SAP Worksheet #1—Title and Approval Page

Final

Sampling and Analysis Plan Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water Ault Field and Outlying Landing Field Coupeville

Naval Air Station Whidbey Island Oak Harbor and Coupeville, Washington

Contract Task Order 4041

October 2017

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Northwest

Under the

NAVFAC CLEAN 9000 Program
Contract N62470-16-D-9000

Prepared by

ch2m

1100 112th Avenue NE, Suite 500
Bellevue, Washington

SAP Worksheet #1—Title and Approval Page (continued)

Approval Signatures:

____
Judy Solomon
Naval Facilities Engineering Command Atlantic
Quality Assurance Officer

Other Approval Signatures:

____
Kendra Leibman
Naval Facilities Engineering Command Northwest
Remedial Project Manager

____
David Einan
United States Environmental Protection Agency Region 3
Remedial Project Manager

Executive Summary

This Sampling and Analysis Plan (SAP) outlines the sampling activities in support of an investigation of and evaluation of treatment options for per- and polyfluoroalkyl substances (PFAS) in drinking water locations impacted by Naval Air Station Whidbey Island (NASWI), near Ault Field in Oak Harbor, Washington, and Outlying Landing Field (OLF) Coupeville, in Coupeville, Washington. These substances are present in the soil and/or groundwater at and around the Department of the Navy (Navy) sites as a result of historical firefighting activities using aqueous film forming foam (AFFF). Activities described herein are conducted under the Navy Environmental Restoration Program.

Ault Field was commissioned on September 21, 1942, and currently supports several types of aircraft, 7,600 military personnel, and 1,300 civilian personnel. The Ault Field's mission is to maintain and operate naval aircraft and aviation facilities, and provide associated support.

Based on a desktop review of available data and previous investigations, one site at NASWI: Area 16 (Ault Field Runway Ditches), was identified as a location where AFFF may have been used, resulting in a potential release of PFAS to groundwater. The Navy has confirmed use of AFFF at two additional sites, Area 31 (Former Runway Fire Training School) and the current firefighting school.

Potable water wells were identified within 1 mile downgradient of the Ault Field on-Base sites where AFFF containing PFAS was used or likely to have been used, and sampled during Phase 1 of a voluntary sampling program beginning in November 2016 to determine whether PFAS are present above the project action limits (PALs), which are defined as the United States Environmental Protection Agency's (USEPA) Lifetime Health Advisory of 0.07 micrograms per liter (µg/L) combined perfluorooctane sulfonate (PFOS)/perfluorooctanoic acid (/PFOA), and the USEPA Regional Screening Level (RSL) for PFBS of 400 µg/L for perfluorobutane sulfonate (PFBS). The Phase 1 off-Base drinking water sampling area was selected based on groundwater flow direction and the 1 mile radius from on-Base locations of known or suspected releases of AFFF, and included more than 176 properties. Phases 2 and 3 extended the investigation areas in a step-out radius from off-Base sample locations, where PFAS were detected at levels exceeding the PALs. The results of all three phases indicated that PFAS compounds are present above the PALs in two off-Base drinking water wells near Ault Field.

OLF Coupeville was commissioned for use by the Navy in 1943, and has provided support for day and night Field Carrier Landing Practice operations by the Navy for aircraft based out of Ault Field. Such operations allow aviators to practice touch-and-go, simulating carrier landings and take offs. OLF Coupeville is seen by the Navy as an ideal airfield for this type of carrier training because of its remote location and low ambient lighting, which allow pilots and crew to have an optimum experience that replicates landing aboard an aircraft carrier. There is no formal documentation of AFFF usage at OLF Coupeville.

The Navy conducted on-Base drinking water sampling at OLF Coupeville in September 2016. PFOA was detected in one on-Base drinking water well below the USEPA health advisory, which indicates a potential previous release of AFFF near Building 2807. No previous groundwater investigations were conducted at OLF Coupeville, so there was significant uncertainty regarding groundwater flow direction. In November 2016, off-Base drinking water wells were sampled under a voluntary sampling program. Due to the uncertainty of groundwater flow direction, the Navy used Building 2807 as the center point to draw a 1-mile radius to initiate the Phase 1 off-Base drinking water sampling, which included more than 397 properties. The Phase 1 results indicate that PFOS and/or PFOA are above the USEPA health advisory in seven off-Base drinking water wells located south of the OLF runway. Based on the Phase 1 results, the Navy expanded the drinking water investigation a half-mile downgradient (determined to be toward the south of OLF, during a water elevation study conducted at OLF following the Phase 1 sampling event) of this area. This additional area is referred to as the Phase 2 sampling area. There were no PAL exceedances in the Phase 2 area, so no additional stepout was required near OLF Coupeville. However, one homeowner's drinking water well in the Phase 1 area was sampled during the Phase 3 sampling event that had not been previously sampled. The results indicated that PFAS compounds are present above the PALs in seven off-Base drinking water wells within the vicinity of OLF Coupeville.

The objectives of the investigation described within this SAP are to:

- Determine the temporal and spatial variability of PFAS concentrations in drinking water wells on off-Base parcels where they were previously detected, and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine whether 11 additional PFAS compounds are present in drinking water wells, where select PFAS were previously detected, and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine if additional parameters are present in the drinking water wells with PFAS detections (including select dissolved metals and cations, geochemical parameters, general water quality parameters, and the 11 additional PFAS compounds) that could impact treatment options for PFAS in these locations.
- Determine if PFAS constituents are present in a deeper aquifer zone near Ault Field (not previously sampled and located several parcels southeast of a drinking water well with prior PFAS exceedances) which could be used to evaluate long-term solutions for affected residents.

The investigation would include resampling all drinking water well locations where PFAS compounds were previously detected (including PAL exceedances and non-exceedances), and sampling drinking water well locations adjacent to those where PFAS compounds previously exceeded the PALs. If PFAS are present in any drinking water wells above the PALs, an alternate drinking water source will be provided (or continued, if drinking water is already being provided based on previous sampling results). For the wells with previous PAL exceedances for PFAS (where alternative drinking water is already being provided), if samples collected during this investigation indicate either PFAS are not detected or are below PALs, the alternate drinking water source will continue to be provided while additional monitoring is being evaluated.

CH2M HILL, Inc. (CH2M) prepared this SAP under the Navy, Naval Facilities Engineering Command (NAVFAC), Comprehensive Long-term Environmental Action—Navy (CLEAN) 9000 Contract N62470-16-D-9000, Contract Task Order (CTO) 4041, in accordance with the Navy's Uniform Federal Policy-SAP policy guidance to help ensure that environmental data collected are scientifically sound, of known and documented quality, and suitable for intended uses.

This SAP was developed in accordance with the following three guidance documents:

- *Guidance for Quality Assurance Project Plans* (USEPA, 2002)
- *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005)
- *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006)

This SAP consists of 37 worksheets specific to the scope of work for the follow-up monitoring of PFAS in off-Base drinking water at Ault Field, Oak Harbor, Washington, and OLF Coupeville, Coupeville, Washington. All tables are embedded within the worksheets. All figures are included at the end of the document. Field standard operation procedures (SOPs) are included in **Appendix A**. Department of Defense Environmental Laboratory Accreditation Program Accreditation Letters are included in **Appendix B**. Meeting minutes from the project scoping session with NAVFAC Northwest are included in **Appendix C**. Laboratory SOPs are included in **Appendix D**.

The laboratory information cited in this SAP is specific to Vista Analytical Laboratory (for PFAS analysis) and TestAmerica (for all other analytes). If additional laboratory services are requested requiring modification to the existing SAP, revised SAP worksheets will be submitted to the Navy for approval.

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SAP Worksheets

Appendixes

Tables

Figures

Acronyms and Abbreviations

±	plus or minus
%	percent
>	more than
≤	less than or equal to
°C	degree Celsius
µg/L	microgram per liter
AM	Activity Manager
amsl	above mean sea level
AFFF	aqueous film-forming foam
AHA	activity hazard analysis
amu	atomic mass unit
bgs	below ground surface
CA	corrective action
CAS	Chemical Abstract Service
CCV	continuing calibration verification
CH2M	CH2M HILL, Inc.
CLEAN	Comprehensive Long-term Environmental Action—Navy
COPC	Contaminants of Potential Concern
CTO	Contract Task Order
DL	detection limit
DO	dissolved oxygen
DOC	dissolved organic carbon
DoD	Department of Defense
DQI	data quality indicator
DV	data validation
EDD	electronic data deliverable
EDS	Environmental Data Services
ELAP	Environmental Laboratory Accreditation Program
FD	field duplicate
feet	feet/ foot
FTL	Field Team Leader
GAC	granular activated carbon
H&S	health and safety
HQ	hazard quotient
HSM	Health and Safety Manager
HSP	Health and Safety Plan
ICAL	initial calibration
ID	identification
IS	internal standards
LCS	laboratory control sample

LCL	lower confidence limit
LHA	Lifetime Health Advisory
LOD	limit of detection
LOQ	limit of quantitation
mL	milliliter(s)
MPC	measurement performance criteria
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NASWI	Naval Air Station Whidbey Island
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCM	Non-Conformance Memorandum
NTR	Navy Technical Representative
OLF	Outlying Landing Field
ORP	oxidation-reduction potential
PA/SI	Preliminary Assessment/Site Investigation
PAL	project action limit
PC	Project Chemist
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFBS	perfluorobutane sulfonate
PM	Project Manager
POC	point of contact
PQL	project quantitation limit
PQO	project quality objective
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QM	Quality Manager
QSM	Quality Systems Manual
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RPM	Remedial Project Manager
RSL	regional screening level
SAP	Sampling and Analysis Plan
SBO	safe behavior observation
SME	Subject Matter Expert
SOP	standard operating procedure
SSC	Site Safety Coordinator
STC	Senior Technical Consultant
TBD	to be determined

TDS	total dissolved solids
TM	Task Manager
TOC	total organic compound
TSS	total suspended solids
UCL	upper confidence limit
UCMR	Unregulated Contaminant Monitoring Rule
UFP	Uniform Federal Policy
UPLC	ultra performance liquid chromatography
USEPA	United States Environmental Protection Agency

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SAP Worksheet #2—SAP Identifying Information

Site Name/Number:	Ault Field, Oak Harbor, Washington, and Outlying Landing Field (OLF) Coupeville, Coupeville, Washington, Naval Air Station Whidbey Island (NASWI)
Operable Unit/Solid Waste Management Unit:	Not applicable (N/A)
Contractor Name:	CH2M HILL, Inc. (CH2M)
Contract Number:	N62470-16-D-9000
Contract Title:	Comprehensive Long-term Environmental Action—Navy (CLEAN) 9000 Program
Work Assignment Number (optional):	Contract Task Order (CTO) 4041

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the following:
    - *Guidance for Quality Assurance Project Plans* (USEPA, 2002)
    - *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005)
    - *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006)
2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act
3. This document is a project-specific SAP. The approval entities are Naval Facilities Engineering Command (NAVFAC) Northwest Remedial Project Manager (RPM) and NAVFAC Atlantic Quality Assurance Officer (QAO).
4. List dates of scoping sessions that were held: A scoping session with NAVFAC Northwest, NAVFAC Atlantic, CH2M, United States Environmental Protection Agency (USEPA), and Island County, Washington was held on August 2, 2017. Minutes for this scoping session are included as **Appendix C.**
5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water Naval Air Station Whidbey Island	January 2017
Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water Outlying Landing Field Coupeville	January 2017

6. List organizational partners (stakeholders) and connection with lead organization:
    - Ault Field, OLF Coupeville – NAVFAC LANT - Project Chemist, Judy Solomon
    - NAVFAC Northwest– Remedial Project Manager, Kendra Leibman
    - USEPA – Technical Representative/ Base stakeholder, Dave Einan
    - Island County, Washington – Technical Representative/ Base stakeholder, Doug Kelly
7. Lead organization:
    - Department of the Navy (Navy)
8. If any required SAP elements or required information are N/A to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion as follows:
    - Crosswalk table is excluded because all required information is provided in this SAP.

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SAP Worksheet #3—Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Email Address or Mailing Address
Kendra Leibman	RPM/ Task Order Contracting Officer's Representative	NAVFAC Northwest	[redacted]	[redacted]
Steve Skeehan	Navy Technical Representative (NTR)	NAVFAC Northwest	[redacted]	[redacted]
Rebecca Maco	Project Manager (PM)/ Activity Manager (AM)	CH2M	[redacted]	[redacted]
Peter Lawson	Senior Technical Consultant (STC)	CH2M	[redacted]	[redacted]
Susan Moore	Quality Manager (QM)	CH2M	[redacted]	[redacted]
Laura Cook	Subject Matter Expert (SME)	CH2M	[redacted]	[redacted]
Rachel Clennon	Project Task Manager (TM)	CH2M	[redacted]	[redacted]
Nicole Badon	Alternate Project TM	CH2M	[redacted]	[redacted]
Janna Staszak	Program SAP Quality Reviewer	CH2M	[redacted]	[redacted]
Anita Dodson	Program Chemist/ SAP Reviewer	CH2M	[redacted]	[redacted]
Tiffany Hill	PC	CH2M	[redacted]	[redacted]
Doug Weaver	Data Validator	Environmental Data Services (EDS)	[redacted]	[redacted]
TBD	Field Team Leader (FTL)	CH2M	TBD	TBD
TBD	Site Safety Coordinator (SSC)	CH2M	TBD	TBD
Martha Maier	Laboratory PM	Vista Analytical	[redacted]	[redacted]
Kristine Allen	Laboratory PM	TestAmerica Seattle	[redacted]	[redacted]

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SAP Worksheet #4—Project Personnel Sign-off Sheet

Name	Organization/Title/Role	Telephone Number	Signature/Email receipt	Date SAP Read
Rebecca Maco	CH2M/PM/ AM	[redacted]		8/25/17
Peter Lawson	CH2M/STC	[redacted]		8/04/17
Susan Moore	CH2M/QM	[redacted]		8/8/17
Laura Cook	CH2M/SME	[redacted]		8/13/17
Rachel Clennon	CH2M/ Project TM	[redacted]		8/20/17
Nicole Badon	CH2M/ Alternate Project TM	[redacted]		8/25/17
Janna Staszak	CH2M/ Program SAP Quality Reviewer	[redacted]		8/23/17
Anita Dodson	CH2M/ Program Chemist/SAP Reviewer	[redacted]		8/25/17
Tiffany Hill	CH2M/PC	[redacted]		8/24/17
Doug Weaver	EDS/Data Validator	[redacted]		
TBD	FTL	CH2M		
TBD	SSC	CH2M		
Martha Maier	Vista Analytical/Laboratory PM	[redacted]		
Kristine Allen	TestAmerica Seattle/Laboratory PM	[redacted]		

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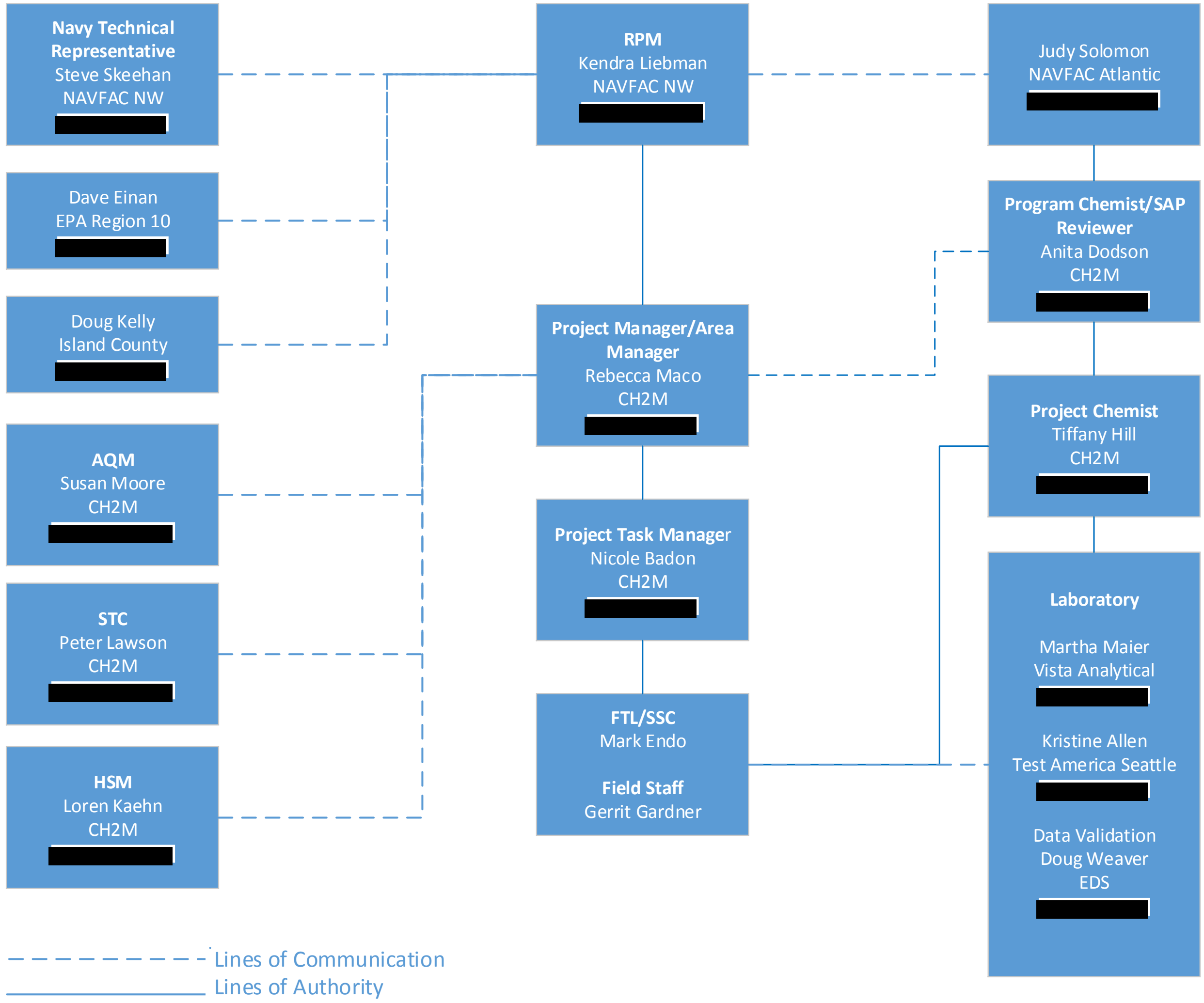
SAP Worksheet #5—Project Organizational Chart



