to penetrate the top 6 inches of sediment. Trip sampler mechanism to close grab sampler jaws. Slowly retrieve sampler.

5) Sieve the contents of the selected sampler device through a U.S. Standard No. 30 mesh screen or screened wash bucket (500 um opening size).

6) Conduct in-field characterization of contents of the sample to the extent practical (e.g., identification of organisms by order, family, genus and/or species; relative abundance) and record this information on a appropriate data sheet (it might also be arrange for a subcontractor specializing in invertebrate taxonomy to conduct this step).

7) Document observations characterizing the substrate conditions including color, odor, and relative organic content, as well as observation of other physical habitat conditions. Photograph sample area if possible (e.g., littoral zones).

8) Transfer the sample contents to sample container(s) and preserve in enough 95% ethanol to cover the sample material (forceps may be needed to remove organisms from the D-frame nets) and place them in the sample bottle.

9) Place a label indicating the sample identification code, date, sampling location, and collector name into the sample container. The outside of the container should include the same information and the words “preservative: 95% ethanol”.

10) Return samples to shore station for packaging and shipping for post collection processing.

11) Wash and rinse sampling equipment between stations to avoid sample material cross contamination.

V. Attachments

None

VI. Key Checks and Items

None

VII. Useful Resources

Useful resources to be considered: Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

STANDARD OPERATING PROCEDURE

Preparation of Fish and Shellfish Tissue Samples

I Purpose

The purpose of this SOP is to provide general reference information and technical guidance on the preparation of fish and shellfish tissue samples for chemical analysis. The chemical analysis of tissue provides information used in the determination of the potential bioaccumulation of contaminants for the assessment of risks to human and ecological receptors.

II Scope

This guideline provides information on proper methods for the preparation of fish and shellfish tissue samples for chemical analysis. Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling and preparation techniques. The techniques described should be followed whenever applicable, noting that site-specific conditions or project-specific plans may require adjustments to the methods.

III. Equipment and Materials

- Fish Measuring Board or Ruler
- 0-16 oz, 1-4 lb, 1-15 lb spring scales
- Appropriate sampling keys for species to be sampled, and any required instruments to aid in the identification
- Field sampling data sheets
- Dangerous goods shipment procedures (if using dry ice)
- Decontamination supplies

IV. Procedures

The procedures for preparing the fish and shellfish samples for chemical analysis of tissues include collecting, weighing, measuring, and processing the fish and shellfish samples for shipment. The primary concerns in preparing the fish and shellfish for analysis is to ensure the sample size is adequate and the sample is not contaminated by improper handling.

A. Preliminary Activities

Contact a chemical analysis laboratory that has the required capability for tissue analysis and set up a subcontract agreement with them. Review the sample preparation requirements with the laboratory. Have the laboratory send an adequate number of coolers for shipping the tissue samples. Determine from the laboratory what the minimum amount of tissue sample required for analysis of all the specified parameters. In addition, determine the holding time for a processed sample, and any other special instructions the laboratory may have.

Ensure adequate volume of decontamination chemicals for entire trip. If dry ice is necessary for sample preservation (wet ice is normally good enough), determine where dry ice may be purchased within close proximity to the site or hotel, and where the closest FedEx drop-off is, or if FedEx picks up from the hotel.

Determine the recommended target sample weights of composite fish and shellfish tissue samples. Weight requirements are dictated by the chemical analytical laboratory and analytical method used. Because sample size requirements may vary among laboratories and the analytical methods used, determine the minimum amount of tissue required by the analytical laboratory for analysis of all the specified parameters for the specific project.

B. Selection of Target Species

When choosing a target species for collection to addressed human health, consideration will be given to the commonly consumed fish species in the area, the fish species ability to bio-accumulate contaminants, and the geographic distribution of the species. Table 2 from USEPA (1993) that present recommended target species for freshwater studies, recommended species for estuarine/marine studies is presented in Attachment 1.

Freshwater collection - at a minimum, target species for freshwater studies should include one bottom fish and one top carnivore and/or commercial and recreational fish species for determining human health and environment risks. In addition, one forage species and one shellfish species should be included for determining environmental risks.

Estuarine/Marine collection - target species for saltwater studies should include one shellfish and one top carnivore and/or commercial and recreational fish species for determining human health and environment risks. In addition, one forage species should be included for determining environmental risks.

When choosing a target species for collection to addressed ecological risks, consideration will be given to the habitat type, receptors present and food chain information.

C. Sample Processing Procedure

Gather fish specimen using the appropriate fish collecting SOP as determined by the site reconnaissance.

The following steps will be taken with each fish and shellfish collected: identify the sample specimen, sort and inspect the samples, rinse the samples and group by target species, prepare the sample for shipment to the laboratory.

Weigh the collected fish/shellfish to the nearest gram and measure to the nearest tenth of a centimeter. The total length of the fish will be measured by the distance in a straight line from the anterior-most projecting part of the head to the farthest tip of the caudal fin when its rays are squeezed together. The total length of the shellfish will be measured for bivalve mollusks by the distance (height) from the umbo to the anterior shell margin. The total length of the crustaceans will be measured for 1) crabs by the distance of the lateral width of the carapace, 2) shrimp and crayfish by the distance from the rostrum to the tip of the telson, and 3) lobsters, either the length of the carapace for spiny and clawed lobsters or the length of the

D. Composite Samples

For finfish, generally three to five individuals will be collected per target species per composite sample. For shellfish, generally three to ten individuals will be collected for a composite sample. A few of the shellfish collected may be resected (edible portions removed) to determine the wet weight of the edible portion to assist in estimating the number of individuals needed to obtain a 500 gram sample.

The same number of individuals will be collected for each composite sample per sampling location and per target species.

E. Preservation of Sample Integrity

Sample integrity is preserved by prevention of a loss of contaminants already existing in the tissue and prevention of extraneous tissue contamination. Sample integrity will be preserved by ensuring the fish skin is not lacerated by the sampling gear and ensuring the shellfish are not cracked. In addition, consideration will be taken in preventing the tissue samples and sample gear from coming directly in contact with grease, engine fluid, engine exhaust, dust, cooler, or ice.

F. Tissue Preparation for Shipment to Laboratory

After the initial processing to determine species, size, and morphological abnormalities, each fish or shellfish will be wrapped individually in aluminum foil and placed in a labeled waterproof freezer bag. If necessary, clean cork stoppers will be placed over the protruding spines or pincers of the shellfish before wrapping in foil, or spines/pincers will be clipped off. A 100% cotton paper label will be placed inside the bag, identifying the project, station location, date, and replicate number. A pencil will be used to mark the label. The outside of the bag also will be labeled with the project, station location, date, and replicate number using a black permanent marker. The bags will be stored on wet ice in coolers if shipment to the laboratories is within 48 hours. If longer, the bags will be stored in a freezer.

Carefully pack the samples in the coolers for shipment to the laboratory. Fill the top and bottom of the coolers with a sufficient amount of wet ice, if shipment to the laboratories is within 48 hours, or with a sufficient amount of dry ice. Enclose the chain-of-custody inside the cooler. Place a chain-of-custody seal on the cooler and

tape the cooler closed. Attach a completed FedEx airbill to the cooler and drop off at a FedEx office. If dry ice is being used, note on FedEx label and adhere to Dangerous Goods shipment procedures, if necessary.

The following information will be recorded in the Field Logbook:

- Sample identification (site name, location, project no.; sample name/number and location; sample type and matrix; time and date; sampler's identity).
- Field observations and measurements (sample setting, appearance of substrate, sampling method, and photograph descriptions).
- Additional remarks, as appropriate.

Proper chain-of-custody procedures play a crucial role in data gathering. SOP F201 describes requirements for completing a chain-of-custody form. Chain-of-custody forms are considered quality assurance records.

V. Attachments

Recommended Target Species Table from USEPA (1993)

VI. References

U.S. EPA, 1993. U.S. Environmental Protection Agency, *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 1 Fish and Sampling Analyses*. Office of Water. August 1993. EPA 823-R-93-002

ATTACHMENT 1

RECOMMENDED TARGET SPECIES TABLES

FROM USEPA, 1993

GUIDANCE FOR ASSESSING CHEMICAL CONTAMINANT DATA FOR USE IN FISH ADVISORIES. VOLUME I FISH SAMPLING AND ANALYSIS

3. TARGET SPECIES

Table 3-1
Recommended Target Species for Inland Fresh Waters

Family Name	Common Name	Scientific Name
Percichthyidae	White bass	*Morone chrysops*
Centrarchidae	Largemouth bass	*Micropterus salmoides*
	Smallmouth bass	*Micropterus dolomieui*
	Black crappie	*Pomoxis* nigromaculatus
	White crappie	*Pomoxis annulatis*
Percidae	Walleye	*Stizostedion vitreum*
	Yellow perch	*Perca flavescens*
Cyprinidae	Common carp	*Cyprinus caipio*
Catostomidae	White sucker	*Catostomus commersoni*
Ictaluridae	Channel catfish	*lctalurus punctatus*
	Flathead catfish	*Pylodictfs olivaris*
Esocidae	Northern pike	*Esox lurius*
Salmonidae	Lake trout	*Salvelinus namaycush*
	Brown trout	*Salmo trutta*
	Rainbow trout	*Oncorhynchus mykiss*[a]

[a] Formerly *Salmo gairdneti.*

Table 3-2
Recommended Target Species for Great Lakes Waters

Family Name	Common Name	Scientific Name
Percichthyidae	White bass	*Morone chrysops*
Centrarchidae	Smallmouth bass	*Micropterus dolomieui*
Percidae	Walleye	*Stizostedion vitreum*
Cyprinidae	Common carp	*Cyprinus caipio*
Catostomidae	White sucker	*Catostomus commersoni*
Ictaluridae	Channel catfish	*lctalurus punctatus*
Esocidae	Muskellunge	*Esox lurius*
Salmonidae	Chinook salmon	*Oncorhynchus tschawytscha*
	Lake trout	*Salvelinus namaycush*
	Brown trout	*Salmo trutta*
	Rainbow trout	*Oncorhynchus mykiss*[a]

[a] Formerly *Salmo gairdneti.*

Table 3-7
Recommended Target Species for Northeast Atlantic Estuaries and Marine Waters (Maine through Connecticut)

Family Name	Common Name	Scientific Name
Finfish Species		
Anguillidae	American eel	*Anguilla rostrata*
Percichthyidae	Striped bass	*Morone saxatilis*
Pomatomidae	Bluefish	*Pomatomus saltatrix*
Sparidae	Scup	*Stenotomus chrysops*
Sciaenidae	Weakfish	*Cynoscion regales*
Bothidae	Summer flounder Four-spotted flounder	*Paralichthys dentatus* *Paralichthys oblongus*
Pleuronectidae	Winter flounder Yellowtail flounder American dab	*Pseudopleuronectes americanus* *Limanda ferruginea* *Hippoglossoides platessoides*
Shellfish Species		
Bivalves	Soft-shell clam Hard clam Ocean quahog Surf clam Blue mussel	*Mya arenaria* *Mercenaria mercenaria* *Arctica islandica* *Spisula solidissima* *Mytiius edulis*
Crustaceans	American lobster Eastern rock crab	*Homarus americanus* *Cancer irroratus*

Appendix D
DoD ELAP Accreditation

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 4.1 4/22/2009 and is accredited is accordance with the:

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

This accreditation demonstrates technical competence for the defined scope:

Environmental Testing

(As detailed in the supplement)

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

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Accreditation No.:*	*Certificate No.:*
January 22, 2010	April 7, 2012	65817	L12-48

Tracy Szerszen
President/Operations Manager

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

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

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous	(CAS SOP) GEN-TICW	UV-VIS	Total inorganic carbon
Aqueous	EPA 1631	CVAFS	Mercury
Aqueous	EPA 1664A	Gravimetric	Oil and grease
Aqueous	EPA 1664A	Gravimetric	Total petroleum hydrocarbons
Aqueous	EPA 218.6	IC-UV	Chromium, Hexavalent
Aqueous	EPA 245.1	CVAA	Mercury
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 351.2	UV-VIS	Nitrogen, total Kjeldahl
Aqueous	EPA 353.2	UV-VIS	Nitrite as N
Aqueous	EPA 410.4	UV-VIS	Chemical oxygen demand
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8151A	GC-ECD	Dinoseb
Aqueous	EPA 8260C	GC-MS-SIM	1,1-Dichloroethene
Aqueous	EPA 8260C	GC-MS-SIM	1,2-Dichlorobenzene
Aqueous	EPA 8260C	GC-MS-SIM	1,2-Dichloroethane
Aqueous	EPA 8260C	GC-MS-SIM	1,4-Dioxane
Aqueous	EPA 8260C	GC-MS-SIM	Carbon tetrachloride
Aqueous	EPA 8260C	GC-MS-SIM	Dichloromethane
Aqueous	EPA 8260C	GC-MS-SIM	Ethylbenzene
Aqueous	EPA 8260C	GC-MS-SIM	m- + p-Xylene
Aqueous	EPA 8260C	GC-MS-SIM	o-Xylene
Aqueous	EPA 8260C	GC-MS-SIM	Tetrachloroethene
Aqueous	EPA 8260C	GC-MS-SIM	Trichloroethene
Aqueous	EPA 8260C	GC-MS-SIM	Vinyl chloride
Aqueous	EPA 8260C	GC-MS-SIM	Xylenes, total
Aqueous	EPA 8310	HPLC-UV/FLUOR	Acenaphthene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Acenaphthylene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Anthracene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Benzo(a)antracene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Benzo(a)pyrene

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 8310	HPLC-UV/FLUOR	Benzo(b)fluoranthene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Benzo(g,h,i)perylene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Benzo(k)fluoranthene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Chrysene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Dibenzo(a,h)anthracene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Fluoranthene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Fluorene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Indeno(1,2,3-cd)pyrene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Naphthalene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Phenanthrene
Aqueous	EPA 8310	HPLC-UV/FLUOR	Pyrene
Aqueous	EPA 9040B, C	POT	pH
Aqueous	EPA 9060, A	UV-VIS	Total organic carbon
Aqueous	EPA 9066	UV-VIS	Phenolics, total
Aqueous	RSK-175	GC-FID	Ethane
Aqueous	RSK-175	GC-FID	Ethylene
Aqueous	RSK-175	GC-FID	Methane
Aqueous	RSK-175	GC-FID	Propane
Aqueous	RSK-175	GC-FID	Acetylene
Aqueous	SM 2320B	Titration	Alkalinity, total, carbonate, and bicarbonate
Aqueous	SM 2340C	Titration	Hardness, total
Solids	(CAS SOP) GEN-351.2	UV-VIS	Nitrogen, total Kjeldahl
Solids	(CAS SOP) GEN-420.4/9066	UV-VIS	Phenolics, total
Solids	EPA Lloyd Kahn	UV-VIS	Total organic carbon
Solids	EPA 300.0	IC	Chloride
Solids	EPA 300.0	IC	Fluoride
Solids	EPA 300.0	IC	Nitrate
Solids	EPA 300.0	IC	Sulfate
Solids	EPA 7471B	CVAA	Mercury
Solids	EPA 8330A	HPLC-UV	1,3,5-Trinitrobenzene
Solids	EPA 8330A	HPLC-UV	1,3-Dinitrobenzene
Solids	EPA 8330A	HPLC-UV	2,4,6-Trinitrotoluene
Solids	EPA 8330A	HPLC-UV	2,4-Dinitrotoluene

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

Matrix	Standard/Method	Technology	Analyte
Solids	EPA 8330A	HPLC-UV	2,6-Dinitrotoluene
Solids	EPA 8330A	HPLC-UV	2-Amino-4,6-dinitrotoluene
Solids	EPA 8330A	HPLC-UV	2-Nitrotoluene
Solids	EPA 8330A	HPLC-UV	3-Nitrotoluene
Solids	EPA 8330A	HPLC-UV	4-Amino-2,6-dinitrotoluene
Solids	EPA 8330A	HPLC-UV	4-Nitrotoluene
Solids	EPA 8330A	HPLC-UV	HMX
Solids	EPA 8330A	HPLC-UV	Nitrobenzene
Solids	EPA 8330A	HPLC-UV	RDX
Solids	EPA 8330A	HPLC-UV	Tetryl
Solids	EPA 9045C, D	POT	pH
Solids	SM 5220B	Titration	Chemical oxygen demand
Aqueous/Solids	EPA 1010A	Pensky Martin	Ignitability
Aqueous/Solids	EPA 353.2	UV-VIS	Nitrate/nitrite as N
Aqueous/Solids	EPA 6010C	ICP-AES	Aluminum
Aqueous/Solids	EPA 6010C	ICP-AES	Antimony
Aqueous/Solids	EPA 6010C	ICP-AES	Arsenic
Aqueous/Solids	EPA 6010C	ICP-AES	Barium
Aqueous/Solids	EPA 6010C	ICP-AES	Beryllium
Aqueous/Solids	EPA 6010C	ICP-AES	Boron
Aqueous/Solids	EPA 6010C	ICP-AES	Cadmium
Aqueous/Solids	EPA 6010C	ICP-AES	Calcium
Aqueous/Solids	EPA 6010C	ICP-AES	Chromium
Aqueous/Solids	EPA 6010C	ICP-AES	Cobalt
Aqueous/Solids	EPA 6010C	ICP-AES	Copper
Aqueous/Solids	EPA 6010C	ICP-AES	Iron
Aqueous/Solids	EPA 6010C	ICP-AES	Lead
Aqueous/Solids	EPA 6010C	ICP-AES	Magnesium
Aqueous/Solids	EPA 6010C	ICP-AES	Manganese
Aqueous/Solids	EPA 6010C	ICP-AES	Nickel
Aqueous/Solids	EPA 6010C	ICP-AES	Potassium
Aqueous/Solids	EPA 6010C	ICP-AES	Selenium
Aqueous/Solids	EPA 6010C	ICP-AES	Silver

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 6010C	ICP-AES	Sodium
Aqueous/Solids	EPA 6010C	ICP-AES	Thallium
Aqueous/Solids	EPA 6010C	ICP-AES	Tin
Aqueous/Solids	EPA 6010C	ICP-AES	Vanadium
Aqueous/Solids	EPA 6010C	ICP-AES	Zinc
Aqueous/Solids	EPA 6020A	ICP-MS	Arsenic
Aqueous/Solids	EPA 6020A	ICP-MS	Antimony
Aqueous/Solids	EPA 6020A	ICP-MS	Barium
Aqueous/Solids	EPA 6020A	ICP-MS	Beryllium
Aqueous/Solids	EPA 6020A	ICP-MS	Cadmium
Aqueous/Solids	EPA 6020A	ICP-MS	Chromium
Aqueous/Solids	EPA 6020A	ICP-MS	Cobalt
Aqueous/Solids	EPA 6020A	ICP-MS	Copper
Aqueous/Solids	EPA 6020A	ICP-MS	Lead
Aqueous/Solids	EPA 6020A	ICP-MS	Manganese
Aqueous/Solids	EPA 6020A	ICP-MS	Nickel
Aqueous/Solids	EPA 6020A	ICP-MS	Selenium
Aqueous/Solids	EPA 6020A	ICP-MS	Silver
Aqueous/Solids	EPA 6020A	ICP-MS	Thallium
Aqueous/Solids	EPA 6020A	ICP-MS	Vanadium
Aqueous/Solids	EPA 6020A	ICP-MS	Zinc
Aqueous/Solids	EPA 680	GC-MS	Monochlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Dichlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Trichlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Tetrachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Pentachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Hexachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Heptachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Octachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Nonachlorobiphenyls, Total
Aqueous/Solids	EPA 680	GC-MS	Decachlorobiphenyls, Total
Aqueous/Solids	EPA 6850	HPLC-MS	Perchlorate

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Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 7196A	UV-VIS	Chromium, hexavalent
Aqueous/Solids	EPA 7199	IC-UV	Chromium, hexavalent
Aqueous/Solids	EPA 8015C	GC-FID	Gasoline range organics
Aqueous/Solids	EPA 8015C	GC-FID	Diesel range organics
Aqueous/Solids	EPA 8081B	GC-ECD	4,4'-DDD
Aqueous/Solids	EPA 8081B	GC-ECD	4,4'-DDE
Aqueous/Solids	EPA 8081B	GC-ECD	4,4'-DDT
Aqueous/Solids	EPA 8081B	GC-ECD	Aldrin
Aqueous/Solids	EPA 8081B	GC-ECD	α-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	Alpha-chlordane
Aqueous/Solids	EPA 8081B	GC-ECD	β-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	Chlordane, technical
Aqueous/Solids	EPA 8081B	GC-ECD	δ-BHC
Aqueous/Solids	EPA 8081B	GC-ECD	Dieldrin
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan I
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan II
Aqueous/Solids	EPA 8081B	GC-ECD	Endosulfan sulfate
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin aldehyde
Aqueous/Solids	EPA 8081B	GC-ECD	Endrin ketone
Aqueous/Solids	EPA 8081B	GC-ECD	γ-BHC (Lindane)
Aqueous/Solids	EPA 8081B	GC-ECD	γ-Chlordane
Aqueous/Solids	EPA 8081B	GC-ECD	Heptachlor
Aqueous/Solids	EPA 8081B	GC-ECD	Heptachlor epoxide
Aqueous/Solids	EPA 8081B	GC-ECD	Hexachlorobenzene
Aqueous/Solids	EPA 8081B	GC-ECD	Methoxychlor
Aqueous/Solids	EPA 8081B	GC-ECD	Toxaphene
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1016
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1221
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1232
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1242
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1248
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1254

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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1260
Aqueous/Solids	EPA 8082A	GC-ECD	PCB 1268
Aqueous/Solids	EPA 8151A	GC-ECD	2,4-D
Aqueous/Solids	EPA 8151A	GC-ECD	Dicamba
Aqueous/Solids	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solids	EPA 8151A	GC-ECD	2,4,5-TP
Aqueous/Solids	EPA 8151A	GC-ECD	Pentachlorophenol (PCP)
Aqueous/Solids	EPA 8260C	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,1,1-Trichloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
Aqueous/Solids	EPA 8260C	GC-MS	1,1,2-Trichloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,1-Dichloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,1-Dichloroethene
Aqueous/Solids	EPA 8260C	GC-MS	1,1-Dichloropropene
Aqueous/Solids	EPA 8260C	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,2,3-Trichloropropane
Aqueous/Solids	EPA 8260C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dibromo-3-chloropropane
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dibromoethane
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichloro-1,1,2-trifluoroethane (Freon 123a)
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichloroethane
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichloroethene, total
Aqueous/Solids	EPA 8260C	GC-MS	1,2-Dichloropropane
Aqueous/Solids	EPA 8260C	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,3-Dichlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,3-Dichloropropane
Aqueous/Solids	EPA 8260C	GC-MS	1,4-Dichlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	1,4-Dioxane

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Columbia Analytical Services

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Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260C	GC-MS	2,2-Dichloro-1,1,1-trifluoroethane (Freon 123)
Aqueous/Solids	EPA 8260C	GC-MS	2,2-Dichloropropane
Aqueous/Solids	EPA 8260C	GC-MS	2-Butanone (MEK)
Aqueous/Solids	EPA 8260C	GC-MS	2-Chloro-1,3-butadiene
Aqueous/Solids	EPA 8260C	GC-MS	2-Chloroethylvinyl ether
Aqueous/Solids	EPA 8260C	GC-MS	2-Chlorotoluene
Aqueous/Solids	EPA 8260C	GC-MS	2-Hexanone
Aqueous/Solids	EPA 8260C	GC-MS	2-Methyl-1-propanol (Isobutlyl alcohol)
Aqueous/Solids	EPA 8260C	GC-MS	2-Methyl-2-propanol (Tertbutyl alcohol)
Aqueous/Solids	EPA 8260C	GC-MS	2-Nitropropane
Aqueous/Solids	EPA 8260C	GC-MS	2-Propanol
Aqueous/Solids	EPA 8260C	GC-MS	3-Chloro-1-propene (Allyl chloride)
Aqueous/Solids	EPA 8260C	GC-MS	4-Chlorotoluene
Aqueous/Solids	EPA 8260C	GC-MS	4-Ethyltoluene
Aqueous/Solids	EPA 8260C	GC-MS	4-Isopropyltoluene
Aqueous/Solids	EPA 8260C	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solids	EPA 8260C	GC-MS	Acetone
Aqueous/Solids	EPA 8260C	GC-MS	Acetonitrile
Aqueous/Solids	EPA 8260C	GC-MS	Acrolein
Aqueous/Solids	EPA 8260C	GC-MS	Acrylonitrile
Aqueous/Solids	EPA 8260C	GC-MS	Benzene
Aqueous/Solids	EPA 8260C	GC-MS	Benzyl chloride
Aqueous/Solids	EPA 8260C	GC-MS	Bromobenzene
Aqueous/Solids	EPA 8260C	GC-MS	Bromochloromethane
Aqueous/Solids	EPA 8260C	GC-MS	Bromodichloromethane
Aqueous/Solids	EPA 8260C	GC-MS	Bromoform
Aqueous/Solids	EPA 8260C	GC-MS	Bromomethane
Aqueous/Solids	EPA 8260C	GC-MS	Carbon disulfide
Aqueous/Solids	EPA 8260C	GC-MS	Carbon tetrachloride
Aqueous/Solids	EPA 8260C	GC-MS	Chlorobenzene
Aqueous/Solids	EPA 8260C	GC-MS	Chloroethane
Aqueous/Solids	EPA 8260C	GC-MS	Chloroform
Aqueous/Solids	EPA 8260C	GC-MS	Chloromethane

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260C	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solids	EPA 8260C	GC-MS	cis-1,3-Dichloropropene
Aqueous/Solids	EPA 8260C	GC-MS	Cyclohexane
Aqueous/Solids	EPA 8260C	GC-MS	Cyclohexanone
Aqueous/Solids	EPA 8260C	GC-MS	Dibromochloromethane
Aqueous/Solids	EPA 8260C	GC-MS	Dibromomethane
Aqueous/Solids	EPA 8260C	GC-MS	Dichlorodifluoromethane (Freon 12)
Aqueous/Solids	EPA 8260C	GC-MS	Dichlorofluoromethane (Freon 21)
Aqueous/Solids	EPA 8260C	GC-MS	Dichloromethane
Aqueous/Solids	EPA 8260C	GC-MS	Diethyl ether
Aqueous/Solids	EPA 8260C	GC-MS	Diisopropyl ether
Aqueous/Solids	EPA 8260C	GC-MS	Ethyl methacrylate
Aqueous/Solids	EPA 8260C	GC-MS	Ethyl tert-butyl ether
Aqueous/Solids	EPA 8260C	GC-MS	Ethylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8260C	GC-MS	Iodomethane
Aqueous/Solids	EPA 8260C	GC-MS	Isopropylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	m- + p-Xylene
Aqueous/Solids	EPA 8260C	GC-MS	Methacrylonitrile
Aqueous/Solids	EPA 8260C	GC-MS	Methyl acetate
Aqueous/Solids	EPA 8260C	GC-MS	Methyl methacrylate
Aqueous/Solids	EPA 8260C	GC-MS	Methylcyclohexane
Aqueous/Solids	EPA 8260C	GC-MS	Methyl-tert-butyl ether (MTBE)
Aqueous/Solids	EPA 8260C	GC-MS	Napthalene
Aqueous/Solids	EPA 8260C	GC-MS	N-butylacetate
Aqueous/Solids	EPA 8260C	GC-MS	N-butylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	N-heptane
Aqueous/Solids	EPA 8260C	GC-MS	N-propylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	o-Xylene
Aqueous/Solids	EPA 8260C	GC-MS	Propionitrile
Aqueous/Solids	EPA 8260C	GC-MS	sec-butylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	Styrene
Aqueous/Solids	EPA 8260C	GC-MS	tert-amyl methyl ether

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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260C	GC-MS	tert-butylbenzene
Aqueous/Solids	EPA 8260C	GC-MS	Tetra hydrofuran
Aqueous/Solids	EPA 8260C	GC-MS	Tetrachloroethene
Aqueous/Solids	EPA 8260C	GC-MS	Toluene
Aqueous/Solids	EPA 8260C	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solids	EPA 8260C	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solids	EPA 8260C	GC-MS	trans-1,4-Dichloro-2-butene
Aqueous/Solids	EPA 8260C	GC-MS	Trichloroethene
Aqueous/Solids	EPA 8260C	GC-MS	Trichlorofluoromethane (Freon 11)
Aqueous/Solids	EPA 8260C	GC-MS	Vinyl acetate
Aqueous/Solids	EPA 8260C	GC-MS	Vinyl chloride
Aqueous/Solids	EPA 8260C	GC-MS	Xylenes, total
Aqueous/Solids	EPA 8270D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2-Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,2-Diphenylhydrazine
Aqueous/Solids	EPA 8270D	GC-MS	1,3,5-Trinitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,3-Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,3-Dinitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,4-Dichlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	1,4-Dioxane
Aqueous/Solids	EPA 8270D	GC-MS	1,4-Naphthoquinone
Aqueous/Solids	EPA 8270D	GC-MS	1-Methyl-2-pyrrolidinone
Aqueous/Solids	EPA 8270D	GC-MS	1-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	1-Naphthylamine
Aqueous/Solids	EPA 8270D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dichlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dimethylphenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dinitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8270D	GC-MS	2,6-Dichlorophenol