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SAP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Communication with Base representatives, RPM, and CH2M FTL/SSC	NTR	Steve Skeehan	[redacted]	Primary point of contact (POC) in field for Navy; can delegate communication to other internal or external POCs.
Communication with Base, NTR, CH2M PM/AM, USEPA RPM, and other stakeholders	RPM	Kendra Leibman	[redacted]	Primary POC for facility; can delegate communication to other internal or external POCs. CH2M PM will notify RPM by email or telephone call within 24 hours for field changes affecting the scope or implementation of the design.
Communication regarding overall project status and implementation, and primary POC with RPMs and project team	CH2M PM/AM	Rebecca Maco	[redacted]	Oversees project and will be informed of project status by the FTL and TM. If field changes occur, PM will work with the RPM to communicate in-field changes to the team by email within 24 hours. All data results will be communicated to the project team following data receipt and review. All information and materials about the project will be forwarded to the Navy, as necessary. POC for FTL, deputy PM, and STC.
Technical communications for project implementation and data interpretation	CH2M STC	Peter Lawson	[redacted]	Contact STC regarding questions/issues encountered in the field, input on data interpretation, as needed. STC will have 24 hours to respond to technical field questions as necessary. Additionally, STC will review the data as necessary prior to Base and Navy discussions and reporting review.
Quality issues during and technical communications for project implementation and data interpretation	CH2M QM	Susan Moore	[redacted]	Contact the QM regarding quality issues during project implementation. The QM will report to the PM and the RPM.
Technical communications for project implementation and data interpretation	CH2M SME	Laura Cook	[redacted]	Contact SME regarding questions/issues encountered in the field, input on data interpretation, as needed. SME will have 24 hours to respond to technical field questions as necessary. Additionally, SME will review the data as necessary before Base and Navy discussions and reporting review.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Health and safety (H&S)	CH2M HSM	Loren Kaehn	[redacted]	Responsible for generation of the Health and Safety Plan (HSP) and approval of the activity hazard analyses (AHAs) prior to the start of fieldwork. The PM will contact the HSM as needed regarding questions/issues encountered in the field.
H&S	CH2M SSC	TBD	TBD	Responsible for the adherence of team members to the site safety requirements described in the HSP. Will report H&S incidents and near-misses to the PM as soon as possible.
Stop Work Order	CH2M PM CH2M FTL/SSC Field Team Members	Rebecca Maco TBD TBD	[redacted] TBD TBD	Any field member can immediately stop work if an unsafe condition that is immediately threatening to human health is observed. The field staff, FTL, or SSC should notify the RPM and the CH2M PM immediately. Ultimately, the FTL and PM can stop work for a period of time.
Work plan changes in field	FTL	TBD	TBD	Documentation of deviations from the work plan will be made in the field logbook, and the PM will be notified immediately. Deviations will be made only with approval from the PM. The PM will communicate changes to the RPM.
Field changes/field progress reports	FTL	TBD	TBD	Documentation of field activities and work plan deviations (made with the approval of STC and/or QM) in field logbooks; provide daily progress reports to PM.
Reporting laboratory data quality issues	Vista Analytical TestAmerica Seattle	Martha Maier Kristine Allen	[redacted] [redacted]	All quality assurance (QA)/quality control (QC) issues with project field samples will be reported within 2 days to the PC by the laboratory.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Analytical corrective actions (CAs)	PC	Tiffany Hill	[redacted]	Any CAs for analytical issues will be determined by the FTL and/or the PC and reported to the PM within 4 hours. The PM will ensure SAP requirements are met by field staff for the duration of the project.
Data tracking from field collection to database upload Release of analytical data	PC	Tiffany Hill	[redacted]	Tracks data from sample collection through database upload daily. No analytical data can be released until the PC validates and approves the data. The PC will review analytical results within 24 hours of receipt for release to the project team. The PC will inform the Navy CLEAN program chemist who will notify the Navy QAO of any laboratory issues that would prevent the project from meeting project quality objectives or would cause significant delay in project schedule.
Reporting data quality issues	Data validation (DV)	Doug Weaver	[redacted]	The data validator reviews and qualifies analytical data as necessary. The data, along with a validation narrative, are returned to the PC within 7 calendar days.
Field CAs	FTL, PM, and Project TM	TBD Rebecca Maco Rachel Clennon/ Nicole Badon	TBD [redacted]	Field issues requiring CA will be determined by the FTL and/or PM on an as-needed basis; the PM will ensure SAP requirements are met by field staff for the duration of the project. The FTL will notify the PM via phone of any need for CA within 4 hours. The FTL will notify the PM and the PM may notify the NTR and RPM of any field issues that would negatively affect the schedule or the ability to meet project data quality objectives.

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SAP Worksheet #7—Personnel Responsibilities Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Kendra Leibman	RPM	NAVFAC Northwest	Oversees project for Navy and provides base-specific information, and coordination with NASWI.
Steve Skeehan	NTR	NAVFAC Northwest	Oversees field work, provides base-specific information, and coordination with NASWI.
Rebecca Maco	PM/AM	CH2M	Oversees and manages project activities.
Peter Lawson	STC	CH2M	Provides senior technical support for project approach and execution.
Susan Moore	QM	CH2M	Provides senior technical support for project approach and execution. Provides QA oversight.
Laura Cook	SME	CH2M	Provides senior technical support for project approach and execution.
Rachel Clennon	Project TM	CH2M	Oversees and manages project tasks.
Nicole Badon	Alternate Project TM	CH2M	Oversees and manages project tasks.
Janna Staszak	Program SAP Quality Reviewer	CH2M	Reviews and approves changes or revisions to the SAP.
Anita Dodson	Program Chemist/SAP Reviewer	CH2M	Provides SAP project delivery support, reviews and approves SAP, and performs final data evaluation and QA oversight.
Tiffany Hill	PC	CH2M	Data management: Performs data evaluation and QA oversight, is the POC with laboratory and validator for analytical issues.
Loren Kaehn	HSM	CH2M	Prepares HSP and manages H&S for all field activities.
Doug Weaver	Data Validator	EDS	Validates laboratory data from an analytical standpoint prior to data use.
TBD	FTL	CH2M	Coordinates all field activities and sampling.
TBD	Field Staff	CH2M	Conducts field activities.
Martha Maier	Laboratory PM	Vista Analytical	Manages samples tracking and maintains good communication with PC.
Kristine Allen	Laboratory PM	TestAmerica Seattle	Manages samples tracking and maintains good communication with PC.
Bahar Amiri	Laboratory QAO	Vista Analytical	Responsible for audits, CA, and checks of QA performance within the laboratory.
Terri Torres	Laboratory QAO	TestAmerica Seattle	Responsible for audits, CA, and checks of QA performance within the laboratory.

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SAP Worksheet #8—Special Personnel Training Requirements Table

No specialized training beyond standard H&S training is required for this project.

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SAP Worksheet #9-1—Project Scoping Session Participants Sheet

Project Name: Investigation of Per- and Polyfluoroalkyl substancesPFAS in Drinking Water **Projected Date(s) of Sampling:** September 2017 **PM:** Rebecca Maco	**Site Name**: Ault Field and OLF Coupeville **Site Location:** Oak Harbor, Washington and Coupeville, Washington
Date of Session: August 2, 2017 **Scoping Session Purpose:** To obtain consensus on the follow-up monitoring approach and schedule.	

Name	Title/Project Role	Affiliation	Phone #	Email Address
Kendra Leibman	RPM	NAVFAC Northwest / NASWI	[redacted]	[redacted]
Laura Himes	Technical Representative	NAVFAC Northwest	[redacted]	[redacted]
Judy Solomon	Technical Representative	NAVFAC Atlantic	[redacted]	[redacted]
Dave Einan[1]	Technical Representative	USEPA	[redacted]	[redacted]
Doug Kelly	Technical Representative	Island County, Washington	[redacted]	[redacted]
Rebecca Maco	PM	CH2M	[redacted]	[redacted]
Rachel Clennon	Lead SAP Author/ Project TM	CH2M	[redacted]	[redacted]
Heather Perry	Project TM	CH2M	[redacted]	[redacted]
Kathryn Brown	Project TM	CH2M	[redacted]	[redacted]
Joe Hauser	Project TM	CH2M	[redacted]	[redacted]
Tiffany Hill	PC	CH2M	[redacted]	[redacted]

[1] Dave Einan of USEPA was invited but unable to attend

Comments

The purpose of the scoping session was to obtain consensus on the proposed path forward for the follow-up monitoring of off-Base drinking water at private or community drinking water wells meeting the following conditions during the investigation conducted from November 2016 through June 2017:

- Sample locations where PFAS (specifically, perfluorooctane sulfonate [PFOS], perfluorooctanoic acid [PFOA] or perfluorobutane sulfonate [PFBS]) were detected.
- Private or community drinking water well locations where there were no prior detections, or were not previously sampled, but are adjacent to the parcels where prior detections above PALs (USEPA Lifetime Health Advisory [LHA] of 0.07 µg/L combined PFOS/PFOA) were observed.

SAP Worksheet #9-1—Project Scoping Session Participants Sheet (continued)

The scope for the upcoming off-Base drinking water sampling will be similar to the previous investigation, but will now include 14 PFAS compounds that will be sampled in a limited area. The sampling will also include collection of additional analytes, the results of which will support evaluation of long-term solutions, such as filter performance or treatability at sample locations where PFOS, PFOA, or PFBS were previously detected or exceeded the PALs. The full list of additional analytes was in development at the time of the scoping session, and will be discussed internally by CH2M, after which a proposed analyte list will be sent to Kendra Leibman for review and approval. Fieldwork is expected to begin in September 2017.

Action Items

CH2M will complete preparation of the SAP for submittal to NAVFAC for review.

Consensus Decisions

The CH2M Team agrees to the following approach for the follow-up monitoring of PFAS in off-Base drinking water at Ault Field, Oak Harbor, Washington, and OLF Coupeville, Coupeville, Washington:

- Collect off-Base drinking water samples for 14 PFAS compounds at private or community drinking water wells, in which PFAS was detected or exceeded the PALs during the drinking water investigation conducted from November 2016 through June 2017.
- Collect off-Base drinking water samples for 14 PFAS compounds at private or community drinking water wells that are adjacent to the parcels in which PFAS exceeded the PALs.
- An additional analyte list would be added to the scope of work to provide data for evaluation of long-term treatment at private or community drinking water wells in which PFAS was detected or exceeded the PALs in previous sampling.

SAP Worksheet #9-2—Project Scoping Session Participants Sheet[1]

Project Name: Investigation of Per- and Polyfluoroalkyl substances (PFAS) in Drinking Water **Projected Date(s) of Sampling:** September 2017 **PM:** Rebecca Maco	**Site Name**: Ault Field and OLF Coupeville **Site Location:** Oak Harbor, Washington and Coupeville, Washington

Date of Session: August 7, 2017

Scoping Session Purpose: To obtain consensus on the additional analyte list.

Name	Title/Project Role	Affiliation	Phone #	Email Address
Kendra Leibman	RPM	NAVFAC Northwest	[redacted]	[redacted]
Rachel Clennon	Project TM	CH2M	[redacted]	[redacted]
Rebecca Maco	Project TM	CH2M	[redacted]	[redacted]
Kathryn Brown	Project TM	CH2M	[redacted]	[redacted]

Comments

Kendra Leibman provided concurrence (via email in August 2017) on the additional analyte list proposed to provide data for evaluation of long-term treatment at private or community drinking water wells in which PFAS were detected or exceeded the PALs in previous sampling. The additional analytes include:

- Major anions – Chloride, nitrate/ nitrite, sulfate, fluorine, phosphate
- Major cations and metals (dissolved) – aluminum, calcium, iron, magnesium, manganese, phosphorus, potassium, silica, ammonia/ammonium
- UV-254 for organics/ carbon demand
- Alkalinity
- Total dissolved solids (TDS)
- Total suspended solids (TSS)
- Dissolved organic carbon (DOC)
- Field water quality parameters: pH, conductivity, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity (measured in field)

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SAP Worksheet #10—Conceptual Site Model

Ault Field is located in Oak Harbor, Washington, and OLF Coupeville is located in Coupeville, Washington (**Figure 1**). **Figure 2** presents the site layout of Ault Field. **Figure 3** presents the site layout of OLF Coupeville. A description and background summary of Ault Field and OLF Coupeville is presented in **Tables 10-1** and **10-2**, respectively.

Table 10-1. Ault Field Area Description and Background
Naval Air Station Whidbey Island, Oak Harbor, Washington

Site Name	Ault Field, NASWI, Oak Harbor, Washington (**Figures 1 and 2**)
Study Area Description	The area to be investigated consists of off-Base drinking water well locations that are impacted, or potentially impacted, by PFAS source areas associated with Ault Field.
Potential Sources	Based on historical use of aqueous film forming foam (AFFF), there are three suspected or confirmed source areas at Ault Field: Area 16 (Ault Field Runway Ditches), Area 31 (the former Runway Fire Training School), and the current Firefighting School (**Figure 2**). Area 16 comprises the Ault Field Runway Ditches, including the flight line area and the onsite drainage areas through Clover Valley. Area 31 is located adjacent to Area 16, approximately 1,200 feet northeast of the intersection of Runways 14-32 and 7-25. The Firefighting School is located in the southwestern portion of Ault Field, approximately 0.25 mile inland from the Strait of Juan de Fuca. Other source areas may be identified in the future as part of the preliminary assessment and site investigation work currently underway.
Study Area Investigation History	The following is a summary of the off-Base site investigation activities completed to date. An evaluation of the off-Base site history, including drinking water well construction and installation information, is ongoing and will be fully evaluated as part of the Ault Field Preliminary Assessment. The history of on-Base source areas is further documented in *Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water Naval Air Station Whidbey Island* (CH2M, 2017a). Drinking water wells were identified within 1 mile downgradient of these Ault Field source areas where AFFF containing PFAS was likely used, and sampled, for PFOS, PFOA and PFBS only, as part of Phase 1 sampling under a phased voluntary sampling program beginning in November 2016. The Phase 1 sampling area included more than 176 properties, from which 82 drinking water well samples were collected. The Phase 1 results indicate that PFOS and/or PFOA are above the PAL in one off-Base drinking water well located south of the current Fire Fighting School. Based on these results and other information made available to the Navy, the drinking water investigation area was extended an additional half-mile downgradient from the current Fire Fighting School to include additional parcels east of the runway, and runway ditches on the east side of Ault Field. This area, referred to as the Phase 2 sampling area, included 60 properties, from which 17 drinking water well samples were collected. Results from Phase 2 investigation indicated that PFOS and/or PFOA are above the PAL in one additional off-Base drinking water well located east of the Ault Field runway, and the investigation area was extended a 0.5-mile downgradient of this area for Phase 3 sampling. The Phase 3 sampling area included 14 properties. PFAS were not detected in any of the samples collected as part of the Phase 3 sampling effort at Ault Field. The sampling areas and locations with PAL exceedances are shown on **Figure 2**.
Current Use	The area surrounding Ault Field is a low-density residential area. Potable water is primarily supplied by private or community drinking water wells.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-1. Ault Field Area Description and Background

Naval Air Station Whidbey Island, Oak Harbor, Washington

Site Conditions	**Physical Characteristics**	Whidbey Island, including the entire proposed sampling area, lies within the Puget Lowland, a topographic and structural depression between the Olympic Mountains and the Cascade Range.
	Geology and Hydrogeology	The surface soil in the vicinity of Ault Field primarily consists of artificial fill, post-glacial deposits, glaciomarine drift, and glacial deposits. Artificial fill, consisting of coarse- or fine-grained material, underlies the runway areas. Post-glacial deposits, consisting of peaty sand and silt, are generally found in the low-lying marshy areas (Navy, 1994). The 1994 Remedial Investigation (RI) Report (Navy, 1994) identified a confined aquifer beneath Area 16 at a depth of approximately 20 to greater than 150 feet below ground surface (bgs) and consisting of fine to medium sand with some silt. Clay and silt of the Everson glaciomarine drift forms the overlying confining layer. A single, unconfined aquifer was identified beneath Area 31, interpreted to be the same as that encountered in Area 16, but without the glaciomarine drift that confines the aquifer in Area 16 (presumed to pinch out). Ault Field is located in a valley, with elevated areas to the southwest, northeast, and southeast of the field. Because Area 31 lies at the base of the southwest side of Monkey Hill, groundwater flow mimics topography in that area, flowing to the southwest, away from the hill and toward the Strait of Juan de Fuca, except for localized flow that travels northeast away from Area 31, near the fence line (see **Figure 2**). This was confirmed by the RI Report (Navy, 1994). Across the remainder of the Base, east of the runway, groundwater generally flows to the east, northeast, and southeast toward Clover Valley Stream, Clover Valley Lagoon, and Dugualla Bay. West of the runway, there is likely a component of flow to the west toward the Strait of Juan de Fuca. However, groundwater flow information for Areas 16 and 31, and the Firefighting School, is sparse and the impact of off-Base water supply wells (pumping conditions) on localized groundwater flow is unknown. Groundwater flow direction will be evaluated at these sites during subsequent investigations to be conducted at Ault Field.
Drinking Water Source Evaluation		Based on Island County real estate records, 297 parcels are located downgradient of the 3 sites within the Phase 1, 2, and 3sampling areas, of which 99 parcels are confirmed as served by private wells and 91 parcels are confirmed as served by community wells. Wells are generally screened at depths between 60 and 200 feet, per reports. There are nine parcels that have been confirmed with no private wells. It is unknown whether the remaining parcels are served by private wells. General water quality parameters (e.g. pH, conductivity, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity) are not available for these wells.
Contaminants of Potential Concern (COPCs)		14 PFAS compounds (listed in **Worksheet #15**).
Nature and Extent		Two of the 105 drinking water wells sampled contain PFOS and/or PFOA above the PALs (**Figure 2**). The other drinking water wells contained PFOA, PFOS, and/or PFBS below the detection limits or below the PALs. A Preliminary Assessment (PA)/Site Investigation (SI) associated with PFAS on Ault Field is currently planned for late 2017.
Migration Pathways		The following migration pathways are relevant to this investigation, additional migration pathways will be investigated during the planned PA/SI: • Transport via advection within groundwater flow
Potential Receptors/ Exposure Routes		Current users of drinking water (ingestion)

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-2. Outlying Field Coupeville Area Description and Background
OLF Coupeville, Coupeville, Washington

Site Name	OLF Coupeville, NASWI, Coupeville, Washington (**Figures 1** and **3**)
Study Area Description	The area to be investigated includes off-Base drinking water well locations impacted, or potentially impacted, by PFAS use associated with OLF Coupeville activities.
Potential Sources	Potential source areas for off-Base drinking water PFAS impacts are on-Base locations of suspected releases of AFFF, including a potential previous release of AFFF near Building 2807. Groundwater data collected during the 2016-2017 SI are consistent with this hypothesis. Well construction records for the water supply well at Building 2807 shows that the well casing was not grouted below 18 feet bgs, potentially leaving an open annulus from 18 feet bgs to the bottom of the borehole at 180 feet bgs. The absence of a grout seal could allow for migration of PFAS in shallower perched groundwater to migrate into the well annular space and potentially into deeper aquifer units. In addition, the primary drinking water aquifer is unconfined, which would allow migration of PFAS.
Study Area Investigation History	The following is a summary of the off-Base site investigation activities completed to date. An evaluation of the off-Base site history, including drinking water well construction and installation information, is ongoing and will be fully evaluated as part of the OLF Preliminary Assessment. There are no reports of on-Base source areas at OLF Coupeville as documented in Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water, Outlying Landing Field Coupeville (CH2M 2017b). The Navy conducted on-Base drinking water sampling at OLF Coupeville in September 2016. PFOA was detected in one on-Base drinking water well below the USEPA health advisory, which indicates a potential previous release of AFFF near Building 2807 (Figure 3). No previous groundwater investigations were conducted at OLF Coupeville, so there was significant uncertainty regarding groundwater flow direction. Because of this uncertainty, the Navy used Building 2807 as the center point to draw a 1-mile radius to initiate off-Base drinking water sampling. Drinking water wells were identified within 1 mile downgradient of the potential OLF source areas, and sampled for PFOS, PFOA, and PFBS only, as part of Phase 1 sampling under a phased voluntary sampling program beginning in November 2016. The Phase 1 sampling area included more than 397 properties, from which 101 drinking water well samples were collected. Based on results from Phase 1 sampling, PFOS and/or PFOA are above the PALs in seven off-Base drinking water wells located south of the OLF runway. Based on these results, the investigation area was extended an additional 1/2-mile downgradient of this area, and referred to as the Phase 2 sampling area. The Phase 2 sampling area included more than 795 properties, including 768 properties in the Admiral's Cove Water District, which are provided water by a common community drinking water system. Nine drinking water samples were collected to the south of OLF Coupeville during Phase 2 sampling. Of those samples, PFOS and/or PFOA were not detected in any wells, including the Admiral's Cove water supply wells and water distribution system. Based on the Phase 2 results, the Navy did not expand the drinking water sampling area near OLF Coupeville beyond the Phase 2 area. The sampling areas and locations with PAL exceedances are shown on **Figure 3**.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-2. Outlying Field Coupeville Area Description and Background