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Columbia Analytical Services

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8270D	GC-MS	2-Acetylaminofluorene
Aqueous/Solids	EPA 8270D	GC-MS	2-Chloronaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	2-Chlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	2-Methyl-5-nitroaniline (5-Nitro-o-toluidine)
Aqueous/Solids	EPA 8270D	GC-MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS	2-Methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	2-Naphthylamine
Aqueous/Solids	EPA 8270D	GC-MS	2-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	2-Nitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	2-Picoline
Aqueous/Solids	EPA 8270D	GC-MS	3,3'-Dichlorobenzidine
Aqueous/Solids	EPA 8270D	GC-MS	3,3'-Dimethylbenzidine
Aqueous/Solids	EPA 8270D	GC-MS	3+4-Methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	3-Methylcholanthrene
Aqueous/Solids	EPA 8270D	GC-MS	3-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4,6-Dinitro-2-methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	4-Aminobiphenyl
Aqueous/Solids	EPA 8270D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solids	EPA 8270D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solids	EPA 8270D	GC-MS	4-Chloroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solids	EPA 8270D	GC-MS	4-Nitroaniline
Aqueous/Solids	EPA 8270D	GC-MS	4-Nitrophenol
Aqueous/Solids	EPA 8270D	GC-MS	4-Nitroquinoline-1-oxide
Aqueous/Solids	EPA 8270D	GC-MS	7,12-Dimethylbenz(a)anthracene
Aqueous/Solids	EPA 8270D	GC-MS	α,α-Dimethylphenethylamine
Aqueous/Solids	EPA 8270D	GC-MS	Acenaphthene
Aqueous/Solids	EPA 8270D	GC-MS	Acenaphthylene
Aqueous/Solids	EPA 8270D	GC-MS	Acetophenone
Aqueous/Solids	EPA 8270D	GC-MS	Aniline
Aqueous/Solids	EPA 8270D	GC-MS	Anthracene
Aqueous/Solids	EPA 8270D	GC-MS	Aramite

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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	Atrazine
Aqueous/Solids	EPA 8270D	GC-MS	Benzaldehyde
Aqueous/Solids	EPA 8270D	GC-MS	Benzidine
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Benzoic acid
Aqueous/Solids	EPA 8270D	GC-MS	Benzyl alcohol
Aqueous/Solids	EPA 8270D	GC-MS	Biphenyl
Aqueous/Solids	EPA 8270D	GC-MS	Bis(1-chloroisopropyl)ether
Aqueous/Solids	EPA 8270D	GC-MS	Bis(-2-chloroethoxy)methane
Aqueous/Solids	EPA 8270D	GC-MS	Bis(2-chloroethyl)ether
Aqueous/Solids	EPA 8270D	GC-MS	Bis(2-ethylhexyl)phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Caprolactam
Aqueous/Solids	EPA 8270D	GC-MS	Carbazole
Aqueous/Solids	EPA 8270D	GC-MS	Chlorobenzilate
Aqueous/Solids	EPA 8270D	GC-MS	Chrysene
Aqueous/Solids	EPA 8270D	GC-MS	Cyclohexane, isothiocyanato-
Aqueous/Solids	EPA 8270D	GC-MS	Diallate
Aqueous/Solids	EPA 8270D	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solids	EPA 8270D	GC-MS	Dibenzofuran
Aqueous/Solids	EPA 8270D	GC-MS	Diethylphthalate
Aqueous/Solids	EPA 8270D	GC-MS	Dimethoate
Aqueous/Solids	EPA 8270D	GC-MS	Dimethyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Di-n-butylphthalate
Aqueous/Solids	EPA 8270D	GC-MS	Di-n-octyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS	Dinoseb
Aqueous/Solids	EPA 8270D	GC-MS	Diphenylamine
Aqueous/Solids	EPA 8270D	GC-MS	Disulfoton
Aqueous/Solids	EPA 8270D	GC-MS	Ethyl methanesulfonate

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	Fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS	Fluorene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorocyclopentadiene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachloroethane
Aqueous/Solids	EPA 8270D	GC-MS	Hexachlorophene
Aqueous/Solids	EPA 8270D	GC-MS	Hexachloropropene
Aqueous/Solids	EPA 8270D	GC-MS	Indeno(1,2,3-cd)pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Isodrin
Aqueous/Solids	EPA 8270D	GC-MS	Isophorone
Aqueous/Solids	EPA 8270D	GC-MS	Isosafrole
Aqueous/Solids	EPA 8270D	GC-MS	Methapyrilene
Aqueous/Solids	EPA 8270D	GC-MS	Methyl methanesulfonate
Aqueous/Solids	EPA 8270D	GC-MS	Methyl parathion
Aqueous/Solids	EPA 8270D	GC-MS	Naphthalene
Aqueous/Solids	EPA 8270D	GC-MS	Nitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosodiethylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosodimethylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosodi-n-butylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitroso-di-n-propylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosodiphenylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosomethylethylamine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosomorpholine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosopiperidine
Aqueous/Solids	EPA 8270D	GC-MS	N-nitrosopyrolidine
Aqueous/Solids	EPA 8270D	GC-MS	Octachlorostyrene
Aqueous/Solids	EPA 8270D	GC-MS	o,o,o-triethyl phosphorothioate
Aqueous/Solids	EPA 8270D	GC-MS	o-toluidine
Aqueous/Solids	EPA 8270D	GC-MS	Parathion (ethyl)
Aqueous/Solids	EPA 8270D	GC-MS	p-dimethylaminoazobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Pentachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Pentachloroethane

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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS	Pentachloronitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS	Pentachlorophenol
Aqueous/Solids	EPA 8270D	GC-MS	Phenacetin
Aqueous/Solids	EPA 8270D	GC-MS	Phenanthrene
Aqueous/Solids	EPA 8270D	GC-MS	Phenol
Aqueous/Solids	EPA 8270D	GC-MS	Phorate
Aqueous/Solids	EPA 8270D	GC-MS	Phthalimide
Aqueous/Solids	EPA 8270D	GC-MS	Pyrene
Aqueous/Solids	EPA 8270D	GC-MS	Pyridine
Aqueous/Solids	EPA 8270D	GC-MS	Safrole
Aqueous/Solids	EPA 8270D	GC-MS	Sulfotepp
Aqueous/Solids	EPA 8270D	GC-MS	Thionazin
Aqueous/Solids	EPA 8270D	GC-MS-LL	1,4-Dioxane
Aqueous/Solids	EPA 8270D	GC-MS-LL	1-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS-LL	2-Methylnaphthalene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Acenaphthene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Acenaphthylene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Anthracene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Benzo(a)anthracene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Benzo(a)pyrene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Bis(2-ethylhexyl)phthalate
Aqueous/Solids	EPA 8270D	GC-MS-LL	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS-LL	Carbazole
Aqueous/Solids	EPA 8270D	GC-MS-LL	Chrysene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Dibenzo(a,h)anthracene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Dibenzofuran
Aqueous/Solids	EPA 8270D	GC-MS-LL	Diethyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS-LL	Dimethyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS-LL	Di-n-butyl phthalate
Aqueous/Solids	EPA 8270D	GC-MS-LL	Di-n-octyl phthalate

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8270D	GC-MS-LL	Fluoranthene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Fluorene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Hexachlorobenzene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Indeno(1,2,3-cd)pyrene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Naphthalene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Nitrobenzene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Octachlorostyrene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Phenanthrene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Pyrene
Aqueous/Solids	EPA 8270D	GC-MS-LL	Pyridine
Aqueous/Solids	EPA 9012A, B	UV-VIS	Cyanide, total
Aqueous/Solids	EPA 9034	Titration	Sulfide, acid soluble
Aqueous/Solids	EPA 9056A	IC	Bromide
Aqueous/Solids	EPA 9056A	IC	Chloride
Aqueous/Solids	EPA 9056A	IC	Fluoride
Aqueous/Solids	EPA 9056A	IC	Nitrate as Nitrogen
Aqueous/Solids	EPA 9056A	IC	Nitrite as Nitrogen
Aqueous/Solids	EPA 9056A	IC	Sulfate
Aqueous/Solids	GEN-AVS	Titrimetric	Acid Volatile Sulfide
Aqueous/Solids	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solids	EPA 8330B	HPLC	1,3-Dinitrobenzene
Aqueous/Solids	EPA 8330B	HPLC	2,4,6-Trinitrotoluene (TNT)
Aqueous/Solids	EPA 8330B	HPLC	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	2-Amino 4,6-Dinitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	2-Nitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	3,5-Dinitroaniline
Aqueous/Solids	EPA 8330B	HPLC	3-Nitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	4-Amino 2,6-Dinitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	4-Nitrotoluene
Aqueous/Solids	EPA 8330B	HPLC	Hexahydro 1,3,5-Trinitro 1,3,5-Triazine
Aqueous/Solids	EPA 8330B	HPLC	Methyl 2,4,6 Trinitrophenylnitramine
Aqueous/Solids	EPA 8330B	HPLC	Nitrobenzene
Aqueous/Solids	EPA 8330B	HPLC	Nitroglycerin

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Columbia Analytical Services

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14609
Lisa Reyes Phone: 585-288-5380

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

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8330B	HPLC	Octahydro 1.3.5.7 Tetranitro 1,3,5,7 Tetraz
Aqueous/Solids	EPA 8330B	HPLC	Pentaerythritol Tetranitrate (PETN)
Aqueous/Solids	HPLC-METACID	HPLC	Acetic Acid
Aqueous/Solids	HPLC-METACID	HPLC	Butanoic Acid (Butyric Acid)
Aqueous/Solids	HPLC-METACID	HPLC	Lactic Acid
Aqueous/Solids	HPLC-METACID	HPLC	Propionic Acid
Aqueous/Solids	HPLC-METACID	HPLC	Pyruvic Acid

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 3010A	Acid Digestion	Metals prep
Aqueous	EPA 3510C	SF Extraction	Semivolatiles, pesticides, PCBs, DRO
Aqueous	EPA 5030B	P&T	Volatiles
Solids	EPA 3050B	Acid Digestion	Metals prep
Solids	EPA 3060A	Digestion	Hexavalent chromium digestion
Solids	EPA 3541	SOX Extraction	Semivolatiles, pesticides, PCBs, DRO
Solids	EPA 5035	P&T closed	Volatiles
Aqueous/Solids	EPA 1311	TCLP	Physical Extraction
Aqueous/Solids	EPA 1312	SPLP	Physical Extraction
Aqueous/Solids	EPA 3620B	Florisil Cleanup	Semivolatiles, pesticides, PCBs
Aqueous/Solids	EPA 3660B	Sulfur Cleanup	Semivolatiles, pesticides, PCBs
Aqueous/Solids	EPA 3665A	Sulfuric Acid Cleanup	PCBs
Aqueous/Solids	EPA 9012A, B	Distillation	Cyanide
Aqueous/Solids	EPA 9030B	Distillation	Sulfide, acid soluble

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TESTAMERICA LABORATORIES WEST SACRAMENTO
880 Riverside Parkway
West Sacramento, CA 95605
Douglas Weir Phone: 916 3744 389

ENVIRONMENTAL

Valid To: January 31, 2014 Certificate Number: 2928.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Inductively Coupled Plasma (ICP), ICP-Mass Spectroscopy, Atomic Absorption Spectroscopy (flame), Gas Chromatography(GC), GC- Mass Spectroscopy, High Resolution Gas Chromatography/High Resolution Mass Spectroscopy, Liquid Chromatography(LC),LC- Mass Spectroscopy, Ion Chromatography, Spectrophotometry, Misc.- Electronic Probes

Parameter/Analyte	**Non potable Water**	**Solid Hazardous Waste**	**Air**	**Associated Prep Methods**
Metals				
Aluminum	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Antimony	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Arsenic	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Barium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Beryllium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Cadmium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Calcium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Chromium (Total)	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Chromium (Hexavalent)	EPA 7196A	EPA 7196A	-------	EPA 3005A/3010A/3050A
Cobalt	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Copper	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Iron	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Lead	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Magnesium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Manganese	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Mercury	EPA 7470A	EPA 7471A	-------	EPA 3005A/3010A/3050A
Molybdenum	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Nickel	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Potassium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Selenium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Silver	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Sodium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Thallium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Vanadium	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Zinc	EPA 6010B/6020	EPA 6010B/6020	-------	EPA 3005A/3010A/3050A
Nutrients				
Nitrate	EPA 353.2/9056A/300.0	EPA 353.2/9056A/300.0	-------	----------
Nitrate-nitrite	EPA 353.2/ SM4500-NO3 F	EPA 353.2	-------	----------
Nitrite	EPA 353.2/9056A/300.0	EPA 353.2/9056A/300.0	-------	----------
Orthophosphate	EPA 9056A/300.0	EPA 9056A/300.0	-------	----------
Wet Chemistry				
Oil and Grease	EPA 1664A/9070	EPA 1664A/9071	-------	----------
Nitrocellulose	WS-WC-0050	WS-WC-0050	-------	----------
Perchlorate	EPA 6850	EPA 6850	-------	----------
Chloride	EPA 9056A/300.0	EPA 9056A/300.0	-------	----------
Fluoride	EPA 9056A/300.0	EPA 9056A/300.0	-------	----------
Sulfate	EPA 9056A/300.0	EPA 9056A/300.0	-------	----------
			-------	----------
Hazardous Waste Characteristics				
TCLP Extractables	----------	EPA 1311		
TCLP Inorganics	----------	EPA 1311	-------	----------
			-------	----------
Purgeable Organics				
(volatiles)				
Acetone	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Acrolein	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Acrylonitrile	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Allyl Chloride	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Benzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Bromochloromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Bromodichloromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Bromoform	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Bromomethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Carbon disulfide	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Carbon tetrachloride	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Chlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Chloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
2-Chloroethyl vinyl ether	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Chloroform	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Chloromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Chloroprene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Cyclohexane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1-Chlorocyclohexane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Dibromochloromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2-Dibromo-3-chloropropane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2-Dibromoethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Dibromomethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2-Dichlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,3-Dichlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,4-Dichlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
T-1,4-Dichloro-2-Butene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Dichlorodifluoromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1-Dichloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2-Dichloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1-Dichloroethene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
trans-1,2-Dichloroethene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
cis-1,2-Dichloroethene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2-Dichloropropane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,3-Dichloropropane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
2,2-Dichloropropane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1-Dichloropropene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
cis-1,3-Dichloropropene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
trans-1,3-Dichloropropene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,4-Dioxane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Ethylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Ethylmethacrylate	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Hexachlorobutadiene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Hexane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
2-Hexanone (MBK)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Iodomethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Isobutanol	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Isopropyl Ether	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Methacrylonitrile	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Methyl tert-butyl ether (MTBE)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Methylene chloride	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Methyl ethyl ketone	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Methyl Methacrylate	EPA 8260B/8260C	EPA 8260B/8260C	-------	----------
4-Methyl-2-pentanone (MIBK)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Naphthalene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Propionitrile	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1,1,2-Tetrachloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1,2,2-Tetrachloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Tetrachloroethene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Tetrahydrofuran	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Toluene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2,3-Trichlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2,4-Trichlorobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1,1-Trichloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1,2-Trichloroethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,1-2-Trichloro-1,2-2-trifluorethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Trichloroethene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Trichlorofluoromethane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2,3-Trichloropropane	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Vinyl acetate	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Vinyl chloride	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
m & p xylene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
o-xylene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Xylenes, Total	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
tert-amyl methyl ether (TAME)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
tert-butyl alcohol (TBA)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Ethyl tert-butyl ether (ETBE)	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Bromobenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
n-Butylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
sec-Butylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
tert-Butylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
2-Chlorotoluene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
4-Chlorotoluene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Isopropylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
n-Propylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Styrene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,2,4-Trimethylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
1,3,5-Trimethylbenzene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Oxygenates	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Gasoline Range Organics (GRO)	EPA 8260B/AK101	EPA 8260B/AK101	-------	EPA 5030A/5030B/5035/5035A
p-Isopropyltoluene	EPA 8260B/8260C	EPA 8260B/8260C	-------	EPA 5030A/5030B/5035/5035A
Extractable Organics				
(semivolatiles)				
Acenaphthene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Acenaphthylene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Acetophenone	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Acetylaminofluorene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Aminobiphenyl	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Aniline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Anthracene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
7,12-Dimethylbenz(a)anthracene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Aramite	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Benzaldehyde	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Dibenze(a,j)acridine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Benzidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Benzo(a)anthracene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzo(b)fluoranthene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzo(k)fluoranthene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzo(j)fluoranthene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Benzo(g,h,i)perylene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzo(a)pyrene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzo(e)pyrene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzoic acid	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Benzyl alcohol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Benzyl butyl phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-sec-Butyl-4,6-dinitrophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Bis(2-chloroethoxy) Methane	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Bis(2-chloroethyl) ether	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Bis(2-chloroisopropyl) ether	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Di(2-ethylhexyl) phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Bromophenyl phenyl ether	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Carbazole	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
4-Chloroaniline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Chloro-3-methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Hexacloropropene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Chloronaphthalene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Chlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Chlorophenyl phenyl ether	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Chrysene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Diallate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3510C/3550B/ 3580A
Dibenz(a,h)anthracene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Dibenzofuran	EPA 8270C/8270D	EPA 8270C/8270D	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
1,2-Dichlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,3-Dichlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,4-Dichlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
3,3'-Dichlorobenzidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,4-Dichlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,6-Dichlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Diethyl Phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,4-Dimethylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Dimethyl Phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Di-n-butyl phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Di-n-octyl phthalate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4,6-Dinitro-2-methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,4-Dinitrophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,4-Dinitrotoluene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,6-Dinitrotoluene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,4-Dioxane	WS-MS-0011	WS-MS-0011	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
1,2-Diphenylhydrazine (as Azobenzene)	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Famphur	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Fluoranthene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Fluorene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Hexachlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Hexachlorobutadiene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Hexachlorocyclopentadiene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Hexachloroethane	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Indeno(1,2,3-c,d)pyrene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Isodrin	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Isophorone	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Isosafrole	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Isosafrole #1	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Isosafrole #2	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Kepone	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Dimethoate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Methapyrilene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Methyl methanesulfonate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Methyl Parathion	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
3-Methylcholanthrene	EPA 8270C/8270D	EPA 8270C/8270D		EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Methylnaphthalene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
2-Methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
3-Methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
3&4-Methylphenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Naphthalene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
1,4-Naphthoquinone	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1-Chloronaphthalene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1-Methylnaphthalene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1-Naphthylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Naphthylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Nitroaniline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
3-Nitroaniline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Nitroaniline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Nitro-o-toluidine-1-oxide	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
5-Nitro-o-toluidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Nitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,2-Dinitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,3-Dinitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,4-Dinitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,3,5-Trinitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Nitrophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
4-Nitrophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosodimethylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosodi-n-propylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosodiphenylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosodiethylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitroso-di-n-butylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosomethylethylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosomorpholine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosopyrrolidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
n-Nitrosopiperidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Parathion	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
p-Chorobenzilate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
p-Dimthylaminoazobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Pentachlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Pentaclorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Pentacloronitrobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Pentacloroethane	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Phenacetin	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Phenanthrene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
a,a-Dimethylphenethlamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Phenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Biphenyl	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Diphenylamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
p-Phenylenediamine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2-Picoline	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Phorate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Promamide	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Pyrene	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	EPA 8270C/8270D/WS-MS-006/WS-MS-0008	WS-MS-0006	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A Air: 3542/TO-13A
Pyridine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Safrole	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Sulfotepp	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Disulfotone	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Ethylmethanesulfonate	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Thionazin	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,2,4,5-Tetrachlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
1,2,4-Trichlorobenzene	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
2,4,5-Trichlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,3,4,6-Tetrachlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,3,5,6-Tetrachlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
2,4,6-Trichlorophenol	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Diesel Range Organics (DRO)	EPA 8015B/8015C/AK102	EPA 8015B/8015C/AK102	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Residual Range Organics	AK103	AK103	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
o,o,o-TEPT	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
o-Toluidine	EPA 8270C/8270D	EPA 8270C/8270D	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3580A
Dioxins				
2,3,7,8-TeCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B		----------
1,2,3,7,8-PeCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,4,7,8-HxCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,6,7,8-HxCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,7,8,9-HxCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,4,6,7,8-HpCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
OCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
2,3,7,8-TeCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,7,8-PeCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
2,3,4,7,8-PeCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,4,7,8-HxCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,6,7,8-HxCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,7,8,9-HxCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
2,3,4,6,7,8-HxCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,4,6,7,8-HpCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
1,2,3,4,7,8,9-HpCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
OCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total TCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Total PeCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total HxCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total HeptaCDD	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total TCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total PeCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total HxCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Total HpCDF	EPA 8280A/8280B/8290 /8290A/1613B	EPA 8280A/8280B/8290 /8290A/1613B	-------	----------
Chemical Warfare Degradates				
1,4-Dithiane	WS-MS-0003	WS-MS-0003	-------	----------
Benzothiazole	WS-MS-0003	WS-MS-0003	-------	----------
p-Chlorophenyl methylsulfide	WS-MS-0003	WS-MS-0003	-------	----------
p-Chlorophenyl methylsulfoxide	WS-MS-0003	WS-MS-0003	-------	----------
p-Chlorophenyl methylsulfone	WS-MS-0003	WS-MS-0003	-------	----------
Chloropicrin	WS-MS-0003	WS-MS-0003	-------	----------
Acetophenone	WS-MS-0003	WS-MS-0003	-------	----------
2-Chloroacetophenone	WS-MS-0003	WS-MS-0003	-------	----------
1,4-Oxathiane	WS-MS-0003	WS-MS-0003	-------	----------
Dimethyl Disulfide	WS-MS-0003	WS-MS-0003	-------	----------
Diisopropylmethylphosphate (DIMP)	WS-LC-0004	WS-LC-0004	-------	----------
Dimethylmethylphosphonate (DMMP)	WS-LC-0004	WS-LC-0004	-------	----------
Ethyl methylphosphonic acid (EMPA)	WS-LC-0004	WS-LC-0004	-------	----------
Isopropyl methylphosphonic acid (IMPA)	WS-LC-0004	WS-LC-0004	-------	----------
Methylphosphonic acid (MPA)	WS-LC-0004	WS-LC-0004	-------	----------
Thiodiglycol (2,2'-Thiodiethanol) (TDG)	WS-LC-0004	WS-LC-0004	-------	----------
Nitroaromatics				
2-Amino-4,6-dinitrotoluene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
4-Amino-2,6-dinitrotoluene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
3,5-Dinitroaniline	EPA 8330B	EPA 8330B	-------	----------
1,3-Dinitrobenzene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
2,4-Dinitrotoluene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
2,6-Dinitrotoluene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Ethylene glycol dinitrate	EPA 8330B	EPA 8330B	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Glycerol trinitrate (Nitroglycerin)	EPA 8330B	EPA 8330B	-------	----------
Hexahydro-1,3,5-trinitro-1,3,5-triazine (Hexogen)	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Nitrobenzene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
2-Nitrotoluene (o-Nitrotoluene)	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
3-Nitrotoluene (m-Nitrotoluene)	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
4-Nitrotoluene (p-Nitrotoluene)	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Octahydro-1,3,5,7-tetranitro1,3,5,7-tetracine (Octogen)	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Picric acid	EPA 8330B	EPA 8330B	-------	----------
Pentaerythritol tetranitrate	EPA 8330B	EPA 8330B	-------	----------
1,3,5-Trinitrobenzene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
2,4,6-Trinitrotoluene	EPA 8330A/8330B	EPA 8330A/8330B	-------	----------
Nitroguanidine	WS-LC-0010	WS-LC-0010	-------	----------
Nitrosamines				
N-Nitrosodimethylamine (NDMA)	WS-MS-0012	WS-MS-0012	-------	----------
Perfluoro Compounds				
Perfluorooctanoic acid	WS-LC-0020	WS-LC-0020	-------	----------
Perfluorooctane sulfonate	WS-LC-0020	WS-LC-0020	-------	----------
Pesticides/PCBs				
Aldrin	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
a-BHC	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
b-BHC	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
d-BHC	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
g-BHC (Lindane)	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
a-Chlordane	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
g-Chlordane	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Oxy-Chlordane	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
4,4'-DDD	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
2,4'-DDD	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
4,4'-DDE	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
2,4'-DDE	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
4,4'-DDT	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
2,4'-DDT	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Dieldrin	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endosulfan I	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endosulfan II	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endosulfan sulfate	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endrin	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endrin aldehyde	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Endrin ketone	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Heptachlor	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Heptachlor epoxide	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Hexachlorobenzene	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Methoxychlor	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Cis-Nonachlor	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Trans-Nonachlor	EPA 1699	EPA 1699		EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Toxaphene	EPA 8081A/8081B/EPA 1699	EPA 8081A/8081B/EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Mirex	EPA 1699	EPA 1699	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
Chlordane (technical)	EPA 8081A/8081B	EPA 8081A/8081B	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A
<u>PCB (Aroclors)</u>				
PCB-1016	EPA 8082/8082A	EPA 8082/8082A	-------	EPA 3500B/3500C/3510C/ 3550B/3550C/3620B/3660A/ 3620B/3665A
PCB-1221	EPA 8082/8082A	EPA 8082/8082A	-------	EPA 3500B/3500C/3510C/
PCB-1232	EPA 8082/8082A	EPA 8082/8082A	-------	3550B/3550C/3620B/3660A/
PCB-1242	EPA 8082/8082A	EPA 8082/8082A	-------	3620B/3665A
PCB-1248	EPA 8082/8082A	EPA 8082/8082A	-------	EPA 3500B/3500C/3510C/
PCB-1254	EPA 8082/8082A	EPA 8082/8082A	-------	3550B/3550C/3620B/3660A/
PCB-1260	EPA 8082/8082A	EPA 8082/8082A	-------	3620B/3665A

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB-1262	EPA 8082/8082A	EPA 8082/8082A	-------	EPA 3500B/3500C/3510C/
PCB-1268	EPA 8082/8082A	EPA 8082/8082A	-------	3550B/3550C/3620B/3660A/
PCB (congeners)				
PCB 1 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 2 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 3 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 4 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 5 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 6 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 7 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 8 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 9 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 10 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 11 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 12 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 13 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 14 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 15 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 16 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 17 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 18 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 19 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 20 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 21 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 22 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 23 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 24 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 25 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 26 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 27 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 28 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 29 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 30 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 32 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 31 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 33 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 34 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 35 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 36 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 37 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 38 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 39 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 40 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 41 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 42 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 43 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 44 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 45 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 46 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 47 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 48 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 49 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 50 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 51 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 52 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 53 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 54 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 55 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 56 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 57 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 58 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 59 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 60 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 61 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 62 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 63 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 64 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 65 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 66 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 67 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 68 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 69 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 70 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 71 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 72 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 73 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 74 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 75 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 76 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 77 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 78 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 79 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 80 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 81 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 82 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 83 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 84 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 85 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 86 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 87 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 88 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 89 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 90 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 91 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 92 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 93 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 94 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 95 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 96 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 97 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 98 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 99 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 100 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 101 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 102 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 103 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 104 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 105 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 106 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 108 (BZ)/107 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 109 (BZ)/108 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 107 (BZ)/109 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 110 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 111 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 112 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 113 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 114 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 115 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 116 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 117 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 118 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 119 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 120 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 121 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 122 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 123 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 124 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 125 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 126 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 127 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 128 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 129 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 130 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 131 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 132 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 133 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 134 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 135 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 136 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 137 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 138 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 139 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 140 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 141 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 142 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 143 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 144 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 145 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 146 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 147 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 148 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 149 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 150 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 151 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 152 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 153 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 154 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 155 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 156 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 157 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 158 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 159 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 160 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 161 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 162 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 163 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 164 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 165 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 166 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 167 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 168 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 169 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 170 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 171 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 172 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 173 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 174 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 175 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 176 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 177 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 178 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 179 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 180 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 181 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 182 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 183 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 184 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 185 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 186 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 187 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
PCB 188 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 189 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 190 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 191 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 192 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 193 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 194 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 195 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 196 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 197 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 198 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 201 (BZ)/199 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 199 (BZ)/200 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 200 (BZ)/201 (IUPAC)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 202 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 203 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 204 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 205 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 206 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 207 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 208 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
PCB 209 (BZ)	EPA 1668A mod/1668C mod	EPA 1668A mod/ 1668C mod	-------	----------
Hormones,Steroids, Pharmaceuticals and Disinfection Byproducts				
Acetominophen	WS-LC-0024	----------	-------	----------
Atenolol	WS-LC-0024	----------	-------	----------
Azithromycin	WS-LC-0024	----------		
Carbadox	WS-LC-0024	----------	-------	----------
Carbamazepine	WS-LC-0024	----------	-------	----------

Parameter/Analyte	Non potable Water	Solid Hazardous Waste	Air	Associated Prep Methods
Clarithromycin	WS-LC-0024	----------		
Diazepam	WS-LC-0024	----------	-------	----------
Digoxigenin	WS-LC-0024	----------	-------	----------
Digoxin	WS-LC-0024	----------		
Diphenylhydramine	WS-LC-0024	----------	-------	----------
Fluoxetine	WS-LC-0024	----------		
Flumequine	WS-LC-0024	----------	-------	----------
Gemfibrozil	WS-LC-0024	----------		
Ibuprofen	WS-LC-0024	----------	-------	----------
Naproxen	WS-LC-0024	----------	-------	----------
Ormetoprim	WS-LC-0024	----------	-------	----------
Penicillin G	WS-LC-0024	----------		
Sulfachloropyridazine	WS-LC-0024	----------	-------	----------
Sulfadiazine	WS-LC-0024	----------	-------	----------
Sulfamethizole	WS-LC-0024	----------	-------	----------
Sulfamethoxazole	WS-LC-0024	----------	-------	----------
Sulfathiazole	WS-LC-0024	----------	-------	----------
Thiabendazole	WS-LC-0024	----------		
Trimethoprim	WS-LC-0024	----------		
Tris (2-chloro-2-propyl)phosphate (TCPP)	WS-LC-0024	----------	-------	----------
Warfarin	WS-LC-0024	----------	-------	----------

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

TESTAMERICA LABORATORIES
WEST SACRAMENTO

West Sacramento, CA

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

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

Presented this 27th day of March 2012.

President & CEO
For the Accreditation Council
Certificate Number 2928.01
Valid to January 31, 2014
Revised June 1, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of 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 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 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
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)

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081B	gamma-Chlordane
GC/ECD	EPA 608 / 8081B	Heptachlor
GC/ECD	EPA 608 / 8081B	Heptachlor epoxide
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	EPA 608 / 8081B	Toxaphene (Chlorinated camphene)
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)
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 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)

Non-Potable Water		
Technology	**Method**	**Analyte**
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
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 8015B/C MOD	Diesel range organics (DRO)
GC/FID	EPA 8015B/C MOD	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable 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

Non-Potable Water		
Technology	**Method**	**Analyte**
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 / 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)
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 / 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 / 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

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C / 524.2	Allyl chloride
GC/MS	EPA 624 / 8260B,C / 524.2	Benzene
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
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	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 / 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

Non-Potable Water		
Technology	**Method**	**Analyte**
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
GC/MS	EPA 8260B,C / 524.2	n-Propylbenzene
GC/MS	EPA 8260B,C / 524.2	o-Xylene
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

Non-Potable Water		
Technology	**Method**	**Analyte**
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-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 625 / 8270C,D	3, 3’-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3’-Dimethylbenzidine
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

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270C,D	4-Methylphenol
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 625 / 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
GC/MS	EPA 8270C,D	7,12-Dimethylphenethylamine
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	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	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) phthalate (DEHP)
GC/MS	EPA 625 / 8270C,D	Butyl benzyl phthalate
GC/MS	EPA 8270C,D	Caprolactam
GC/MS	EPA 8270C,D	Carbazole
GC/MS	EPA 8270C,D	Chlorobenzilate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 625 / 8270C,D	Chrysene
GC/MS	EPA 8270C,D	Diallate
GC/MS	EPA 625 / 8270C,D	Dibenz(a h)anthracene
GC/MS	EPA 8270C,D	Dibenzofuran
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	Ethyl methanesulfonate
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	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
GC/MS	EPA 8270C,D	Isosafrole
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

Non-Potable Water		
Technology	**Method**	**Analyte**
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-Triethyl phosphorothioate
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
GC/MS	EPA 8270C,D	Thionazin
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-2,3-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

Non-Potable Water		
Technology	**Method**	**Analyte**
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
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

Non-Potable Water		
Technology	**Method**	**Analyte**
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
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

Non-Potable Water		
Technology	**Method**	**Analyte**
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 310.2 / SM 2320B	Alkalinity
Caculation	SM 2340C	Hardness
Gravimetric	EPA 1664A	Oil and Grease
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 2340B	Hardness
Titration	SM 4500SO_3 B	Sulfite
Titration	EPA 9034 / SM 4500S^{2-} E	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 365.1 / SM 4500P E	Orthophosphate as P
UV/VIS	EPA 365.4	Phosphorus total

Non-Potable Water		
Technology	**Method**	**Analyte**
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
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	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
GC/ECD	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 608 / 8081B	Chlordane (tech.)
GC/ECD	EPA 8081B	delta-BHC
GC/ECD	EPA 8081B	Dieldrin

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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	EPA 8081B	Methoxychlor
GC/ECD	EPA 8081B	Toxaphene (Chlorinated camphene)
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)
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)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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 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
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	Diesel range organics (DRO)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/FID	EPA 8015C	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable 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
GC/MS	EPA 8260B,C	1, 2, 3-Trichloropropane
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-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-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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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	Bromobenzene
GC/MS	EPA 8260B,C	Bromochloromethane
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	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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	Isopropyl benzene
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)
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	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-Methylnaphthalene
GC/MS	EPA 8270C,D	1-Naphthylamine

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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-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
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-Methylphenol
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
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	Benzaldehyde
GC/MS	EPA 8270C,D	Benzidine
GC/MS	EPA 8270C,D	Benzo(a)anthracene
GC/MS	EPA 8270C,D	Benzo(a)pyrene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Benzo(b)fluoranthene
GC/MS	EPA 8270C,D	Benzo(g h i)perylene
GC/MS	EPA 8270C,D	Benzo(k)fluoranthene
GC/MS	EPA 8270C,D	Benzoic Acid
GC/MS	EPA 8270C,D	Benzyl alcohol
GC/MS	EPA 8270C,D	Biphenyl
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-Ethylhexyl) phthalate (DEHP)
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	Dibenzofuran
GC/MS	EPA 8270C,D	Diethyl phthalate
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	Ethyl methanesulfonate
GC/MS	EPA 8270C,D	Famfur
GC/MS	EPA 8270C,D	Fluoranthene
GC/MS	EPA 8270C,D	Fluorene
GC/MS	EPA 8270C,D	Hexachlorobenzene
GC/MS	EPA 8270C,D	Hexachlorobutadiene
GC/MS	EPA 8270C,D	Hexachlorocyclopentadiene
GC/MS	EPA 8270C,D	Hexachloroethane
GC/MS	EPA 8270C,D	Hexachloropropene
GC/MS	EPA 8270C,D	Isodrin
GC/MS	EPA 8270C,D	Isophorone

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Isosafrole
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	Nitroquinoline-1-oxide
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-Triethyl phosphorothioate
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
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	Thionazin
GC/MS	EPA 8270C,D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C,D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8270C,D	1, 3, 5-Trinitrobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	1, 2, 4, 5-Tetrachlorobenzene
GC/MS	EPA 8270C,D	2, 4, 5-Trochlorophenol
GC/MS	EPA 8270C,D	2, 4, 6-Trichlorophenol
GC/MS	EPA 8270C,D	2, 3, 4, 6-Tetrachlorophenol
GC/MS	EPA 8270C,D	1, 2-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Diphenylhydrazine
GC/MS	EPA 8270C,D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 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	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane))
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	3, 3`-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3’-Dimethylbenzidine
GC/MS	EPA 8270C,D	2-Methyl-4, 6-dinitrophenol
GC/MS	EPA 8270C,D	7,12-Dimethylphenethylamine
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
HPLC/UV	EPA 8330A	4-Amino-2,3-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
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
ICP/AES	EPA 6010B,C	Beryllium
ICP/AES	EPA 6010B,C	Boron
ICP/AES	EPA 6010B,C	Cadmium
ICP/AES	EPA 6010B,C	Calcium
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
ICP/MS	EPA 6020A	Cobalt
ICP/MS	EPA 6020A	Copper
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	Sulfate
Gravimetric	EPA 9070A / 9071B	Oil and Grease
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
UV/VIS	Chap. 7.3.4	Reactive Cyanide

LABORATORY ACCREDITATION BUREAU

Certificate # L2223

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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

Notes:

1) This laboratory offers commercial testing service.

Approved By: _____ Date: May 26, 2011

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

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TEST AMERICA SAVANNAH
5102 LaRoche Avenue
Savannah, GA 31404
Andrea Teal Phone: 912 354 7858

ENVIRONMENTAL

Valid To: February 28, 2013 Certificate Number: 0399.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the current DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below and for the test methods applicable to Kentucky Statute KRS 224.60-130(2)(a):

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, Ion Chromatography, ICP/MS, Methylene Blue Active Substances, Misc.- Electronic Probes (pH, F^-, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Total Organic Halide, Turbidity

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
Metals				
Aluminum	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Antimony	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Arsenic	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Barium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Beryllium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Boron	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Cadmium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Calcium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Chromium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Chromium 3+	SM 3500 Cr B_01 SM3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 3060A/7196A
Chromium 6+	SM 3500 Cr B_01 SM3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 3060A/7196A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Cobalt	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Copper	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Iron	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Iron, Ferric	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	- - - - - - - - - -
Iron, Ferrous	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	- - - - - - - - - -
Lead	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Magnesium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Manganese	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Mercury	EPA 200.8 EPA 245.1	EPA 200.8 EPA 245.1 SM 3112B	EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A EPA 7470A ISM01.2 (Hg) SM 3112B	EPA 3050B/6020 EPA 3050B/6020A EPA 7471A EPA 7471B ISM01.2 (Hg)
Molybdenum	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nickel	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Potassium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Selenium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Silica	EPA 200.7	EPA 200.7	EPA 6010B EPA 6010C	- - - - - - - - - -
Silicon	EPA 200.7	EPA 200.7	EPA 6010B EPA 6010C	- - - - - - - - - -
Silver	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Sodium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Sodium Adsorption Ratio	- - - - - - - - - -	USDA 20B	USDA 20B	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Strontium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Thallium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Tin	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Titanium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Vanadium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Zinc	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nutrients				
Ammonia (as N)	EPA 350.1 SM4500NH3_G	EPA 350.1 SM4500NH3_G	EPA 350.1 SM4500NH3_G	- - - - - - - - - -
Kjeldahl nitrogen	EPA 351.2	EPA 351.2	EPA 351.2	- - - - - - - - - -
Nitrate (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate-nitrite (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrite (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate (as NO3)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate-nitrite (as NO3-NO2)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrite (as NO2)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Organic Nitrogen (as N)	- - - - - - - - - -	TKN minus Ammonia	TKN minus Ammonia	- - - - - - - - - -
Orthophosphate (as P)	EPA 365.1 SM4500P F	EPA 365.1 SM4500P F	EPA 365.1 SM4500P F	- - - - - - - - - -
Total Nitrogen (as N)	- - - - - - - - - -	TKN plus Nitrate-Nitrite (as N)	TKN plus Nitrate-Nitrite (as N)	- - - - - - - - - -
Total phosphorus	EPA 365.4	EPA 365.4	EPA 365.4	- - - - - - - - - -
Demands				
Adsorbable organic halides (AOX)	- - - - - - - - - -	EPA 1650	EPA 1650	- - - - - - - - - -
Biochemical oxygen demand	EPA 405.1 SM 5210 B	EPA 405.1 SM 5210 B	EPA 405.1 SM 5210 B	- - - - - - - - - -
Carbonacious BOD	SM 5210 B	SM 5210 B	SM 5210 B	- - - - - - - - - -
Chemical oxygen demand	EPA 410.4 SM 5220 D	EPA 410.4 SM 5220 D	EPA 410.4 SM 5220 D	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Dissolved carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Dissolved inorganic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Dissolved organic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Extractable organic halides	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	EPA 9023
Total carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Total inorganic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Total organic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 9060 EPA 9060A Lloyd Kahn
Total organic halides	EPA 9020B	EPA 450.1 EPA 9020B	EPA 9020B EPA 450.1	- - - - - - - - - -
Wet Chemistry				
Acidity	EPA 305.1 SM 2310B	EPA 305.1 SM 2310B	EPA 305.1 SM 2310B	- - - - - - - - - -
Alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Anion/Cation Balance	- - - - - - - - - -	SM 1030 F	SM 1030 F	- - - - - - - - - -
Bicarbonate alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Bromide	EPA 300.1B	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Bromate	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Carbon dioxide, free	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Carbonate alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B SM 4500 CO2 D	EPA 310.1 SM 2320B SM 4500 CO2 D	- - - - - - - - - -
Chlorate	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chloride	EPA 300.0 EPA 325.2 SM 4500 Cl- E	EPA 300.0 EPA 325.2 SM4500 Cl- E EPA 9056 EPA 9056A EPA 9251	EPA 9056 EPA 9056A EPA 9251 EPA 300.0 EPA 325.2 SM4500 Cl-E	EPA 300.0 EPA 9056 EPA 9056A EPA 9251
Chloride, residual	EPA 330.3 SM 4500 Cl-B	EPA 330.3 SM4500 Cl-B	EPA 330.3 SM4500 Cl-B	- - - - - - - - - -
Chlorite	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Color	EPA 110.2 SM 2120B	EPA 110.2 SM 2120B	EPA 110.2 SM 2120B	- - - - - - - - - -
Corrosivity-calc.carb. stability	SM 2330B	SM 2330B	SM 2330B	- - - - - - - - - -
Cyanide	EPA 335.4 SM 4500-CN-E	EPA 335.4 SM 4500 CN-E ISM01.2 (CN) EPA 9012A EPA 9012B	EPA 9012A EPA 9012B ISM01.2 (CN) EPA 335.4 SM 4500 CN-E	EPA 9012A EPA 9012B ISM01.2 (CN)
Cyanide amenable to chlorination	EPA 335.1	EPA 335.1 EPA 9013/9012A EPA 9013/9012B	EPA 9013/9012A EPA 9013/9012B EPA 335.1	EPA 9013/9012A EPA 9013/9012B
Cyanide, weak acid dissociable	- - - - - - - - - -	SM 4500-CN-I	SM 4500-CN-I	- - - - - - - - - -
Fluoride	EPA 300.0 SM 4500-F-C	EPA 300.0 EPA 9056 EPA 9056A SM 4500-F-C	EPA 300.0 EPA 9056 EPA 9056A SM 4500-F-C	EPA 300.0 EPA 9056 EPA 9056A
Hardness (as calcium carbonate)	EPA 130.2 SM 2340B SM 2340C	EPA 130.2 SM 2340B SM 2340C	EPA 130.2 SM 2340B SM 2340C	- - - - - - - - - -
Hardness, Calcium (as calcium carbonate)	SM 2340B	SM 2340B	SM 2340B	- - - - - - - - - -
Hardness, Magnesium (as calcium carbonate)	SM 2340B	SM 2340B	SM 2340B	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Hydroxide alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Odor	EPA 140.1 SM 2150 B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Oxygen, dissolved	EPA 360.2 SM 4500 O C	EPA 360.2 SM 4500 O C	EPA 360.2 SM 4500 O C	- - - - - - - - - -
Perchlorate	EPA 314.0	EPA 314.0	EPA 314.0	EPA 314.0
pH	EPA 150.1 SM 4500 H+ B	EPA 150.1 SM 4500 H+ B EPA 9040B EPA 9040C	EPA 9040B EPA 9040C EPA 150.1 SM 4500 H+ B	EPA 9045C EPA 9045D
Phenolphthalein alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
MBAS (Surfactants)	EPA 425.1 SM 5540C	EPA 425.1 SM 5540C	EPA 425.1 SM 5540C	
Oil and Grease (HEM)	- - - - - - - - - -	EPA 1664A	EPA 1664A	EPA 9071B
Phenols	EPA 420.1	EPA 420.1 EPA 9065 EPA 9065A	EPA 9065 EPA 9065A EPA 420.1	EPA 9065 EPA 9065A
Filterable residue	EPA 160.1 SM 2540C	EPA 160.1 SM 2540C	EPA 160.1 SM 2540C	- - - - - - - - - -
Nonfilterable residue	EPA 160.2 SM 2540D	EPA 160.2 SM 2540D	EPA 160.2 SM 2540D	- - - - - - - - - -
Settleable Residue	EPA 160.5 SM 2540F	EPA 160.5 SM 2540F	EPA 160.5 SM 2540F	- - - - - - - - - -
Total residue	EPA 160.3 SM 2540B	EPA 160.3 SM 2540B	EPA 160.3 SM 2540B	SM2540G
Volatile dissolved residue	- - - - - - - - - -	SM 2540E	SM 2540E	- - - - - - - - - -
Total volatile suspended residue	- - - - - - - - - -	SM 2540E	SM 2540E	- - - - - - - - - -
Volatile residue	EPA 160.4 SM 2540E	EPA 160.4 SM 2540E	EPA 160.4 SM 2540E	SM2540G
Ash Content	- - - - - - - - - -	SM 2540E	SM 2540E	SM2540G
Fixed residue	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	SM2540G
Percent Moisture	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	SM2540G
Resistivity	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	- - - - - - - - - -
Salinity	SM 2520B	SM 2520B	SM 2520B	- - - - - - - - - -
Specific conductance	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	EPA 9050A EPA 120.1 SM 2510B	EPA 9050A

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
Sulfide	EPA 376.1 SM4500-S2-F	EPA 376.1 EPA 9030B/9034 SM4500 S2 F	EPA 9030B/9034 EPA 376.1 SM4500 S2 F	EPA 9030B/9034
Sulfate	EPA 300.0 EPA 375.4	EPA 300.0 EPA 375.4 EPA 9038 EPA 9056 EPA 9056A	EPA 300.0 EPA 375.4 EPA 9056 EPA 9056A EPA 9038	EPA 300.0 EPA 9056 EPA 9056A EPA 9038
Sulfite	EPA 377.1 SM4500 SO3 B	EPA 377.1 SM4500 SO3 B	EPA 377.1 SM4500-SO3-B	- - - - - - - - - -
Tannin & Lignin	- - - - - - - - - -	SM 5550 B	SM 5550 B	- - - - - - - - - -
Thiocyanate	SM 4500 CN M	SM 4500 CN M	SM 4500 CN M	- - - - - - - - - -
Total Petroleum Hydrocarbons (TPH or SGT-HEM)	- - - - - - - - - -	EPA 1664A	EPA 1664A	EPA 9071B
Turbidity	EPA 180.1 SM 2130B	EPA 180.1 SM 2130B	EPA 180.1 SM 2130B	- - - - - - - - - -
Unionized ammonia	- - - - - - - - - -	FL-DEP SOP	FL-DEP SOP	- - - - - - - - - -
UV-254	SM5910B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Purgeable Organics (Volatiles)				
Acetone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acetonitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acrolein	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acrylonitrile	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Amyl acetate, mixed isomers	- - - - - - - - - -	EPA 1666	EPA 1666	- - - - - - - - - -
Benzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
BTEX, Total		EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromochloromethane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromodichloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromoform	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Bromomethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
n-Butanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
sec-Butanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
2-Butanone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Butoxyethanol (Butyl cellosolve)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Butyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
sec-Butyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
tert-Butyl alcohol (2-methyl-2-propanol)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Sec-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Carbon disulfide	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Carbon tetrachloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Cellosolve acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Chlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Chloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Chloroethyl vinyl ether	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	- - - - - - - - - -
Chloroform	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1-Chlorohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
4-Isopropyltoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Chloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
3-Chloro-1-propene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Chloroprene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Cyclohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Chlorotoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
4-Chlorotoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Dibromoacetic Acid (DBAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dibromochloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1 EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
Dibromomethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dibromoethane (EDB)	EPA 504.1 EPA 524.2	EPA 624	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
Dichloroacetic Acid (DCAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,4-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trans-1,4-dichloro-2-butene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Dichlorodifluoromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
cis-1,2-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
trans-1,2-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloroethene, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloropropane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,3-Dichloropropane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2,2-Dichloropropane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
cis-1,3-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
trans-1,3-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3-Dichloropropene, Total	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Diethyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Diisopropyl ether	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,4-Dioxane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI EPA 5030B/8260B	EPA 8015B-DAI EPA 8015C-DAI EPA 5030/8260B EPA 5035A/8260B
Ethyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Ethyl benzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethyl methacrylate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Tetraethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Triethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Furan	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Haloacetic Acids, Total (HAA5)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
n-Heptane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
n-Heptanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
2-Hexanone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Hexachlorobutadiene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Hexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Isoamyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isobutanol	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B EPA 8015B-DAI EPA 8015C-DAI	EPA 5030/8260B EPA 5035A/8260B EPA 8015B-DAI EPA 8015C-DAI
Isobutyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Isopropylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Iodomethane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methacrylonitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Methyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B EPA 8015B-DAI EPA 8015C-DAI	EPA 5030/8260B EPA 5035A/8260B EPA 8015B-DAI EPA 8015C-DAI
Methylene chloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl isobutyl ketone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl methacrylate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl cyclohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Monobromoacetic Acid (MBAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Monochloroacetic Acid (MCAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methyl tert-butyl ether (MTBE)	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Naphthalene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2,2'-Oxybisethanol (Diethylene glycol)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Pentachloroethane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Phenol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Propanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Propionitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Propoxy ethanol (Propyl cellosolve)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Propyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Propylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Propylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Di-propylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Di-propylene glycol methyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI	EPA 8015B-DAI
Styrene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-amyl alcohol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Tert-amyl methyl ether (TAME)	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Tert-butyl alcohol (TBA)	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-butyl ethyl ether (ETBE)	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,1,1,2-Tetrachloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1,2,2-Tetrachloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tetrachloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tetrahydrofuran	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Toluene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Trichloroacetic acid	EPA 552.2	- - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,1,1-Trichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1,2-Trichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trichlorofluoromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,3-Trichlorobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,4-Trichlorobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,3-Trichloropropane	EPA 524.2 EPA 504.1	- - - - - - - - - -	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,4-Trimethylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3,5-Trimethylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trihalomethanes, Total	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Vinyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Vinyl chloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Xylenes, total	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Xylene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3 & 1,4-Xylene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Gasoline Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8015B EPA 5030B/8015C	EPA 5030/8015B EPA 5035A/8015B EPA 5030/8015C EPA 5035A/8015C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Extractable Organics (Semivolatiles)				
Acenaphthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Acenaphthylene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Acetochlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Acetophenone	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Acetylaminofluorene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Alachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
4-Aminobiphenyl	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Aniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Aramite, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Atrazine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzaldehyde	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Benzidine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzoic acid	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (a) anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (b) fluoranthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (k) fluoranthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (ghi) perylene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (a) pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzyl alcohol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,1-Biphenyl	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-chloroethoxy) methane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-chloroethyl) ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Bis (2-chloroisopropyl) ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-ethylhexyl) phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bromacil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
4-Bromophenylphenyl ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Butachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Butylate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Butyl benzyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-sec-Butyl-4,6-dinitrophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Caprolactam	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Carbazole	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chloroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chloro-3-methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Chloronaphthalene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Chlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2-Chlorophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chlorophenyl phenyl ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Chrysene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Cresols (total methyl phenols)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diallate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dibenzofuran	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dibenz(a,h) anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,2-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
3,3-Dichlorobenzidine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dichlorophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,6-Dichlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diethyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di(2-ethylhexyl)adipate	EPA 525.2	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dimethoate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
p-Dimethylaminoazobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
7,12-Dimethylbenz (a) anthracene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,3'-Dimethylbenzidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Alpha-, alpha-Dimethylphenethylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,3-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,4-Dimethylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,5-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4 & 2,5-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,6-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dimethyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di-n-butyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di-n-octyl phthalate	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diphenyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3-Dinitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dinitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,4-Dinitrotoluene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,6-Dinitrotoluene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Dioxane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,2-Diphenylhydrazine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diphenamide	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
EPTC	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Ethoprop (Mocap)	EPA 525.2	- - - - - - - - - -		- - - - - - - - - -
Ethyl methane sulfonate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Etridiazole	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Fenarimol	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Fluoroanthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Fluorene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Fluridone	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,2',3,3',4,4',6-Heptachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Hexachlorobenzene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachlrobutadiene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Hexachlorocyclopentadiene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachloroethane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachlorophene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachloropropene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexazinone	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Indeno (1,2,3-cd) pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Isophorone	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Isosafrole	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methapyrilene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methylbenzoate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3-Methylcholanthrene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Methyl-4,6-Dinitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Methyl methane sulfonate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1-Methylnaphthalene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Methylnaphthalene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methyl paraoxon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2-Methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3 & 4-Methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Metolachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Metribuzin	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Mevinphos	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
MGK 264, total (isomer a+b)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Molinate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Napropamide	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Naphthalene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Naphthoquinone	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1-Naphthylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Naphthylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Nitrobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Nitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitroso-di-n-butylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodiethylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodimethylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosomethylethylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosomorpholine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
N-Nitrosodi-n-propylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodiphenylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosopiperidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosopyrrolidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitroquinoline-1-oxide	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
trans-Nonachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Norflurazon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pebulate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pentachlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,2',3,4,6-Pentachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pentachlronitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pentachlorophenol	- - - - - - - - - -	EPA 625 EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Permethrin, total	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Phenacetin	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Phenanthrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phenyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
p-Phenylene diamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phorate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Picoline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
alpha-Pinene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pronamide	EPA 525.2	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Propazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pyridine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Safrole, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Terbacil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2,4,5-Tetrachlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,2',4,4'-Tetrachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Tetrachlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Tetrachloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
2,3,4,6-Tetrachlorophenol	- - - - - - - - - -	EPA 1653	EPA 1653 EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Toluidine (o-Toluidine)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Triademefon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,4,5-Trichlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2,3-Trichlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,2,4-Trichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3,5-Trichlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4,5-Trichlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,6-Trichlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,5-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,6-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
4,5,6-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
2,4,5-Trichlorophenol	- - - - - - - - - -	EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,3,6-Trichlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,4,6-Trichlorophenol	- - - - - - - - - -	EPA 625 EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4,5-Trichlorophenol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Trichlorosyringol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Tricyclazole	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
o,o',o"-Triethylphosphorothioate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Trifluralin	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,3,5-Trinitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Vernolate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,3-Xylenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4-Xylenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
#2 Diesel Fuel (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Diesel Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Kerosene (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Mineral Spirits (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Motor Oil (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Oil Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Petroleum Range Organics	- - - - - - - - - -	- - - - - - - - - -	FL-PRO	FL-PRO
Pesticides-Herbicides-PCBs				
Acifluorfen	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb sulfone	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb sulfoxide	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Atrazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Azinphos methyl	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
alpha-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Bentazon	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	----------
beta-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
delta-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
gamma-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Bolstar	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Carbaryl	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Carbofuran (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chloramben	EPA 515.1			
Chlordane (technical)	EPA 508	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlordane (alpha)	EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlordane (gamma)	EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlorobenzilate	EPA 525.2		EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Decachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Dichlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Heptachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Hexachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Monochlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Nonachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Octachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Pentachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Tetrachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Trichlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Chloroneb	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlorpropham	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlorpyrifos	EPA 525.2	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Chlorthalonil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Coumaphos	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Cycloate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,4-D	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,6-Dichlorophenol	- - - - - - - - - -	EPA 615	EPA 8151A	EPA 8151A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
DCPA (Dacthal)	EPA 515.1 EPA 525.2	- - - - - - - - - -	EPA 8151A	EPA 8151A
Dalapon	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,4-DB	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,4'-DDD	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
2,4' DDE	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
2,4'-DDT	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4,4'-DDD	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4,4' DDE	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4,4'-DDT	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Demeton-O	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Demeton-S	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Diazinon	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Dicamba	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Dichlorvos	EPA 525.2	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
3,5-Dichlorobenzoic acid	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,3-Dichlorobiphenyl (PCB 5)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dichloroprop	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Dieldrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Dimethoate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Dinoseb	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Diquat	EPA 549.2	- - - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Disulfoton	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Endosulfan I (alpha)	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endosulfan II (beta)	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endosulfan sulfate	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endothall	EPA 548.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Endrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endrin aldehyde	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endrin ketone	- - - - - - - - - -	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
EPN	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Ethoprop (Mocap)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Famphur	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Fensulfothion	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Fenthion	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Glysophate	EPA 547	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Heptachlor	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Heptachlor epoxide	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B.	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,2',4,4',5,6'-Hexachlorobiphenyl (PCB 154)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
3-Hydroxycarbofuran	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Isodrin	- - - - - - - - - -		EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Malathion	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
MCPA	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
MCPP	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Merphos	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Methiocarb	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methomyl	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methoxychlor	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Mevinphos	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Mirex	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Monocrotophos	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Naled	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
4-Nitrophenol	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (PCB 201)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Oxamyl (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Paraquat	EPA 549.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Parathion ethyl	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Parathion methyl	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
PCB-1016	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1221	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1232	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1242	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1248	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1254	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
PCB-1260	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1262	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1268	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCBs, Total	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
Pentachlorophenol	EPA 515.1	- - - - - - - - - -	EPA 8151A	EPA 8151A
Picloram	EPA 515.1	- - - - - - - - - -	EPA 8151A	EPA 8151A
Phorate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Propachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Propoxur (Baygon)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Ronnel	- - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Simazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Stirophos	EPA 525.2	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Sulfotepp	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4,5-T	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
Thionazin	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4,6-Trichlorophenol	- - - - - - - - - -	EPA 615	EPA 8151A	EPA 8151A
Tokuthion	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
2,4,5-TP (Silvex)	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Toxaphene	EPA 508	EPA 608	EPA 3520C/8081A EPA 3520C/8081B EPA 3520C/8276	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B EPA 3546/8276
Trichloronate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8141A EPA 3520C/8141B	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B
Hp-Sed	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Hx-Sed	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 26	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 40	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 41	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 44	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 50	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 62	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Hazardous Waste Characteristics				
BTU	- - - - - - - - - -	ASTM D240	ASTM D240	ASTM D240
Free Liquid	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	EPA 9095A EPA 9095B
Ignitability	- - - - - - - - - -	EPA 1010 EPA 1010A	EPA 1010 EPA 1010A	EPA 1030
Specific Gravity	- - - - - - - - - -	SM2710 F	SM2710 F	SM2710 F
SPLC	- - - - - - - - - -	- - - - - - - - - -	EPA 1312	EPA 1312
TCLP	- - - - - - - - - -	- - - - - - - - - -	EPA 1311	EPA 1311
Air Testing				

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
Purgeable Organics				
Methane (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Methane (TCD)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Ethane (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Ethene (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Kentucky UST Program				
TCLP Metals				
Arsenic	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Barium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Cadmium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Chromium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Lead	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Mercury	- - - - - - - - - -	- - - - - - - - - -	EPA 7470A	EPA 7470A
Selenium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Silver	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B

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Environmental Testing

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the current DoD Quality Systems Manual for Environmental Laboratories); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 5th day of April 2011.