OLF Coupeville, Coupeville, Washington

Current Use		The area surrounding OLF Coupeville is a low density residential area. Potable water is primarily supplied by private or community drinking water wells.
Site Conditions	**Physical Characteristics**	The area in the vicinity of OLF Coupeville, including the Phase 1 and 2 sample areas, is located on a broad plateau of Smith Prairie in southern Whidbey Island at an elevation of approximately 195 feet above mean sea level (amsl) and lies within the Puget Lowland, a topographic and structural depression between the Olympic Mountains and the Cascade Range.
	Geology and Hydrogeology	The shallowest deposits represent glaciomarine drift, consisting of sands and gravel extending to approximately 50 feet bgs. These materials are generally unsaturated, although evidence of localized perched groundwater exists southwest of the OLF, with static water levels reported at 15 feet bgs. The shallow sands and gravel are generally underlain by recessional outwash (Partridge Gravel) consisting primarily of sand and gravel extending to roughly 180 feet bgs. The sands and gravel are underlain by Vashon till, consisting of a dark gray, laterally continuous, sand, silt, and clay unit present in the majority of well borings completed within a mile of the OLF. The till likely acts as an aquitard and ranges in depth from 180 to 220 feet bgs. Localized saturated conditions exist above the till. However, few nearby water supply wells are completed to depths of less than 180 feet bgs. A highly-transmissive sand and gravel bed (advance outwash; 5 to 10 feet thick) underlies the till and is widely used for water supply purposes. Static water levels in wells screened in this sand and gravel indicate confined conditions, with hydrostatic heads rising 30 to 40 feet above the base of the till aquitard. The sand and gravel bed is underlain by fine-grained undifferentiated Pleistocene deposits. At OLF Coupeville, the first encountered groundwater in the northern portion of the site is present in perched zones between 90 and 130 feet bgs. Beneath this interval, a discontinuous clay and silt layer is encountered, which pinches out in the southern portion of the site. An underlying “middle” aquifer zone is both confined and unconfined, with confined conditions in portions of the northern portion of OLF Coupeville and unconfined conditions in the southern portion, ranging in thickness from just a few feet to greater than 50 feet. The potentiometric surface for the “middle” zone is at approximately 60 to 85 feet amsl, or 120 to 130 feet bgs. A heterogeneous clay, claystone, and silt confining layer underlies the “middle” zone, frequently containing organic material, such as plant material and peat. Transmissive sandy zones are present within and beneath the organic silt and clay unit. Borings completed at the site were typically terminated in the organic clay zone or sandy zones within or beneath it, which are considered the “deep” aquifer zone. A groundwater elevation survey/ transducer study indicated that the dominant flow direction in the “middle” aquifer zone is to the southwest in the northern portion of the site, shifting to the south-southeast in the southern portion of the site. Groundwater flow in the deep zone is to the south. In general, the overall groundwater flow direction appears to be consistent regardless of tidal influence observed. The Island County Water Resource Management Plan (Island County, 2005) suggests that OLF is located on a hydrogeologic divide, and groundwater flow is likely to be radial away from OLF Coupeville (**Figure 3**). The impact of off-Base water supply wells (pumping conditions) on localized groundwater flow is unknown and will be studied during a PA/SI planned for late 2017.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-2. Outlying Field Coupeville Area Description and Background

OLF Coupeville, Coupeville, Washington

COPCs	14 PFAS compounds (listed in Worksheet #15).
Nature and Extent	Seven of the 110 drinking water wells sampled contain PFOA above the PALs (**Figure 3**). The other drinking water wells contained PFOA, PFOS, and/or PFBS below detection limits or below the PALs. A PA/SI associated with PFAS on OLF Coupeville is currently planned for late 2017.
Migration Pathways	The following migration pathways are relevant to this investigation, additional migration pathways will be investigated during the planned PA/SI: • Transport via advection within groundwater flow
Potential Receptors/ Exposure Routes	Current users of drinking water (ingestion)

Data Needs

The following data needs were identified based on the previous investigations summarized in **Tables 10-1** and **10-2**.

The initial sampling protocol only included PFOS, PFOA, and PFBS, and not the additional 11 PFAS compounds, additional data are needed to:

- Determine the temporal and spatial variability of PFAS concentrations in drinking water on off-Base parcels where they were previously detected and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine whether 11 additional PFAS compounds are present in drinking water wells, where select PFAS were previously detected, and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine if additional parameters are present in the groundwater (including select dissolved metals and cations, geochemical parameters, general water quality parameters, and the 11 additional PFAS compounds) that could impact treatment options for PFAS in these locations.

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

Problem Definition, Environmental Questions, and Project Quality Objectives

Due to known or suspected AFFF releases at Ault Field and OLF Coupeville, the Navy conducted an off-Base drinking water investigation near Ault Field and OLF Coupeville. PFAS was detected above the PAL in two off-Base drinking water wells downgradient of the Ault Field known or suspected AFFF (i.e., PFAS) source areas. At OLF Coupeville, PFAS was detected in one on-base drinking water well at Building 2807, which was sampled under the Navy's extended UCMR 3 investigation. PFAS was detected above the PAL in seven off-base drinking water wells downgradient of suspected AFFF source areas.

The investigation objectives, environmental questions, general investigation approach, and project quality objectives (PQOs) are presented in **Table 11-1**. The detailed sampling approach, including number of samples, sample depths, and full list of analyses are included in **Worksheet #17**. **Figures 4** and **5** present the proposed sampling locations for monitoring covered under this SAP for Ault Field and OLF Coupeville, respectively. The sampling rationale and counts are outlined in **Worksheets #17** and **#18**.

What are the Project Action Limits?

- USEPA LHA for PFOA and PFOS: 0.07 µg/L, unless both chemicals are detected, then 0.07 µg/L is the LHA for the cumulative concentration of the two chemicals
- USEPA Regional Screening Level (RSL) for PFBS: 400 µg/L (based on a hazard quotient [HQ] = 1.0)
- PALs currently do not exist for the remaining 11 PFAS compounds. At the time of drafting this SAP there are no USEPA RSLs or any state regulatory screening levels available. Per Navy policy, data need to be collected for all 14 analytes listed in USEPA Method 537 rev. 1.1.

For what will the data be used?

The data will be used to answer the environmental questions discussed in **Table 11-1**. Data from additional analyses conducted in drinking water sample locations where PFAS is present (including cations/ metals, anions, and geochemical parameters, listed in **Table 11-2** and **Worksheet #15**, and field water quality parameters, listed in **Table 11-2** and **Worksheet #14**) will be used to evaluate potential long-term drinking water treatment options in affected wells.

What types of data are needed (matrix, target analytes, analytical groups, field screening, onsite analytical or offsite laboratory techniques, sampling techniques)?

Data types include:

- Analytical results for drinking water samples as listed in **Worksheet #15**.
- Field water quality data collected at the time of sampling, including pH, conductivity, temperature, DO, ORP, and turbidity.
- All sampling locations are shown on **Figures 4** and **5** and are based on the rationale presented in **Worksheet #17** and in accordance with the project schedule outlined in **Worksheet #16**.
- The data will be collected following the standard operating procedures (SOPs) presented in **Worksheet #21**.

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

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

None in addition to those outlined elsewhere in this SAP.

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

The data will be collected during a 2-week sampling event to be conducted in October 2017. The sampling approach is summarized in **Worksheets #14.** All sampling locations are shown on **Figures 4** and **5** and are based on the rationale presented in **Worksheet #17** and in accordance with the project schedule outlined in **Worksheet #16**.

Table 11-1. Problem Definition/Objective, Environmental Questions, and Project Quality Objectives

Objective	Environmental Question(s)	General Investigation Approach	PQOs
Determine the temporal and spatial variability of PFAS concentrations (including 11 additional PFAS compounds that were not previously analyzed) in off-Base drinking water wells where PFAS were detected below the PALs or in exceedance of the PALs, and in drinking water wells adjacent to parcels with previous PFAS exceedances. These additional wells are locations with no detections for PFAS or were previously not sampled by the Navy under the prior investigation.	Is there temporal variability in PFAS concentrations detected in off-Base wells during the initial sampling events (November 2016 to June 2017 Are adjacent properties to those where PFAS constituents previously exceeded the PALs impacted?	Drinking water samples will be collected from off-Base drinking water wells with previous detections (both exceedances and non-exceedances of the PALs) of PFAS, to provide additional data for temporal comparisons, and from drinking water wells located in adjacent parcels (whether previously sampled or not) to those where PFAS were previously detected above the PALs to evaluate spatial variability. Proposed locations are shown on **Figures 4** and **5**. Drinking water samples will be collected from these wells (**Worksheet #17**) and analyzed via USEPA Method 537 for the 14 PFAS compounds listed in Worksheet #15.	If samples collected during this investigation indicate PFAS concentrations are significantly higher or lower than those previously detected, temporal variability is likely and will be documented in the report. If samples collected during this investigation indicate PFAS concentrations are similar to those previously detected, temporal variability is not likely. In either case, if PFAS concentrations exceed the PAL, an alternate drinking water source will be (or will continue to be) provided while additional monitoring, to be included in a subsequent SAP, and long-term solutions are evaluated using the new data. If PFAS constituents are above the PALs at a property adjacent to those where PFAS constituents previously exceeded the PALs, the adjacent property has been impacted and an alternate drinking water source will be provided while additional monitoring, to be included in a subsequent SAP, and long-term solutions are evaluated. If PFAS constituents are below the PALs at a property adjacent to those where PFAS constituents previously exceeded the PALs, the adjacent property's drinking water has not been impacted. However, if temporal variation in PFAS is identified, additional monitoring, to be included in a subsequent SAP, will be evaluated.

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

Table 11-1. Problem Definition/Objective, Environmental Questions, and Project Quality Objectives

Objective	Environmental Question(s)	General Investigation Approach	PQOs
Determine the presence or absence of PFAS constituents in a deeper aquifer zone near Ault Field which could be used to evaluate long-term solutions for affected residents.	Are PFAS constituents present in a deeper aquifer zone to the SE of drinking water wells with previous detections (both exceedances and non-exceedances of the PALs) of PFAS?	Drinking water samples will be collected from one drinking water well (not previously sampled) located several parcels to the southeast of a drinking water well where detections of PFAS exceeded the PALs (to the east of Ault Field Area 16) (**Figure 4**) and analyzed via USEPA Method 537 for the 14 PFAS compounds listed in **Worksheet #15**.	Analytical results from this well will be used to evaluate potential long-term drinking water solutions for affected wells nearby. The presence or absence of PFAS constituents in the deeper aquifer zone will be used to evaluate the feasibility of installing a new drinking water well for affected residents.
Determine concentrations of additional parameters in the groundwater (including select dissolved metals and cations, geochemical parameters, general water quality parameters, and the 11 additional PFAS compounds) that could impact treatment options for PFAS in these locations.	What are the concentrations of other constituents present (e.g. total organic carbon [TOC] or anions, or any of the 11 additional PFAS compounds) that may affect treatment effectiveness (e.g. granular activated carbon [GAC] longevity)?	Drinking water samples will be collected from off-Base drinking water wells where PFAS were previously detected, and analyzed for the additional analytical compounds (including cations/ metals, anions, geochemical parameters, and water quality parameters) listed in **Worksheet #15** per the methods cited within this worksheet.	Results of these analyses will be used to evaluate potential long-term drinking water treatment options for these wells. A summary of the rationale for each additional parameter is provided in **Table 11-2**. If data indicates that the treatment effectiveness will be compromised, then it will be included in the long-term drinking water treatment option evaluation.

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

Table 11-2. Additional Parameter Sampling Rationale

Parameter	Note Reference	Rationale Notes
Chloride	1	1) Potentially a major cation or anion; used in QC check of correctness and completeness of analysis. 2) Potential membrane fouling (scaling) species due to precipitation when concentrated above the solubility level of a resulting compound (e.g., $CaCO_3$ and $CaSO_4$). 3) Potential membrane and granular media fouling species due to oxidation of reduced form and precipitation, and/or due to growth of iron oxidizing bacteria. DO and ORP are indicators of redox conditions, and, therefore, speciation of redox-sensitive elements. 4) Potentially competing species for adsorption sites (or indicator thereof), that could result in reduced adsorption of PFOS, PFOA, and PFBS and shortened service life of adsorptive media (e.g., GAC). 5) TDS (and its field indicator parameter, conductivity) affects membrane scaling potential and membrane treatment recovery. 6) TSS (and its field indicator parameter, turbidity) is a measure of potential fouling due to physical clogging by solids, and an indicator of the need for pre-treatment. 7) Nutrients (organic or inorganic) that can promote biofouling at elevated levels. 8) pH affects the adsorbability of some (e.g., ionizable) compounds; alkalinity is a measure of a water's resistance to pH changes. 9) Eleven of the 14 PFAS compounds that are listed in Method 537, Rev 1.1 as method analytes. Potential to degrade into PFOS/PFOA and affect treatment. 10) Although not particularly expected, any degradation of PFAS that brings about dehalogenation would release fluoride as a breakdown product. 11) Measures of general water quality and environmental conditions.
Nitrate/nitrite	1,7	
Sulfate	1,2	
Fluoride	1,2,10	
Phosphate	1,7	
Aluminum (dissolved)	1	
Ammonia/ammonium	1,7	
Calcium (dissolved)	1,2	
Iron (total and dissolved)	1,3	
Magnesium (dissolved)	1,2	
Manganese (dissolved)	1,3	
Potassium (dissolved)	1	
Silica (dissolved)	1,2	
UV-absorbing organic constituents (UV-254)	4,7	
Alkalinity	1,2,8	
TDS	1,5	
TSS	6	
DOC	4,7	
PFAS (excluding PFOA, PFOS, and PFBS)	4, 9	
Field water quality parameters (measured in field): pH, conductivity, temperature, DO, ORP, turbidity	3 (DO, ORP), 5 (conductivity), 6 (turbidity), 8 (pH), 11 (all)	

What are the Project Action Limits?

- USEPA LHA for PFOA and PFOS: 0.07 µg/L, unless both chemicals are detected, then 0.07 µg/L is the LHA for the cumulative concentration of the two chemicals
- USEPA Regional Screening Level (RSL) for PFBS: 400 µg/L (based on a hazard quotient [HQ] = 1.0)
- PALs currently do not exist for the remaining 11 PFAS compounds. At the time of drafting this SAP there are no USEPA RSLs or any state regulatory screening levels available. Per Navy policy, data need to be collected for all 14 analytes listed in USEPA Method 537 rev. 1.1.

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

For what will the data be used?

The data will be used to answer the environmental questions discussed in **Table 11-1**. Data from additional analyses conducted in drinking water sample locations where PFAS is present (including cations/ metals, anions, and geochemical parameters, listed in **Table 11-2** and **Worksheet #15**, and field water quality parameters, listed in **Table 11-2** and **Worksheet #14**) will be used to evaluate potential long-term drinking water treatment options in affected wells.

What types of data are needed (matrix, target analytes, analytical groups, field screening, onsite analytical or offsite laboratory techniques, sampling techniques)?

Data types include:

- Analytical results for drinking water samples as listed in **Worksheet #15**.
- Field water quality data collected at the time of sampling, including pH, conductivity, temperature, DO, ORP, and turbidity.
- All sampling locations are shown on **Figures 4 and 5** and are based on the rationale presented in **Worksheet #17** and in accordance with the project schedule outlined in **Worksheet #16**.
- The data will be collected following the standard operating procedures (SOPs) presented in **Worksheet #21**.

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

None in addition to those outlined elsewhere in this SAP.

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

The data will be collected during a 2-week sampling event to be conducted in October 2017. The sampling approach is summarized in **Worksheets #14.** All sampling locations are shown on **Figures 4** and **5** and are based on the rationale presented in **Worksheet #17** and in accordance with the project schedule outlined in **Worksheet #16**.

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SAP Worksheet #12—Measurement Performance Criteria Table – Field QC Samples

Matrix: Drinking Water
Analytical Group: PFAS, METALS, FMETALS, WCHEM
Concentration Level: Low

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Matrix Spike(MS)/Matrix Spike Duplicate (MSD)	PFAS, METALs, FMETALs	One per 20 samples	Accuracy/Precision	See **Worksheet #28**.
Field Duplicate (FD)	PFAS, METALs, FMETALs	One per 10 samples	Precision	Relative percent difference (RPD) less than 20%
Field Reagent Blank	PFAS	One per property, per well where drinking water sampled	Bias/Contamination	No analytes detected more than (>) 1/3 limit of quantitation (LOQ). Concentrations greater than 1/3 will require all associated samples to be re-sampled and re-analyzed; however, decision making and/or action (i.e., providing an alternate drinking water source) may proceed in advance of the resampling and re-analysis
Cooler Temperature Indicator	PFAS, WCHEM, METALs, FMETALs,	One per cooler PFAS	Accuracy/Representativeness	Temperature less than or equal to (≤) 10 degrees Celsius (°C), not frozen

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SAP Worksheet #13—Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation/collection dates)	How Data Will Be Used	Limitations on Data Use
Drinking water sources	CH2M. *Drinking Water Source Verification Technical Memorandum*. 2016.	Desktop data search performed by CH2M in September 2016, using available historical documents and public records to identify off-Base, potentially impacted, drinking water sources.	Identify drinking water sources	None
UCMR 3 Results	ALS Environmental. *Analytical Report for Service Request No. K161172*. 2016.	Analytical results for PFAS in onsite drinking water wells	Identify area of potential concern	None
Off-Base Drinking Water Results	CH2M. Document to be prepared discussing results of off-Base drinking water investigation. Results have been published at: **https://www.navfac.navy.mil/navfac_worldwide/atlantic/fecs/northwest/about_us/northwest_documents/environmental-restoration/pfas-groundwater-and-drinking-water-investigation.html**	Analytical results for off-Base drinking water well sampling performed from November 2016 through June 2017.	Identify impacted off-Base drinking water sources	None

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SAP Worksheet #14—Summary of Project Tasks

Pre-sampling Tasks

- Subcontractor procurement
  - Analytical laboratory
  - Data Validator
- Fieldwork scheduling

Sampling Tasks

Applicable field book and forms should be filled out completely each day.

- Drinking Water Samples
  - Samples will be collected in accordance with **Worksheet #18** and with the SOPs listed in **Worksheet #21** and provided in **Appendix A**.
  - Drinking water samples will be collected from properties following the sampling protocol as specified in **Worksheet #18**.
  - Drinking water sample locations will vary by residence and will be collected, if possible, at a tap or spigot prior to any treatment or filtering system installed by the homeowner. For example, if there is a filter on the kitchen faucet, samples will be collected from the bathroom faucet. If an outdoor location is chosen, samples will be collected from a spigot. The first choice will be to collect the sample as close to the well as possible. Samples will be collected after 3 to 5 minutes of flushing.
  - Field water quality data will be collected prior to sample collection. Data will be collected at the well site using a water quality meter (such as multi-meter) for the following parameters: pH, conductivity, temperature, DO, ORP, and turbidity. Water quality data will be collected at the same location as the drinking water sample. Care will be taken such that the water quality meter does not contact the water that will be collected into sample bottles for PFAS analysis.
  - Dissolved metals samples will be filtered in the field before preservation using disposable plastic syringes and 0.45-micron syringe filters.