President & CEO
For the Accreditation Council
Certificate Number 0399.01
Valid to February 28, 2013

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

TestAmerica West Sacramento requests the following exceptions to DOD QSM Version 4.2

1.0 Common Laboratory Contaminants

The concentrations of common laboratory contaminants in the method blank shall not exceed the reporting limit. When determining whether a blank is contaminated the LOQ will be used rather than ½ the LOQ.

The common laboratory contaminants for TestAmerica West Sacramento comprise the following:

Method	Analytes
PCBs 1668	PCB-118

2.0 ***Dilutions for Organic Analyte***s

TestAmerica West Sacramento often uses screening techniques to determine appropriate dilution levels. Screening can include visual observation of the samples or sample extracts in instances where high concentrations of organic compounds are evident (e.g., non-aqueous liquid phase).
If the dilution is overestimated by the screening technique (i.e., peak/signal is too low), the lab will conduct additional analyses to produce lower detection limits.
The laboratory may not be able to analyze less dilute samples if significant levels of non-target and/or target compounds are present at concentrations high enough to prevent further dilutions.
In order to protect our instruments from failure and contamination, initial analysis of sample dilutions based on screening data will be used to document any samples containing concentrations high enough to prevent further dilutions.
Screening data will be included in the data package.
TestAmerica West Sacramento will make every attempt to minimize dilutions and to analyze extracts without dilution if it can be done without damaging the analytical equipment.

3.0 HIGH RESOLUTION MS ISOTOPE DILUTION METHODS

When reporting data below the LOQ for methods 8290, 1668 , 1698 and 1699 results will be “J” flagged down to the estimated detection limit (EDL) rather than the LOD.

High resolution MS instruments have the capability and method requirement that the EDLs be calculated. These EDLs are analyte and sample specific estimates of detection sensitivity produced during the actual instrumental analysis. As such the EDL is a better estimate of analyte sensitivity in a specific sample than are the statistically derived LOD or MDL.

4.0 PCB CONGENERS BY ISOTOPE DILUTION – METHOD 1668A

PCB congeners will be reported only to the LOQ.
PCBs are common trace laboratory contaminants at levels < ½ the LOQ. TestAmerica will analyze and report to the estimated detection limit (EDL) if requested but this will often result in many trace

"J" value hits in samples and method blanks that are well below the LOQ and are not necessarily characteristic of the site being studied.

The 5-point Initial Calibration for the PCB congeners will be carried out only for the congeners required by EPA Method 1668. As per the method, all other congeners will be calculated off a 1-point calibration. Second source samples will only be controlled off the congeners that have a 5-point calibration.

The Laboratory Control Sample (LCS) will be required to be spiked and controlled only with the congeners that have a 5-point calibration.

Response to Comments

From:	Smith, Wade (DEQ)
To:	scott.park@navy.mil
Cc:	Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; Burchette.John@epamail.epa.gov
Subject:	CAX: Site 4 SAP - DEQ Comments
Date:	Thursday, July 05, 2012 11:38:25 AM

Thank you for giving the DEQ the opportunity to comment on the April 2012 Draft SAP for Site 4 at CAX.

The Draft SAP was received by the DEQ on May 1, 2012.

Based on our discussion of this SAP during the June 28, 2012 CAX Partnering Meeting, the DEQ has two additional minor comments:

Please include the October 26, 2011 Conference Call Comments/Decisions in Section 2; and

Please include the locations of Jones Mill Pond and Penniman Lake on Figure 1 (as referenced in the Executive Summary).

Upon your submittal of the Draft Final SAP and/or RTCs, the DEQ will issue an official letter for your files.

Please let me know if you have any questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
Phone: (804) 698-4125
wade.smith@deq.virginia.gov

Response to Comments
Tier II Sampling and Analysis Plan
Site 4 – Remedial Investigation
Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
July 19, 2012

VADEQ Comment 1: Please include the October 26, 2011 Conference Call Comments/Decisions in Section 2

Response: The October 26, 2011 Conference Call was not held to discuss any proposed sampling discussed in this Site 4 SAP, but was rather a discussion with the CAX Partnering Team and their technical support to discuss the perceived path forward presented in the various SI Reports (the Site 4, Site 9, and AOC 3 SI, the AOC 1, 2, 6, 7, and 8 SI, and the Site 7 SI). However, since this conference call was referenced under the summary of the November 2011 Scoping Session section, a brief summary of this conference call was added to Section 2 of the SAP.

VADEQ Comment 2: Please include the locations of Jones Mill Pond and Penniman Lake on Figure 1 (as referenced in the Executive Summary).

Response: Following a review of local maps, it was determined that Jones Mill Pond is in fact currently identified as Jones Pond. As such, all references to Jones Mill Pond within the SAP text were revised to Jones Pond. No changes to the name of the pond were made to Figure 1; however; text identifying Penniman Lake on Figure 1 was added to this figure.

From:	Sawyer, Stephanie/VBO
To:	Smith, Wade (DEQ); Park, Scott R CIV NAVFAC MIDLANT, EV; Susanne Haug; Ivester, Marlene/VBO
Cc:	Sawyer, Stephanie/VBO; John Burchette
Subject:	Responses to the DEQ"s comments on the CAX Site 4 RI UFP-SAP
Date:	Tuesday, July 17, 2012 3:14:20 PM
Attachments:	image001.jpg Draft Site 4 RI SAP DEQ RTCs.pdf

To All:

Attached are responses to the DEQ's comments on the draft CAX Site 4 RI UFP-SAP. The DEQ comments were received via email on July 5, 2012. Wade, please review these responses and let us know if you have any further comments.

Once both the EPA's comments (submitted about 3 weeks ago on 6/26) and the DEQ's comments (attached) have been resolved, we will submit the draft final UFP-SAP (red-lined for easy review) for review and final approval before submitting a final SAP.

I've mentioned it before, but *please* remember we have a very *narrow* window in which we need to complete the biota sampling (no later than mid-October) so we need to have all comments resolved soon in order to have enough time to prepare for and complete these sampling activities.

If anyone has any questions or comments, please let me know.

Thanks,
Stephanie

clip_image001

Stephanie Sawyer
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

June 13, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Comments on the Tier II Sampling and Analysis Plan. Site 4 Remedial Investigation

Mr. Park:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA Tox Comment 1: Page 17. The response to Question 4 proposes sampling gw for VOCs, PAHs and inorganics (total and dissolved) during the RI. According to the report, this proposal for limited analyses is based on the findings of the 2009 SI conducted at Site 4. However, during the SI, gw samples were collected from *temporary* wells; data collected from such wells can not be duplicated. For this reason, I suggest conducting a full suite analysis of the permanent mws that will be installed for the RI.

EPA Tox Comment 2: Pages 24, 26, 31, and Figure 4. For soil and gw, if on-site metal concentrations pose an unacceptable risk, the report indicates that a comparison to 95 percent UTLs for bg will be performed. This type of statistical evaluation of on-site and bg conditions is acceptable and defensible. The report continues, however, to state that if 95 percent UTLs are exceeded, then a comparison to maximum bg concentrations will be conducted to eliminate any CoPCs that are present below maximum bg levels. This step completely negates the previous step, does not represent sound science, and should be eliminated from the DQO process.

EPA Tox Comment 3: Page 29. According to the last sentence of the second paragraph, based on spatial coverage of the current data set (that is, the SI data), no additional sampling is necessary to adequately assess potential risks to human health. However, other sections of this report indicate that additional sampling conducted during the RI will be combined with SI data in the Baseline Risk Assessment. The language on page 29 should be clarified in this regard.

EPA Tox Comment 4: Based on data from the SI, chromium was identified as a CoPC in soil (surface and subsurface) and gw. As a consequence, the SAP for Site 4 states that during the RI, two *surface* soil samples will be collected from the areas of highest total chromium contamination (per page 19) and analyzed for hexavalent chromium. This type of analysis should also be performed for subsurface soil. With regard to gw, no analysis for hexavalent chromium is proposed; therefore, irrespective of the soil

investigation findings, chromium in gw will have to be assumed to be present in the more toxic form (unless valence-specific analysis is conducted).

EPA RPM Comment 1: Please include a figure in the SI showing all SI exceedences of screening criteria and previous sampling locations.

EPA RPM Comment 2: Page 19. Didn't we later discuss the 100ppb with John M. and lower the number to 50 or so?

EPA RPM Comment 3: Pages 22 and 23. Was the area with the railroad ties and drum sampled.

EPA RPM Comment 4: Page 25. Human Health Risk Decision Logic. Why wasn't a recreational user scenario evaluated? Are there currently any engineering controls present at the site (e.g. fense)?

EPA RPM Comment 5: Page 39. Offsite reference pond. What pond will be used? Will data be compared against Eco Screening Levels as well?

EPA RPM Comment 6: Page 40. "risk posed frogs". Typo.

EPA RPM Comment 7: Page 44. Reference Ponds (2?). The Site 4 sediment data should be compared to Eco screening data as well as the reference pond samples. Reference pond samples should not show elevated concentrations of contaminants and data that do should not be utilized.

EPA RPM Comment 8: Comparison to Maximum Background should not be used to screen out COPCs. This should only be used as a supporting line of evidence as part of possible risk management decisions.

EPA BTAG Comment 1: Page 16: The second bullet indicates that Youth Pond will be investigated later in its own study. It is not clear why this is decision was made. Based on culverts alone, the Upstream Pond drains into Youth Pond which subsequently drains into the York River. This was also acknowledged in the draft SLERA (June 29, 2001) for Site 4. The text of this document needs to specifically address why these ponds will be addressed separately.

EPA BTAG Comment 2: Page 16: Number 1 indicates that one surface and subsurface sediment sample will be collected from Youth Pond. As the Navy has indicated that Youth Pond will be addressed in its own study, the Navy needs to specifically explain why one sediment sample in Youth Pond is proposed in this Site 4 (Upstream Pond) study. If the Navy continues to support the need for sampling Youth Pond, then a minimum of five samples need to be collected.

EPA BTAG Comment 3: Page 16: Number 2 states "…the test pit locations are on the opposite shore of the pond from the known extent of debris…." The text needs to clearly inform the reader about the information that was used to select only these two locations. Considering the amount of land extending from the southeast shoreline of the Upstream Pond to both D Street and the street on the southeast side of the pond, it is uncertain if two test pits are adequate. If the concern is that the buried debris extends across the Upstream Pond and into the upland on the

southeast side of the pond, then the number and location of the text pits are not adequate. If debris were placed on the southeast side of the pond from either street, the two test pit locations may not be adequate. Lacking further data, eight test pits may be needed to adequately cover the area in question.

EPA BTAG Comment 4: Page 17: Number 5 indicates that no additional surface water or sediment samples were needed for Site 4. The current sample locations in the Upstream Pond appear to be along the edge of the pond. It would be helpful to show SI and SLERA sample locations to document better sample coverage than is currently shown on Figure 5. In addition, the text needs to document that historical samples are still valid to use in the BERA. The uncertainty associated with using data that is 11 or more years old needs to be included in this report.

EPA BTAG Comment 5: Page 18: Section 2.1.2 mentions the Site 4 SI data set. Since this data set was collected prior to June 2001 (draft SLERA), this data set (e.g., final SLERA) needs to be included as an appendix to this report or the RI.

EPA BTAG Comment 6: Page 19: Section 2.1.3 in the last paragraph indicates that two, not five, surface soil samples will be collected for total and hexavalent chromium analysis and that groundwater would not be analyzed for hexavalent chromium as scoped in September 2011. The basis of this change should be provided.

EPA BTAG Comment 7: Page 22: Section 2.2.1 indicates a Screening Ecological Risk Assessment (SERA) was completed for soil, sediment and surface water in 2005. The BTAG has no record of a risk assessment document or involvement in the risk assessment process since its February 10, 2003 comment letter on the draft SLERA for Sites 4 and 9.

EPA BTAG Comment 8: Page 26: Section 2.3.2, under Ecological Risk Decision Logic in bullet 1and other bullets, notes that ecological risk to soil invertebrates and plants will be determined using mean soil concentrations. Because these ecological receptors groups have limited or no mobility, maximum soil concentrations need to be used to assess risk. Mean soil concentrations can be used to indicate a potential range of risk for these receptor groups, but is inappropriate to use by itself in assessing risk.

EPA BTAG Comment 9: Page 26: Section 2.3.2, under Ecological Risk Decision Logic in the first bullet (under soil analytical sampling), indicates that if the soil concentration "…is below the soil screening values, the chemical will not be considered a COPC, although the magnitude of the maximum hazard quotient (HQ) will also be considered when making this determination." The text needs to specifically detail how this "criteria" (magnitude of the maximum hazard quotient) will be worded.

EPA BTAG Comment 10: Page 26: Section 2.3.2, under sediment toxicity, indicates, in the last bullet, that a "…weight of evidence evaluation will be conducted to determine if the site sample is significantly impacted." This report, the RI, or a separate technical memorandum needs to

specifically document how this weight of evidence will be structured and how decisions will be made.

EPA BTAG Comment 11: Page 27: Section 2.3.2 indicates in the first bullet that a statistical (correlation) analyses will be conducted on impacted samples to see what is correlated with the reduced endpoint responses. A decision tree should be provided and should address if the statistical analyses are inconclusive.

EPA BTAG Comment 12: Page 27: Section 2.3.2, under fish and frog tissue sampling, associates mean site concentrations with bioaccumulative chemicals. The document should indicate which site concentrations will be used with non-bioaccumulative chemicals. In addition, both mean and maximum concentrations need to be run in food web models to fully characterize the potential range of risk.

EPA BTAG Comment 13: Page 27: Section 2.3.2, under fish and frog tissue sampling, states "…fish tissue concentration will be compared with literature-based tissue screening values, if available…." The text needs to describe what will happen when a screening value is not available.

EPA BTAG Comment 14: Page 27, Section 2.3.3 indicates that one additional sample in Youth Pond will be added to two other samples reported in 2001 to determine if contaminants from the Upstream Pond are entering Youth Pond. Because the Navy has specifically separated the study of the Upstream Pond (Site 4) from Youth Pond / York River, the Navy needs to specifically identify how these Youth Pond data will be used at Site 4. In addition, the Navy needs to specifically justify the use of data collected before 2001 with the use 2012 / 2013 data to make conclusions about what has entered Youth Pond from the Upstream Pond.

EPA BTAG Comment 15: Page 28, Section 2.3.3: Groundwater needs to be analyzed for all potential contaminants. The discharge areas (potentially Youth Pond and the York River) for groundwater need to be identified and sampled / analyzed all potential contaminants.

EPA BTAG Comment 16: Page 30, Section 2.3.3: The third bullet refers to using one organism (Hyalella azteca) for sediment toxicity tests. Because of the errors that can happen in toxicity testing that can result in data interpretation difficulties, it would be better to utilize at least two species. Differences in sensitivity between test organisms is another reason for testing another species. The other one being Chironomus tentans (dilitus).

EPA BTAG Comment 17: Page 30, Section 2.3.4: Number 2 indicates for subsurface soil that literature based ecological screening values for plants and invertebrates (if less than 2 feet) will be used. Documentation will need to be provided indicating that only the top 2 feet is used by invertebrates.

EPA BTAG Comment 18: Page 30, Section 2.3.4: Number 6 must indicate that both mean and maximum tissue concentrations will be run in food web models to fully characterize the potential range of risk.

EPA BTAG Comment 19: Page 31, Section 2.3.4: The first paragraph on this page refers to using base background concentrations. Background data for the same soil type will need to be used.

EPA BTAG Comment 20: Page 44, Section 3.2.12: Regarding earthworm tissue sampling, it is not clear from this paragraph if the areas from where earthworm tissue will be collected will also have a soil sample (surface and/or subsurface). Also, it is not clear why earthworms from only the "…three areas adjacent to the streams west of Upstream Pond" are proposed for collection / analysis. There appear to be other areas within the Site 4 boundary as well as outside this boundary (southeast of the pond / test pit areas) that would need earthworm tissue sampling. If earthworms are not found (which may be due to temperature and moisture, and/or chemicals) within the first 12 inches of soil bgs, then the next 12 inches bgs should be examined and considered for sampling. If earthworms are not found, the Navy will need to adequately document why this is not related to contaminants from the site.

EPA BTAG Comment 21: Page 45, Section 3.2.12: Under benthic invertebrate sampling in shallow water a D-frame dip net will be used and the level of effort will be determined in the field and standardized among locations. The level of effort in using this sampling device will also need to be within established protocols.

EPA BTAG Comment 22: Page 45, Section 3.2.12: Under benthic invertebrate sampling, the text indicates that if more than 250 organisms are collected, a 100 organism subsample (randomly selected) will be identified and the results extrapolated to the entire sample. The reference for this technique needs to be included in the text. Standard operating procedures for the benthic assessment must be provided. While the document indicates that the benthic survey will be qualitative, the description of how the data will be used indicates that a more formal approach to the benthic work is warranted. At a minimum, in addition to providing the aforementioned methodology, the individual(s) classifying the invertebrates should have NABS certification and the appropriate documentation should be provided.

EPA ESC Comment 1: Under the proposed number of samples to be collected from Site 4, the reviewer fails to understand how the suggested number of samples, including previously sampled areas, can possibly characterize the nature and extent of contamination over the 2,300 acre area.

EPA ESC Comment 2: This Remedial Investigation (RI)/Sampling and Analysis Plan (SAP) does not contain a Decision Threshold. If the analytes are found above action levels, what remediation procedure will be implemented? Section 2.2.1, Site Background and History, mentions the results from the soil, groundwater, sediment, and surface water sampling activities indicated potential risk to human health and ecological receptors and that a RI was recommended, but fails to state if any action had been taken.

EPA ESC Comment 3: The language, "these samples will be field determined," appears throughout the SAP. The third party Utility Clearance Subcontractor, mentioned in section 3.2.1 under utility clearance should be employed to map the entire site which would enable

predetermined sample locations to be pinpointed without fear of disrupting buried utility lines. All sampling points should be predetermined and documented using a GPS device listing both the longitude and latitude for each sample location. It is because of the location specific constraints, mentioned in Section 2.5 Sampling Design and Rationale that it is of the utmost importance to have sample locations well defined and predetermined. A grid sampling collection plan is highly recommended. Because of the size of the area, dividing it into quadrants would be beneficial.

EPA ESC Comment 4: Groundwater flow is estimated to be north-northeast towards Upstream Pond. The reviewer fails to understand how the installation of just six monitoring wells over 2,300 acres will be sufficient to characterize the extent of groundwater contamination and determine the direction of flow. This plan does not take into account the possibility of multiple unconnected groundwater networks.

EPA ESC Comment 5: In order to properly characterize the site and support the completion of a Human Health Risk Assessment (HHRA) and a Baseline Ecological Risk Assessment (BERA), a more complete and comprehensive list of analyses should be performed on all matrices sampled. The reviewer recommends each sample be analyzed for VOCs, PAHs, PCBs, Total Metals, Aroclors, and Hexavalent Chromium.

EPA ESC Comment 6: Laboratory generated data should be validated by third party validators, not by CH2MHILL validators as mentioned in Section 2.3.9.

EPA ESC Comment 7: Tentatively Identified Compounds (TICs) should be reported by the laboratory to provide a list of possible contaminates not screened for.

EPA ESC Comment 8: The water bodies located at Site 4 should be sampled using a sample grid pattern for both water and sediment samples as well. If a water body contains a submerged canister or drum filled with a chemical contaminant, and it has a small opening due to erosion, the concentration of the contaminate will be higher closer to the point of origin and very diluted downstream.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

From:	Sawyer, Stephanie/VBO
To:	John Burchette
Cc:	Park, Scott R CIV NAVFAC MIDLANT, EV; Smith, Wade (DEQ); Ivester, Marlene/VBO; Sawyer, Stephanie/VBO
Subject:	Response to EPA Comments on the Draft Site 4 RI UFP-SAP
Date:	Wednesday, June 27, 2012 8:18:00 AM
Attachments:	image001.jpg Site 4 RI SAP EPA RTCs_062612.pdf

John,

Attached are the Navy's responses to the EPA's comments on the Draft Site 4 RI UFP-SAP. The USEPA comments were received via email on June 13, 2012. These RTCs were sent out yesterday in preparation for the CAX Partnering Team Meeting on June 28th, however that submittal did not include the figure attachment, the attached version does.

Once we have resolved these comments, we will submit the draft final Site 4 RI UFP-SAP (red-lined for easy review) for review.

We will be discussing these RTCs on June 28th, during our Partnering Meeting, however if you have any questions prior to the meeting please let us know.

Thanks,
Stephanie

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Response to Comments
Tier II Sampling and Analysis Plan
Site 4 – Remedial Investigation
Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
June 26, 2012

EPA Tox Comment 1: Page 17. The response to Question 4 proposes sampling gw for VOCs, PAHs and inorganics (total and dissolved) during the RI. According to the report, this proposal for limited analyses is based on the findings of the 2009 SI conducted at Site 4. However, during the SI, gw samples were collected from temporary wells; data collected from such wells can not be duplicated. For this reason, I suggest conducting a full suite analysis of the permanent mws that will be installed for the RI.

Response: Analyzing the monitoring wells for full suite is unnecessary for the following reasons:

- As described in the SI Report (CH2M HILL, 2011), the temporary monitoring wells at Site 4 were installed using one-inch PVC casing with 0.010-inch machine-slotted screen surrounded by a pre-installed sand filter pack. Following installation, each temporary monitoring well was developed and purged prior to groundwater sampling (as is done with permanent monitoring wells). The monitoring well construction and development/purging process was conducted to ensure the temporary monitoring wells were as similar to permanent monitoring wells as possible so that the groundwater was adequately characterized and the data collected could be used to adequately assess potential risk to human health and ecological receptors.
- There are no issues with the quality of that data that would require the duplication/confirmation of the SI results. During the completion of the SI Report (during which the Navy addressed three rounds of EPA comments), no comments were received from the regulatory agencies indicating that there were concerns with the quality of the SI data that would require duplication/confirmation.
- Based on the number and location of the groundwater samples evaluated in the SI, Site 4 is already adequately characterized and enough groundwater chemical data have been collected to assess potential risks to human health and ecological receptors without installing and sampling additional monitoring wells. However, since groundwater flow and velocity information will be needed to complete the RI, the team agreed that the monitoring wells installed to collect these data will be sampled for those contaminants identified in the SI as potentially posing risk to human health or ecological receptors (VOCs, PAHs, and inorganic constituents).

No changes to the SAP were made.

EPA Tox Comment 2: Pages 24, 26, 31, and Figure 4. For soil and gw, if on-site metal concentrations pose an unacceptable risk, the report indicates that a comparison to 95 percent UTLs for bg will be performed. This type of statistical evaluation of on-site and bg conditions is acceptable and defensible. The report continues, however, to state that if 95 percent UTLs are exceeded, then a comparison to maximum bg concentrations will be conducted to eliminate any CoPCs that are present below maximum bg levels. This step completely negates the previous step, does not represent sound science, and should be eliminated from the DQO process.

Response: Clarification to the text in the final bullet under the decision logic for soil and groundwater is proposed as presented below, but the Navy does not agree with eliminating a comparison of site data to maximum background concentrations as a potential evaluation criterion in determining whether or not a release has occurred. The larger the background data set, the less the 95 percent UTL becomes an estimate of the upper range of background concentrations and the more it becomes a more focused estimate of the 95th percentile. In other words, when a larger background data set is available, the more likely the calculated 95 percent UTL is to be less than some of the very background concentrations used in its calculation. Therefore, using a 95 percent UTL

calculated with a large background data set produces a virtual guarantee of potential false positives in point-by-point comparisons to site data. As a result, the 95 percent UTLs will be utilized for initial background screening purposes, but will conduct additional evaluation of site concentrations exceeding background 95 percent UTLs, including potentially comparing concentrations to maximum background concentrations, before determining if these exceedances represent evidence of a release. This is consistent with Navy guidance for environmental background data analysis, which states: "Select the background threshold value as the value that represents the upper range of ambient conditions. In the case of an adequate and comprehensive background dataset, the maximum concentration should be used as the background threshold value. If the number of background measurements is small, the threshold value should be selected either as the highest measured value, or the pth percentile (such as 95th or 99th percentile) of measured values, whichever is higher." (U.S. Navy, 2002).

The final bullet under the decision logic for soil and groundwater was revised (blue text) to state the following:

> If the COC concentrations exceed the background 95 percent UTL, further evaluation will be conducted to consider whether the COC concentrations may be attributed to a release or may be associated with background conditions (such as comparing site data to the maximum base background concentrations). If the results of this evaluation potentially indicate that site concentrations are not consistent with background conditions, then recommendations for additional investigation and/or action will be made in the RI report.

EPA Tox Comment 3: Page 29. According to the last sentence of the second paragraph, based on spatial coverage of the current data set (that is, the SI data), no additional sampling is necessary to adequately assess potential risks to human health. However, other sections of this report indicate that additional sampling conducted during the RI will be combined with SI data in the Baseline Risk Assessment. The language on page 29 should be clarified in this regard.

Response: The spatial coverage of the 2009 SI dataset is adequate to conduct a Baseline Human Health Risk Assessment (HHRA); therefore, no additional sampling would be required for this specific purpose. However, since additional data are being collected to answer the questions *What is the nature and extent of contamination in soil?, What is the nature and extent of contamination in groundwater and the groundwater flow direction and velocity?,* and *Do soil, sediment or surface water pose a potentially unacceptable risk to ecological receptors?*, the data collected to answer these questions will also be used in completing the HHRA. The referenced sentence was revised (blue text) to read:

> Based on spatial coverage of the current data set, no additional sampling (in addition to the sampling proposed in this UFP-SAP) is necessary to adequately assess the potential risk to human health.

EPA Tox Comment 4: Based on data from the SI, chromium was identified as a CoPC in soil (surface and subsurface) and gw. As a consequence, the SAP for Site 4 states that during the RI, two surface soil samples will be collected from the areas of highest total chromium contamination (per page 19) and analyzed for hexavalent chromium. This type of analysis should also be performed for subsurface soil. With regard to gw, no analysis for hexavalent chromium is proposed; therefore, irrespective of the soil investigation findings, chromium in gw will have to be assumed to be present in the more toxic form (unless valence-specific analysis is conducted).

Response: Agreed. A scoping session was held via e-mail with the CAX Partnering Team regarding the addition of two subsurface (6-24 inches) soil samples to the SAP. The EPA and DEQ agreed on the locations of the proposed sampling locations on June 20, 2012 and June 26, 2012, respectively. The SAP was revised to include the results of the scoping session and the addition of these two samples.

EPA RPM Comment 1: Please include a figure in the SI showing all SI exceedences of screening criteria and previous sampling locations.

Response: Figures showing the exceedances of the screening criteria at Site 4 were included in the Site 4, Site 9, and AOC 3 Site Inspection Report. Since a single figure showing all SI exceedances of screening criteria and

previous sampling locations would be extremely difficult to interpret due to the number of sampling locations and volume of results, Appendix B was added to the SAP and includes figures showing soil, groundwater, sediment, and surface water exceedances.

EPA RPM Comment 2: Page 19. Didn't we later discuss the 100ppb with John M. and lower the number to 50 or so?

Response: The referenced page is a summary of the discussion the team had during the scoping session conducted in November 2011 (at which time no agreement was reached regarding the pesticide threshold number to use); however, since the team did later discuss lowering the intended pesticide usage number from 100 ppb to 50 ppb (during the November 16, 2011 Partnering Meeting), the SAP was revised to include discussion of this agreement in an Action Items and Results section of the November 2011 Scoping Session.

EPA RPM Comment 3: Pages 22 and 23. Was the area with the railroad ties and drum sampled.

Response: Surface debris, including railroad ties (among other debris), was encountered throughout Burial Investigation Area 2 as indicated in the SAP. During a recent site visit, the locations of a few of the areas where railroad ties were observed at the ground surface were recorded with a GPS. These locations are shown on the attached figure and show that several site samples were collected in the vicinity of or downgradient of the railroad ties (specifically, CAS04-SD06, CAS04-SW06, CAS004-4-SD03, and CAS004-4HA03). No changes to the SAP were made.

EPA RPM Comment 4: Page 25. Human Health Risk Decision Logic. Why wasn't a recreational user scenario evaluated? Are there currently any engineering controls present at the site (e.g. fense)?

Response: While access to Site 4 is not restricted, it is located between CAD buildings 11 and 12 and access to the CAD area is restricted (the CAD area is surrounded by a fence and access can only be gained through check-in at a guard shack). In addition, the site is not used for recreational purposes; therefore an evaluation of the trespasser/visitor scenario as opposed to a recreational user scenario is more applicable for this site.

The trespasser/visitor scenario evaluation is basically the same scenario evaluation as a recreational user for surface water and sediment (i.e., exposure parameters such as exposure frequency, exposure duration, ingestion rate, etc. would be the same for the recreational user). Therefore, an evaluation of the trespasser/visitor scenario would cover the same exposure parameters as the recreational user. No changes were made to the SAP.

EPA RPM Comment 5: Page 39. Offsite reference pond. What pond will be used? Will data be compared against Eco Screening Levels as well?

Response: The specific offsite reference pond cannot be identified at this time because data from the two potential reference ponds (Jones Mill Pond and Cheatham Pond) will need to be collected during the biological survey and evaluated in order to finalize the selection. As stated in Section 3.2.12 of the SAP, a reconnaissance survey of these two ponds will be conducted prior to the beginning of field work to determine suitability for use as a reference pond in terms of how similar one or both of these ponds (or portions of the pond) are to Upstream Pond in terms of habitat, water depth, substrate type, etc. Results of sediment sampling during the 2000 Pond Study will also be used to evaluate suitability. For clarification, Section 2.3.3 (the proposed work to answer the question, *Do soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors?*) was revised (blue text) to state the following:

- Eleven surface sediment samples from Upstream Pond and three surface sediment samples from an upgradient drainage channel (**Figure 5**) will be collected. In addition, two surface sediment samples will be collected from a reference pond (anticipated to be either Jones Mill Pond or Cheatham Pond [Figure 1]; the specific pond and sample locations are to be determined based on the results of the biological survey [described in Section 3.2.12]). All of these samples will be analyzed for PAHs, PCBs, metals, pH, TOC, grain size, and AVS/SEM.

- Six surface sediment samples from Upstream Pond and two surface sediment samples from a reference pond (anticipated to be either Jones Mill Pond or Cheatham Pond [Figure 1]; the specific pond and sample locations are to be determined based on the results of the biological survey [described in Section 3.2.12]) will be evaluated for toxicity using laboratory-based 28-day sediment tests (endpoints of survival and growth) with the invertebrate *Hyalella azteca*. The SOP for this toxicity test is referenced in **Table 3-2**. Sulfide and ammonia will also be analyzed in sediment samples submitted for toxicity testing.

In addition, all site sample concentrations will be compared with ecological screening values, as well as with the resulting reference concentrations.

EPA RPM Comment 6: Page 40. "risk posed frogs". Typo.

Response: The typo was corrected.

EPA RPM Comment 7: Page 44. Reference Ponds (2?). The Site 4 sediment data should be compared to Eco screening data as well as the reference pond samples. Reference pond samples should not show elevated concentrations of contaminants and data that do should not be utilized.

Response: The plural of reference ponds is a typo and was revised. All site sample concentrations will be compared with ecological screening values as well as with the resulting reference concentrations. The reference samples will not be formally compared with ecological screening values, but they will be qualitatively reviewed to ensure that they do not contain highly elevated levels of chemical constituents (e.g., PCBs, explosives). Section 2.3.4 of the SAP was revised to include the information above.

EPA RPM Comment 8: Comparison to Maximum Background should not be used to screen out COPCs. This should only be used as a supporting line of evidence as part of possible risk management decisions.

Response: See the response to EPA Tox Comment 2.

EPA BTAG Comment 1: Page 16: The second bullet indicates that Youth Pond will be investigated later in its own study. It is not clear why this is decision was made. Based on culverts alone, the Upstream Pond drains into Youth Pond which subsequently drains into the York River. This was also acknowledged in the draft SLERA (June 29, 2001) for Site 4. The text of this document needs to specifically address why these ponds will be addressed separately.

Response: The referenced text documents part of the discussion the CAX Partnering Team had during the September 2011 scoping session. As Section 2.1 is entirety a summary of the discussions the Partnering Team had during the various scoping sessions and not a presentation of the work to be performed, it may not provide the level of detail or entirely reflect the actual sampling plan proposed in Sections 2.3 and 2.5 of the SAP.

There are also other sections of the SAP that refer to Youth Pond being investigated in its own study. Youth Pond is being investigated as its own investigation as a result of team discussions on July 16, 2009 and team agreement on July 21, 2009 as documented in the *Response to Additional EPA Comments Regarding the Navy's July 2009 Response to Comment Letter for the Draft Sampling and Analysis Plan, Sites 4, 9, and AOC 3 Site Investigation*, dated August 28, 2009. The UFP-SAP for Youth Pond (submitted to the EPA on 6/7/12) contains elements that are not relevant to the Site 4 investigation and describes how Site 4 is not the only surface feature that could potentially contribute to constituents detected in Youth Pond. Since this is the case, Youth Pond is being investigated separately in order to identify all other potential contaminant sources. If it is determined that the other surface features that may impact Youth Pond do not contribute to contamination, the CAX Partnering Team will discuss the potential of combining the Youth Pond investigation with the investigation of Site 4. No changes to the SAP were made.

EPA BTAG Comment 2: Page 16: Number 1 indicates that one surface and subsurface sediment sample will be collected from Youth Pond. As the Navy has indicated that Youth Pond will be addressed in its own study, the Navy needs to specifically explain why one sediment sample in Youth Pond is proposed in this Site 4 (Upstream Pond)

study. If the Navy continues to support the need for sampling Youth Pond, then a minimum of five samples need to be collected.

Response: As noted in the response to EPA BTAG Comment 1, the referenced text is part of the discussion the CAX Partnering Team had during the September 2011 scoping session. As Section 2.1 is entirety a summary of the discussions the Partnering Team had during the various scoping sessions and not a presentation of the work to be performed, it may not provide the level of detail or entirely reflect the actual sampling plan proposed in Sections 2.3 and 2.5 of the SAP.

However, it should be noted that Section 2.3.3 specifically states the rationale for collecting this one sediment sample in Youth Pond as part of the Site 4 investigation. Section 2.3.3 states "While Youth Pond will be evaluated under a separate investigation [*for the reasons stated above*], one additional surface and subsurface sediment sample is needed to determine if site-related contaminants from Site 4 are migrating into Youth Pond". This one sample, collected in the immediate vicinity of the outfall connecting Upstream Pond to Youth Pond and analyzed for the Site 4 related contaminants, will definitively answer this question that is relevant with respect to Site 4. This sample is not intended to delineate the nature and extent of contamination in Youth Pond, which may or may not be impacted by Site 4 and/or other potential sources. This latter objective will be addressed in the separate Youth Pond study. No changes to the SAP were made.

EPA BTAG Comment 3: Page 16: Number 2 states "…the test pit locations are on the opposite shore of the pond from the known extent of debris…." The text needs to clearly inform the reader about the information that was used to select only these two locations. Considering the amount of land extending from the southeast shoreline of the Upstream Pond to both D Street and the street on the southeast side of the pond, it is uncertain if two test pits are adequate. If the concern is that the buried debris extends across the Upstream Pond and into the upland on the southeast side of the pond, then the number and location of the text pits are not adequate. If debris were placed on the southeast side of the pond from either street, the two test pit locations may not be adequate. Lacking further data, eight test pits may be needed to adequately cover the area in question.

Response: As noted in the response to EPA BTAG Comment 1, the referenced text is part of the discussion the CAX Partnering Team had during the September 2011 scoping session. As Section 2.1 is entirety a summary of the discussions the Partnering Team had during the various scoping sessions and not a presentation of the work to be performed, it may not provide the level of detail or entirely reflect the actual sampling plan proposed in Sections 2.3 and 2.5 of the SAP.

The extent of contamination at Site 4 is described in the first paragraph of Section 2.2.3. As stated in Section 2.3.3 under the question *What is the extent of Buried Debris?*, the nature of buried debris is known; however, the lateral extent of Burial Area 1 requires further delineation. As presented in the Final Site 4, Site 9, and AOC 3 SI Report, only the southeastern and eastern boundaries of buried debris within Burial Area 1 could not be delineated due to the close proximity to Upstream Pond. Accordingly, the team agreed that since additional test pits could not be excavated within Upstream Pond itself, two test pits would be excavated across the Pond in order to eliminate this data gap. In addition, as stated in the SAP, if buried debris is encountered within these test pits, additional test pits will be excavated to determine the extent of buried debris. Therefore, the Navy believes the two proposed test pits are adequate because all other areas of buried debris were defined during the SI. No changes to the SAP were made.

EPA BTAG Comment 4: Page 17: Number 5 indicates that no additional surface water or sediment samples were needed for Site 4. The current sample locations in the Upstream Pond appear to be along the edge of the pond. It would be helpful to show SI and SLERA sample locations to document better sample coverage than is currently shown on Figure 5. In addition, the text needs to document that historical samples are still valid to use in the BERA. The uncertainty associated with using data that is 11 or more years old needs to be included in this report.

Response: As noted in the response to EPA BTAG Comment 1, the referenced text is part of the discussion the CAX Partnering Team had during the September 2011 scoping session. As Section 2.1 is entirety a summary of the discussions the Partnering Team had during the various scoping sessions and not a presentation of the work to be

performed, it may not provide the level of detail or entirely reflect the actual sampling plan proposed in Sections 2.3 and 2.5 of the SAP.

In addition, as noted in the response to EPA RPM Comment 1, Appendix B has been added to the SAP that shows not only the locations of all existing sampling locations to be included in the evaluation to characterize the nature and extent of contamination and to determine potential risk to human health and the environment, but the exceedance data presented in the 2009 SI Report to document the spatial coverage of the previous sample locations.

Regarding the uncertainty of using data that is 11 or more years old, only 6 surface soil, 5 subsurface soil, 4 surface sediment, and 4 subsurface sediment samples were collected during the SLERA in 1999. The majority of the data were collected during the SI in 2009 (specifically 15 surface soil, 19 subsurface soil, 9 groundwater, 13 surface sediment, 13 subsurface sediment, and 13 surface water samples). All of these data were presented and evaluated in the Final Site 4, Site 9, and AOC 3 SI. The only uncertainty with including the SLERA data in the BERA is that by including them, the evaluation will be more conservative due to the fact that, in general, the samples collected for the SLERA (1999) show higher detected concentrations of site-related contaminants than those collected in 2009. No changes were made to the SAP.

EPA BTAG Comment 5: Page 18: Section 2.1.2 mentions the Site 4 SI data set. Since this data set was collected prior to June 2001 (draft SLERA), this data set (e.g., final SLERA) needs to be included as an appendix to this report or the RI.

Response: As noted in the response to EPA BTAG Comment 1, the referenced text is part of the discussion the CAX Partnering Team had during the September 2011 scoping session. As Section 2.1 is entirety a summary of the discussions the Partnering Team had during the various scoping sessions and not a presentation of the work to be performed, it may not provide the level of detail or entirely reflect the actual sampling or data evaluation proposed in Sections 2.3 and 2.5 of the SAP.

Also, as noted in the response to EPA BTAG Comment 4, only a minority of the Site 4 data set includes data collected in 1999. As stated in the SAP, all data evaluated in the 2009 SI (which includes the 1999 SLERA data) will be combined with the data collected as part of this RI to complete the RI Report. As a result, all data collected from Site 4 will be included in the RI Report in order to complete the RI evaluations.

EPA BTAG Comment 6: Page 19: Section 2.1.3 in the last paragraph indicates that two, not five, surface soil samples will be collected for total and hexavalent chromium analysis and that groundwater would not be analyzed for hexavalent chromium as scoped in September 2011. The basis of this change should be provided.

Response: Section 2.1.3 is a summary of the comments/discussions held during the September 2011 scoping session. The team later discussed that collecting two instead of five soil samples and no groundwater samples for hexavalent chromium analysis were acceptable, which is what this section captures. The basis is explained within Section 2.1.3 itself – that the Navy technical folks feel two soil samples for hexavalent chromium are sufficient and that no groundwater samples are needed *unless* there is a known source. The team concurred with this change and there is nothing else to add to the SAP.

EPA BTAG Comment 7: Page 22: Section 2.2.1 indicates a Screening Ecological Risk Assessment (SERA) was completed for soil, sediment and surface water in 2005. The BTAG has no record of a risk assessment document or involvement in the risk assessment process since its February 10, 2003 comment letter on the draft SLERA for Sites 4 and 9.

Response: The SERA was finalized in June 2005. Appendix A of the document is the response to BTAG comments on the document. Resolution of comments and the go-ahead to produce the final document was a Partnering Team decision. The SERA recommended additional evaluation at Site 4, thus the 2009 SI and now the RI. The data evaluated in the SERA will be re-evaluated in conjunction with the 2009 SI data and data collected as part of this RI in the BERA.

EPA BTAG Comment 8: Page 26: Section 2.3.2, under Ecological Risk Decision Logic in bullet 1 and other bullets, notes that ecological risk to soil invertebrates and plants will be determined using mean soil concentrations. Because these ecological receptors groups have limited or no mobility, maximum soil concentrations need to be used to assess risk. Mean soil concentrations can be used to indicate a potential range of risk for these receptor groups, but is inappropriate to use by itself in assessing risk.

Response: As indicated in the last sentence of the referenced bullet (Bullet 1), the magnitude of the maximum HQ will also be considered in determining the list of COPCs.

EPA BTAG Comment 9: Page 26: Section 2.3.2, under Ecological Risk Decision Logic in the first bullet (under soil analytical sampling), indicates that if the soil concentration "…is below the soil screening values, the chemical will not be considered a COPC, although the magnitude of the maximum hazard quotient (HQ) will also be considered when making this determination." The text needs to specifically detail how this "criteria" (magnitude of the maximum hazard quotient) will be worded.

Response: For chemicals whose maximum HQ exceeds one but whose mean HQ is less than one (and which exceed background), the magnitude of the maximum HQ, the frequency of detection, the frequency of exceedance, and the spatial distribution of exceedances will be considered to determine if the chemical should be retained as a COPC and to account for possible spatially-limited areas of contamination. The SAP was revised to include the information above.

EPA BTAG Comment 10: Page 26: Section 2.3.2, under sediment toxicity, indicates, in the last bullet, that a "…weight of evidence evaluation will be conducted to determine if the site sample is significantly impacted." This report, the RI, or a separate technical memorandum needs to specifically document how this weight of evidence will be structured and how decisions will be made.

Response: Comment noted. The weight of evidence evaluation will be documented in the RI report.

EPA BTAG Comment 11: Page 27: Section 2.3.2 indicates in the first bullet that a statistical (correlation) analyses will be conducted on impacted samples to see what is correlated with the reduced endpoint responses. A decision tree should be provided and should address if the statistical analyses are inconclusive.

Response: If the statistical analysis is inconclusive, a weight of evidence evaluation will be used (encompassing all relevant endpoints) to determine overall potential impacts. As indicated in the response to the previous comment, this weight of evidence evaluation will be documented in the RI report and may include a formal decision tree. The SAP was revised to include the information above.

EPA BTAG Comment 12: Page 27: Section 2.3.2, under fish and frog tissue sampling, associates mean site concentrations with bioaccumulative chemicals. The document should indicate which site concentrations will be used with non-bioaccumulative chemicals. In addition, both mean and maximum concentrations need to be run in food web models to fully characterize the potential range of risk.

Response: Non-bioaccumulative chemicals will not be included in the food web models. For bioaccumulative chemicals, the maximum, 95% UCL, and mean concentrations will all be used in the food web models. The SAP was revised to include the information above.

EPA BTAG Comment 13: Page 27: Section 2.3.2, under fish and frog tissue sampling, states "…fish tissue concentration will be compared with literature-based tissue screening values, if available…." The text needs to describe what will happen when a screening value is not available.

Response: Detected chemicals for which a screening value is not available will be addressed in the uncertainty section of the ERA report if a surrogate value is also not available. The SAP was revised to include the information above.

EPA BTAG Comment 14: Page 27, Section 2.3.3 indicates that one additional sample in Youth Pond will be added to two other samples reported in 2001 to determine if contaminants from the Upstream Pond are entering Youth

Pond. Because the Navy has specifically separated the study of the Upstream Pond (Site 4) from Youth Pond / York River, the Navy needs to specifically identify how these Youth Pond data will be used at Site 4. In addition, the Navy needs to specifically justify the use of data collected before 2001 with the use 2012 / 2013 data to make conclusions about what has entered Youth Pond from the Upstream Pond.

Response: The proposed surface and subsurface sediment sample will be used to determine if and what site related contaminants are migrating from Site 4 into Youth Pond. As discussed in response to EPA BTAG Comment 1, Site 4 is not the only surface feature that could potentially contribute to constituents detected in Youth Pond, and Youth Pond is being investigated as its own study (for the reasons also outlined in the response to EPA BTAG Comment 1). The results of the two Youth Pond samples reported in 2001 will not be used to determine if contaminants from Upstream Pond are entering Youth Pond (they were collected approximately 90 and 250 feet from the outfall connecting Upstream and Youth Pond and could be related to a contamination source other than Site 4), but will be addressed in the Youth Pond investigation. The SAP has been revised as shown below (blue text) to clarify this.

> During the Pond Study (Baker, 2001), two surface water and two surface sediment samples were collected from Youth Pond. While Youth Pond will be evaluated under a separate investigation, one ~~additional~~ surface and subsurface sediment sample is needed to determine if and what site-related contaminants from Site 4 are migrating into Youth Pond

EPA BTAG Comment 15: Page 28, Section 2.3.3: Groundwater needs to be analyzed for all potential contaminants. The discharge areas (potentially Youth Pond and the York River) for groundwater need to be identified and sampled / analyzed all potential contaminants.

Response: Please see the response to EPA Tox Comment 1 and EPA BTAG Comment 1.

EPA BTAG Comment 16: Page 30, Section 2.3.3: The third bullet refers to using one organism (Hyalella azteca) for sediment toxicity tests. Because of the errors that can happen in toxicity testing that can result in data interpretation difficulties, it would be better to utilize at least two species. Differences in sensitivity between test organisms is another reason for testing another species. The other one being Chironomus tentans (dilitus).

Response: The use of multiple test organisms may actually complicate data interpretation if the multiple tests have inconsistent outcomes. Hyalella azteca is a suitably sensitive test organism for use at Site 4. No changes were made to the SAP.

EPA BTAG Comment 17: Page 30, Section 2.3.4: Number 2 indicates for subsurface soil that literature based ecological screening values for plants and invertebrates (if less than 2 feet) will be used. Documentation will need to be provided indicating that only the top 2 feet is used by invertebrates.

Response: The 0 to 2 foot ecological evaluation depth has been the "standard" at CAX and Yorktown and is based upon previous BTAG guidance.

EPA BTAG Comment 18: Page 30, Section 2.3.4: Number 6 must indicate that both mean and maximum tissue concentrations will be run in food web models to fully characterize the potential range of risk.

Response: Please see the response to BTAG Comment 12.

EPA BTAG Comment 19: Page 31, Section 2.3.4: The first paragraph on this page refers to using base background concentrations. Background data for the same soil type will need to be used.

Response: Comment noted.

EPA BTAG Comment 20: Page 44, Section 3.2.12: Regarding earthworm tissue sampling, it is not clear from this paragraph if the areas from where earthworm tissue will be collected will also have a soil sample (surface and/or subsurface). Also, it is not clear why earthworms from only the "…three areas adjacent to the streams west of Upstream Pond" are proposed for collection / analysis. There appear to be other areas within the Site 4 boundary

as well as outside this boundary (southeast of the pond / test pit areas) that would need earthworm tissue sampling. If earthworms are not found (which may be due to temperature and moisture, and/or chemicals) within the first 12 inches of soil bgs, then the next 12 inches bgs should be examined and considered for sampling. If earthworms are not found, the Navy will need to adequately document why this is not related to contaminants from the site.

Response: Soil/sediment samples (surface only) will also be collected at these three locations (shown as sediment samples on Figure 5 of the draft SAP). The three earthworm tissue sample locations cited in the comment were added at the request of BTAG during the August 31, 2011 site visit (in which representatives from the Navy, BTAG, and CH2M HILL attended) with the focus on potential food web exposures (not on the earthworm community per se); no other potential sampling areas were discussed or requested by BTAG. If earthworms are not found in the top 12 inches at the initial location sampled, areas in the immediate vicinity will be sampled in an attempt to obtain sufficient specimens. If the top 12 inches of soil do not yield specimens and the soil is not saturated, the 12 to 24 inch stratum may be sampled (depending upon conditions). If the earthworm samples are obtained from this deeper depth stratum, the associated soil sample will be collected from 0 to 24 inches (not 0 to 12 inches). If earthworms are not found, habitat conditions will be documented to possibly explain their absence. These data, plus the results of the soil sampling, will be used in the RI to determine if the lack of worms may be due to site-related contaminations.

EPA BTAG Comment 21: Page 45, Section 3.2.12: Under benthic invertebrate sampling in shallow water a D-frame dip net will be used and the level of effort will be determined in the field and standardized among locations. The level of effort in using this sampling device will also need to be within established protocols.

Response: It is unclear what "established protocols" are being referenced in the comment. The proposed sampling will be consistent with methods such as the Rapid Bioassessment Protocol (RBP), Level I.

EPA BTAG Comment 22: Page 45, Section 3.2.12: Under benthic invertebrate sampling, the text indicates that if more than 250 organisms are collected, a 100 organism subsample (randomly selected) will be identified and the results extrapolated to the entire sample. The reference for this technique needs to be included in the text. Standard operating procedures for the benthic assessment must be provided. While the document indicates that the benthic survey will be qualitative, the description of how the data will be used indicates that a more formal approach to the benthic work is warranted. At a minimum, in addition to providing the aforementioned methodology, the individual(s) classifying the invertebrates should have NABS certification and the appropriate documentation should be provided.

Response: Sub-sampling is a common procedure for reconnaissance-level invertebrate surveys (e.g., 1989 RBP Level I) and references will be added to the text. SOPs are listed in Table 3-1 of the SAP and have been added to the SAP as an appendix (Appendix C). The benthic survey will be qualitative and organisms will be identified and enumerated in the field. However, the standardization of collection among locations will allow a semi-quantitative evaluation of the resulting data. Qualified aquatic biologists will conduct the surveys.

EPA ESC Comment 1: Under the proposed number of samples to be collected from Site 4, the reviewer fails to understand how the suggested number of samples, including previously sampled areas, can possibly characterize the nature and extent of contamination over the 2,300 acre area.

Response: As stated in the SAP (the final sentence of the first paragraph under the Section 2.2.1 [Page 21]), Site 4 is approximately 4 acres in size (**Figure 2**). As indicated in the first sentence of Section 2.2.1, CAX in its entirety encompasses 2,300 acres; therefore, the number of existing and proposed samples is adequate to characterize Site 4.

EPA ESC Comment 2: This Remedial Investigation (RI)/Sampling and Analysis Plan (SAP) does not contain a Decision Threshold. If the analytes are found above action levels, what remediation procedure will be implemented? Section 2.2.1, Site Background and History, mentions the results from the soil, groundwater,

sediment, and surface water sampling activities indicated potential risk to human health and ecological receptors and that a RI was recommended, but fails to state if any action had been taken.

Response: Section 2.3.2, Data Quality Objectives, outlines the decision logic to be used to identify site-related contaminants of concern. As stated in the SAP, the purpose of the RI is to collect additional data to supplement the current SI dataset in order to adequately characterize Site 4 and evaluate potential risks to human health and the environment. Any risk management decisions, including the evaluation or selection of a remediation procedure, cannot be determined until Site 4 is adequately characterized and potential human health and ecological risks are identified, and is outside the scope of this UFP-SAP as the site is in the RI stage of the CERCLA process. However, a final environmental question to be answered (Section 2.3.3) will be added to the SAP, as shown below (blue text), to indicate that further action may be taken based on the results of the RI.

> **Is further action (that is, further investigation, removal, or remediation) warranted at this site based on the results of this study?**
>
> Further action may be recommended, based on the nature and extent of buried debris, findings of the HHRA and BERA, exceedances of groundwater MCLs, and the expected future use of the site.

EPA ESC Comment 3: The language, "these samples will be field determined," appears throughout the SAP. The third party Utility Clearance Subcontractor, mentioned in section 3.2.1 under utility clearance should be employed to map the entire site which would enable predetermined sample locations to be pinpointed without fear of disrupting buried utility lines. All sampling points should be predetermined and documented using a GPS device listing both the longitude and latitude for each sample location. It is because of the location specific constraints, mentioned in Section 2.5 Sampling Design and Rationale that it is of the utmost importance to have sample locations well defined and predetermined. A grid sampling collection plan is highly recommended. Because of the size of the area, dividing it into quadrants would be beneficial.

Response: Many of the samples to be collected as part of this SAP will need to be field-determined, as their precise locations cannot be predetermined for reasons that follow:

- The six surface soil samples to be collected from Site 4 in order to determine if soil, sediment, or surface water pose a potentially unacceptable risk to ecological receptors, need to be field-determined because they are to be located based on natural drainage ways and these natural drainage ways will not be identified until the completion of the biological survey.
- All tissue samples to be collected from Site 4 will need to be field-determined because those animals that will be sampled (fish, frogs, and earthworms) move over time and will likely not be in the same location if the sample points were predetermined.
- Reference pond samples will need to be field-determined for the reasons outlined in the response to EPA RPM Comment 5.

In addition, it is by necessity a standard practice that proposed sample locations may require changes based on unknown field conditions. While there are no known location-related constraints and significant deviations from the proposed sampling locations are not anticipated, if a sample location needs to be moved (possible reasons are listed below), any deviation is not anticipated to affect the quality of the data and any new sample location would likely be no more than a few feet from the proposed sample location.

- Sample locations may be within the immediate vicinity of an unknown subsurface utility line.
- Sample locations should be biased towards areas where it is observed that potential contamination may be the greatest; this will not be known prior to the start of field work.
- Sediment sample locations should be biased toward depositional areas, which must be observed during field work.

- Site conditions may change over time (such as, surface water may not be present at a proposed sampling location during the field efforts due to drought conditions, resulting in the need to move the sample location).

Finally, as stated in the SAP (Section 1.2), field changes will be communicated to the CAX Partnering Team and they will have 24 hours to approve or comment on those changes. No changes were made to the SAP.

EPA ESC Comment 4: Groundwater flow is estimated to be north-northeast towards Upstream Pond. The reviewer fails to understand how the installation of just six monitoring wells over 2,300 acres will be sufficient to characterize the extent of groundwater contamination and determine the direction of flow. This plan does not take into account the possibility of multiple unconnected groundwater networks.

Response: Please see the response to EPA ESC Comment 1 – the study area is 4 acres, not 2,300.

EPA ESC Comment 5: In order to properly characterize the site and support the completion of a Human Health Risk Assessment (HHRA) and a Baseline Ecological Risk Assessment (BERA), a more complete and comprehensive list of analyses should be performed on all matrices sampled. The reviewer recommends each sample be analyzed for VOCs, PAHs, PCBs, Total Metals, Aroclors, and Hexavalent Chromium.

Response: A complete and comprehensive list of sampling analytes (VOCs, SVOCs, pesticides, PCBs, explosives, and metals) was performed on all site samples as part of the 2009 SI. Based on the results of that investigation, the team agreed that the only sampling that needs to be conducted as part of this RI is sampling for those analytes which were determined to be site-related. Site-related contaminants were determined based on exceedances of the conservative screening criteria (RSLs and ESVs). In addition, please refer to the last bullet under the response to EPA Tox Comment 1. No changes were made to the SAP.

EPA ESC Comment 6: Laboratory generated data should be validated by third party validators, not by CH2MHILL validators as mentioned in Section 2.3.9.

Response: According to the DoD Quality Systems Manual (QSM) Version 4.2 (dated 10/25/2010), third-party is defined as "from outside the laboratory" or data generator. Additionally, Part 2B of the UFP-QAPP Compendium (March 2005) gives the following guidance on validation, which is similar to the DoD QSM in regards to validation of the analytical data:

> **Step II (validation):** Step IIa (Compliance with Methods, Procedures, and Contracts). Validation associated with Step IIa should be conducted by an entity *at least one step removed from the entity that generated the data* (field or analytical). In general, this will mean that validation Step IIa of analytical data will be conducted outside the laboratory, while the validation of the field sampling activities will be conducted by entities working for the prime contractor who are not responsible for the field sampling activities.