Analyses and Testing Tasks

- The subcontracted analytical laboratory will process and prepare samples for analyses, and will analyze all samples for the 14 PFAS compounds, and select samples for the 14 PFAS compounds, cations/ metals, anions, general chemistry, and water quality parameters listed in **Worksheet #15**, in accordance with **Worksheets #18** and **#19**.

Quality Control Tasks

- Implement SOPs for field and laboratory activities being performed.
- QC samples are described on **Worksheets #12** and **#20**.

Secondary Data

- See **Worksheet #13**.

Data Validation, Review, and Management Tasks

- See **Worksheets #34** through **#36** for discussion of data management procedures.

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

Documentation and Reporting

- A summary of field activities as well as a data evaluation will be documented in a technical memorandum and submitted to the RPM and NTR for review and approval.

Assessment/Audit Tasks

- **Worksheets #31** and **#32**.

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

Matrix: Drinking Water
Analytical Group: PFAS(USEPA Method 537)

Analyte	Chemical Abstract Service (CAS) Number	USEPA Lifetime Health Advisory (µg/L)	RSLs Tapwater HQ = 1.0 (June 2017) (µg/L)	PQL Goal[1] (µg/L)	Laboratory Limits (µg/L)			LCS and MS/MSD Recovery Limits and RPD[2] (%)		
					LOQs (µg/L)	LODs (µg/L)	DLs (µg/L)	LCL[3]	UCL[3]	RPD
Perflurooctane Sulfonate (PFOS)	1763-23-1	0.07	--	0.035	0.01	0.005	0.00104	70	130	30
Perfluoro-n-octanoic acid (PFOA)	335-67-1	0.07	--	0.035	0.01	0.005	0.00108	70	130	30
Perfluorobutane sulfonate (PFBS)	375-73-5	--	400	200	0.01	0.005	0.000443	70	130	30
Perfluorohexanoic acid (PFHxA)	307-24-4	--	--	--	0.01	0.005	0.000663	70	130	30
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	0.01	0.005	0.000533	70	130	30
Perfluorohexane sulfonate (PFHxS)	355-46-4	--	--	--	0.01	0.005	0.000415	70	130	30
Perfluorononanoic acid (PFNA)	375-95-1	--	--	--	0.01	0.005	0.00144	70	130	30
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	0.01	0.005	0.00128	70	130	30
Perfluoroundecanoic acid (PFUnA)	2058-94-8	--	--	--	0.01	0.005	0.000255	70	130	30
Perfluorododecanoic acid (PFDoA)	307-55-1	--	--	--	0.01	0.005	0.000952	70	130	30
Per(fluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	0.01	0.005	0.000943	70	130	30
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	0.01	0.005	0.000777	70	130	30
N-Ethylperfluoro-1-octancesulfonamidoacetic acid (EtFOSAA)	2991-50-6	--	--	--	0.01	0.005	0.00193	70	130	30
N-Methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	--	--	--	0.01	0.005	0.00304	70	130	30
PFOA + PFOS (calculated)[4]	--	0.07	--	--	--	--	--	--	--	--

Notes:

[1] The project quantitation limit (PQL) goal is half the lesser of applicable screening levels.

[2] Accuracy and precision limits follow USEPA Method 537 Revision 1.1 per Navy policy.

[3] PALs are available for PFOS, PFOA, and PFBS. No other criteria are available or applicable to the remaining analytes. The analytes have been included to follow Navy policy.

[4] If both PFOS and PFOA are detected, the combined concentration must be less than 0.07ug/L. Otherwise, the chemicals will be compated to the USEPA Lifetime Health Advisory of 0.07 ug/L individually.

DL = detection limit; LCL = lower confidence limit; LCS = laboratory control sample; LOD = limit of detection; LOQ = limit of quantitation; RPD = relative percent difference; UCL = upper confidence limit

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

Matrix: Drinking Water
Analytical Group: METALs (SW-846 6010C)

Analyte	Chemical Abstract Service (CAS) Number	RSLs Tapwater HQ = 1.0 (June 2017) (mg/L)	PQL Goal[1] (mg/L)	Laboratory Limits (mg/L)			LCS and MS/MSD Recovery Limits and RPD[2] (%)		
				LOQs (mg/L)	LODs (mg/L)	DLs (mg/L)	LCL3	UCL3	RPD
Aluminum	7429-90-5	20	10	1.5	0.44	0.11	86	115	20
Calcium	7440-70-2	--	1.1	1.1	0.6216	0.1554	87	113	20
Iron (Total and Dissolved species)	7439-89-6	14	7	0.5	0.47	0.1175	87	115	20
Magnesium	7439-95-4	--	1.1	1.1	0.532	0.133	85	113	20
Manganese	7439-96-5	0.43	0.215	0.02	0.0068	0.0017	90	114	20
Potassium	7440-09-7	--	3.3	3.3	1.6444	0.4111	86	114	20
Silicon	7440-21-3	--	1.05	1.05	0.2528	0.0632	82	119	20

Notes:

[1] The PQL goal is half the lesser of applicable screening levels. If no screening level is available, the PQL will be the laboratory's LOQ.

[2] Accuracy and precision limits follow DoD QSM v. 5.0.

DL = detection limit

LCL = lower confidence limit

LCS = laboratory control sample

LOD = limit of detection

LOQ = limit of quantitation

RPD = relative percent difference

UCL = upper confidence limit

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

Matrix: Drinking Water
Analytical Group: WCHEM

Analyte	Analytical Method	Chemical Abstract Service (CAS) Number	PQL Goal[1] (mg/L)	Laboratory Limits (mg/L)			LCS and MS/MSD Recovery Limits and RPD[2] (%)		
				LOQs (mg/L)	LODs (mg/L)	DLs (mg/L)	LCL[3]	UCL[3]	RPD
Alkalinity	SM2320B	471-34-1	5	5	NA	NA	**85**	**115**	**20**
Ammonia	350.1	7664-41-7	0.5	0.5	0.16	0.06	**90**	**110**	**20**
Chloride	300.0	16887-00-6	0.5	0.5	0.08	0.04	87	111	20
Fluoride	300.0	16984-48-8	0.2	0.2	0.08	0.03	88	112	20
Nitrate/Nitrite	353.2	NO3/NO2	0.05	0.05	0.01	0.005	87	111	20
Ortho-phosphate	365.1	7723-14-0	0.25	0.25	0.22	0.1	80	116	20
Sulfate	300.0	14808-79-8	1.2	1.2	0.4	0.26	87	112	20
Dissolved Organic Carbon	SW846 9060	DOC	1.0	1.0	0.5	0.19	**85**	**115**	**20**
TDS	ASTM D2216	TDS	10	10	NA	NA	**80**	**120**	**20**
TSS	ASTM D2216	TSS	10	10	NA	NA	**70.6**	**120**	**20**

Notes:

[1] The PQL goal is set at the laboratory LOQ.

[2] Accuracy and precision limits follow DoD QSM v. 5.0. **Bolded values represent in-house laboratory limits.**

There are no criteria for these compounds. Table 11-2 provides rationale for collection.

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

Matrix: Drinking Water
Analytical Group: WCHEM

Analyte	Chemical Abstract Service (CAS) Number	PQL Goal[1] (cm^{-1})	Laboratory Limits (cm^{-1})		LCS and MS/MSD Recovery Limits and RPD[2] (%)		
			LOQs (cm^{-1})	DLs (cm^{-1})	LCL[3]	UCL[3]	RPD
UV-254	UV-254	0.009	0.009	0.002	**75**	**125**	**20**

Notes:

[1] The PQL goal is half the lesser of applicable screening levels

[2] Accuracy and precision limits follow DoD QSM v. 5.0. **Bolded values represent in-house laboratory limits.**

DL = detection limit
LCL = lower confidence limit
LCS = laboratory control sample
LOD = limit of detection
LOQ = limit of quantitation
RPD = relative percent difference
UCL = upper confidence limit

SAP Worksheet #16—Project Schedule/Timeline Table

Activities	**Organization**	**Dates (MM/DD/YY)**		**Deliverable**
		Anticipated Date of Initiation	**Anticipated Date of Completion**	
SAP Schedule				
Draft SAP preparation	CH2M	07/13/17	08/25/2017	Draft SAP
Navy SAP review	NAVFAC Northwest	08/28/2017	09/04/2017	Comments
Draft SAP preparation	CH2M	09/04/17	09/08/17	Draft SAP
Stakeholder review	Various	09/11/17	09/22/17	Comments
Final SAP	CH2M	09/25/17	09/29/17	Final SAP
Sampling Schedule				
Off-Base Drinking Water Sampling	CH2M	10/02/17	10/13/17	N/A
Analytical Data	Subcontractor	10-day turnaround time		
Rapid Response – Drinking Water Supply (as needed)	CH2M	Within 24 hours of date of receipt of sample results, if warranted (See **Worksheet #11**)	Within 24 hours of date of receipt of sample results (See **Worksheet #11**)	N/A
Offsite Drinking Water Sampling Step-out	CH2M	TBD	TBD	N/A
Analytical Data	Subcontractor	10-day turnaround time		
Data management	CH2M	October 2017	TBD	N/A
Reporting	CH2M	TBD	TBD	Results Technical Memorandum

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SAP Worksheet #17—Sampling Design and Rationale

The objective of the investigation described within this SAP is to:

- Determine the temporal and spatial variability of PFAS concentrations in groundwater on off-Base parcels, where they were previously detected and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine whether 11 additional PFAS compounds are present in drinking water wells, where select PFAS were previously detected and in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances.
- Determine if additional parameters are present in the groundwater (including select dissolved metals and cations, geochemical parameters, general water quality parameters, and the 11 additional PFAS compounds) that could impact treatment options for PFAS in these locations.

Determine if PFAS constituents are present in a deeper aquifer zone near Ault Field (not previously sampled and located several parcels southeast of a drinking water well with prior PFAS exceedances) which could be used to evaluate long-term solutions for affected residents. **Table 17-1** presents the sampling strategy and rationale.

Table 17-1. Ault Field and Outlying Field Coupeville Sampling Strategy and Rationale
Ault Field, Oak Harbor, Washington, and OLF Coupeville, Coupeville, Washington

Matrix	Depth of Samples	Analysis and Method	Number of Samples	Rationale
Drinking Water	N/A[a]	14 PFAS USEPA Method 537	Up to 35[b]	Samples will be collected from off-Base drinking water wells (**Figures 4** and **5**) and analyzed to determine whether PFOA, PFOS, and PFBS are present above the PALs and whether 11 other PFAS compounds are present (**Worksheet #15**)
		Metals SW846 3005A, 6010C / TA-IP-0205, TA-MT-0200	Up to 28[b]	
		Filtered Metals SW846 3005A, 6010C / TA-IP-0205, TA-MT-0200		
		Alkalinity SM2320B / TA-WC-0101		
		Anions USEPA Method 300.0 / TA-WC-0161		
		Nitrate-Nitrite USEPA Method 353.2 / TA-WC-0187		
		DOC SW846 9060 / TA-WC-157		
		Ammonia USEPA Method 350.1 / TA-WC-0111		
		Phosphate USEPA Method 365.1 / TA-WC-0124		
		UV-254 SM5910B / GEN 26		

[a] Drinking water samples will be collected as described in **Worksheet #14**.

[b] Number of samples is estimated pending field verification; up to 35 samples may be collected. If sampling community wells, samples of finished water will be collected if the community systems (**Worksheet #18**, **Figure 3**) treat the water prior to distribution.

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

Station Identification (ID)	Sample ID	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference
Community and Private Wells						
WI-AF-1RW12	WI-AF-1RW12-MMYY	Drinking water[a]	N/A	PFAS, METALS, FMETALS, WCHEM	1	**Worksheet #21**
WI-AF-1RW28	WI- AF-1RW28-MMYY				3 (MS/MSD)	
	WI- AF-1RW28-MMYY-MS					
	WI- AF-1RW28-MMYY-MSD					
WI-AF-1RW32	WI- AF-1RW32-MMYY				1	
WI-AF-1RW33	WI- AF-1RW33-MMYY				1	
WI-AF-1RW40	WI- AF-1RW40-MMYY				1	
WI-AF-1RW51	WI- AF-1RW51-MMYY				1	
WI-AF-3RW41	WI- AF-3RW41-MMYY				2 (FD)	
	WI-AF-3RW41P-MMYY					
WI-AF-2RW01	WI-AF-2RW01-MMYY				1	
WI-AF-1RW11	WI-AF-1RW11-MMYY				1	
WI-AF-1RW100	WI-AF-1RW100-MMYY				1	
WI-CV-1RW01	WI-CV-1RW01-MMYY				1	
WI-CV-1RW07	WI-CV-1RW07-MMYY				2 (FD)	
	WI-CV-1RW07P-MMYY					
WI-CV-1RW23	WI-CV-1RW23-MMYY				1	
WI-CV-1RW22	WI-CV-1RW22-MMYY				1	
WI-CV-1RW34	WI-CV-1RW34-MMYY				3 (MS/MSD)	
	WI-CV-1RW34-MMYY-MS					
	WI-CV-1RW34-MMYY-MSD					
WI-CV-1RW50	WI-CV-1RW50-MMYY				1	
WI-CV-2RW02	WI-CV-2RW02-MMYY				1	
WI-CV-2RW04	WI-CV-2RW04-MMYY				1	
WI-CV-2RW06	WI-CV-2RW06-MMYY				1	
WI-CV-3RW07	WI-CV-3RW07-MMYY				1	
WI-CV-3RW10	WI-CV-3RW10-MMYY				1	
WI-CV-3RW11	WI-CV-3RW11-MMYY				2 (FD)	
	WI-CV-3RW11P-MMYY					
WI-CV-1RW28	WI-CV-1RW28-MMYY				1	
WI-CV-1RW55	WI-CV-1RW55-MMYY				1	
WI-CV-1RW60	WI-CV-1RW60-MMYY				1	
WI-CV-1RW61	WI-CV-1RW61-MMYY				1	
WI-CV-1RW72	WI-CV-1RW72-MMYY				1	
WI-AF-1RWXX[b]	WI-AF-1RWXX-MMYY			PFAS	Up to 4	
WI-CV-1RWXX[b]	WI-CV-1RWXX-MMYY			PFAS	Up to 4	

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

Station Identification (ID)	Sample ID	Matrix	Depth (feet bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference
WI-AF-QC	WI-AF-1FB12-MMYY	QC	N/A	PFAS	1	**Worksheet #21**
	WI-AF-1FB28-MMYY				1	
	WI-AF-1FB32-MMYY				1	
	WI-AF-1FB33-MMYY				1	
	WI-AF-1FB40-MMYY				1	
	WI-AF-1FB51-MMYY				1	
	WI-AF-1FB100-MMYY				1	
	WI-AF-3FB41-MMYY				1	
	WI-AF-2FB01-MMYY				1	
	WI-AF-1FB11-MMYY				1	
	WI-AF-1FBXX-MMYY[b]				Up to 4	
WI-CV-QC	WI-CV-1FB01-MMYY	QC	N/A	PFAS	1	**Worksheet #21**
	WI-CV-1FB07-MMYY				1	
	WI-CV-1FB23-MMYY				1	
	WI-CV-1FB27-MMYY				1	
	WI-CV-1FB34-MMYY				1	
	WI-CV-1FB50-MMYY				1	
	WI-CV-1FB61-MMYY					
	WI-CV-2FB02-MMYY				1	
	WI-CV-2FB04-MMYY				1	
	WI-CV-2FB06-MMYY				1	
	WI-CV-3FB07-MMYY				1	
	WI-CV-3FB10-MMYY				1	
	WI-CV-3FB11-MMYY				1	
	WI-CV-1FB28-MMYY				1	
	WI-CV-1FB55-MMYY				1	
	WI-CV-1FB60-MMYY				1	
	WI-CV-1FB72-MMYY				1	
	WI-CV-1FBXX-MMYY[b]				Up to 4	

[a] Drinking water samples will be collected as described in **Worksheet #14**.

[b] Potential samples to be collected at properties adjacent to exceedances in previous sampling events. Samples to be collected pending resident confirmation.

SAP Worksheet #19—Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method/ SOP Reference	Containers	Sample Volume	Preservation Requirements	Maximum Holding Time[1] (preparation/ analysis)
Drinking Water	PFAS	USEPA Method 537/ SOP 64	2 x 250 milliliters (mL) polypropylene	250 mL	≤10°C but not frozen, Trizma (5.0 grams per liter)	14 days/ 28 days
Drinking Water	METAL	SW846 3005A, 6010C / TA-IP-0205, TA-MT-0200	1 x 100 mL HDPE	100 mL	HNO3 to pH <2	180 days
Drinking Water	FMETAL	SW846 3005A, 6010C / TA-IP-0205, TA-MT-0200	1 x 100 mL HDPE	100 mL	Field filtered; HNO3 to pH <2	180 days
Drinking Water	WCHEM (Alkalinity)	SM2320B / TA-WC-0101	1 x 500 mL HDPE	30 mL	Cool to 0-6 °C	28 days
Drinking Water	WCHEM (Anions)	USEPA Method 300.0 / TA-WC-0161	1 x 100 mL HDPE	10 mL	Cool to 0-6 °C	28 days
Drinking Water	WCHEM (Nitrate-Nitrite)	USEPA Method 353.2 / TA-WC-0187	1 x 100 mL HDPE	50 mL	H2SO4 to pH <2; Cool to 0-6 °C	28 days
Drinking Water	WCHEM (DOC)	SW846 9060 / TA-WC-157	1 x 500 mL Amber glass	50 mL	Field filtered; H2SO4 to pH <2; Cool to 0-6 °C	28 days
Drinking Water	WCHEM (Ammonia)	USEPA Method 350.1 / TA-WC-0111	1 x 250 mL Amber glass	50 mL	Cool to 0-6 °C	26 days
Drinking Water	WCHEM (Phosphate)	USEPA Method 365.1 / TA-WC-0124	1 x 250 mL Amber glass	10 mL	H2SO4 to pH <2; Cool to 0-6 °C	28 days
Drinking Water	WCHEM (UV-254)	SM5910B / GEN 26	1 x 250 mL glass	50 mL	Cool to 0-6 °C	48 hours

Notes:

[1] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

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SAP Worksheet #20—Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates[1]	No. of MS/MSDs[1]	No. of Equip. Blanks[1]	No. of Field Reagent Blanks	No. of Trip Blanks[1]	Total No. of Samples to Lab[1]
Ault Field								
Drinking Water	PFAS	Up to 14	2	1/1	-	Up to 14	-	Up to 32
	METAL	Up to 10	1	1/1	-	-	-	Up to 13
	FMETAL	Up to 10	1	1/1	-	-	-	Up to 13
	WCHEM	Up to 10	-	-	-	-	-	Up to 10
OLF Coupeville								
Drinking Water	PFAS	Up to 21	Up to 3	Up to 2/2	-	Up to 21	-	Up to 51
	METAL	Up to 17	Up to 2	Up to 1/1	-	-	-	Up to 21
	FMETAL	Up to 17	Up to 2	Up to 1/1	-	-	-	Up to 21
	WCHEM	Up to 17	-	-	-	-	-	Up to 14