While CH2M HILL will collect the samples, they are not the entity that generates the data, that entity is the laboratory specified in the SAP. CH2M HILL has a team of chemists that completes the data validation and is not associated with the project in any other fashion, is 100% completely removed from the sample collection and data generation, and is located in CH's Gainesville, FL office. The group consists of chemists with decades of laboratory and data validation experience. CH2M HILL has performed data validation for projects on several Region 3 Navy bases for a few years now and with no issues. All data packet and electronic files are accessible to EPA upon request. The use of CH2M HILL to perform data validation is a Partnering Team decision.

EPA ESC Comment 7: Tentatively Identified Compounds (TICs) should be reported by the laboratory to provide a list of possible contaminates not screened for.

Response: As stated in the response to EPA ESC Comment 2, the purpose of the RI is to collect additional data to supplement the current SI dataset in order to adequately characterize Site 4 and evaluate potential risks to human health and the environment. As such, the investigation is not a release assessment. Therefore, the analytical suite will consist of constituents already established to be present at the site and TIC analysis is not appropriate.

EPA ESC Comment 8: The water bodies located at Site 4 should be sampled using a sample grid pattern for both water and sediment samples as well. If a water body contains a submerged canister or drum filled with a chemical contaminant, and it has a small opening due to erosion, the concentration of the contaminate will be higher closer to the point of origin and very diluted downstream.

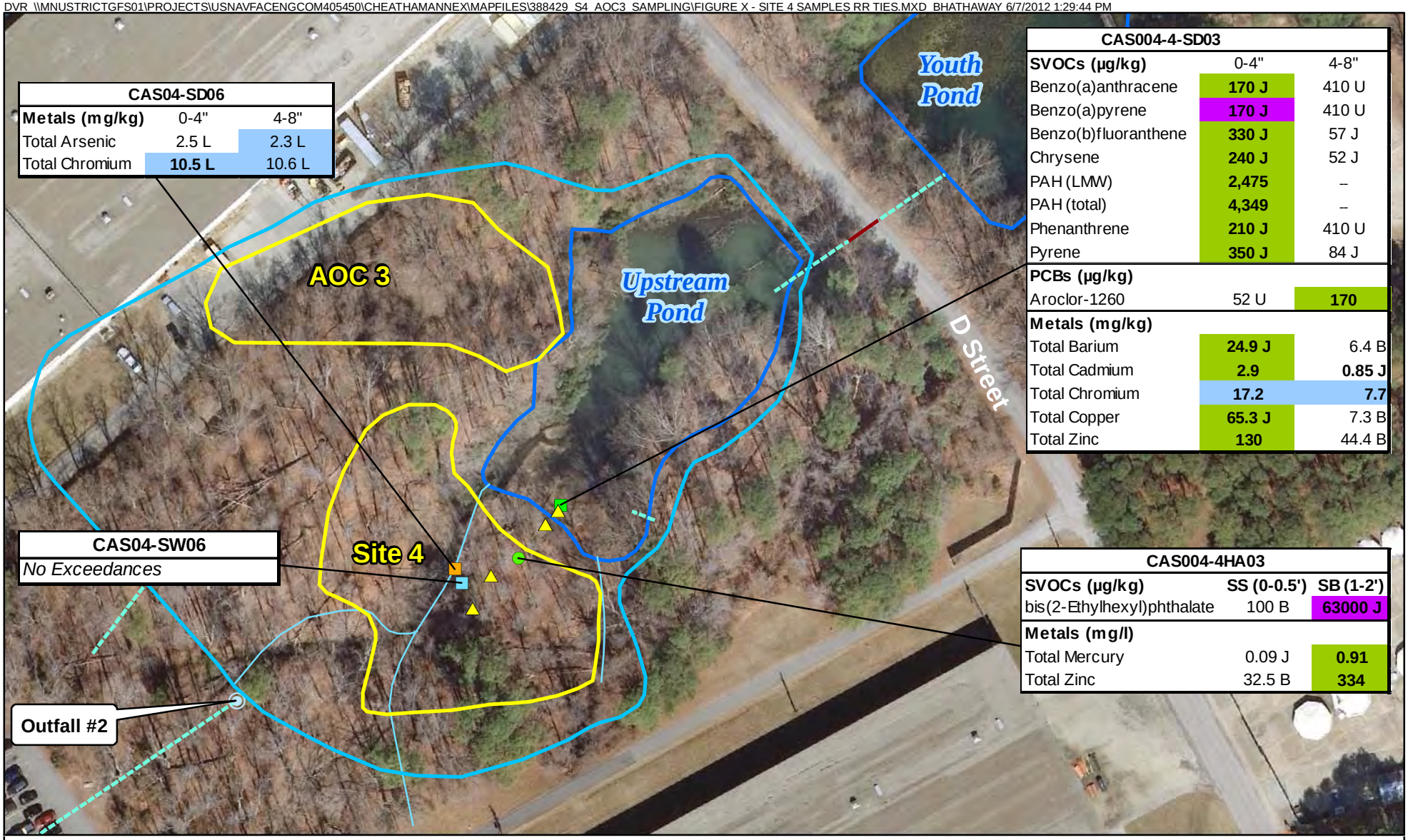
Response: There is no known or suspected drum in Upstream Pond, and there is no historical evidence of direct disposal of waste into Upstream Pond; therefore, a sample grid pattern for surface water and sediment samples is not necessary to adequately characterize Site 4 and to determine if site-related contaminants pose potential risks to human health and ecological receptors. Site 4 is approximately 4 acres in size and the numbers of samples evaluated in the 2009 SI and to be evaluated as part of this RI were determined with the concurrence of the CAX Partnering Team and adequately cover the site.

References

CH2M HILL. 2011. *Final Site Inspection Site 4, Site 9, and Area of Concern 3, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia.* December

U.S. Navy. 2002. *Guidance for Environmental Background Analysis, Volume I: Soil*. Naval Facilities Engineering Command. Washington, D.C.

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\388429_S4_AOC3_SAMPLING\FIGURE X - SITE 4 SAMPLES RR TIES.MXD BHATHAWAY 6/7/2012 1:29:44 PM



CAS04-SD06		
Metals (mg/kg)	0-4"	4-8"
Total Arsenic	2.5 L	2.3 L
Total Chromium	**10.5 L**	10.6 L

CAS004-4-SD03		
SVOCs (µg/kg)	0-4"	4-8"
Benzo(a)anthracene	**170 J**	410 U
Benzo(a)pyrene	**170 J**	410 U
Benzo(b)fluoranthene	**330 J**	57 J
Chrysene	**240 J**	52 J
PAH (LMW)	**2,475**	–
PAH (total)	**4,349**	–
Phenanthrene	**210 J**	410 U
Pyrene	**350 J**	84 J
PCBs (µg/kg)		
Aroclor-1260	52 U	**170**
Metals (mg/kg)		
Total Barium	**24.9 J**	6.4 B
Total Cadmium	**2.9**	**0.85 J**
Total Chromium	**17.2**	**7.7**
Total Copper	**65.3 J**	7.3 B
Total Zinc	**130**	44.4 B

CAS04-SW06
No Exceedances

CAS004-4HA03		
SVOCs (µg/kg)	**SS (0-0.5')**	**SB (1-2')**
bis(2-Ethylhexyl)phthalate	100 B	**63000 J**
Metals (mg/l)		
Total Mercury	0.09 J	**0.91**
Total Zinc	32.5 B	**334**

Legend

- Railroad Tie
- 1999 Sediment Sample Location
- 1999 Soil Sample
- Surface Water Sample Location
- Sediment Sample Location
- Outfall
- Culvert
- Drainage Channels
- Storm Water Line
- Proposed Site 4 Study Area
- Site Boundary
- Water Body

N W E S

0 50 100 Feet

Site 4/AOC 3 Results
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

From:	Susanne Haug
To:	scott.park@navy.mil
Cc:	Wade.Smith@deq.virginia.gov; Ivester, Marlene/VBO; Sawyer, Stephanie/VBO
Subject:	Site 4 SAP RTC comments
Date:	Wednesday, August 01, 2012 3:15:24 PM
Attachments:	CAX Site 4 SAP EPA RTC.pdf

Hi Scott,

We reviewed the responses to the comments on the Site 4 SAP. There are still a few comments we need to discuss. I suggest you take a look at the comments and we get everyone on the phone to resolve them. I think if we have everyone together we can work these out. I know we are running short on time since the sampling has to take place in September/October.

Let me know if you have any questions.

Sue

Susanne Haug, P.E.
Remedial Project Manager
US EPA Region III (3HS11)
215-814-3394 (phone)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 1, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, VA

Mr. Park:

Thank you for your responses to our comments regarding the subject document. Responses are acceptable except for those listed below. After you've reviewed the comments below, I suggest we have a conference call to resolve these remaining comments.

EPA Tox Comment 2: EPA supports using a 95th percent Upper Tolerance Limit (UTL) to represent the upper end of background. This is not a conservative approach for estimating background conditions, at all; in fact, the 95th percent UTL allows for a great deal of leniency in defining background. At this site, where an on-site concentration exceeds the 95th percent UTL of the background dataset, the Navy proposes to default to the maximum background concentration as the comparison value. This type of point comparison alone simply is not good science. [RPM note: I also forwarded this comment/response to our statistician. If there are any changes or additions to this comment I will let you know within 1 week.]

EPA RPM Comment 1: The response indicates that Appendix B was added to the SAP and includes figures showing soil, groundwater, sediment, and surface water exceedances. It would be helpful if these figures also showed all sample locations within each of these media so we can see the distribution of samples.

EPA RPM Comment 2: The response is vague. It states that "the SAP was revised to include discussion of this agreement in an Action Items and Results section of the November 2011 Scoping Session". Was just the discussion documented in the SAP or will the number be revised to 50 ppb?

EPA RPM Comment 5: Based on results shown in the 2001 Pond Study, Jones Mill Pond and Cheatham Pond indicate COPCs. Because these ponds have received contaminants, they cannot be used as reference ponds.

EPA RPM Comment 7: I don't understand the use of reference pond data and how it relates to Site 4. Why would finding high levels chemical constituents (e.g., PCB's, explosives) in the reference pond change the conclusions drawn from Site 4 results? These are not naturally occurring substances.

EPA RPM Comment 8: See Tox Comment 2.

EPA BTAG Comment 2: The response indicates that one additional surface and subsurface sediment sample is needed to determine if site related contaminants from Site 4 are migrating into Youth Pond. Without an understanding of the spatial variability of sediment concentrations in Youth Pond, one sediment sample is insufficient to make this determination. Either additional samples should be collected as part of this investigation or the investigation of this pathway should be deferred to the study of Youth Pond.

EPA BTAG Comment 3: The response indicates the lateral extent of the buried debris required further delineation and the team agreed that two test pits across the pond would address this data gap. The report does not indicate that the debris on the south side of the Upstream Pond would be the same as the debris that has been identified on the north side of the Upstream Pond. The Upstream Pond is not being sampled for debris. Again, the two debris test pits on the south side of this pond will not definitively address the existence of debris, or not.

EPA BTAG Comment 6: The response indicates "…the Navy technical folks feel two soil samples for hexavalent chromium are sufficient and that no groundwater samples are needed unless there is a known source." Support for this is needed to justify the decision reached. Section 2.1.3 appears to be related to human health only. Chromium can also impact ecological receptors. It is not clear that these two samples for hexavalent chromium would be adequate to assess ecological risk. In addition, if groundwater discharges to surface water (e.g., into the Upstream Pond, Youth Pond, or the York River) then multiple forms of chromium that would/could adversely impact ecological receptors need to be included in the analysis.

EPA BTAG Comment 9: The response states "…maximum HQ exceeds one…." This needs to change to "…maximum HQ is equal to or exceeds one…." It is not clear that this response can be applied to invertebrates and plants because the maximum HQ and the mean HQ will be used to describe the range of risk for these ecological receptors. Also, because contaminant concentrations in soil can be highly variable, using frequency of detection, frequency of exceedance, as well as spatial distribution of exceedances may not be a good indicator of the spatial extent of the ecological risk. The uncertainty of using these variables will need to be adequately addressed in the report given the potential for concentrations to be spatially variable (e.g., site related contamination not uniformly distributed). BTAG does not support the unqualified use of the magnitude of the HQ exceedance as an indicator of risk.

EPA BTAG Comment 14: The response states that one surface and subsurface sediment sample will be used to determine if and what site related contaminants are migrating from Site 4 into Youth Pond. Making this determination based upon a single sample is highly questionable and uncertain. Currents within Youth Pond, resulting from groundwater discharge and storms, can redistribute contaminants which will not be identified by a single sample. Finally, no meaningful statistics can be applied to a single sample.

EPA BTAG Comment 16: The response indicates the use of a single test organism (*Hyalella azteca*) is appropriate. The uncertainty of using one species to assess toxicity to invertebrates should be addressed in the report.

EPA BTAG Comment 17: The response indicates that the top two feet of soil is the standard depth of invertebrates that has been established for CAX. A number of previous comments have been made asking for support for this depth range as appropriate, but no adequate responses have been provided that pertain to the biology/habits of soil invertebrates. The question/concern is still valid and needs to be addressed in this report.

EPA BTAG Comment 19: The comment indicated that background data from the same soil types found at Site 4 will need to be used. The response was "Comment noted." This response needs to confirm that background soil data from the same soil types that are at Site 4 will be used.

EPA BTAG Additional comments on Figure 5:

a. It is not clear why the complete Burial Area 1 is not contained within the Burial Investigation Area 1. In both Burial Investigation Areas, there are areas included which are outside of the two identified Burial Areas. The text needs to adequately explain why there are no samples in these areas.

b. The SAP needs to clearly document why the sample locations proposed on this figure were selected. There appears to be a large amount of area in the burial areas where sampling will not occur, and the rationale for this needs to be provided.

Please contact me at 215-814-3394 if you have any questions.

Sincerely,

Susanne Haug, P.E.
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

From:	Sawyer, Stephanie/VBO
To:	Haug.Susanne@epamail.epa.gov
Cc:	Park, Scott R CIV NAVFAC MIDLANT, EV; Smith, Wade (DEQ); Ivester, Marlene/VBO; Sawyer, Stephanie/VBO
Subject:	Response to EPA"s Second Round Comments on the Draft Site 4 RI UFP-SAP
Date:	Friday, September 07, 2012 1:20:14 PM
Attachments:	image001.jpg Site 4 Responses to EPA Round 2 Comment August 2012.pdf
Importance:	High

Sue,

Attached are the Navy's responses to the EPA's second round comments on the Draft Site 4 RI UFP-SAP. The USEPA comments were received via email on August 1, 2012. We will be discussing these RTCs at our partnering meeting next week so we can get consensus on the responses and mobilize to the field at the beginning of October.

I'll send the redline draft final version of the SAP in a separate email. If you have any questions prior to the meeting please let us know.

Thanks,
Stephanie

clip_image001

Stephanie Sawyer
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Fax: 757-497-6885
stephanie.sawyer@ch2m.com

Response to Comments
Tier II Sampling and Analysis Plan
Site 4 – Remedial Investigation
Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
September 7, 2012

EPA Tox Comment 2: EPA supports using a 95th percent Upper Tolerance Limit (UTL) to represent the upper end of background. This is not a conservative approach for estimating background conditions, at all; in fact, the 95th percent UTL allows for a great deal of leniency in defining background. At this site, where an on-site concentration exceeds the 95th percent UTL of the background dataset, the Navy proposes to default to the maximum background concentration as the comparison value. This type of point comparison alone simply is not good science. [RPM note: I also forwarded this comment/response to our statistician. If there are any changes or additions to this comment I will let you know within 1 week.]

Response: As discussed with the team on August 21, 2012, the intention of the Decision Tree (Figure 4) presented in the SAP is that comparison of COPC/COC concentrations to background 95% UTL data (or any other background-related criteria) will be conducted independently of the evaluation of potential risk through the completion of the human health and ecological risk assessments. Only in cases where potential human health or ecological risk is identified *and* comparison of site data to the background 95% UTLs indicates UTL exceedances, would further evaluation of the data with respect to consistency with background conditions be considered. In other words, should further evaluation methods (such as evaluating the magnitude of the 95% UTL exceedance and/or comparing to maximum background concentrations) be employed, they would only be utilized following the completion of the risk assessments. Therefore, the final step in the decision logic (Section 2.3.2, last bullet under "Human Health Decision Logic") was revised to state:

- If the COC concentrations exceed the background 95 percent UTLs, further evaluation will be conducted to consider whether the COC concentrations are consistent with background conditions or if they represent a release such that further action is warranted.

And the 2nd to last box in the decision logic (Figure 4) was revised to state:

> Conduct further evaluation to consider whether the COC concentrations are consistent with background conditions or if they represent a release such that further action is warranted. In addition, the text label for the arrow from this box directed to the left will be revised to read "COC concentrations not indicative of a CERCLA-related release" and the arrow directed to the right to read "COC concentrations indicative of a CERCLA-related release."

EPA RPM Comment 1: The response indicates that Appendix B was added to the SAP and includes figures showing soil, groundwater, sediment, and surface water exceedances. It would be helpful if these figures also showed all sample locations within each of these media so we can see the distribution of samples.

Response: There was a typo in the June 26, 2012 response to comment document. The response should have read as follows:

> Figures showing the exceedance of the screening criteria at Site 4 were included in the Site 4, Site 9, and AOC 3 Site Inspection Report. Since a single figure showing all SI exceedances of screening criteria and previous sampling locations would be extremely difficult to interpret due to the number of sampling locations and volume of results, Appendix B was added to the SAP and includes figures showing all soil, groundwater, sediment, and surface water ~~exceedances~~ sample locations and those constituents that exceeded their respective screening criteria.

EPA RPM Comment 2: The response is vague. It states that "the SAP was revised to include discussion of this agreement in an Action Items and Results section of the November 2011 Scoping Session". Was just the discussion documented in the SAP or will the number be revised to 50 ppb?

Response:

As a result of the original EPA RPM Comment 2 (dated June 13, 2012), in order clarify that 50 ppb will be used as the pesticide threshold (as opposed to what was originally discussed by the team during the Site 4 scoping sessions) the following text was added to the November 2011 scoping session summary:

> **Action Items and Results**
>
> The Team will discuss a threshold level for pesticides when determining if detected pesticides are as a result of normal base operations. *Follow-up: The Team agreed during the November 16, 2011 Partnering Meeting to use the threshold of 50 ppb when making risk management decisions on pesticides (i.e., pesticide detections of 50 ppb or below could be attributable to basewide pesticide use and not attributable to a CERCLA-related release).*

EPA RPM Comment 5: Based on results shown in the 2001 Pond Study, Jones Mill Pond and Cheatham Pond indicate COPCs. Because these ponds have received contaminants, they cannot be used as reference ponds.

Response: It is the Navy's position that the Pond Study sediment data do not preclude the use of Cheatham or Jones Pond as potential reference areas, particularly since the Pond Study sampling was biased toward portions of the ponds nearest to known source areas (sites); there are large, un-sampled areas within the ponds that are not near any known Navy source areas. However, based on further evaluation of the physical characteristics of the two proposed ponds, Cheatham Pond is the preferred choice for the reference area since it is more likely to provide areas with similar habitats for all of the surface water/sediment site evaluations (Site 4, Youth Pond, and Penniman Lake). Thus, Jones Pond has been removed from the SAP as a potential reference site. The results of the 2000 Pond Study indicate that very few organic constituents were detected in Cheatham Pond sediments (eight samples); a comparison of detected organic constituent concentrations with ecological sediment screening values indicate that none of the existing screening values were exceeded (see attached table). While several detected metals (e.g., arsenic, barium, and iron) exceeded ecological sediment screening values in one or more samples, the relatively small range in the detected concentrations do not suggest that they are the result of a release.

The Navy proposes that the suitability of Cheatham Pond as a reference area be evaluated as follows: (1) the site reconnaissance surveys at Site 4 (Upstream Pond), as well as at Youth Pond and Penniman Lake, will be conducted at the beginning of the sampling field event to characterize the physical characteristics of each water body; (2) a reconnaissance survey of Cheatham Pond will then be conducted to find specific areas that match, as closely as possible, the physical properties of each site water body (e.g., water depth, substrate type); (3) surface water and sediment samples will then be collected at the identified areas within Cheatham Pond and submitted for chemical analysis on a quick-turn basis; (4) while media and biological sampling of site water bodies is occurring, the unvalidated surface water and sediment data from Cheatham Pond will be reviewed (following a qualitative evaluation by a CH2M HILL chemist for critical quality issues) to determine if the sampling results preclude any of the identified areas in Cheatham Pond from being used for reference purposes following a similar process as used for the Pond Study data (see above); the Pond Study data will also be utilized as warranted during this process, which will be coordinated with the Partnering Team and technical support; and (5) biological data (tissue, invertebrates, and/or toxicity test samples) will be collected from the identified areas within Cheatham Pond that are deemed suitable. This approach was discussed during the August 21, 2012 Partnering Team and technical support conference call, with agreement by all participating parties. Thus, this approach has been added to Section 3.2.12 of the SAP.

EPA RPM Comment 7: I don't understand the use of reference pond data and how it relates to Site 4. Why would finding high levels chemical constituents (e.g., PCB's, explosives) in the reference pond change the conclusions drawn from Site 4 results? These are not naturally occurring substances.

Response: The purposes of the reference site samples are to provide background concentrations for naturally occurring constituents (such as metals) and widely occurring anthropogenic constituents with a multitude of sources (e.g., PAHs and certain pesticides), and to provide comparative data for site-specific biological surveys and toxicity testing. Significant detections of constituents such as PCBs and explosives within a reference area would preclude the use of that area as a suitable reference site. This information has been added to Section 2.3.4 of the SAP for clarity.

EPA RPM Comment 8: See Tox Comment 2.

Response: Please see the response to EPA Tox Comment 2 above.

EPA BTAG Comment 2: The response indicates that one additional surface and subsurface sediment sample is needed to determine if site related contaminants from Site 4 are migrating into Youth Pond. Without an understanding of the spatial variability of sediment concentrations in Youth Pond, one sediment sample is insufficient to make this determination. Either additional samples should be collected as part of this investigation or the investigation of this pathway should be deferred to the study of Youth Pond.

Response: As discussed and agreed to by the CAX Partnering Team, with input from their respective technical support during the August 21, 2012 conference call, these Youth Pond samples will be removed from the Site 4 SAP and included in the Youth Pond investigation SAP.

EPA BTAG Comment 3: The response indicates the lateral extent of the buried debris required further delineation and the team agreed that two test pits across the pond would address this data gap. The report does not indicate that the debris on the south side of the Upstream Pond would be the same as the debris that has been identified on the north side of the Upstream Pond. The Upstream Pond is not being sampled for debris. Again, the two debris test pits on the south side of this pond will not definitively address the existence of debris, or not.

Response: The lateral extent of buried debris within Burial Area 1 is the only area that requires further delineation; the extent of buried debris within Burial Area 2 has been delineated (see attached figure). During the 2009 SI test pitting activities, only the southeastern and eastern boundaries of Burial Area 1 could not be delineated due to the close proximity of Upstream Pond. Based on historical aerial photographs presented in the EPIC, it is not likely that buried debris extends beneath the pond such that it would be found on the southeastern or eastern side of Upstream Pond. While the potential exists for buried debris to be located in Upstream Pond, logistically, it is not possible to confirm its absence or presence within the pond. It is because of these reasons, that only two test pits are being proposed on the other side of the pond to identify the worst case scenario. In addition, as stated in the SAP, if buried debris is found in either of these two test pits, additional test pits will be excavated to determine the full extent of the debris.

EPA BTAG Comment 6: The response indicates "…the Navy technical folks feel two soil samples for hexavalent chromium are sufficient and that no groundwater samples are needed unless there is a known source." Support for this is needed to justify the decision reached. Section 2.1.3 appears to be related to human health only. Chromium can also impact ecological receptors. It is not clear that these two samples for hexavalent chromium would be adequate to assess ecological risk. In addition, if groundwater discharges to surface water (e.g., into the Upstream Pond, Youth Pond, or the York River) then multiple forms of chromium that would/could adversely impact ecological receptors need to be included in the analysis.

Response: The referenced quote at the beginning of the comment is a *summary* of the scoping session held by the Partnering Team. No other discussions regarding justification of the Navy's stance on hexavalent chromium sampling occurred at this time; therefore, no changes were made to Section 2.1.3.

The EPA is correct that the discussion summarized in Section 2.1.3 was related to human health only because the Partnering Team's hexavalent chromium analysis discussion was directly related to refining the human health risk assessment. The analysis of hexavalent chromium (along with total chromium) was included in this SAP specifically in order to refine the human health risk assessment. In accordance with EPA Policy, all detected

chromium must be assumed to be hexavalent chromium (the most toxic form) unless proven otherwise. It is for this reason alone that hexavalent chromium data are being collected.

Discussions regarding using hexavalent chromium analysis in the ecological risk assessment were not held (during the referenced scoping session or any other scoping session); therefore, information regarding using hexavalent chromium in the ecological risk assessment was not added to this section. It is understood that chromium (and all other constituents) can also pose potential risk to ecological receptors; however, the results of all other sampling proposed in this SAP will be used to determine which constituents pose potential risk to these receptors. Total chromium data (which will be collected in samples of all media) are typically sufficient for conducting an ERA. No changes were made to the SAP.

EPA BTAG Comment 9: The response states "…maximum HQ exceeds one…." This needs to change to "…maximum HQ is equal to or exceeds one…." It is not clear that this response can be applied to invertebrates and plants because the maximum HQ and the mean HQ will be used to describe the range of risk for these ecological receptors. Also, because contaminant concentrations in soil can be highly variable, using frequency of detection, frequency of exceedance, as well as spatial distribution of exceedances may not be a good indicator of the spatial extent of the ecological risk. The uncertainty of using these variables will need to be adequately addressed in the report given the potential for concentrations to be spatially variable (e.g., site related contamination not uniformly distributed). BTAG does not support the unqualified use of the magnitude of the HQ exceedance as an indicator of risk.

<u>Response:</u> The requested change in the first sentence of this comment was made to the relevant bullets in Section 2.3.2 of the SAP. The factors listed in the original response to this comment (submitted June 26, 2012) will be used as lines of evidence to determine if specific constituents warrant retention as COPCs for particular media. The uncertainties will be discussed in the ERA portion of the RI report. This information has also been added to Section 2.3.2.

EPA BTAG Comment 14: The response states that one surface and subsurface sediment sample will be used to determine if and what site related contaminants are migrating from Site 4 into Youth Pond. Making this determination based upon a single sample is highly questionable and uncertain. Currents within Youth Pond, resulting from groundwater discharge and storms, can redistribute contaminants which will not be identified by a single sample. Finally, no meaningful statistics can be applied to a single sample.

<u>Response:</u> Please see the response to EPA BTAG Comment 2.

EPA BTAG Comment 16: The response indicates the use of a single test organism (Hyalella azteca) is appropriate. The uncertainty of using one species to assess toxicity to invertebrates should be addressed in the report.

<u>Response:</u> The uncertainties will be discussed in the ERA portion of the RI report.

EPA BTAG Comment 17: The response indicates that the top two feet of soil is the standard depth of invertebrates that has been established for CAX. A number of previous comments have been made asking for support for this depth range as appropriate, but no adequate responses have been provided that pertain to the biology/habits of soil invertebrates. The question/concern is still valid and needs to be addressed in this report.

<u>Response:</u> This depth range was originally selected at the request of BTAG to conform to their previous FAQ guidance. A TEARS issue paper issued at about the same time (May 2003) concluded the following: "…a sampling depth of 0 to 12 inches (0 to 30 cm) should capture the bulk of critical ecological exposure point concentrations for most receptors, with some plant, invertebrate, and vertebrate receptors requiring additional sampling at depths of 12 to 24 inches (30 to 61 cm)." In addition, this comment was discussed during the August 21, 2012 Partnering Team and technical support conference call, and the participating parties agreed sampling the top two feet for evaluation of ecological risk is acceptable. While there are situations where the soil horizons with biological activity may extend beyond two feet deep, this situation can, and will, be addressed as part of the uncertainty section of the ERA in the RI report. No changes were made to the SAP.

EPA BTAG Comment 19: The comment indicated that background data from the same soil types found at Site 4 will need to be used. The response was "Comment noted." This response needs to confirm that background soil data from the same soil types that are at Site 4 will be used.

Response: The CAX Background data set for soil is based on depth (surface vs. subsurface) not soil lithology. As with the Site 4 SI, all surface soil evaluated in the Site 4 RI will be compared to the surface soil background dataset. Likewise, all subsurface soil will be compared so the subsurface soil background data set. Since the groundwater at Site 4 is the Yorktown-Eastover aquifer, all groundwater will be compared to the Yorktown-Eastover background dataset. Section 2.3.4 was revised to include this information.