Note:

[1] Samples will be collected as detailed in **Worksheets #14, #17,** and **#18** of this SAP. Field QA/QC samples will be collected as detailed in **Worksheet #12**. Sample counts include properties with previous detections, exceedances, those adjacent to previous exceedances, and one deeper zone well near a previous exceedance

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SAP Worksheet #21—Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-001	Chain-of-Custody, rev. April 2015	CH2M	Chain-of-custody form	No	
SOP-002	Preparing Field Log Books, rev. April 2015	CH2M	PFC-free logbook and indelible pen	No	
SOP-003	Potable Water Supply Sampling rev. September 2016	CH2M	2 x 250 mL high-density polyethylene sample bottles	No	
SOP-004	Packaging and Shipping Procedures for Low-Concentration Samples, rev. April 2015	CH2M	Laboratory-supplied coolers	No	
SOP-005	Field Sampling Protocols to Avoid Cross-Contamination during Water Sampling for Perfluorinated Compounds (PFAS)	NAVFAC	Field sampling equipment (various)	No	

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

Field Equipment	Calibration Activity	Maintenance Activity	Testing / Inspection Activity	Frequency	Acceptance Criteria	CA	Resp. Person	SOP Reference
Water quality meter	Calibration of pH, dissolved oxygen, and conductivity probes	Check mechanical and electronic parts, verify system continuity, check battery, and clean probes. Calibration check.	Visual Inspection	Daily before use, at the end of the day, and when unstable readings occur.	Parameter specific per model/ instruction manual	Manufacturer technical support for calibration errors	FTL	SOP-06

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SAP Worksheet #23—Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and/or Number	Date 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)
12	*Sample Receiving and Sample Control Procedures; 11/08/16; rev. 12*		N/A	Drinking Water/ PFAS	N/A	Vista Analytical Laboratory	N	N
14	*Bottle Order Preparation; 09/03/14; rev. 4*		N/A	Drinking Water/ PFAS	N/A	Vista Analytical Laboratory	N	N
64	*Preparation and Analysis for the Determination of Per and Polyfluorinated Compounds in Drinking Water; 12/8/16; rev. 1*		Definitive	Drinking Water/ PFAS	UPLC/MS/MS	Vista Analytical Laboratory	N	N
TA-MT-0200	*Trace Metals Analysis by ICP; 02/21/17; rev. 27*		Definitive	Drinking Water / METAL/FMETAL	ICP	TestAmerica Seattle	N	N
TA-WC-0101	*Alkalinity by Titration; 03/29/17; rev. 17*		Definitive	Drinking Water / WCHEM	pH meter	TestAmerica Seattle	N	N
TA-WC-0161	*Anions by Ion Chromatography; 08/19/16; rev. 24*	Currently in review	Screening	Drinking Water / WCHEM	IC	TestAmerica Seattle	N	N
TA-WC-0156	*Total Organic Carbon; 01/08/17; rev. 10*	January 2017	Screening	Drinking Water / WCHEM	TOC instrument	TestAmerica Seattle	N	N
TA-WC-0187	*Determination of Nitrate-Nitrite in Water; 10/24/16; rev. 13*		Screening	Drinking Water / WCHEM	Automated Flow Injection	TestAmerica Seattle	N	N
TA-WC-0160	*Solids; 3/29/17; rev. 20*		Screening	Drinking Water / WCHEM	NA	TestAmerica Seattle	N	N
TA-WC-0124	*Orthophosphate and Total Phosphate; 05/18/17; rev.*		Screening	Drinking Water / WCHEM	RFA	TestAmerica Seattle	N	N
GEN 26	*Standard Operating Procedure for Determination of UV Scan and UV-254; 08/16/16; Rev. 14*	January 2017	Screening	Drinking Water / WCHEM	Spectrophotometer	TestAmerica ASL	NA	NA
TA-WC-0111	*Ammonia; 10/26/16; rev. 18*		Screening	Drinking Water / WCHEM	RFA	TestAmerica Seattle	N	N

Notes:

UPLC = ultra performance liquid chromatography

DoD Environmental Laboratory Accreditation Program (ELAP) certification is required for all definitive data. Vista Analytical has DoD ELAP certification that is valid through September 30, 2017. TestAmerica Seattle has DoD ELAP certification that is valid through January 19, 2019. TestAmerica ASL has DoD ELAP certification that is valid through September 24, 2018 but is not certified for UV-254.

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SAP Worksheet #24—Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
UPLC/MS/MS	Tune Check	Prior to ICAL and after any mass calibration or maintenance is performed.	Tuning standard must contain analytes of interest or appropriate substitute. Mass assignments of tuning standard within 0.5 amu of true value.	Retune instrument. If the tuning will not meet acceptance criteria, an instrument mass calibration must be performed and the tuning redone.	Lab Manager/ Analyst	64
	Minimum five-point initial calibration for target analytes, lowest concentration standard at or below the RL	Initial calibration prior to sample analysis	Each calibration point for each analyte (natives and surrogates) must calculate to be within 70-130 percent, except the lowest cal point, which must calculate to within 50 to 150 percent for natives.	Evaluate standards, chromatography, and mass spectrometer response. If problem found with above, correct as appropriate, then repeat initial calibration.		
	Peak Asymmetry Verification	With initial calibration	Calculated factor in the range of 0.8 to 1.5.	Change instrument conditions to correct, then repeat initial calibration.		
	Second-source calibration verification	Once per initial calibration, following initial calibration.	All reported analytes and labeled compounds within ± 30 percent of true value.	Evaluate data. If problem (e.g., concentrated standard, plugged transfer line) found, correct, then repeat second source verification. If it still fails, then repeat initial calibration.		
	Daily calibration verification	Analysis of mid-level standard after every 10 field samples. All samples must be bracketed by the analysis of a standard.	All CV analytes must be within ± 30 percent of true value. For all continuing calibration verifications (CCVs), internal standards must be within ± 50 percent of true value and 70 to 140 percent of the most recent prior CCV.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV. OR Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.		
ICP	Linear dynamic range or high-level check standard	Every 6 months	Within ±10% of the true value for all target analytes.	Adjust dynamic range downward and repeat.	Lab Manager / Analyst	TA-MT-0200
	Initial calibration (ICAL) per manufacturer's instructions, with a minimum of one standard and a calibration blank	Daily Initial calibration prior to sample analysis	Correlation coefficient >0.995 (if more than one point).	The validity of the calibration is determined by the subsequent calibration verifications. If invalid, identify and correct problem, then repeat ICAL.		
	Initial Calibration Verification (ICV)	Once after each ICAL, prior to beginning anaytical run	Within ±10% of the true value for all target analytes.	Evaluate standards and instrument response. If standard issue, repeat or remake then repeat standard as appropriate. If still fails, repeat initial calibration.		
	Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Within ±10% of the true value for all target analytes.	Evaluate standard and instrument response. If problem with instrument (autosampler failure, response poor, etc) or standards, correct as appropriate, then repeat. If still fails, repeat initial calibration. Re-analyze all samples not bracketed by successful calibration verification. or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Low-Level Calibration Check Standard (Low-level ICV)	Once after each ICAL, and daily prior to beginning anaytical run	Within ±20% of the true value for all target analytes.	Evaluate standards and instrument response. If standard issue, repeat or remake then repeat standard as appropriate. If still fails, repeat initial calibration.		
	Initial and Continution Calibration Blank (ICB/CCB)	Before beginning a sample run, after every 10 field samples, and at the end of the analysis sequience.	No analytes detected >LOD	Reanalyze once. If acceptable, continue. If unacceptable, terminate analysis; correct the problem, recalibrate the instrument, verify calibration and rerun all samples since the last acceptable CCB.		

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

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
pH probe	pH measurement using 4 and 10 buffers	Daily Initial calibration prior to sample analysis	When calibration is complete the instrument will print out a calculated slope. This slope must be between –58 and –64 mV/pH to be valid.	If the slope is outside of the approved range, the probe must be recalibrated.	Lab Manager / Analyst	TA-WC-0101
Spectrophotometer	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit	Daily calibration prior to sample analysis	Linear least squares regression: r ≥ 0.995	Evaluate standards, and spectrophotometer response. If problem found with above, correct as appropriate, then repeat initial calibration	Lab Manager / Analyst	TA-WC-0104
	Initial calibration verification (ICV, Second Source)	Immediately following ICAL.	Calculated concentration within ± 10% of the expected value from the ICAL.	Evaluate data. If problem (e.g., concentrated standard, incorrectly prepared standard) found, correct, then repeat second source verification. If still fails, repeat initial calibration.		
	Calibration Blank (ICB/CCB)	Immediately following ICV (ICB) and immediately following CCV (CCB).	Result within ± RL from zero.	Evaluate data. If problem found (e.g. contaminated cuvet or solution), correct, then repeat. If still fails, investigate further and repeat initial calibration. Repeat all samples since last successful calibration blank.		
	Daily calibration verification	After every 10 field samples, and at the end of the sequence.	Calculated concentration within ± 10% of the expected value from the ICAL.	Evaluate standard and response. If problem found with above, correct as appropriate, then repeat CCV. If still fails, repeat initial calibration. Re-analyze all samples since the last successful calibration verification.		
IC	Initial calibration (IC) per manufacturer's instructions, with a minimum of 3 standards and a calibration blank	Daily Initial calibration prior to sample analysis	Correlation coefficient >0.995	The validity of the calibration is determined by the subsequent calibration verifications. If invalid, identify and correct problem, then repeat ICAL.	Lab Manager / Analyst	TA-WC-0161
	Second-source ICV, prepared at the calibration midpoint	Once after each ICAL, prior to beginning anaytical run	Within ±10% of the true value for all target analytes. RT must be ±10% of established RT.	Repeat once, and recalibrate and reanalyze if it fails a second time.		
	Initial Calibration Blank (ICB)	Immediately after each ICV	No analytes detected >1/2 LOD	Re-prepare and reanalyze.		
	Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Within ±10% of the true value for all target analytes.	Repeat. If repeat fails, reanalyze all samples since the last acceptable CCV.		
	Continuing Calibration Blank (CCB)	Immediately following each CCV	No analytes detected >1/2 LOD	Repeat. If repeat fails, reanalyze all samples since the last acceptable CCB.		
RFA	Initial calibration (IC) per manufacturer's instructions, with a minimum of 6 standards and a calibration blank	Following IC, after every 10 samples and the end of the sequence	Within ±10% of the true value for all target analytes.	Repeat once, and recalibrate and reanalyze if it fails a second time.	Lab Manager / Analyst	TA-WC-0111 and TA-WC-124
Spectrophotometer	Calibration Blank (ICB/CCB)	Immediately following ICV (ICB) and immediately following CCV (CCB).	Result >0.0045 abs/cm.	Evaluate data. If problem found (e.g. contaminated cuvet or solution), correct, then repeat. If still fails, investigate further and repeat initial calibration. Repeat all samples since last successful calibration blank.	Lab Manager / Analyst	GEN26
	Daily calibration verification	After every 10 field samples, and at the end of the sequence.	Acceptance criteria within 80-120%.	Evaluate standard and response. If problem found with above, correct as appropriate, then repeat CCV. If still fails, repeat initial calibration. Re-analyze all samples since the last successful calibration verification.		

Notes:
± = plus or minus
amu = atomic mass unit
CCV = continuing calibration verification
ICAL = initial calibration
RL = reporting limit
UPLC = ultra performance liquid chromatography

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

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
UPLC/MS/MS	Clean sample and gas cones. Change the column. Clean the T-Wave.	USEPA 537	Check the sample and gas cones.	T-Wave cleaning is performed when the instrument response deteriorates. Other instrument maintenance is done as needed to keep the instrument performing at peak performance.	ICAL within acceptance criteria on WS#24 and IS recovery within acceptance criteria on WS#28	Recalibrate and/or perform the necessary equipment maintenance. Check the calibration standards. Reanalyze the affected data.	Analyst/Supervisor	SOP 64
ICP	Increase rinse time Clean or replace tip Clean or replace torch Clean or replace sample tubing Clean or replace nebulizer Clean or replace mixing chamber	Normal analysis	High blanks are noticed	As needed	None	Clean and replace parts	Test America Chemist	TA-MT-0200
ICP	RF not cooling properly Replace torch (Crack) Clean or replace nebulizer (blockage) Check room temperature (changing) Replace pump tubing Room humidity too high Clean torch tip (salt buildup) Check for argon leaks Adjust sample carrier gas Replace PA tube	Initial and continuing calibration	Instrument Drift is noted	As needed	None	Clean and replace parts	Test America Chemist	TA-MT-0200
ICP	Check for argon leaks Adjust sample carrier gas Replace tubing (clogged) Check drainage (back pressure changing) Increase uptake time (too short) Increase flush time (too short) Clean nebulizer, torch or spray chamber Increase sample volume introduced Check that autosampler tubes are full Sample or dilution of sample not mixed Increase integration time (too short) Realign torch Reduce amount of tubing connectors	Normal analysis	Erratic Readings, Flickering Torch or High RSD	As needed	None	Clean and replace parts	Test America Chemist	TA-MT-0200
pH Probe	Change Membrane	Normal analysis	Calibration errors	Daily, as needed	None	Clean and replace parts	Test America Chemist	TA-WC-0101
Spectrophotomer	Replace Lamp and/or fuse	Sensitivity check	Instrument performance and sensitivity	As needed	ICAL/ICB pass criteria	Recalibrate	TestAmerica Chemist	TA-WC-0104 and GEN 26
Spectrophotomer	Wavelength Calibration	Sensitivity check	Instrument performance and sensitivity	Annually	ICAL/ICB pass criteria	Recalibrate	TestAmerica Chemist	TA-WC-0104 and GEN 26
Dionex IC and associated equipment	Check for leaks	Normal analysis	Pressure changes, chromatography issues	Weekly	None	Fix leaks, rinse parts, reposition tubing	Test America Chemist	TA-WC-0161

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

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
Dionex IC and associated equipment	Replace filters, columns, guard columns	Normal analysis	Pressure changes, chromatography issues	As needed	None	Replace parts	Test America Chemist	TA-WC-0161
Dionex IC and associated equipment	Lubricate pistons and replace seals	Preventative maintenance	Preventative Maintenance and when a leak is noted	Every 6 months	None	Lubricate and Replace parts	Test America Chemist	TA-WC-0161
RFA	Replace worn tubing. Flush reagent lines.	Preventative maintenance	Preventative Maintenance and when a leak is noted	Every 2 -4 weeks	None	Replace worn tubing	Test America Chemist	TA-WC-0111 and TA-WC-124

Notes:

UPLC = ultra performance liquid chromatography

SAP Worksheet #26—Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Project Field Team, FTL/CH2M. Field SOPs are in Appendix A of this SAP.
Sample Packaging (Personnel/Organization): Project Field Team, FTL/CH2M. Field SOPs are in Appendix A of this SAP.
Coordination of Shipment (Personnel/Organization): FTL/CH2M.
Type of Shipment/Carrier: FedEx Priority Overnight to respective laboratory
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Receiving – Vista Analytical, TestAmerica Seattle, TestAmerica ASL
Sample Custody and Storage (Personnel/Organization): Sample Receiving – Vista Analytical, TestAmerica Seattle, TestAmerica ASL
Sample Preparation (Personnel/Organization): Vista Analytical, TestAmerica Seattle, TestAmerica ASL
Sample Determinative Analysis (Personnel/Organization): Vista Analytical, TestAmerica Seattle, TestAmerica ASL
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 45 days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): 90 days
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization): Sample Disposal – Vista Analytical, TestAmerica Seattle, TestAmerica ASL
Number of Days from Analysis: 45 days

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SAP Worksheet #27—Sample Custody Requirements Table

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Samples will be collected by field team members under the supervision of the FTL. As samples are collected, they will be placed into containers and labeled. Labels will be taped to the jar to ensure they do not separate. Samples will be cushioned with packaging material and placed into coolers containing enough ice to keep the samples 0-6°C (but not frozen; requirements for USEPA 537 are less than 10°C for the first 48 hours) until they are received by the laboratory. The chain-of-custody form will be placed into the cooler in a resealable zip-top plastic bag. Coolers will be taped and shipped to the laboratories via FedEx overnight, with the air bill number indicated on the chain-of-custody form (to relinquish custody). Upon delivery, the laboratory will log each cooler and report the status of the samples to CH2M. See **Worksheet #21** for SOPs containing sample custody guidance. The CH2M field team will ship all environmental samples directly to the laboratory performing the analysis. This will require shipment to Vista Analytical in El Dorado Hills, California, and TestAmerica Laboratory in Seattle, Washington (TestAmerica ASL samples will be delivered by Seattle).
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Laboratory custody procedures can be found in the laboratory SOPs, which will be provided upon request.
Sample ID Procedures: Sample labels will include, at a minimum, client name, site, sample ID, date/time collected, analysis group or method, preservation, and sampler's initials. The field logbook will identify the sample ID with the location and time collected and the parameters requested. The laboratory will assign each field sample a laboratory sample ID based on information in the chain-of-custody. The laboratory will send sample log-in forms to the PC to check that sample IDs and parameters are correct.
Chain-of-Custody Procedures: Chains of custody forms will include, at a minimum, laboratory contact information, client contact information, sample information, and relinquished by/received by information. Sample information will include sample ID. Date/time collected, number and type of containers, preservative information, analysis method, and comments. The chain-of-custody form will link location of the sample from the field logbook to the laboratory receipt of the sample. The laboratory will use the sample information to populate the Laboratory Information Management Systems database for each sample.

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SAP Worksheet #28-1—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: PFAS
Analytical Method/SOP Reference: USEPA Method 537/SOP 64

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	Correct problem. Reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, the data must be qualified and explained in the case narrative.	Analyst/ Supervisor	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-1**	Reanalyze LCS once. If acceptable, report. Evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment. If LCS has low bias, or if there are detections for critical compounds of concern, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and narrated.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	Method Limits of 70 to 130 percent for spikes > LOQ, and 50 to 150 percent for spikes at or below the LOQ.	Evaluate the data, and re-prepare /reanalyze the native sample and MS/MSD pair if laboratory error is indicated.		Precision/ Accuracy/Bias	
Internal Standards (IS)	Every sample, spiked sample, standard, and method blank	13C-PFOA 50-150% 13C-PFOS 50-150%	For failed QC samples, correct problem and rerun all associated failed field samples. If reanalysis cannot be performed, the data must be qualified and explained in the case narrative.		Accuracy	
Surrogates	Every samples, spiked sample, and method blank	13C2-PFHxA 70-130% 13C2-PFDA 70-130%	Identify and correct the problem. Re-prep and reanalyze all samples with failed surrogates in the associated preparatory batch. If obvious chromatographic interference with surrogate is present, re-analysis may not be necessary. Qualify all applicable data if acceptance criteria are not met, and explain in case narrative.		Accuracy/Bias	

SAP Worksheet #28-2—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: METAL, FMETAL
Analytical Method/SOP Reference: SW846 6010C / TA-MT-0200

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-2**	Evaluate LCS data and reanalyze if bias appears instrument related. If bias appears preparation related, determine if trend requires correction prior to reprep and reanalysis of the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-2**; RPD – 20%	Evaluate the data, and re-prepare /reanalyze the native sample and MS/MSD pair if laboratory error is indicated.		Precision/ Accuracy/Bias	
Interference check solution (ICS)	At the beginning of the analytical run and every 12 hours.	ICSA-A: Absolute values of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes); ICSA-B: Within ±20% of true value in accordance with DoD QSM requirements	Terminate analysis, correct problem, then reanalyze ICS and all affected samples in accordance with DoD QSM requirements.		Accuracy	
Dilution test	One per batch of 20 field samples or fewer.	1:5 dilution must agree within ±10% of the original determination in accordance with DoD QSM requirements	Perform post-digestion spike addition in accordance with DoD QSM requirements.		Accuracy	
Post digestion spike addition	Perform when MS/MSD fails. One pre preparatory batch (using the same samples as MS/MSD if adequate sample volume).	Recovery within 80% to 120% for sample concentrations < 50x LOQ prior to dilution	Flag affected analytes in parent samples with J-flag and note in narrative.		Accuracy	

SAP Worksheet #28-3—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: USEPA 300.0 / TA-WC-0161

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	Reprepare LCS and re-analyze.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**; RPD – 20%	If LCS and CCVs are in control, then document in an NCM, unless project requires reanalysis.		Precision/ Accuracy/Bias	
Sample Duplicate	One duplicate per 10 samples	QC acceptance criteria is within 20% RPD	Reanalysis of duplicate and associated samples		Precision/ Accuracy/Bias	

SAP Worksheet #28-4—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: SM2320B / TA-WC-0101

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Sample Duplicate	One duplicate per batch, not to exceed 20 samples	QC acceptance criteria is within 20% RPD	Reanalysis or flag data as being outside control limits	Lab Manager / Analyst	Precision/ Accuracy/Bias	Same as Method/ SOP QC Acceptance Limits

SAP Worksheet #28-5—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: SW846 9060 / TA-WC-0156

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	Reprepare LCS and re-analyze.		Accuracy/Bias	
Sample Duplicate	One duplicate per preparation batch	QC acceptance criteria is within 20% RPD	Reanalysis of duplicate and associated samples		Precision/ Accuracy/Bias	

SAP Worksheet #28-6—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: USEPA 353.2 / TA-WC-0187

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	Reprepare LCS and re-analyze.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**; RPD – 20%	If LCS and CCVs are in control, then document in an NCM, unless project requires reanalysis.		Precision/ Accuracy/Bias	
Sample Duplicate	One duplicate per 20 samples	QC acceptance criteria is within 20% RPD	Reanalysis of duplicate and associated samples		Precision/ Accuracy/Bias	

SAP Worksheet #28-7—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: USEPA Method 350.1 / TA-WC-0111

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	Reprepare LCS and re-analyze.		Accuracy/Bias	
MS/MSD	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**; RPD – 20%	If LCS and CCVs are in control, then document in an NCM, unless project requires reanalysis.		Precision/ Accuracy/Bias	

SAP Worksheet #28-8—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: SM5910B / GEN 26

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected >0.0045 abs/cm	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-4**	Reprepare LCS and re-analyze.		Accuracy/Bias	
Analytical Replicate	Every sample and standard is analyzed twice	< 0.045 abs/cm must be ≤ 20 % RPD. Replicates for concentration > 0.045 abs/cm must be ≤ 10 % RPD.	If replicate RPD criteria are not met, report the failure on the case narrative		Precision/ Accuracy/Bias	

SAP Worksheet #28-9—Laboratory QC Samples Table

Matrix: Drinking Water
Analytical Group: WCHEM
Analytical Method/SOP Reference: USEPA 365.1 / TA-WC-0124

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria (MPC)
Method Blank	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	No analytes detected > 1/2 LOQ or >1/10 sample concentration or >1/10 regulatory limit, whichever is greater. For common laboratory contaminants, no analytes detected >LOQ.	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	Lab Manager / Analyst	Bias/ Contamination	Same as Method/ SOP QC Acceptance Limits
LCS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	Reprepare LCS and re-analyze.		Accuracy/Bias	
MS	One per prep batch of 20 or fewer samples of similar matrix; or one per day, whichever comes first	See **Worksheet #15-3**	If LCS and CCVs are in control, then document in an NCM, unless project requires reanalysis.		Precision/ Accuracy/Bias	
Sample Duplicate	One duplicate per 20 samples	QC acceptance criteria is within 20% RPD	Reanalysis of duplicate and associated samples		Precision/ Accuracy/Bias	

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SAP Worksheet #29—Project Documents and Records Table

Document	Where Maintained
• Field Notebooks • Chain-of-Custody Records • Air Bills • Custody Seals • CA Forms • Electronic data deliverables (EDDs) • ID of QC Samples • Meteorological Data from Field • Sampling instrument calibration logs • Sampling Locations and Sampling Plan • Sampling Notes and Drilling Logs • Water quality parameter • Sample Receipt, Chain of Custody, and Tracking Records • Standard Traceability Logs • Equipment Calibration Logs • Sample Preparation Logs • Run Logs • Equipment Maintenance, Testing, and Inspection Logs • CA Forms • Reported Field Sample Results • Reported Result for Standards, QC Checks, and QC Samples • Instrument printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples • Data Package Completeness Checklists • Sample disposal records • Extraction/Clean-up Records • Raw Data (archived per Navy CLEAN contract) • DV Reports • CA Forms • Laboratory QA Plan • Method Detection Limit Study Information	• Field data deliverables (e.g., logbooks entries, chains-of-custody, air bills, and EDDs) will be kept on CH2M's network server. • Field parameter data will be loaded with the analytical data into the Navy database • Analytical laboratory hard copy deliverables and DV reports will be saved on the network server and archived per the Navy CLEAN contract. • Electronic data from the laboratory will be loaded into Navy database • Following project completion, hard copy deliverables (e.g., logbooks, chains-of-custody) will be archived at Iron Mountain: • Iron Mountain Headquarters 745 Atlantic Avenue Boston, MA 02111 (800) 899-IRON • Following project completion, hard copy deliverables including chains-of-custody and raw data will be archived at the Washington National Records Center: • Washington National Records Center 4205 Suitland Road Suitland, Maryland 20746-8001 301-778-1550

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SAP Worksheet #30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID	Analytical Method	Data Package Turnaround Time	Laboratory/Organization	Backup Laboratory/ Organization[a]
Drinking Water	PFAS	Refer to **Worksheets #18** and **#20**	USEPA Method 537	10 calendar days	Vista Analytical Laboratory 1104 Windfield Way, El Dorado Hills, CA 95762 Contact: Martha Maier (916)-673-1520	TBD
Drinking Water	METAL	Refer to **Worksheets #18** and **#20**	SW846 6010C	10 calendar days	TestAmerica Laboratories, Inc. Seattle 5755 8th Street East Tacoma, WA 98424 Contact: Terri Torres (253) 922-2310	TBD
Drinking Water	FMETAL	Refer to **Worksheets #18** and **#20**	SW846 6010C	10 calendar days		TBD
Drinking Water	WCHEM (Alkalinity)	Refer to **Worksheets #18** and **#20**	SM2320B	10 calendar days		TBD
Drinking Water	WCHEM (Anions)	Refer to **Worksheets #18** and **#20**	USEPA Method 300.0	10 calendar days		TBD
Drinking Water	WCHEM (Nitrate-Nitrite)	Refer to **Worksheets #18** and **#20**	USEPA Method 353.2	10 calendar days		TBD
Drinking Water	WCHEM (DOC)	Refer to **Worksheets #18** and **#20**	SW846 9060	10 calendar days		TBD
Drinking Water	WCHEM (Phosphate)	Refer to **Worksheets #18** and **#20**	USEPA Method 365.1	10 calendar days		TBD
Drinking Water	WCHEM (Ammonia)	Refer to **Worksheets #18** and **#20**	USEPA Method 350.1	10 calendar days		TBD
Drinking Water	WCHEM (UV-254)	Refer to **Worksheets #18** and **#20**	SM5910B	10 calendar days	TestAmerica ASL 1100 NE Circle Blvd, Suite 310 Corvallis, OR 97330 Contact: Ginger Collins (541) 243-0966	TBD

[a] A backup laboratory will be determined if necessary.

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SAP Worksheet #31—Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Implementing CA (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Field Performance Audit	One during sampling event	Internal	CH2M	PM CH2M	FTL CH2M	PM CH2M	PM CH2M
Safe Work Observation	One during sampling event	Internal	CH2M	SSC CH2M	Field Team Member observed CH2M	HSM CH2M	SSC CH2M
Field Document Review	Daily during sampling event	Internal	CH2M	PM or Task Manager CH2M	FTL CH2M	PM CH2M	PM CH2M

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SAP Worksheet #32—Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response (name, title, organization)	Timeframe for Response
Field Performance Audit	Checklist and Written Audit Report	FTL CH2M	Within 1 day of audit	Verbal and Memorandum	FTL CH2M	Within 1 day of receipt of CA Form
Safe Behavior Observation (SBO)	SBO Form	HSM CH2M	Within 1 week of SBO	Memorandum	Field Team Member CH2M	Immediately
Field Document Review	Markup copy of field documentation	FTL CH2M	Within 1 day of review	Verbal and Memorandum	FTL CH2M	Within 1 day of receipt of markup

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SAP Worksheet #32-1—Laboratory Corrective Action Form

Person initiating CA: ______________________________ Date: ____________

Description of problem and when identified:

Cause of problem, if known or suspected:

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

CA implemented by: ______________________________ Date: ____________
CA initially approved by: ______________________________ Date: ____________
Follow-up date: ______________________________
Final CA approved by: ______________________________ Date: ____________

Information copies to:

Anita Dodson, CH2M Navy CLEAN Program Chemist

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SAP Worksheet #32-2—Field Performance Audit Checklist

Project Responsibilities

Project No.: ____ Date: ____________________________________

Project Location: ____________________________________ Signature: _______________________________

Team Members

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

Comments ____

____

Yes No 2) Was a briefing held for project participants?

Comments ____

____

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

Comments ____

____

Sample Collection

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

Comments ____

____

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

Comments ____

____

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

Comments ____

____

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

Comments ____

____

Yes No 5) Are the number, frequency, and type of samples collected as specified in the work plan?

Comments ____

____

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

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

Comments ______________________________

____

Yes No 7) Are photographs taken and documented?

Comments ______________________________

____

Document Control

Yes No 1) Have any accountable documents been lost?

Comments ______________________________

____

Yes No 2) Have any accountable documents been voided?

Comments ______________________________

____

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

Comments ______________________________

____

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

Comments ______________________________

____

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

Comments ______________________________

____

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

Comments ______________________________

____

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

Comments ______________________________

____

SAP Worksheet #32-3—Safe Behavior Observation Form

☐ Federal or ☐ Commercial Sector (check one)		☐ Construction or ☐ Consulting (check one)	
Project Number:		Client/Program:	
Project Name:		Observer:	Date:
Position/Title of Worker Observed:		Background Information/ comments:	
Task/Observation Observed:			

- ❖ Identify and reinforce safe work practices/behaviors
- ❖ Identify and improve on at-risk practices/acts
- ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards
- ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)
- ❖ Positive, corrective, cooperative, collaborative feedback/recommendations

Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current and accurate Pre-Task Planning/Briefing (for example, Project Safety Plan, Safety Training and Consulting, AHA, Pre-task Safety Plan, tailgate briefing, as needed)			**Positive Observations/Safe Work Practices:**
Properly trained/qualified/ experienced			
Tools/Equipment Available and Adequate			
Proper Use of Tools			**Questionable Activity/Unsafe Condition Observed:**
Barricades/Work Zone Control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/Attentiveness			**Observer's CAs/Comments:**
Pace			
Uncomfortable/Unsafe Position			
Inconvenient/Unsafe Location			
Position/Line of Fire			
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			**Observed Worker's CAs/Comments:**
Other			

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SAP Worksheet #33—QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, and so forth)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (title and organizational affiliation)	Report Recipient(s) (title and organizational affiliation)
Field Audit Report	One during sampling event	TBD	PM CH2M	Included in project files

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

Data Review Input	Description[a]	Responsible for Verification or Validation	Step I/IIa/IIb[b]	Internal/ External[c]
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	FTL/CH2M	Step I	Internal
Chains of Custody and Shipping Forms	Chain of custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain of custody forms will be initialed by the reviewer, a copy of the chains of custody forms retained in the site file, and the original and remaining copies taped inside the cooler for shipment. Chain of custody forms will also be reviewed for adherence to the SAP by the PC.	FTL/CH2M PC/CH2M	Step I	Internal & External
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the PC in the form of laboratory logins.	PC/CH2M	Step I	External
Documentation of Laboratory Method Deviations	Laboratory Method Deviations will be discussed and approved by the PC. Documentation will be incorporated into the case narrative, which becomes part of the final hard copy data package.	PC/CH2M	Step I	External
EDDs	EDDs will be compared against hard copy laboratory results (10 percent check).	PC/CH2M	Step I	External
Case Narrative	Case narratives will be reviewed by the data validator during the DV process. This is verification that they were generated and applicable to the data packages.	Data Validator	Step I	External
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	Laboratory QAO	Step I	Internal
Laboratory Data	The data will be verified for completeness by the PC. To ensure completeness, EDDs will be compared to the SAP. This is a verification that all samples were included in the laboratory data and that correct analyte lists were reported.	PC/CH2M	Step I	External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and CA forms will be reviewed internally to ensure that all appropriate CAs have been taken and that CA reports are attached. If CAs have not been taken, the site manager will be notified to ensure action is taken.	PM/CH2M PC/CH2M	Step I	Internal
CA Reports	CA reports will be reviewed by the PC or PM and placed into the project file for archival at project closeout.	PM/CH2M PC/CH2M	Step I	External
Laboratory Methods	During the pre-validation check, ensure that the laboratory analyzed samples using the correct methods specified in the SAP. If methods other than those specified in the SAP were used, the reason will be determined and documented.	PC/CH2M	Step IIa	External
Target Compound List and Target Analyte list	During the pre-validation check, ensure that the laboratory reported all analytes from each analysis group as per **Worksheet #15**. If the target compound list is not correct, then it must be corrected prior to sending the data for validation. Once the checks are complete, the project manager is notified via email	PC/CH2M	Step IIa	External
Laboratory Limits (DL/LOD/LOQs)	During the pre-validation check, the laboratory limits (DL, LOD, LOQs) will be compared to those listed in the project SAP. If limits were not met, the laboratory will be contacted and asked to provide an explanation, which will then be discussed in the associated project report. Often times the cause for minor laboratory limit deviation from those presented in the SAP is due to the quarterly update of laboratory LOD.	PC/CH2M	Step IIb	External
Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed. Any such discrepancies will be discussed first in the data validation narrative and will be included in the associated project report.	Laboratory QAO	Step IIa	Internal
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered during the DV process.	Data Validator	Step IIa and IIb	External
Raw Data	Ten percent review of raw data to confirm laboratory calculations. For a recalculated result, the data validator attempts to re-create the reported numerical value. The laboratory is asked for clarification if a discrepancy is identified, which cannot reasonably be attributed to rounding. In general, this is outside 5 percent difference.	Data Validator	Step IIa	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	Step IIb	Internal
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Data Validator	Step IIa	External

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

Data Review Input	**Description[c]**	**Responsible for Verification or Validation**	**Step I/IIa/IIb[a]**	**Internal/ External[b]**
Documentation of Field QC Sample Results	Establish that all required QC samples were run and met limits, and will be discussed in the associated project report.	PC/CH2M	Step IIa	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.	PC/CH2M	Step I	External
Analytical data for PFAS, METALs, FMETALs analyzed for in drinking water	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 National Functional Guidelines for Superfund Organic Data Review (USEPA, 2017b) and National Functional Guidelines for Superfund Inorganic Data Review (USEPA, 2017a) may be used for DV, and 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	Step IIa and IIb	External

Notes:

[c] Should CH2M find discrepancies during the verification or validation procedures above, an email documenting the issue will be circulated to the internal project team, and a Corrections to File Memo will be prepared identifying the issues and the corrective action needed. This memo will be sent to the laboratory, or applicable party, and maintained in the project file.

[a] Verification (Step I) is a completeness check that is performed before the data review process continues to determine whether the required information (complete data package) is available for further review. Validation (Step IIa) is a review that the data generated is in compliance with analytical methods, procedures, and contracts. Validation (Step IIb) is a comparison of generated data against measurement performance criteria in the SAP (both sampling and analytical).

[b] Internal or external is in relation to the data generator.

SAP Worksheet #37—Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

- Nondetected site contaminants will be evaluated to ensure that project required quantitation limits in **Worksheet #15** were achieved. If PQLs were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable.
- During verification and validation steps, data may be qualified as estimated with the following qualifiers: J or UJ. The qualifiers represent minor QC deficiencies, which will not affect the usability of the data. When major QC deficiencies are encountered, data will be qualified with an R and in most cases is not considered usable for project decisions.
  - J = Analyte present. Reported value may or may not be accurate or precise.
  - J+ = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
  - J- = Analyte present. Reported value may be biased low. Actual value is expected to be higher.
  - UJ = Analyte not detected. Associated nondetect value may be inaccurate or imprecise.
  - R = Rejected result. Result not reliable.
- The following additional qualifiers may be given by the validator:
  - N = Tentative ID. Consider Present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
  - NJ = Qualitative ID questionable due to poor resolution. Presumptively present at approximate quantity.
  - U = Not Detected.
- Analytical data will be checked to ensure the values and any qualifiers are appropriately transferred to the electronic database. The checks include comparison of hard copy data and qualifiers to the EDD. Once the data have been uploaded into the electronic database, another check will be performed to ensure all results were loaded accurately.
- Field and laboratory precision will be compared as RPD between the two results.
- Deviations from the SAP will be reviewed to assess whether CA is warranted and to assess impacts to achievement of project objectives.

Describe the evaluative procedures used to assess overall measurement error associated with the project.

- To assess whether a sufficient quantity of acceptable data is available for decision making, the data will be compared to the 95-percent completeness goal and reconciled with MPC following validation and review of DQI.
- If significant biases are detected with laboratory QA/QC samples, they will be evaluated to assess impact on decision making. Low biases will be described in greater detail as they represent a possible inability to detect compounds that may be present at the site.
- If significant deviations are noted between laboratory and field precision, the cause will be further evaluated to assess impact on decision making.

SAP Worksheet #37—Usability Assessment (continued)

Describe the documentation that will be generated during the usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The following will be prepared by CH2M and presented to and submitted to the Navy and Base for review and decisions on the path forward for the site:

- Data tables will be produced to reflect detected and non-detected site analytes and geochemical parameters.
- Data qualifiers will be reflected in the tables and discussed in the data quality evaluation, and will be provided in a technical memorandum.

Identify the personnel responsible for performing the usability assessment.

The CH2M Team, including the PM and PC, will review the data and present to the Navy for review and approval of usability.

References

ALS Environmental. 2016. *Analytical Report for Service Request No. K161172, Naval Air Station Outlying Field Coupeville, Coupeville, Washington.* October.

CH2M HILL, Inc. (CH2M). 2016. *Technical Memorandum – Results of Desktop Evaluation to Verify Off-Base Drinking Water Sources.* September.

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CH2M. 2017b. *Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water, Outlying Landing Field Coupeville.* January.

Department of the Navy (Navy). 1994. *Final Remedial Investigation Report for Operable Unit 3, Naval Air Station Whidbey Island. Prepared for Engineering Field Activity Northwest, Naval Facilities Engineering Command by URS Consultants Under Contract No. N62474-89-D-9295, CTO 0074*. January.

Navy. 2013. *Annual 2012-2-13 Groundwater Long-Term Monitoring Report for Operable Unit 1 Area 6, and Operable Unit 5 Area 31, Naval Air Station Whidbey Island, Whidbey Island, Washington.* Prepared for Naval Facilities Engineering Command Northwest by Sealaska Environmental Services under Contract No. N44255-09-D-4005, CTO 56. August 1.