EPA BTAG Additional comments on Figure 5:

a. It is not clear why the complete Burial Area 1 is not contained within the Burial Investigation Area 1. In both Burial Investigation Areas, there are areas included which are outside of the two identified Burial Areas. The text needs to adequately explain why there are no samples in these areas.

b. The SAP needs to clearly document why the sample locations proposed on this figure were selected. There appears to be a large amount of area in the burial areas where sampling will not occur, and the rationale for this needs to be provided.

Responses:

a. As described in the SAP, Burial Investigation Areas 1 and 2, shown on Figure 5 with yellow lines, are the previous study area boundaries for AOC 3 and Site 4, respectively, thus they represent previous, not current, conditions. Based on the SI, the Partnering Team agreed to incorporate AOC 3 into Site 4 for one large study area (shown on Figure 5 with a turquoise line). Burial Area 1 and Burial Area 2 represent the results of the 2009 SI test pitting activities, which revealed two distinct buried debris areas. The attached figure depicts all of the SI sample locations, as well as the proposed RI sample locations. Based on the results of the SI, the proposed RI sample locations cover data gaps, and there is adequate coverage within these areas. The Partnering Team agreed this sample density was adequate and no additional sampling within these areas was needed. In addition, the data evaluated in the 2009 SI will also be evaluated in this RI. The proposed sampling rationale is presented in Table 2-12 of the SAP.

b. The proposed sampling locations and laboratory analyses for the Site 4 RI were selected because the CAX Partnering Team (with consultation from their respective technical support) agreed that these sampling locations, combined with those evaluated in the 2009 SI, would fulfill the objectives of the RI (i.e., to adequately characterize Site 4 and evaluate the potential risk to human health and ecological receptors). Regarding the absence of samples within the burial areas, please refer to the response above.

Table 1
Exceedances - Cheatham Pond Surface Sediment - Pond Study
Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Station ID	**Sediment ESV**	Cheatham Pond-SD02		Cheatham Pond-SD03	Cheatham Pond-SD04	Cheatham Pond-SD05	Cheatham Pond-SD06	Cheatham Pond-SD07	Cheatham Pond-SD18	Cheatham Pond-SD19
Sample ID		CP-00-POND-SD02-0300	CP-00-POND-SD02D-0300	CP-00-POND-SD03-0300	CP-00-POND-SD04-0300	CP-00-POND-SD05-0300	CP-00-POND-SD06-0300	CP-00-POND-SD07-0300	CP-00-POND-SD18-0300	CP-00-POND-SD19-0300
Sample Date		03/30/00	03/30/00	03/30/00	03/30/00	03/31/00	03/31/00	03/31/00	03/30/00	03/30/00
Volatile Organic Compounds (UG/KG)										
Acetone	NSV	210 B	110 U	310 B	180 B	65 U	**780**	**1,500**	320 B	540 B
Toluene	4,194	110 U	110 U	85 U	**11 J**	65 U	79 U	**32 J**	82 U	60 U
Semivolatile Organic Compounds (UG/KG)										
bis(2-Ethylhexyl)phthalate	750	220 B	3,600 U	**260 J**	2,600 U	120 B	2,600 U	180 B	2,700 U	2,000 U
Diethylphthalate	630	3,600 U	3,600 U	2,900 U	**370 J**	2,100 U	2,600 U	2,900 U	2,700 U	2,000 U
Nitrobenzene	11,137	3,600 U	3,600 U	2,900 U	2,600 U	2,100 U	2,600 U	**69 J**	2,700 U	2,000 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
No Detections	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides (UG/KG)										
Diquat	NSV	NA	NA	NA	NA	NA	NA	NA	**110,000**	**48,000**
Explosives (UG/KG)										
4-Amino-2,6-dinitrotoluene	145	250 UJ	250 UJ	250 UJ	250 UJ	250 UJ	250 UJ	250 UJ	**96 J**	250 UJ
Inorganics (MG/KG)										
Aluminum	25,500	**8,710**	**9,400**	**10,100**	**12,400**	**10,900**	**12,200**	**7,990**	**10,300**	**4,880**
Arsenic	9.79	**63.6**	**65.3**	**75.2**	**58.5**	**50.3**	**45.4**	**51.1**	**61.6**	**36.5**
Barium	20	**59**	**56.9**	**69.9**	**61.8**	**67.8**	**66**	**57.6**	**56.7**	**46.2**
Beryllium	NSV	**1.2**	1.15 U	**0.53**	0.851 U	**0.4**	**0.54**	**0.29**	**1.2**	**1.1**
Calcium	--	**177,000**	**172,000**	**65,700**	**79,600**	**180,000**	**66,700**	**150,000**	**128,000**	**189,000**
Chromium	43.4	**22.9**	**31.3**	**25.7**	**38**	**21.2**	**26.5**	**17.2**	**29.1**	**9**
Cobalt	50	**8**	**12.7**	**4.5**	**9.4**	**2.7**	**3.8**	**3.4**	**6.3**	**5.4**
Copper	31.6	**19.5**	**19.1**	**15.6**	**20.2**	**11.6**	**13.3**	**12.5**	**20.8**	**10**
Iron	20,000	**24,100**	**23,800**	**35,800**	**32,800**	**20,300**	**28,600**	**16,300**	**22,600**	**11,000**
Lead	35.8	**27**	**27.4**	**31.3**	**29.6**	**23.6**	**29.1**	**26.2**	**29.2**	**13.8**
Magnesium	--	**1,660**	**1,780**	**2,300**	**2,650**	**2,340**	**1,950**	**1,730**	**2,110**	**1,450**
Manganese	460	**221**	**222**	**300**	**292**	**186**	**179**	**129**	**244**	**141**
Mercury	0.18	**0.15**	**0.13**	**0.18**	**0.18**	**0.12**	**0.17**	**0.13**	**0.24**	**0.08**
Nickel	22.7	22.2 U	24.4 U	**13.2**	18.1 U	**9.5**	**10.3**	**7.1**	16.3 U	11.7 U
Potassium	--	**1,600**	**2,090**	**2,080**	**2,440**	**1,510**	**1,870**	**1,490**	**1,670**	**1,020**
Sodium	--	**308**	**329**	**343**	**349**	**344**	**344**	**341**	**519**	**212**
Thallium	NSV	5.90 U	6.72 U	5.61 U	**6.5**	4.02 U	4.95 U	5.34 U	4.51 U	3.23 U
Vanadium	57	**27**	**33**	**36.9**	**41.1**	**30.9**	**39.1**	**28.2**	**35.2**	**17.5**
Zinc	121	**76.9**	**79.2**	**77.1**	**91.1**	**51.4**	**58.3**	**45.6**	**61.1**	**30.4**
Other Parameters (various units)										
pH (PH)	--	**7.6**	**7.7**	**8**	**7.8**	**7.7**	**7.9**	**7.3**	**7.7**	**7.8**
Total organic carbon (TOC) (MG/KG)	--	**43,200**	**60,800**	**108,000**	**29,500**	**46,700**	**78,300**	**12,700**	**96,500**	**68,500**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BJ

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

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

MG/KG - Milligrams per kilogram

PH - pH units

UG/KG - Micrograms per kilogram

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\388429_SITE4_RI_UFPSAP\BURIAL AREAS.MXD BHATHAWAY 8/29/2012 2:51:02 PM

Legend

- Outfall
- Storm Water Line
- Culvert
- Drainage Channels
- Proposed Test Pit Locations
- Burial Investigation Areas
- Water Body
- Site 4 Boundary
- Burial Area Boundary
- Inferred Boundary of Burial Area

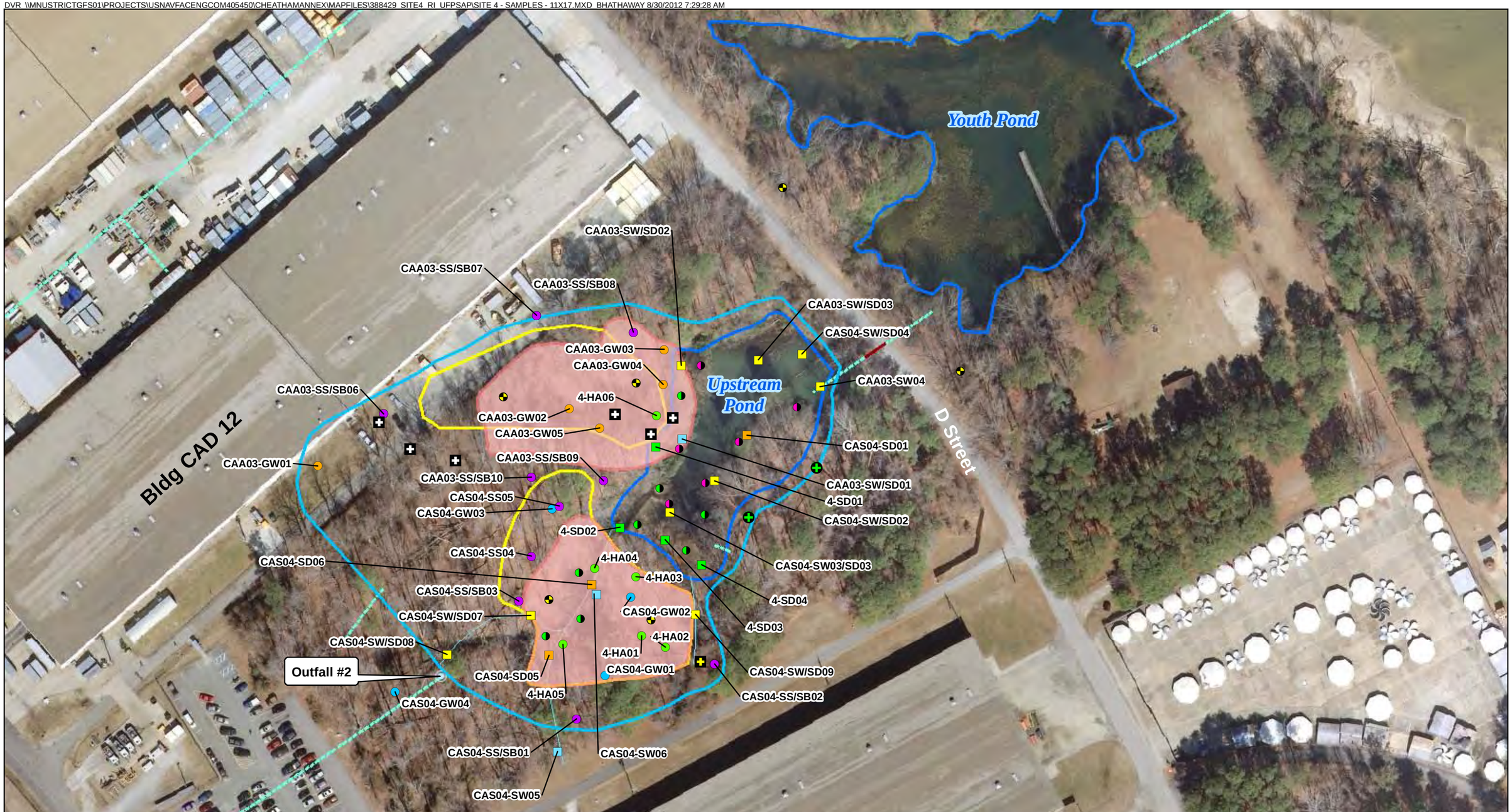
N
W E
S

0 30 60
Feet

Burial Area Map
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\388429_SITE4_RI_UFPSAP\SITE 4 - SAMPLES - 11X17.MXD BHATHAWAY 8/30/2012 7:29:28 AM



Legend

- Proposed Surface Soil Samples
- Proposed Groundwater Sample Location
- Proposed Surface Soil Samples for Hexavalent/Total Chromium
- Proposed Surface/Subsurface Soil Samples
- Proposed Surface Sediment Samples
- Proposed Sediment/Toxicity Samples
- 1999 Soil Sample
- 1999 Sediment Sample Location
- 2009 SI DPT Soil Sample/Well Point Groundwater Sample Location
- 2009 SI Soil Sample Location
- 2009 SI Well Point Groundwater Sample Location
- 2009 SI Surface Water Sample Location
- 2009 SI Sediment Sample Location
- 2009 SI Surface Water/Sediment Sample Location
- Site 4 Study Area
- Burial Areas
- Water Body
- Outfall
- Storm Water Line
- Culvert
- Drainage Channels

N
W E
S

0 50 100
Feet

Sample Locations
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

Regulatory Acceptance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

September 18, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Tier II Sampling and Analysis Plan, Site 4 – Remedial Investigation, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, VA

Mr. Park:

Thank you for your responses to our comments regarding the subject document. Based on the written responses and subsequent meeting discussions the report is acceptable. Please forward a final copy for our records.

Please contact me at 215-814-3394 if you have any questions.

Sincerely,

Susanne Haug, P.E.
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

August 9, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Tier II Sampling and Analysis Plan Response to Comments
Site 4 – Remedial Investigation
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Mr. Park:

The Virginia Department of Environmental Quality (DEQ) has received the *Tier II Sampling and Analysis Plan Response to Comments* (SAP RTCs) for Site 4 at Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The SAP RTCs, prepared by CH2M HILL, was received by the DEQ (electronically) on July 17, 2012.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced SAP RTCs. Subsequent to DEQ's internal review, this office concurs with the proposed text revisions and recommends submittal of the *Final Tier II Sampling and Analysis Plan.*

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: Susanne Haug, EPA

Appendix B
Supporting Documentation – Approval to use Tier II SAP

FW: Questionnaire for Tier II UFP-SAP.docx - Message (Plain Text)

Message

Reply | Reply to All | Forward | Delete | Move to Folder | Create Rule | Other Actions | Block Sender | Safe Lists | Not Junk | Categorize | Follow Up | Mark as Unread | Find | Related | Select | Send to OneNote

Respond | Actions | Junk E-mail | Options | Find | OneNote

You forwarded this message on 9/22/2011 1:25 PM.
This message was sent with High importance.
Extra line breaks in this message were removed.

From: Dodson, Anita/VBO
Sent: Thu 9/22/2011 1:13 PM
To: Sawyer, Stephanie/VBO
Cc:
Subject: FW: Questionnaire for Tier II UFP-SAP.docx

Message | Questionnaire for Tier II UFP-SAP.docx

Hi Stephanie,

Here's email documentation from Jan giving her approval to use the Tier II as long as the team is on board. I've included the original email that was sent to Jan which has the questionnaire attached.

Thanks and let me know if you need anything else, Anita

-----Original Message-----
From: Nielsen, Janice L CIV NAVFAC LANT, EV [mailto:janice.nielsen@navy.mil]
Sent: Thursday, September 22, 2011 1:07 PM
To: Dodson, Anita/VBO
Cc: Bowers, Kenneth A CIV NAVFAC LANT, EV; Tucker, Jonathan P CIV NAVFAC LANT, EV
Subject: RE: Questionnaire for Tier II UFP-SAP.docx

If the team is on board I don't have a problem with the Tier II approach being used for this project.
Jan

Jan Nielsen
Technical Support
NAVFAC LANT
757.322.8339

-----Original Message-----
From: Anita.Dodson@CH2M.com [mailto:Anita.Dodson@CH2M.com]
Sent: Wednesday, September 21, 2011 10:00
To: Nielsen, Janice L CIV NAVFAC LANT, EV
Subject: Questionnaire for Tier II UFP-SAP.docx

Hi Jan,

Attached is a request to use the Tier II UFP-SAP format. Please review and let me know if you think this project is a good candidate for the Tier II format.

Feel free to call if you'd like to discuss.

Thanks,

Anita Dodson
Chemist

CH2M HILL
5700 Cleveland Street, Suite 101
Virginia Beach, VA, 23462

Address

Questionnaire for Tier II UFP-SAP.docx - Message (HTML)

Message

Reply | Reply to All | Forward | Delete | Move to Folder | Create Rule | Other Actions | Block Sender | Safe Lists | Not Junk | Categorize | Follow Up | Mark as Unread | Find | Related | Select | Send to OneNote

Respond | Actions | Junk E-mail | Options | Find | OneNote

From: Dodson, Anita/VBO

Sent: Wed 9/21/2011 10:00 AM

To: Nielsen, Janice L CIV NAVFAC LANT, EV

Cc:

Subject: Questionnaire for Tier II UFP-SAP.docx

Message | Questionnaire for Tier II UFP-SAP.docx

Hi Jan,

Attached is a request to use the Tier II UFP-SAP format. Please review and let me know if you think this project is a good candidate for the Tier II format.

Feel free to call if you'd like to discuss.

Thanks,

Anita Dodson
Chemist

CH2M HILL
5700 Cleveland Street, Suite 101
Virginia Beach, VA, 23462
Direct:: 757-671-6218
Fax: 757-497-6885
www.ch2m.com

Solutions without Boundaries

Questionnaire for Tier II UFP-SAP (2).docx - Microsoft Word

Questionnaire for Tier II UFP-SAP

Please fill out this questionnaire the best you can and return to the Navy CLEAN program chemist, Anita Dodson.

- What base and CTO is this request associated with?
  - CAX CTO 055
- Is the project going to be conducted at an NPL site or other installation where US EPA is a regulatory partner?
  - Yes
- Have there been any disputes with regulators at this site?
  - No
- Is it likely that this site might be the subject of litigation in the future (e.g. known PRP issues, potential cancer clusters, environmental justice concerns, media attention, etc.)?
  - No
- List any stakeholder issues related to ER that have arisen at the installation.
  - None identified at this time
- Approximately how many samples will be collected?
  - 18 sediment, 15 soil, 6 groundwater, and up to 17 tissue samples
- Approximately how many matrices?
  - Soil (surface and subsurface), groundwater, sediment, and tissue samples
- Approximately how many analytical methods will be used?
  - Groundwater samples will be analyzed for VOCs, PAHs, total/dissolved metals (incl. mercury) and natural attenuation parameters, soil/sediment will be analyzed for PAHs, PCBs, and metals (incl. mercury), tissue samples will be analyzed for PCBs and metals (incl. mercury)
- Will the project involve multi-increment sampling?
  - No
- Will any participants require specialized training?
  - None identified at this time
- Will secondary data or data limitations play a role in developing or implementing the SAP?
  - Data presented in the 2010 SI Report was used in determining proposed RI sampling locations and will be used in completing the RI Report; there are no known limitations to this data.
- Will any field screening methods be used? If yes, please describe.
  - Aside from collecting water quality parameters with a Horiba (pH, conductivity, DO, ORP, and turbidity) and confirming the Horiba DO readings with CHEMets, no other field screening methods are proposed.
- Will any unusual analyses or non-standard methods be used?
  - Split toxicity tests will be conducted on 8 sediment samples to support an associated BERA.

Attachment A-1
Additional Sample Analysis Detail Table

Table A-9A

Reference Limits and Evaluation Table

Matrix: Groundwater

Analytical Group: VOCs

Analyte	CAS Number	Adjusted Tapwater RSL[1] (Nov 2012) (µg/L)	MCL[1] (µg /L)	PQL Goal[2] (µg/L)	Laboratory-Specific (µg/L)			LCS, MS, and MSD %R Limits[3]		
					LOQ	LOD	DL	LCL	UCL	%RPD
Tetrachloroethene	127-18-4	3.5	5	1	1	0.5	0.4	45	150	20

Notes:

[1] Refer to **Section 2.3.4** for a discussion of the PALs.

[2] PQL goal was set to 1 µg/L, since this was the PCE concentration that prompted UESPA concern based on the 2009 SI groundwater analytical results. This value is equal to the LOQ and is lower than the RSL and MCL.

[3] DoD QSM v.4.2 is the basis for LCS and MS/MSD limits: values are bolded to indicate instances where statistical in-house limits are used.

Attachment C-1
Additional Field Standard Operating Procedure

STANDARD OPERATING PROCEDURE

Direct-Push Groundwater Sample Collection

I. Purpose

To provide a general guideline for the collection of groundwater samples using direct-push (e.g., Geoprobe®) sampling methods.

II. Scope

Standard direct-push (e.g., Geoprobe®) groundwater sampling methods.

III. Equipment and Materials

- Truck-mounted hydraulic percussion hammer
- Direct-push (e.g., Geoprobe®) sampling rods and slotted lead rod
- Polyethylene sampling tubing and stainless steel foot valve
- Pre-cleaned sample containers
- Clean latex or surgical gloves

IV. Procedures and Guidelines

1. Decontaminate slotted lead rod and other downhole equipment in accordance with SOP *Decontamination of Personnel and Equipment*.

2. Drive slotted steel lead rod to the desired sampling depth using the truck-mounted hydraulic percussion hammer.

3. Insert the stainless steel foot valve into the end of the polyethylene sampling tubing and insert tubing through the rods or insert peristaltic pump tubing through rods, depending on which method is used.

4. Purge groundwater from screened interval prior to sampling to clear some of the sediment from the slotted screen. Amount of groundwater purged will vary dependent on the amount of fine material in the sampling interval and will be determined in the field on a case by case basis.

5. Fill all sample containers, beginning with the containers for VOC analysis.

6. Remove polyethylene sampling tubing from the rods. Remove the foot valve and discard polyethylene tubing.

7. Backfill borehole at each sampling location with grout or bentonite and repair the surface with like material (bentonite, asphalt patch, concrete, etc.), as required.

V. Key Checks and Items

- Verify that the hydraulic percussion hammer is clean and in proper working order.
- Ensure that the direct-push operator thoroughly completes the decontamination process between sampling locations.
- Ensure that the slotted lead rod has been inserted to the desired sampling depth.
- Verify that the borehole made during sampling activities has been properly backfilled.

Attachment D-1
Current Department of Defense Environmental Laboratories Accreditation Program Accreditation Letter

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: February 1, 2016

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; EPA 8081B	4, 4`-DDD
GC/ECD	EPA 608; EPA 8081B	4, 4`-DDE
GC/ECD	EPA 608; EPA 8081B	4, 4`-DDT
GC/ECD	EPA 608; EPA 8081B	Aldrin
GC/ECD	EPA 608; EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane
GC/ECD	EPA 608; EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Cis-Nonaclor
GC/ECD	EPA 608; EPA 8081B	Chlordane (tech.)
GC/ECD	EPA 608; EPA 8081B	delta-BHC
GC/ECD	EPA 608; EPA 8081B	Dieldrin
GC/ECD	EPA 608; EPA 8081B	Endosulfan I
GC/ECD	EPA 608; EPA 8081B	Endosulfan II

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/ECD	EPA 608; EPA 8081B	Endosulfan sulfate
GC/ECD	EPA 608; EPA 8081B	Endrin
GC/ECD	EPA 608; 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 608; EPA 8081B	Heptachlor
GC/ECD	EPA 608; EPA 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; EPA 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	EPA 8081B	trans-Nonachlor
GC/ECD	EPA 608; EPA 8082A	Aroclor-1016 (PCB-1016)
GC/ECD	EPA 608; EPA 8082A	Aroclor-1221 (PCB-1221)
GC/ECD	EPA 608; EPA 8082A	Aroclor-1232 (PCB-1232)
GC/ECD	EPA 608; EPA 8082A	Aroclor-1242 (PCB-1242)
GC/ECD	EPA 608; EPA 8082A	Aroclor-1248 (PCB-1248)
GC/ECD	EPA 608; EPA 8082A	Aroclor-1254 (PCB-1254)
GC/ECD	EPA 608; 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)
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; EPA 504	1, 2-Dibromoethane (EDB)
GC/ECD	EPA 8011; EPA 504	1, 2-Dibromo-3-chloropropane
GC/FID	RSK-175	Methane Ethane Ethene
GC/MS	EPA 8260B/C; EPA 524.2	1, 1, 1, 2-Tetrachloroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 1, 1-Trichloroethane
GC/MS	EPA 624; 8260B/C; EPA 524.2	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA 8260B/C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 1, 2-Trichloroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 1-Dichloroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 1-Dichloroethene
GC/MS	EPA 8260B/C; EPA 524.2	1, 1-Dichloropropene
GC/MS	EPA 8260B/C; EPA 524.2	1, 2, 3-Trichlorobenzene
GC/MS	EPA 8260B/C; EPA 524.2	1, 2, 3-Trichloropropane
GC/MS	EPA 8260B/C	1,2,3-Trimethylbenzene
GC/MS	EPA 8260B/C; EPA 524.2	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8260B/C; EPA 524.2	1, 2, 4-Trimethylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C; EPA 524.2	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B/C; EPA 524.2	1, 2-Dibromoethane (EDB)
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 2-Dichlorobenzene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 2-Dichloroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 2-Dichloropropane
GC/MS	EPA 8260B/C	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B/C; EPA 524.2	1, 3, 5-Trimethylbenzene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	1, 3-Dichlorobenzene
GC/MS	EPA 8260B/C; EPA 524.2	1, 3-Dichloropropane
GC/MS	EPA 624; EPA 8260B/C; EPA 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; EPA 524.2	2, 2-Dichloropropane
GC/MS	EPA 8260B/C; EPA 524.2	2-Butanone
GC/MS	EPA 624; EPA 8260B/C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B/C; EPA 524.2	2-Chlorotoluene
GC/MS	EPA 8260B/C; EPA 524.2	2-Hexanone
GC/MS	EPA 8260B/C; EPA 524.2	4-Chlorotoluene
GC/MS	EPA 8260B/C; EPA 524.2	4-Methyl-2-pentanone
GC/MS	EPA 8260B/C; EPA 524.2	Acetone
GC/MS	EPA 8260B/C	Acetonitrile
GC/MS	EPA 624; EPA 8260B/C	Acrolein
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Acrylonitrile
GC/MS	EPA 8260B/C; EPA 524.2	Allyl chloride
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Benzene
GC/MS	EPA 8260B/C	Benzyl chloride
GC/MS	EPA 8260B/C; EPA 524.2	Bromobenzene
GC/MS	EPA 8260B/C; EPA 524.2	Bromochloromethane

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Bromodichloromethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Bromoform
GC/MS	EPA 8260B/C; EPA 524.2	Carbon disulfide
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Carbon tetrachloride
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Chlorobenzene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Chloroethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Chloroform
GC/MS	EPA 8260B/C	Chloroprene
GC/MS	EPA 8260B/C; EPA 524.2	cis-1, 2-Dichloroethene
GC/MS	EPA 624; EPA 8260B/C; EPA 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; EPA 8260B/C; EPA 524.2	Dibromochloromethane
GC/MS	EPA 8260B/C; EPA 524.2	Dibromomethane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Dichlorodifluoromethane
GC/MS	EPA 8260B/C; EPA 524.2	Diethyl ether
GC/MS	EPA 8260B/C	Di-isopropylether
GC/MS	EPA 8260B/C; EPA 524.2	Ethyl methacrylate
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Ethylbenzene
GC/MS	EPA 8260B/C	Ethyl-t-butylether
GC/MS	EPA 8260B/C; EPA 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; EPA 524.2	Isopropyl benzene
GC/MS	EPA 8260B/C; EPA 524.2	m p-xylenes
GC/MS	EPA 8260B/C	Methyl acetate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C; EPA 524.2	Methacrylonitrile
GC/MS	EPA 624 / 8260B,C	Methyl bromide (Bromomethane)
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B/C; EPA 524.2	Methyl methacrylate
GC/MS	EPA 8260B/C; EPA 524.2	Methyl tert-butyl ether
GC/MS	EPA 8260B/C	Methylcyclohexane
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Methylene chloride
GC/MS	EPA 8260B/C; EPA 524.2	Naphthalene
GC/MS	EPA 8260B/C; EPA 524.2	n-Butylbenzene
GC/MS	EPA 8260B/C; EPA 524.2	n-Propylbenzene
GC/MS	EPA 8260B/C; EPA 524.2	o-Xylene
GC/MS	EPA 8260B/C	Pentachloroethane
GC/MS	EPA 8260B/C; EPA 524.2	p-Isopropyltoluene
GC/MS	EPA 8260B/C; EPA 524.2	Propionitrile
GC/MS	EPA 8260B/C; EPA 524.2	sec-butylbenzene
GC/MS	EPA 8260B/C; EPA 524.2	Styrene
GC/MS	EPA 8260B/C	t-Amylmethylether
GC/MS	EPA 8260B/C; EPA 524.2	tert-Butyl alcohol
GC/MS	EPA 8260B/C	tert-Butylbenzene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Tetrachloroethene (Perchloroethylene)
GC/MS	EPA 8260B/C; EPA 524.2	Tetrahydrofuran
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Toluene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	trans-1, 2-Dichloroethylene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	trans-1, 3-Dichloropropylene
GC/MS	EPA 8260B/C; EPA 524.2	trans-1, 4-Dichloro-2-butuene
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Trichloroethene (Trichloroethylene)
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Trichlorofluoromethane
GC/MS	EPA 8260B/C	Vinyl acetate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 624; EPA 8260B/C; EPA 524.2	Vinyl chloride
GC/MS	EPA 624 / 8260B,C	Xylene
GC/MS	EPA 8260B/C SIM	1,1,1,2-Tetrachloroethane
GC/MS	8260B, C SIM	1,1,1-Trichloroethane
GC/MS	EPA 8260B/C SIM	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/C SIM	1, 1, 2-Trichloroethane
GC/MS	EPA 8260B/C SIM	1,2,3-Trichloropropane
GC/MS	EPA 8260B/C SIM	1,1-Dichloroethane
GC/MS	EPA 8260B/C SIM	1,1-Dichloroethene
GC/MS	EPA 8260B/C SIM	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/C SIM	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/C SIM	1,2-Dibromo-3-chloropropane
GC/MS	EPA 8260B/C SIM	1,2-Dibromoethane
GC/MS	EPA 8260B/C SIM	1,2-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	1,2-Dichloroethane
GC/MS	EPA 8260B/C SIM	1,2-Dichloropropane
GC/MS	EPA 8260B/C SIM	1,3-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	1,3-Dichloropropane
GC/MS	EPA 8260B/C SIM	1,4-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	2-Hexanone
GC/MS	EPA 8260B/C SIM	4-Methyl-2-pentanone
GC/MS	EPA 8260B/C SIM	Benzene
GC/MS	EPA 8260B/C SIM	Bromodichloromethane
GC/MS	EPA 8260B/C SIM	Carbon Tetrachloride
GC/MS	EPA 8260B/C SIM	Chloroform
GC/MS	EPA 8260B/C SIM	Chloromethane
GC/MS	EPA 8260B/C SIM	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/C SIM	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/C SIM	Dibromochloromethane
GC/MS	EPA 8260B/C SIM	Ethylbenzene
GC/MS	EPA 8260B/C SIM	Isopropylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C SIM	Hexachlorobutadiene
GC/MS	EPA 8260B/C SIM	Methylcyclohexane
GC/MS	EPA 8260B/C SIM	m,p-Xylene
GC/MS	EPA 8260B/C SIM	o-Xylene
GC/MS	EPA 8260B/C SIM	Tetrachloroethene
GC/MS	EPA 8260B/C SIM	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/C SIM	Trans-1,3-Dichloropropene
GC/MS	EPA 8260B/C SIM	Trichloroethene
GC/MS	EPA 8260B/C SIM	Trichlorofluoromethane
GC/MS	EPA 8260B/C SIM	Vinyl Chloride
GC/MS	EPA 8260B/C SIM	Xylenes (total)
GC/MS	EPA 8270C/D	1, 2, 4, 5-Tetrachlorobenzene
GC/MS	EPA 625; EPA 8270C/D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 625; EPA 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; EPA 8270C/D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C/D	1, 3-Dinitrobenzene
GC/MS	EPA 625; 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-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; EPA 8270C/D	2, 4, 6-Trichlorophenol
GC/MS	EPA 625; EPA 8270C/D	2, 4-Dichlorophenol
GC/MS	EPA 625; EPA 8270C/D	2, 4-Dimethylphenol
GC/MS	EPA 625; EPA 8270C/D	2, 4-Dinitrophenol