Navy. 2016. *Summary Report, Groundwater Sampling for Perfluorinated Compounds, Hangar 5 and Areas 16 and 31, Naval Air Station Whidbey Island, Oak Harbor, Washington.* Prepared for Naval Facilities Engineering Command Northwest by MMEC Group under Contract. No. N62473-12-D-2012, CTP JP02. April 14.

Island County. 2005. *Island County Water Resource Management Plan.* 2514 Watershed Planning. Adopted by the Board of Island County Commissioners. June 20.

United States Environmental Protection Agency (USEPA). 2002. *Guidance for Quality Assurance Project Plans, USEPA QA/G-5.* EPA/240/R-02/009. December.

USEPA. 2005. *Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs - Part 1: UFP-QAPP Manual.* Intergovernmental Data Quality Task Force. EPA-505-B-04-900A. Final Version 1. March.

USEPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4.* EPA/240/B-06/001. February.

USEPA. 2017a. *National Functional Guidelines for Inorganic Superfund Methods Data Review. 540-R-2017-001. January.*

USEPA. 2017b. *National Functional Guidelines for Organic Superfund Methods Data Review. 540-R-2017-002. January.*

USEPA. 2017c. *Regional Screening Level (RSL) Resident Tapwater Table*. June.

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Figures

R:\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\SAP\Fig1_Whidbey_BaseLoc.mxd8/22/2017bmailhes

Figure 1
Base Location Map
Ault Field
Oak Harbor, WA
Outlying Field (OLF) Coupeville,
Coupeville, WA

For Official Use Only

Figure 2 has been redacted because it contains personally identifiable information

Figure 3 has been redacted because it contains personally identifiable information

Figure 4 has been redacted because it contains personally identifiable information

Figure 5 has been redacted because it contains personally identifiable information

Appendix A

CH2M Field Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Chain-of-Custody

I Purpose

The purpose of this SOP is to provide information on chain-of-custody procedures to be used under the CLEAN Program.

II Scope

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities (except wellhead samples taken for measurement of field parameters). Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over region specific or site-specific requirements for chain-of-custody.

III Definitions

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

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

- It is in one’s actual possession.
- It is in one’s view, after being in one’s physical possession.
- It was in one’s physical possession and then he/she locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

IV. Procedures

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

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

A. Sample Identification

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

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

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

Measurements and observations shall be recorded using waterproof ink.

B. Sample Label

Samples, other than for *in situ* measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling and Analysis Plan. Each sample container is identified by a sample label (see Attachment A). Sample labels are provided, along with sample containers, by the analytical laboratory. The information recorded on the sample label includes:

- Project - CTO Number.

- Station Location - The unique sample number identifying this sample.

- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 08/21/12).

- Time - A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type and quantity of preservation added.
- Analysis - VOA, BNAs, PCBs, pesticides, metals, cyanide, other.
- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

Using only the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing the analysis from knowing the identity of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site). The field team should always follow the sample ID system prepared by the project EIS and reviewed by the Project Manager.

C. Chain-of-Custody Procedures

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

D. Field Custody Procedures

- Samples are collected as described in the site Sampling and Analysis Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the Chain-of-Custody Record exactly.
- A Chain-of-Custody Record will be prepared for each individual cooler shipped and will include ***only*** the samples contained within that particular cooler. The Chain-of-Custody Record for that cooler will then be sealed in a zip-log bag and placed in the cooler prior to sealing. This ensures that the laboratory properly attributes trip blanks with the correct cooler and allows for easier tracking should a cooler become lost during transit.
- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.
- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once downloaded to the server or developed, the electronic files or photographic prints shall be serially numbered, corresponding to the logbook descriptions; photographic prints will be stored in the project files. To identify sample

locations in photographs, an easily read sign with the appropriate sample location number should be included.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions (e.g., a logbook notation would explain that a pencil was used to fill out the sample label if the pen would not function in freezing weather.)

E. Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. **A Chain-of-Custody Record Form must be completed for each cooler and should include only the samples contained within that cooler**. A Chain-of-Custody Record Form example is shown in Attachment B. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as given below:

- Enter header information (CTO number, samplers, and project name).
- Enter sample specific information (sample number, media, sample analysis required and analytical method grab or composite, number and type of sample containers, and date/time sample was collected).
- Sign, date, and enter the time under “Relinquished by” entry.
- Have the person receiving the sample sign the “Received by” entry. If shipping samples by a common carrier, print the carrier to be used in this space (i.e., Federal Express).
- If a carrier is used, enter the airbill number under “Remarks,” in the bottom right corner;
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in a plastic zipper-type bag or other appropriate sample-shipping package. Retain the copy with field records.
- Sign and date the custody seal, a 1-inch by 3-inch white paper label with black lettering and an adhesive backing. Attachment C is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seal across the shipping container opening (front and back) so that it would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the shipping container (enclosed with other documentation in a plastic zipper-type bag). As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

V Quality Assurance Records

Once samples have been packaged and shipped, the Chain-of-Custody copy and airbill receipt become part of the quality assurance record.

VI Attachments

A. Sample Label
B. Chain of Custody Form
C. Custody Seal

VII References

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

Attachment A

Example Sample Label

QAL

Quality Analytical Laboratories, Inc.
2567 Fairlane Drive
Montgomery, Alabama 36116
PH. (334)271-2440

Client
Sample No.
Location

Analysis

Preservative HCL
Date By

CEIMIC
CORPORATION
10 Dean Knauss Drive, Narragansett, R.I. 02882 • (401) 782-8900

SITE NAME	**DATE**
ANALYSIS	**TIME**
	PRESERVATIVE

SAMPLE TYPE

☐ **Grab** ☐ **Composite** ☐ **Other** __________

COLLECTED BY:

Attachment B

Example Chain-of-Custody Record

CH2M H

APPLIED S ENCES LABORATORY

CHAIN OF CUSTODY ORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # ☐☐☐☐☐☐☐☐☐.☐☐.☐☐

Purchase Order #

Project Name

Company Name CH2M HILL Office

Project Manager & Phone #
Mr. [ ]
Ms. [ ]
Dr. [ ]

Report Copy to:

Requested Completion Date:

Sampling Requirements
SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

Sample Disposal:
Dispose ☐ Return ☐

LAB TEST CODES

SHADED AREA– FOR LAB USE ONLY

Lab 1 #	Lab 2 #
Quote #	Kit Request #
Project #	
No. of Samples	Page of
Login	LIMS Ver

Sampling		Type		Matrix			CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	ANALYSES REQUESTED	REMARKS	LAB 1 ID	LAB 2 ID
Date	Time	COMP	GRAB	WATER	SOIL	AIR						

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	QC Level: 1 2 3 Other: ____
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	COC Rec / ICE Ana Req / TEMP Cust Seal / Ph
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	
Received By (Please sign and print name)	Date/Time	Shipped Via UPS BUS Fed-Ex Hand Other ____	Shipping #	
Work Authorized By (Please sign and print name)	Remarks			

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client
REV 3/94 FORM 340

Attachment C

Example Custody Seal

CH2M HILL

CUSTODY SEAL

Date

Signature

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:

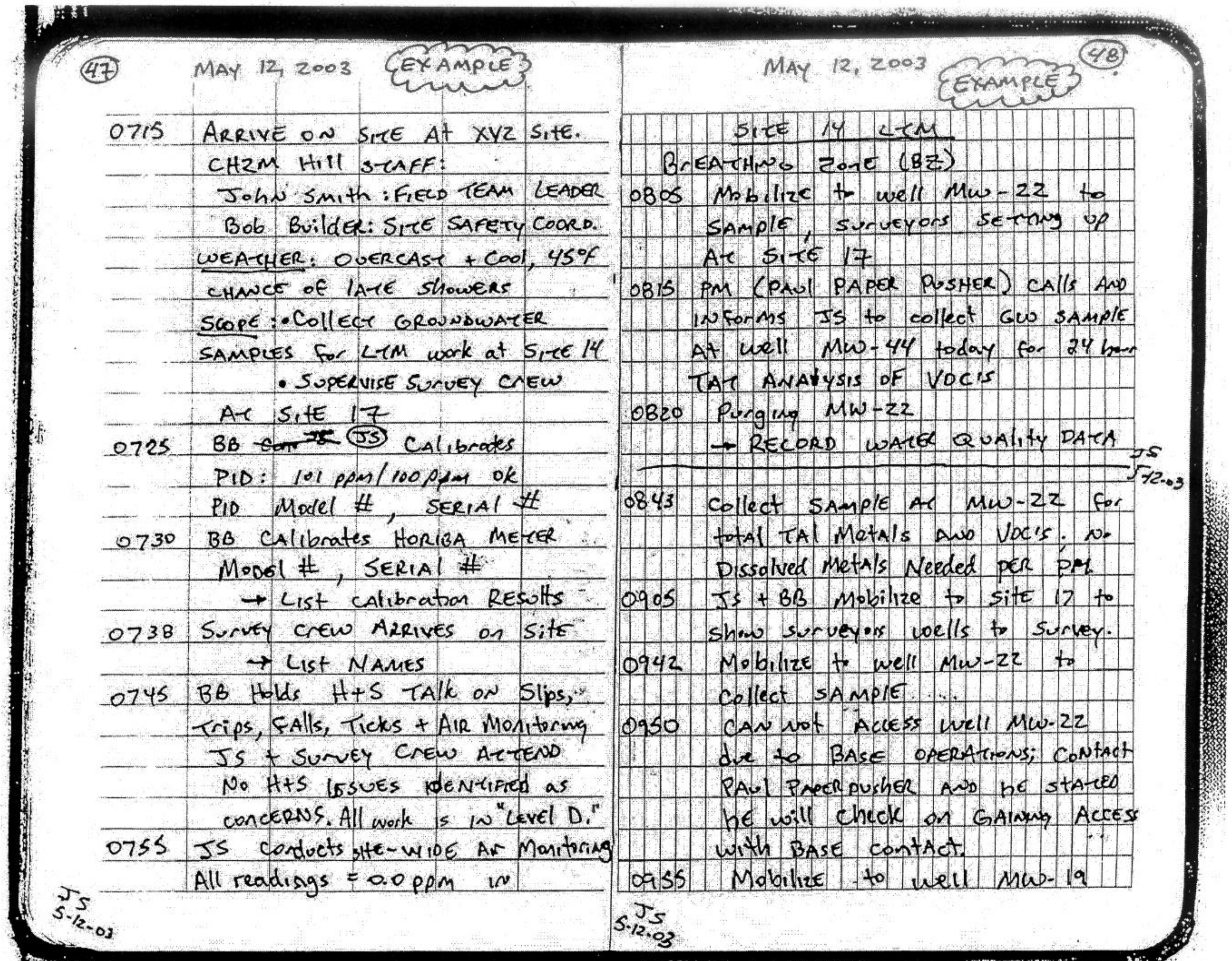
    - Description of the general sampling area – site name, buildings and streets in the area, etc.
    - Station/Location identifier
    - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to 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.



(47) MAY 12, 2003 EXAMPLE

0715 ARRIVE ON SITE At XYZ SitE.
CH2M Hill STAFF:
John Smith : FIELD TEAM LEADER
Bob Builder: SITE SAFETY COORD.
WEATHER: OVERCAST + Cool, 45°F
CHANCE of LATE showERS
SCOPE: • Collect GROUNDWATER
SAMPLES for LTM work at SitE 14
• SUPERVISE SURVEY CREW
At SitE 17
0725 BB ~~Con JS~~ (JS) CAlibrates
PID: 101 ppm/100 ppm ok
PID Model #, SERIAL #
0730 BB CAlibrates HORIBA METER
MODEL #, SERIAL #
→ List calibration Results
0738 Survey crew ARRIVES on Site
→ List NAMES
0745 BB Holds H+S TAlk ON Slips,
Trips, FAlls, Ticks + AIR Monitoring
JS + SURVEY CREW ATTEND
No H+S ISSUES IDENTIFIED as
CONCERNS. All work is IN "LEVEL D."
0755 JS conducts SITE-WIDE Air Monitoring
All readings = 0.0 ppm in

JS
5-12-03

MAY 12, 2003 EXAMPLE (48)

SITE 14 LTM
BREATHING ZONE (BZ)
0805 Mobilize to well MW-22 to
SAMPLE, surveyors setting up
At SITE 17
0815 PM (PAUL PAPER PUSHER) CAlls AND
INFORMS JS to collect GW SAMPLE
At well MW-44 today for 24 hour
TAT ANALYSIS OF VOC'S
0820 Purging MW-22
→ RECORD WATER QUALity DATA

JS
5-12-03

0843 Collect SAMPLE At MW-22 for
total TAL Metals AND VOC'S. No
Dissolved Metals Needed PER PM
0905 JS + BB Mobilize to SitE 17 to
show surveyors wells to Survey.
0942 Mobilize to well MW-22 to
Collect SAMPLE ...
0950 CAN not ACCESS well MW-22
due to BASE OPERATIONS; CONTACT
PAUL PAPERPUSHER AND HE STATED
HE will check on GAINING ACCESS
with BASE contAct.
0955 Mobilize to well MW-19

JS
5-12-03

STANDARD OPERATING PROCEDURE – Navy CLEAN PROGRAM

Drinking Water Sampling when Analyzing for Per- and Polyfluoroalklyl Substances (PFASs)

I. Purpose and Scope

This SOP provides guidelines for drinking water sample collection for samples that will be analyzed for Per- and Polyfluoroalklyl Substances (PFASs), aka perfluorinated compounds (PFCs), including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) via EPA Method 537 (not modified).

Standard techniques for collecting representative samples are summarized. These procedures are specific to the Navy Comprehensive Long-term Environmental Action Navy (CLEAN) Program under Contract N62470-16-D-9000.

II. Equipment and Materials

Equipment and Materials Required

- Drinking water sample containers (polypropylene bottle with polypropylene screw cap and Trizma preservative)
- Laboratory pre-filled polypropylene bottles containing field reagent blank water and Trizma preservative
- Field Reagent Blank sample containers (polypropylene bottle with polypropylene screw cap and no preservative)
- Shipping supplies (labels, coolers, and ice)
- Loose leaf paper without waterproof coating
- Clip board
- Pen (not Sharpie)
- Nitrile or latex gloves

Equipment and Materials to Avoid During Sampling

Equipment and materials used to collect drinking water samples should not contain any fluorinated compounds, including polytetrafluoroethylene (PTFE), Teflon® or synthetic rubber with fluoropolymer elastomers (e.g., Viton®).

Specifically, the following material should be avoided during sampling:

- Gore-Tex brand or similar high-performance outdoor clothing, clothing treated with ScotchGuard® brand or similar water repellent, fluoropolymer-coated Tyvek®, wrinkle-resistant fabrics, and fire resistant clothing with fluorochemical treatment or anything advertised as water repellant.
- Weather-proof log books with fluorochemical coatings

The sample collection area should be clear of the following items:

- Pre-packaged food wrappers (e.g., fast food sandwich wrappers, pizza boxes, etc.)
- Microwave popcorn bags
- Blue ice containers
- Aluminum foil
- Kim-Wipes
- Sunscreen, insect repellant and other personal hygiene products that may contain PFAS

  Sample bottles should be polypropylene in accordance with Method 537. PFASs have a tendency to adhere to glass surfaces. Contact the project manager (PM) if the lab sends glass bottles. Sample vials should not have PTFE/Teflon® lined bottles or caps.

III. Procedures and Guidelines

A. Setup

1. Obtain well construction information from homeowner, if available, in accordance with homeowner questionnaire developed for your project.
2. Record personnel onsite, address, homeowner name, and designated sample ID in the field logbook. Sample IDs should not contain identifying information about the property location due to potential privacy issues, so be sure both address and designated ID are carefully recorded for tracking. Sample IDs and addresses on the sample bottles and in the sample notebook must be checked by both field team members and the address in the field notebook should be confirmed with the homeowner or resident.
3. As feasible, select a sampling collection point prior to any treatment system installed by the homeowner. For example, if the homeowner has a point of use reverse osmosis or granular activated carbon filter in their kitchen sink, collect at the bathroom sink. If there is a point of entry filtration system, ask if there is a sampling port between the well and the system. If there is no way to bypass the existing treatment system without disconnecting pump components or potentially damaging the system, collect a treated sample and note that the sample was collected post-treatment. Avoid collecting samples through hoses. Instead, disconnect the hose and sample from the spigot if an outside collection station is selected.

3. Wash hands before sampling with dish detergent and don nitrile gloves.

4. Open the tap and allow the system to flush for three to five minutes. Do not open bottles until you are ready to sample.

B. Sample Collection

Once flushing is complete, samples can be collected.

The steps to be followed for sample collection are as follows:

1. Turn the tap off briefly. Remove the cap from the sample bottle. Position the sample bottle under the tap and turn the tap on.
2. Fill the bottle, taking care not to flush out the sample preservative. Samples do not need to be collected headspace free.

3. After collecting the sample, cap the bottle and agitate by hand until the preservative is dissolved.
4. Pack the sample on ice immediately for shipment to the offsite laboratory.

C. Field Reagent Blank Collection

A field reagent blank is required at each drinking water sampling location and is to be collected immediately following collection of the drinking water sample. The steps to complete collection of the field reagent blank are as follows:

1. A preserved field reagent blank for each sample location will be provided by the laboratory along with empty bottles for the field reagent blanks. While still at the drinking water sample collection point, open the preserved field reagent blank water bottle and an empty unpreserved sample bottle.
2. Pour the preserved reagent blank water from the preserved bottle into the unpreserved blank container.
3. Be sure the field reagent blank bottle is labeled and will be labeled and packed in the same cooler as the associated drinking water sampling for shipment to the offsite laboratory.

V. References

United States Environmental Protection Agency (USEPA), 2009. *Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)*. September

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

FIELD SAMPLING PROTOCOLS TO AVOID CROSS-CONTAMINATION DURING WATER SAMPLING FOR PERFLUORINATED COMPOUNDS (PFCs)

1.0 PURPOSE

While EPA method 537 provides basic guidance on sampling for PFC's in drinking water, due to the potential for cross contamination this Standard Operating Procedure (SOP) addendum describes additional precautionary procedures/considerations when collecting groundwater or drinking water samples. Sampling specific SOPs should also be reviewed prior to conducting field sampling activities at PFC sites.

2.0 SCOPE

This procedure applies to all qualified personnel and subcontractors who collect or otherwise handle water samples for analysis of PFCs. This SOP should be reviewed by all on-site personnel prior to implementation of field activities.

3.0 GENERAL

Given the low detection limits associated with PFC analysis and the many potential sources of trace levels of PFCs, field personnel are advised to act on the side of caution by strictly following these protocols, frequently replacing nitrile gloves, and rinsing field equipment to help mitigate the potential for background contamination detections of PFCs. Specific items related to field sampling are discussed below.

4.0 PROCEDURES/CONSIDERATIONS

The following are procedures/considerations to be made during field activities at potential PFC release sites.

Field Equipment

- **Do not use Teflon®-containing materials** (e.g., Teflon® tubing, bailers, tape, plumbing paste, or other Teflon® materials) since Teflon® contains fluorinated compounds.
- High-density polyethylene (HDPE), low-density polyethylene (LDPE), and silicon materials are acceptable for sampling. Samples should not be stored in containers made of LDPE materials.
- To avoid plastic coating or glue materials, **do not use waterproof field books**. Field reports should be documented on loose paper on masonite or aluminum clipboards (i.e. plastic clipboards, binders, or spiral hard cover notebooks are not acceptable). Sharpies®/markers should be avoided.
- **Post-It Notes are not allowed** on project sites.