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 625; EPA 8270C/D	2, 4-Dinitrotoluene (2, 4-DNT)
GC/MS	EPA 8270C/D	2, 6-Dichlorophenol
GC/MS	EPA 625; EPA 8270C/D	2, 6-Dinitrotoluene (2, 6-DNT)
GC/MS	EPA 8270C/D	2-Acetylaminofluorene
GC/MS	EPA 625; EPA 8270C/D	2-Chloronaphthalene
GC/MS	EPA 625; EPA 8270C/D	2-Chlorophenol
GC/MS	EPA 625; 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 625; EPA 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; EPA 8270C/D	4-Bromophenyl phenyl ether
GC/MS	EPA 625; EPA 8270C/D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D	4-Chloroaniline
GC/MS	EPA 625; EPA 8270C/D	4-Chlorophenyl phenylether
GC/MS	EPA 8270C/D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270C/D	3, 4-Methylphenol
GC/MS	EPA 8270C/D	4-Nitroaniline
GC/MS	EPA 625; 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-Dimethylbenz(a)anthracene
GC/MS	EPA 8270C/D	a a-Dimethylphenethylamine
GC/MS	EPA 625; EPA 8270C/D	Acenaphthene
GC/MS	EPA 625; EPA 8270C/D	Acenaphthylene
GC/MS	EPA 8270C/D	Acetophenone

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D	Aniline
GC/MS	EPA 625; 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 625; EPA 8270C/D	Benzidine
GC/MS	EPA 625; EPA 8270C/D	Benzo(a)anthracene
GC/MS	EPA 625; EPA 8270C/D	Benzo(a)pyrene
GC/MS	EPA 625; EPA 8270C/D	Benzo(b)fluoranthene
GC/MS	EPA 625; EPA 8270C/D	Benzo(g h i)perylene
GC/MS	EPA 625; 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	1,1-Biphenyl
GC/MS	EPA 625; EPA 8270C/D	bis(2-Chloroethoxy)methane
GC/MS	EPA 625; EPA 8270C/D	bis(2-Chloroethyl) ether
GC/MS	EPA 625; EPA 8270C/D	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane)
GC/MS	EPA 625; EPA 8270C/D	bis(2-Ethylhexyl)adipate
GC/MS	EPA 625; EPA 8270C/D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 625; 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 625; EPA 8270C/D	Chrysene
GC/MS	EPA 8270C/D	Diallate
GC/MS	EPA 8270C/D	Dibenzo(a,j)acridine
GC/MS	EPA 625; EPA 8270C/D	Dibenz(a h)anthracene
GC/MS	EPA 8270C/D	Dibenzofuran
GC/MS	EPA 8270C/D	Diethyladipate
GC/MS	EPA 625; EPA 8270C/D	Diethyl phthalate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D	Dimethoate
GC/MS	EPA 625; EPA 8270C/D	Dimethyl phthalate
GC/MS	EPA 625; EPA 8270C/D	Di-n-butyl phthalate
GC/MS	EPA 625; EPA 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; EPA 8270C/D	Fluoranthene
GC/MS	EPA 625; EPA 8270C/D	Fluorene
GC/MS	EPA 625; EPA 8270C/D	Hexachlorobenzene
GC/MS	EPA 625; EPA 8270C/D	Hexachlorobutadiene
GC/MS	EPA 625; EPA 8270C/D	Hexachlorocyclopentadiene
GC/MS	EPA 625; EPA 8270C/D	Hexachloroethane
GC/MS	EPA 8270C/D	Hexachlorophene
GC/MS	EPA 8270C/D	Hexachloropropene
GC/MS	EPA 625; EPA 8270C/D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C/D	Isodrin
GC/MS	EPA 625; 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	Methy methanesulfonate
GC/MS	EPA 8270C/D	Methyl parathion
GC/MS	EPA 625; EPA 8270C/D	Naphthalene
GC/MS	EPA 625; EPA 8270C/D	Nitrobenzene
GC/MS	EPA 8270C/D	Nitroquinoline-1-oxide
GC/MS	EPA 8270C/D	n-Nitrosodiethylamine
GC/MS	EPA 625; EPA 8270C/D	n-Nitrosodimethylamine

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D	n-Nitroso-di-n-butylamine
GC/MS	EPA 625; EPA 8270C/D	n-Nitrosodi-n-propylamine
GC/MS	EPA 625; 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-Triethyl phosphorothioate
GC/MS	EPA 8270C/D	o,o-Diethyl o-2pyrazinyl phosphorothioate
GC/MS	EPA 8270C/D	o-Toluidine
GC/MS	EPA 8270C/D	Pentachlorobenzene
GC/MS	EPA 8270C/D	Pentachloronitrobenzene
GC/MS	EPA 625; EPA 8270C/D	Pentachlorophenol
GC/MS	EPA 8270C/D	Phenacetin
GC/MS	EPA 625; EPA 8270C/D	Phenanthrene
GC/MS	EPA 625; EPA 8270C/D	Phenol
GC/MS	EPA 8270C/D	Phorate
GC/MS	EPA 8270C/D	Pronamide
GC/MS	EPA 625; EPA 8270C/D	Pyrene
GC/MS	EPA 8270C/D	Pyridine
GC/MS	EPA 8270C/D	Safrole
GC/MS	EPA 8270C/D	Sulfotepp
GC/MS	EPA 8270C/D	Thionazin
GC/MS	EPA 625; EPA 8270C/D	3, 3’-Dichlorobenzidine
GC/MS	EPA 8270C/D	3, 3’-Dimethylbenzidine
GC/MS	EPA 8270C/D SIM	1,1'-Biphenyl
GC/MS	EPA 8270C/D SIM	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C/D SIM	1,4-Dioxane
GC/MS	EPA 8270C/D SIM	1-Methylnaphthalene
GC/MS	EPA 8270C/D SIM	2,2'-Oxybis(1-chloropropane
GC/MS	EPA 8270C/D SIM	2,3,4,6-Tetrachlorophenol

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D SIM	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D SIM	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/D SIM	2,4-Dichlorophenol
GC/MS	EPA 8270C/D SIM	2,4-Dimethylphenol
GC/MS	EPA 8270C/D SIM	2,4-Dinitrophenol
GC/MS	EPA 8270C/D SIM	2,4-Dinitrotoluene
GC/MS	EPA 8270C/D SIM	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D SIM	2-Chloronaphthalene
GC/MS	EPA 8270C/D SIM	2-Chlorophenol
GC/MS	EPA 8270C/D SIM	2-Methylnaphthalene
GC/MS	EPA 8270C/D SIM	2-Methylphenol
GC/MS	EPA 8270C/D SIM	2-Nitroaniline
GC/MS	EPA 8270C/D SIM	2-Nitrophenol
GC/MS	EPA 8270C/D SIM	3&4-Methylphenol
GC/MS	EPA 8270C/D SIM	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/D SIM	3-Nitroaniline
GC/MS	EPA 8270C/D SIM	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/D SIM	4-Bromophenyl-phenylether
GC/MS	EPA 8270C/D SIM	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D SIM	4-Chloroaniline
GC/MS	EPA 8270C/D SIM	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C/D SIM	4-Nitroaniline
GC/MS	EPA 8270C/D SIM	4-Nitrophenol
GC/MS	EPA 8270C/D SIM	Acenaphthene
GC/MS	EPA 8270C/D SIM	Acenaphthylene
GC/MS	EPA 8270C/D SIM	Acetophenone
GC/MS	EPA 8270C/D SIM	Anthracene
GC/MS	EPA 8270C/D SIM	Atrazine
GC/MS	EPA 8270C/D SIM	Benzaldehyde
GC/MS	EPA 8270C/D SIM	Benzo(a)anthracene
GC/MS	EPA 8270C/D SIM	Benzo(a)pyrene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D SIM	Benzo(k)fluoranthene
GC/MS	EPA 8270C/D SIM	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/D SIM	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/D SIM	Bis(2-ethylhexyl)phthalate
GC/MS	EPA 8270C/D SIM	Butylbenzylphthalate
GC/MS	EPA 8270C/D SIM	Caprolactam
GC/MS	EPA 8270C/D SIM	Carbazole
GC/MS	EPA 8270C/D SIM	Chrysene
GC/MS	EPA 8270C/D SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C/D SIM	Dibenzofuran
GC/MS	EPA 8270C/D SIM	Diethylphthalate
GC/MS	EPA 8270C/D SIM	Dimethyl phthalate
GC/MS	EPA 8270C/D SIM	Di-n-butylphthalate
GC/MS	EPA 8270C/D SIM	Di-n-octylphthalate
GC/MS	EPA 8270C/D SIM	Fluoranthene
GC/MS	EPA 8270C/D SIM	Fluorene
GC/MS	EPA 8270C/D SIM	Hexachlorobenzene
GC/MS	EPA 8270C/D SIM	Hexachlorobutadiene
GC/MS	EPA 8270C/D SIM	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/D SIM	Hexachloroethane
GC/MS	EPA 8270C/D SIM	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C/D SIM	Isophorone
GC/MS	EPA 8270C/D SIM	Naphthalene
GC/MS	EPA 8270C/D SIM	Nitrobenzene
GC/MS	EPA 8270C/D SIM	n-Nitroso-di-n-propylamine
GC/MS	EPA 8270C/D SIM	n-Nitrosodiphenylamine
GC/MS	EPA 8270C/D SIM	Pentachlorophenol
GC/MS	EPA 8270C/D SIM	Phenanthrene
GC/MS	EPA 8270C/D SIM	Phenol

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D SIM	Pyrene
HPLC/UV	EPA 8330A/B	1, 3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A/B	1, 3-Dinitrobenzene
HPLC/UV	EPA 8330A/B	2, 4, 6-Trinitrotoluene
HPLC/UV	EPA 8330A/B	2, 4-Dinitrotoluene
HPLC/UV	EPA 8330A/B	2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/B	2-Amino-4, 6 -Dinitrotoluene
HPLC/UV	EPA 8330A/B	2-Nitrotoluene
HPLC/UV	EPA 8330A/B	3-Nitrotoluene
HPLC/UV	EPA 8330A/B	3,5-Dinitroaniline
HPLC/UV	EPA 8330A/B	4-Amino-2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/B	4-Nitrotoluene
HPLC/UV	EPA 8330A/B	Ethylene glycol dinitrate (EGDN)
HPLC/UV	EPA 8330A/B	Hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	EPA 8330A/B	Nitrobenzene
HPLC/UV	EPA 8330A MOD	Nitroglycerin
HPLC/UV	EPA 8330B	Nitroglycerin
HPLC/UV	EPA 8330A/B	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	EPA 8330A/B	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	EPA 8330A/B	Tetryl
CVAA	EPA 245.1; EPA 7470A	Mercury
CVAF	EPA 1631E	Low Level Mercury
ICP/AES	EPA 200.7; EPA 6010B/C	Aluminum
ICP/AES	EPA 200.7; EPA 6010B/C	Antimony
ICP/AES	EPA 200.7; EPA 6010B/C	Arsenic
ICP/AES	EPA 200.7; EPA 6010B/C	Barium
ICP/AES	EPA 200.7; EPA 6010B/C	Beryllium
ICP/AES	EPA 200.7; EPA 6010B/C	Boron
ICP/AES	EPA 200.7; EPA 6010B/C	Cadmium
ICP/AES	EPA 200.7; EPA 6010B/C	Calcium
ICP/AES	EPA 200.7; EPA 6010B/C	Chromium

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP/AES	EPA 200.7; EPA 6010B/C	Cobalt
ICP/AES	EPA 200.7; EPA 6010B/C	Copper
ICP/AES	EPA 200.7; EPA 6010B/C	Iron
ICP/AES	EPA 200.7; EPA 6010B/C	Lead
ICP/AES	EPA 200.7; EPA 6010B/C	Magnesium
ICP/AES	EPA 200.7; EPA 6010B/C	Manganese
ICP/AES	EPA 200.7; EPA 6010B/C	Molybdenum
ICP/AES	EPA 200.7; EPA 6010B/C	Nickel
ICP/AES	EPA 200.7; EPA 6010B/C	Potassium
ICP/AES	EPA 200.7; EPA 6010B/C	Selenium
ICP/AES	EPA 200.7; EPA 6010B/C	Silicon
ICP/AES	EPA 200.7; EPA 6010B/C	Silver
ICP/AES	EPA 200.7; EPA 6010B/C	Sodium
ICP/AES	EPA 6010B/C	Strontium
ICP/AES	EPA 200.7; EPA 6010B/C	Thallium
ICP/AES	EPA 200.7; EPA 6010B/C	Tin
ICP/AES	EPA 200.7; EPA 6010B/C	Titanium
ICP/AES	EPA 200.7; EPA 6010B/C	Vanadium
ICP/AES	EPA 200.7; EPA 6010B/C	Zinc
ICP/MS	EPA 200.8; EPA 6020A	Aluminum
ICP/MS	EPA 200.8; EPA 6020A	Antimony
ICP/MS	EPA 200.8; EPA 6020A	Arsenic
ICP/MS	EPA 200.8; EPA 6020A	Barium
ICP/MS	EPA 200.8; EPA 6020A	Beryllium
ICP/MS	EPA 200.8; EPA 6020A	Boron
ICP/MS	EPA 200.8; EPA 6020A	Cadmium
ICP/MS	EPA 200.8; EPA 6020A	Calcium
ICP/MS	EPA 200.8; EPA 6020A	Chromium
ICP/MS	EPA 200.8; EPA 6020A	Cobalt
ICP/MS	EPA 200.8; EPA 6020A	Copper
ICP/MS	EPA 200.8; EPA 6020A	Iron

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP/MS	EPA 200.8; EPA 6020A	Lead
ICP/MS	EPA 200.8; EPA 6020A	Magnesium
ICP/MS	EPA 200.8; EPA 6020A	Manganese
ICP/MS	EPA 200.8; EPA 6020A	Molybdenum
ICP/MS	EPA 200.8; EPA 6020A	Nickel
ICP/MS	EPA 200.8; EPA 6020A	Potassium
ICP/MS	EPA 200.8; EPA 6020A	Selenium
ICP/MS	EPA 200.8; EPA 6020A	Silicon
ICP/MS	EPA 200.8; EPA 6020A	Silver
ICP/MS	EPA 200.8; EPA 6020A	Sodium
ICP/MS	EPA 6020A	Strontium
ICP/MS	EPA 200.8; EPA 6020A	Thallium
ICP/MS	EPA 200.8; EPA 6020A	Tin
ICP/MS	EPA 200.8; EPA 6020A	Titanium
ICP/MS	EPA 200.8; EPA 6020A	Tungsten
ICP/MS	EPA 200.8	Uranium
ICP/MS	EPA 200.8; EPA 6020A	Vanadium
ICP/MS	EPA 200.8; EPA 6020A	Zinc
IC	EPA 300.0; EPA 9056A	Bromide
IC	EPA 300.0; EPA 9056A	Chloride
IC	EPA 300.0; EPA 9056A	Fluoride
IC	EPA 300.0; EPA 9056A	Nitrate as N
IC	EPA 300.0; EPA 9056A	Nitrite as N
IC	EPA 300.0; EPA 9056A	Nitrate + Nitrite
IC	EPA 300.0; EPA 9056A	Orthophosphate as P
IC	EPA 300.0; EPA 9056A	Sulfate
IC	SOP CA-776	Lactic Acid
IC	SOP CA-776	Acetic Acid
IC	SOP CA-776	Propionic Acid
IC	SOP CA-776	Formic Acid
IC	SOP CA-776	Butyric Acid

Non-Potable Water		
Technology	**Method**	**Analyte**
IC	SOP CA-776	Pyruvic Acid
IC	SOP CA-776	i-Pentanoic Acid
IC	SOP CA-776	Pentanoic Acid
IC	SOP CA-776	i-Hexanoic Acid
IC	SOP CA-776	Hexanoic Acid
Titration	EPA 310.1; SM 2320B	Alkalinity
Caculation	SM 2340B	Hardness
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	EPA SW-846 Chapter 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

Non-Potable Water		
Technology	**Method**	**Analyte**
UV/VIS	EPA 365.4	Phosphorus total
UV/VIS	EPA 821/R-91-100	AVS-SEM
UV/VIS	EPA 410.4	COD
UV/VIS	EPA 420.1; EPA 9065	Total Phenolics
UV/VIS	SM 4500Cl G	Total Residual Chlorine
UV/VIS	SM 5540C	MBAS
UV/VIS	EPA 7196A; SM 3500-Cr D	Chromium VI
UV/VIS	EPA 9012B; EPA 335.4	Total Cyanide
UV/VIS	EPA 9251; SM 4500Cl E	Chloride
UV/VIS	EPA SW-846 Chapter 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	EPA 8081B	2,4`-DDD
GC/ECD	EPA 8081B	2,4`-DDE
GC/ECD	EPA 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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane
GC/ECD	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 608; EPA 8081B	Chlordane (tech.)
GC/ECD	EPA 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	EPA 8081B	Hexachlorobenzene
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	EPA 8081B	Mirex
GC/ECD	EPA 8081B	Oxychlordane
GC/ECD	EPA 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	EPA 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)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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)
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)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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	MA DEP EPH EPA 3546	Extractable Petroleum Hydrocarbons Microwave Extraction Preparation
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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	1-Chlorohexane
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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)
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C SIM	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/C SIM	1,1,1-Trichloroethane
GC/MS	EPA 8260B/C SIM	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/C SIM	1, 1, 2-Trichloroethane
GC/MS	EPA 8260B/C SIM	1,2,3-Trichloropropane
GC/MS	EPA 8260B/C SIM	1,1-Dichloroethane
GC/MS	EPA 8260B/C SIM	1,1-Dichloroethene
GC/MS	EPA 8260B/C SIM	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/C SIM	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/C SIM	1,2-Dibromo-3-chloropropane
GC/MS	EPA 8260B/C SIM	1,2-Dibromoethane
GC/MS	EPA 8260B/C SIM	1,2-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	1,2-Dichloroethane
GC/MS	EPA 8260B/C SIM	1,2-Dichloropropane
GC/MS	EPA 8260B/C SIM	1,3-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	1,3-Dichloropropane
GC/MS	EPA 8260B/C SIM	1,4-Dichlorobenzene
GC/MS	EPA 8260B/C SIM	2-Hexanone
GC/MS	EPA 8260B/C SIM	4-Methyl-2-pentanone
GC/MS	EPA 8260B/C SIM	Benzene
GC/MS	EPA 8260B/C SIM	Bromodichloromethane
GC/MS	EPA 8260B/C SIM	Carbon Tetrachloride
GC/MS	EPA 8260B/C SIM	Chloroform
GC/MS	EPA 8260B/C SIM	Chloromethane
GC/MS	EPA 8260B/C SIM	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/C SIM	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/C SIM	Dibromochloromethane
GC/MS	EPA 8260B/C SIM	Ethylbenzene
GC/MS	EPA 8260B/C SIM	Isopropylbenzene
GC/MS	EPA 8260B/C SIM	Hexachlorobutadiene
GC/MS	EPA 8260B/C SIM	Methylcyclohexane

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C SIM	m,p-Xylene
GC/MS	EPA 8260B/C SIM	o-Xylene
GC/MS	EPA 8260B/C SIM	Tetrachloroethene
GC/MS	EPA 8260B/C SIM	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/C SIM	Trans-1,3-Dichloropropene
GC/MS	EPA 8260B/C SIM	Trichloroethene
GC/MS	EPA 8260B/C SIM	Trichlorofluoromethane
GC/MS	EPA 8260B/C SIM	Vinyl Chloride
GC/MS	EPA 8260B/C SIM	Xylenes (total)
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
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-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)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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-Dimethylbenz(a)anthracene
GC/MS	EPA 8270C/D	a a-Dimethylphenethylamine
GC/MS	EPA 8270C/D	Acenaphthene
GC/MS	EPA 8270C/D	Acenaphthylene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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; EPA 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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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	Dinoseb
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
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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-Triethyl phosphorothioate
GC/MS	EPA 8270C/D	o,o-Diethyl o-2-pyrazinyl phosphorothioate
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
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	Pyridine
GC/MS	EPA 8270C/D	Safrole
GC/MS	EPA 8270C/D	Sulfotepp
GC/MS	EPA 8270C/D	Thionazin
GC/MS	EPA 8270C/D SIM	1,1'-Biphenyl
GC/MS	EPA 8270C/D SIM	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C/D SIM	1,4-Dioxane
GC/MS	EPA 8270C/D SIM	1-Methylnaphthalene
GC/MS	EPA 8270C/D SIM	2,2'-Oxybis(1-chloropropane
GC/MS	EPA 8270C/D SIM	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/D SIM	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D SIM	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/D SIM	2,4-Dichlorophenol

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D SIM	2,4-Dimethylphenol
GC/MS	EPA 8270C/D SIM	2,4-Dinitrophenol
GC/MS	EPA 8270C/D SIM	2,4-Dinitrotoluene
GC/MS	EPA 8270C/D SIM	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D SIM	2-Chloronaphthalene
GC/MS	EPA 8270C/D SIM	2-Chlorophenol
GC/MS	EPA 8270C/D SIM	2-Methylnaphthalene
GC/MS	EPA 8270C/D SIM	2-Methylphenol
GC/MS	EPA 8270C/D SIM	2-Nitroaniline
GC/MS	EPA 8270C/D SIM	2-Nitrophenol
GC/MS	EPA 8270C/D SIM	3&4-Methylphenol
GC/MS	EPA 8270C/D SIM	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/D SIM	3-Nitroaniline
GC/MS	EPA 8270C/D SIM	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/D SIM	4-Bromophenyl-phenylether
GC/MS	EPA 8270C/D SIM	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D SIM	4-Chloroaniline
GC/MS	EPA 8270C/D SIM	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C/D SIM	4-Nitroaniline
GC/MS	EPA 8270C/D SIM	4-Nitrophenol
GC/MS	EPA 8270C/D SIM	Acenaphthene
GC/MS	EPA 8270C/D SIM	Acenaphthylene
GC/MS	EPA 8270C/D SIM	Acetophenone
GC/MS	EPA 8270C/D SIM	Anthracene
GC/MS	EPA 8270C/D SIM	Atrazine
GC/MS	EPA 8270C/D SIM	Benzaldehyde
GC/MS	EPA 8270C/D SIM	Benzo(a)anthracene
GC/MS	EPA 8270C/D SIM	Benzo(a)pyrene
GC/MS	EPA 8270C/D SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D SIM	Benzo(k)fluoranthene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/D SIM	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/D SIM	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/D SIM	Bis(2-ethylhexyl)phthalate
GC/MS	EPA 8270C/D SIM	Butylbenzylphthalate
GC/MS	EPA 8270C/D SIM	Caprolactam
GC/MS	EPA 8270C/D SIM	Carbazole
GC/MS	EPA 8270C/D SIM	Chrysene
GC/MS	EPA 8270C/D SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C/D SIM	Dibenzofuran
GC/MS	EPA 8270C/D SIM	Diethylphthalate
GC/MS	EPA 8270C/D SIM	Dimethyl phthalate
GC/MS	EPA 8270C/D SIM	Di-n-butylphthalate
GC/MS	EPA 8270C/D SIM	Di-n-octylphthalate
GC/MS	EPA 8270C/D SIM	Fluoranthene
GC/MS	EPA 8270C/D SIM	Fluorene
GC/MS	EPA 8270C/D SIM	Hexachlorobenzene
GC/MS	EPA 8270C/D SIM	Hexachlorobutadiene
GC/MS	EPA 8270C/D SIM	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/D SIM	Hexachloroethane
GC/MS	EPA 8270C/D SIM	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C/D SIM	Isophorone
GC/MS	EPA 8270C/D SIM	Naphthalene
GC/MS	EPA 8270C/D SIM	Nitrobenzene
GC/MS	EPA 8270C/D SIM	n-Nitroso-di-n-propylamine
GC/MS	EPA 8270C/D SIM	n-Nitrosodiphenylamine
GC/MS	EPA 8270C/D SIM	Pentachlorophenol
GC/MS	EPA 8270C/D SIM	Phenanthrene
GC/MS	EPA 8270C/D SIM	Phenol
GC/MS	EPA 8270C/D SIM	Pyrene
HPLC/UV	EPA 8330A	1 ,3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A	1, 3-Dinitrobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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 6010B/C	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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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
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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
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; EPA 9071B	Oil and Grease, Oil and Grease with SGT
Physical	EPA 1010A	Ignitability
Physical	EPA 9045D	pH
Titration	EPA SW-846 Chapter 7.3.4	Reactive Sulfide
Titration	Walkley-Black	Total Organic Carbon
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
UV/VIS	EPA SW-846 Chapter 7.3.4	Reactive Cyanide
UV/VIS	EPA 821/R-91-100	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

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
Organic Preparation	EPA 3546	Microwave Extraction Preparation for EPA 8082A, 8081B and 8270C, D
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
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

Air		
Technology	**Method**	**Analyte**
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
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

Air		
Technology	**Method**	**Analyte**
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	1,1,2-Trichloro1,2,2-trifluoroethane (Freon 113)
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 1, 2013

R. Douglas Leonard
Chief Technical Officer

Re-issued: 2/1/13

Regulatory Acceptance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 8, 2013

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Tier II Sampling and Analysis Plan Addendum, Site 4 – Remedial Investigation, DPT Groundwater Collection, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia, June 2013

Mr. Park:

Thank you for the opportunity to review the subject document. EPA has no comments on this document. Please submit a final copy of the subject document for our records.

If you have any questions, please contact me at 215-814-2077.

Sincerely,

Gerald F. Hoover

Gerald F. Hoover, RPM
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

From: Smith, Wade (DEQ) <Wade.Smith@deq.virginia.gov>
Sent: Thursday, July 11, 2013 1:26 PM
To: scott.park@navy.mil
Cc: Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; Haug.Susanne@epa.gov; hoover.gerald@epa.gov
Subject: CAX: Site 4 Tier II SAP Addendum - DEQ Response

Follow Up Flag: Follow up
Flag Status: Flagged

Thank you for giving the DEQ the opportunity to comment on the June 2013 *Draft Tier II SAP Addendum* for CAX Site 4.

The Draft Tier II SAP Addendum was received by the DEQ on June 12, 2013.

The DEQ agrees with the revised path forward as discussed during the March 13, 2013 Scoping Session and has no additional comments at this time.

Please let me know if you have any questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
Phone: (804) 698-4125
wade.smith@deq.virginia.gov