- **Do not use markers.** Pens should be used when documenting field activities in the field log and on field forms as well as labeling sample containers and preparing the Chain of Custody.
- **Do not use chemical (blue) ice packs** during the sampling program. This includes the use of ice packs for the storage of food and/or samples.

Field Clothing and Personal Protective Equipment

- **Do not wear water resistant, waterproof, or stain-treated clothing** during the field program. Field clothing made of synthetic and natural fibers (preferably cotton) are acceptable. Field clothing should be laundered avoiding the use of fabric softener. Preferably, field gear should be cotton construction and well laundered (a minimum of 6 times from time of purchase). New clothing may contain PFC related treatments. **Do not use new clothing** while sampling or sample handling.
- **Do not wear clothing or boots containing Gore-Tex™** during the sampling program as it consists of a PFC membrane.
- All safety footwear will consist of steel-toed boots made with polyurethane and polyvinyl chloride (PVC).
- **Do not wear Tyvek® clothing** on-site since it contains fluorinated compounds.
- Disposable nitrile gloves must be worn at all times. Further, a new pair of nitrile gloves should be donned prior to the following activities at each sample location:
  - Decontamination of re-usable sampling equipment;
  - Prior to contact with sample bottles or water containers;
  - Insertion of anything into the well (e.g. HDPE tubing, HydraSleeve bailer, etc.);
  - Insertion of silicon tubing into the peristaltic pump;
  - Completion of monitor well purging, prior to sample collection;
  - Handling of any quality assurance/quality control samples including field blanks and equipment blanks; and,
  - After the handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.

Sample Containers

- Samples should be collected in polypropylene or HDPE bottles fitted with an unlined (no Teflon®), polypropylene HDPE screw cap. This is an especially important point as many laboratories utilize Teflon-lined bottles.
- Container labels will be completed using pen (**NO MARKERS**) after the caps have been placed back on each bottle.

- Glass containers should also be avoided due to potential loss of analyte through adsorption.

Wet Weather

- Field sampling occurring during wet weather (e.g., rainfall and snowfall) should be conducted while wearing appropriate clothing that will not pose a risk for cross-contamination. Teams should avoid synthetic gear that has been treated with water-repellant finishes containing PFCs. Use rain gear made from polyurethane and wax-coated materials.

Equipment Decontamination

For GW sampling, it is highly recommended that disposable equipment be utilized. However, if equipment re-use is performed, field sampling equipment, including oil/water interface meters and water level indicators, that are utilized at each sample location will require cleaning between uses. Alconox® and Liquinox® soap is acceptable for use since the Material Safety Data Sheets do not list fluoro-surfactants as an ingredient. However, **Decon 90 must not be used** during decontamination activities. Water used for the decontamination of sampling equipment will be laboratory certified "PFC-free" water.

Personnel Hygiene

- Field personnel should not use cosmetics, moisturizers, hand cream, or other related products as part of their personal cleaning/showering routine on the morning of a sampling event, as these products may contain surfactants and represent a potential source of PFCs.
- Many manufactured sunblock and insect repellants contain PFCs and should not be brought or used on-site. Sunblock and insect repellants that are used on-site should consist of 100% natural ingredients.

Food Considerations

- No food or drink shall be brought on-site, with the exception of bottled water and hydration drinks (i.e., Gatorade® and Powerade®).

Blanks

- Utilization of blanks is a good quality check to monitor and control the effects of contamination. Trip blanks and field blanks are recommended.

REFERENCES

- Transport Canada, 2013. *Perfluorochemical (PFC) Field Sampling Protocol*. May.

- Delta Consultants, 2010. *Report of Investigation Activities at Select Firefighting Foam Training Areas and Foam Discharge Sites in Minnesota*. February.
- MPCA, 2008. *Closed Landfill Program Sampling Protocol for Monitoring Wells.* October.
- *Oregon State University, 2015. COLLECTION AND HANDLING OF SAMPLES FOR FLUOROCHEMICAL ANALYSIS. July.*
- *EPA, 2009. EPA Document #: EPA/600/R-08/092, METHOD 537. DETERMINATION OF SELECTED PERFLUORINATED ALKYL ACIDS IN DRINKING WATER BY SOLID PHASE EXTRACTION AND LIQUID CHROMATOGRAPHY/TANDEM MASS SPECTROMETRY (LC/MS/MS). Version 1.1. September*

EQUIPMENT CALIBRATION, OPERATION, AND MAINTENANCE

1.0 PURPOSE

This standard operating procedure (SOP) describes the activities and responsibilities of the U.S. Naval Facilities Engineering Command Northwest (NAVFAC NW) personnel pertaining to the operating, calibration, and maintenance of equipment used to collect environmental data. Reliable measurements of data required by the field sampling plan are necessary because the information recorded may be the basis for development of remedial action and responses.

2.0 PROCEDURES

2.1 EQUIPMENT CALIBRATION

All air and water quality monitoring equipment will be calibrated and adjusted to operate within the manufacturers' specifications. Air and water quality instruments and equipment that require calibration are to be calibrated to specifications prior to field use. In addition, a one-point calibration check is made at midday and at intervals outlined in the field sampling plan. A final check is conducted at the end of each field day. This is not a recalibration of the meter but a check of the calibration to ensure the continued accuracy of the meter. All calibration information shall be recorded in the project logbook.

Special attention shall be paid to instruments that may be affected by the change in the ambient temperature or humidity. Calibration checks should also be performed when sampling conditions change significantly, a change of sample matrix, and/or readings are unstable or there is a change of parameter measurements that appear unusual.

2.2 GENERAL PROCEDURES AND GUIDELINES

2.2.1 Drinking Water Sampling

A water quality instrument will be used during the collection of drinking water samples. The pH, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity meters will be calibrated, compensating for temperature, in the field at the beginning of each day, following the manufacturer's specifications. The calibration procedures are described below and will be carried out by field personnel.

2.2.1.1 *pH Meter Calibration*

The pH meters will be calibrated against two sets of standard pH solutions, either 4.0 standard units (SU) and 7.0 SU or 7.0 SU and 10.0 SU, depending on whether previous pH measurements have been less than or greater than 7.0 SU, respectively. At the end of calibration, the meter readings will be adjusted and the probe will be rinsed thoroughly with distilled water. Calibration records will be documented in the field book or on calibration logs. Spent calibration fluids will be disposed of as specified in the Waste Management Plan (WMP).

2.2.1.2 *Specific Conductivity Meter Calibration*

The specific conductivity meters will be standardized by immersing the decontaminated conductivity probe into a standard solution of conductivity buffer. The conductivity of the standard solution will be within the same order of magnitude as the water sample. The value of the standard may vary and may be temperature dependent. At the end of calibration, the meter readings will be adjusted and the probe will be rinsed thoroughly with distilled water. Calibration records will be documented in the field book or on calibration logs. Spent calibration fluids will be disposed of as specified in the WMP.

2.2.1.3 *Oxidation-Reduction Potential Meter Calibration*

The ORP meters will be standardized by immersing the decontaminated ORP probe into an ORP standard solution. The value of the standard may vary and may be temperature dependent. At the end of calibration, the meter readings will be adjusted and the probe will be rinsed thoroughly with distilled water. Calibration records will be documented in the field book or on calibration logs. Spent calibration fluids will be disposed of as specified in the WMP.

2.2.1.4 *Dissolved Oxygen Meter Calibration*

The DO meters will be standardized by thoroughly rinsing the probe in distilled water, then placing the probe in the calibration cup without screwing the cap in place. A small amount of water may remain in the cap, but the probe should not be submersed. The calibrated DO probe should read a saturation percentage near, or at, 100 percent (usually indicated by 8 to 9 milligrams per liter). At the end of calibration, the meter readings will be adjusted and the probe will be rinsed thoroughly with distilled water. Calibration records will be documented in the field book or on calibration logs. Spent calibration fluids will be disposed of as specified in the WMP.

2.2.1.5 *Turbidimeter Calibration/Check*

A turbidimeter included as part of a water quality meter will be standardized by immersing the decontaminated turbidity probe into turbidity standard solution of 0 nephelometric turbidity units (NTU). At the end of calibration, the meter readings will be adjusted and the probe will be rinsed thoroughly with distilled water. If a separate turbidimeter is used, the accuracy of the machine will be checked by using NTU standards of three different orders of magnitude and reading on the machine. Calibration records will be documented in the field book or on calibration logs.

2.2.2 Key Checks

- The water quality meter probes will be rinsed with distilled water before storage each day.
- The meters will be checked for battery charge and physical damage each day.
- The meters, standard solutions, buffers, and gases will be stored in a cool, dry environment and will be discarded upon expiration.

2.3 EQUIPMENT MAINTENANCE

All field monitoring equipment, field sampling equipment, and accessories are to be maintained in accordance with the manufacturer's recommendations and specifications and/or established field practices. All maintenance will be performed by qualified personnel and documented in the field logbook.

Equipment requiring battery charging shall be charged as recommended by the manufacturer. Backup batteries for meters requiring them shall be included as part of the meters accessories. Care must be taken to protect meters from adverse elements. This may involve placing the meter in a large plastic bag to shield it from the weather.

3.0 DOCUMENTATION

All field equipment calibration, maintenance, and operation information shall be recorded within the field logbook. This is to document that appropriate procedures have been followed and to track the equipment operation. All entries in the field logbook must be written accurately and legibly as outlined in the SOP-002, *Preparing Field Log Books*.

Logbook entries shall contain, but are not necessarily limited to, the following:

- Equipment model and serial numbers
- Date and time of calibration or maintenance performed
- Calibration standard used
- Calibration lot number and expiration date if listed on bottle
- Calibration procedure used if there are multiple options
- Calibration and calibration check readings including units used
- Problems and solutions regarding use, calibration or maintenance of the equipment

- And other pertinent information

4.0 REFERENCES

SOP-002, *Preparing Field Log Books*

5.0 ATTACHMENTS

None.

Appendix B
Department of Defense Environmental Laboratory Accreditation Program Accreditation Letters

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

VISTA ANALYTICAL LABORATORY
1104 Windfield Way
El Dorado Hills, CA 95762
Martha Maier Phone: [redacted]
[redacted]

ENVIRONMENTAL

Valid To: September 30, 2019 Certificate Number: 3091.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2009 TNI Environmental Testing Laboratory Standard, the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.1 of the DoD Quality Systems Manual for Environmental Laboratories), accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

High Resolution Gas Chromatography / Mass Spectrometry
Liquid Chromatography Mass Spectrometry / Mass Spectrometry

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
Dioxins/Furans				
2,3,7,8-Tetrachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,7,8-Tetrachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8-Pentachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,4,7,8-Pentachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8-Hexachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
1,2,3,6,7,8-Hexachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,4,6,7,8-Hexachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8,9-Hexachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8-Heptachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8,9-Heptachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Heptachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Heptachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Hexachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Hexachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Pentachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Pentachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Tetrachlorodibenzofuran	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Tetrachlorodibenzo-p-dioxin	------------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
PCBs				
2-Chlorobiphenyl (1)	------------------------	EPA 168A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3-Chlorobiphenyl (2)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4-Chlorobiphenyl (3)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'-Dichlorobiphenyl (4)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3-Dichlorobiphenyl (5)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3'-Dichlorobiphenyl (6)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4-Dichlorobiphenyl (7)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4'-Dichlorobiphenyl (8)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,5-Dichlorobiphenyl (9)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,6-Dichlorobiphenyl (10)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
3,3'-Dichlorobiphenyl (11)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4-Dichlorobiphenyl (12)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4'-Dichlorobiphenyl (13)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,5-Dichlorobiphenyl (14)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4,4'-Dichlorobiphenyl (15)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3-Trichlorobiphenyl (16)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4-Trichlorobiphenyl (17)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5-Trichlorobiphenyl (18)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6-Trichlorobiphenyl (19)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3'-Trichlorobiphenyl (20)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4-Trichlorobiphenyl (21)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4'-Trichlorobiphenyl (22)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,5-Trichlorobiphenyl (23)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,6-Trichlorobiphenyl (24)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4-Trichlorobiphenyl (25)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5-Trichlorobiphenyl (26)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',6-Trichlorobiphenyl (27)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4'-Trichlorobiphenyl (28)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,5-Trichlorobiphenyl (29)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,6-Trichlorobiphenyl (30)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',5-Trichlorobiphenyl (31)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',6-Trichlorobiphenyl (32)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4-Trichlorobiphenyl (33)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,5-Trichlorobiphenyl (34)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
3,3',4-Trichlorobiphenyl (35)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5-Trichlorobiphenyl (36)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4'-Trichlorobiphenyl (37)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,5-Trichlorobiphenyl (38)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4',5-Trichlorobiphenyl (39)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3'-Tetrachlorobiphenyl (40)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4-Tetrachlorobiphenyl (41)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4'-Tetrachlorobiphenyl (42)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5-Tetrachlorobiphenyl (43)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5'-Tetrachlorobiphenyl (44)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6-Tetrachlorobiphenyl (45)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6'-Tetrachlorobiphenyl (46)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4'-Tetrachlorobiphenyl (47)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5-Tetrachlorobiphenyl (48)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5'-Tetrachlorobiphenyl (49)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6-Tetrachlorobiphenyl (50)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6'-Tetrachlorobiphenyl (51)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5,5'-Tetrachlorobiphenyl (52)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5,6'-Tetrachlorobiphenyl (53)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6,6'-Tetrachlorobiphenyl (54)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4'-Tetrachlorobiphenyl (55)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4'-Tetrachlorobiphenyl (56)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5-Tetrachlorobiphenyl (57)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5'-Tetrachlorobiphenyl (58)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,3,3',6-Tetrachlorobiphenyl (59)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4'-Tetrachlorobiphenyl (60)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,5-Tetrachlorobiphenyl (61)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,6-Tetrachlorobiphenyl (62)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',5-Tetrachlorobiphenyl (63)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',6-Tetrachlorobiphenyl (64)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,5,6-Tetrachlorobiphenyl (65)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4'-Tetrachlorobiphenyl (66)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5-Tetrachlorobiphenyl (67)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5'-Tetrachlorobiphenyl (68)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,6-Tetrachlorobiphenyl (69)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4',5-Tetrachlorobiphenyl (70)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4',6-Tetrachlorobiphenyl (71)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5,5'-Tetrachlorobiphenyl (72)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5',6-Tetrachlorobiphenyl (73)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4',5-Tetrachlorobiphenyl (74)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4',6-Tetrachlorobiphenyl (75)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5-Tetrachlorobiphenyl (76)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4'-Tetrachlorobiphenyl (77)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5-Tetrachlorobiphenyl (78)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5'-Tetrachlorobiphenyl (79)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5,5'-Tetrachlorobiphenyl (80)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4',5-Tetrachlorobiphenyl (81)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4-Pentachlorobiphenyl (82)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,2',3,3',5-Pentachlorobiphenyl (83)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6-Pentachlorobiphenyl (84)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4'-Pentachlorobiphenyl (85)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5-Pentachlorobiphenyl (86)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5'-Pentachlorobiphenyl (87)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6-Pentachlorobiphenyl (88)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6'-Pentachlorobiphenyl (89)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5-Pentachlorobiphenyl (90)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',6-Pentachlorobiphenyl (91)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,5'-Pentachlorobiphenyl (92)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6-Pentachlorobiphenyl (93)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6'-Pentachlorobiphenyl (94)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5',6-Pentachlorobiphenyl (95)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6,6'-Pentachlorobiphenyl (96)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3',4,5-Pentachlorobiphenyl (97)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3',4,6-Pentachlorobiphenyl (98)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5-Pentachlorobiphenyl (99)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',6-Pentachlorobiphenyl (100)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,5'-Pentachlorobiphenyl (101)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,6'-Pentachlorobiphenyl (102)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,'6-Pentachlorobiphenyl (103)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6,6'-Pentachlorobiphenyl (104)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4'-Pentachlorobiphenyl (105)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5-Pentachlorobiphenyl (106)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,3,3',4',5-Pentachlorobiphenyl (107)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5'-Pentachlorobiphenyl (108)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,6-Pentachlorobiphenyl (109)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',6-Pentachlorobiphenyl (110)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,5'-Pentachlorobiphenyl (111)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,6-Pentachlorobiphenyl (112)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5',6-Pentachlorobiphenyl (113)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',5-Pentachlorobiphenyl (114)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',6-Pentachlorobiphenyl (115)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,5,6-Pentachlorobiphenyl (116)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',5,6-Pentachlorobiphenyl (117)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5-Pentachlorobiphenyl (118)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',6-Pentachlorobiphenyl (119)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5,5'-Pentachlorobiphenyl (120)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5,'6-Pentachlorobiphenyl (121)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,3',4,5-Pentachlorobiphenyl (122)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,4',5-Pentachlorobiphenyl (123)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5,5'-Pentachlorobiphenyl (124)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5,6'-Pentachlorobiphenyl (125)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5-Pentachlorobiphenyl (126)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5,5'-Pentachlorobiphenyl (127)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4'-Hexachlorobiphenyl (128)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5-Hexachlorobiphenyl (129)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5'-Hexachlorobiphenyl (130)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,2',3,3',4,6-Hexachlorobiphenyl (131)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6'-Hexachlorobiphenyl (132)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5'-Hexachlorobiphenyl (133)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6-Hexachlorobiphenyl (134)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6'-Hexachlorobiphenyl (135)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6,6'-Hexachlorobiphenyl (136)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5-Hexachlorobiphenyl (137)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5'-Hexachlorobiphenyl (138)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6-Hexachlorobiphenyl (139)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6'-Hexachlorobiphenyl (140)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,5'-Hexachlorobiphenyl (141)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6-Hexachlorobiphenyl (142)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6'-Hexachlorobiphenyl (143)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5',6-Hexachlorobiphenyl (144)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6,6'-Hexachlorobiphenyl (145)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,5'-Hexachlorobiphenyl (146)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6-Hexachlorobiphenyl (147)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6'-Hexachlorobiphenyl (148)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5',6-Hexachlorobiphenyl (149)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',6,6'-Hexachlorobiphenyl (150)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,5',6-Hexachlorobiphenyl (151)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6,6'-Hexachlorobiphenyl (152)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5,5'-Hexachlorobiphenyl (153)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5',6-Hexachlorobiphenyl (154)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,2',4,4',6,6'-Hexachlorobiphenyl (155)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5-Hexachlorobiphenyl (156)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5'-Hexachlorobiphenyl (157)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',6-Hexachlorobiphenyl (158)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5'-Hexachlorobiphenyl (159)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,6-Hexachlorobiphenyl (160)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5',6-Hexachlorobiphenyl (161)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,5'-Hexachlorobiphenyl (162)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,6-Hexachlorobiphenyl (163)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5',6-Hexachlorobiphenyl (164)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,5',6-Hexachlorobiphenyl (165)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',5,6-Hexachlorobiphenyl (166)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5',6-Hexachlorobiphenyl (168)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'3,3',4,4',6-Heptachlorobiphenyl (171)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5'-Heptachlorobiphenyl (172)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6-Heptachlorobiphenyl (173)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6'-Heptachlorobiphenyl (174)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6-Heptachlorobiphenyl (175)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6,6'-Heptachlorobiphenyl (176)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4',5,6-Heptachlorobiphenyl (177)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6-Heptachlorobiphenyl (178)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,2',3,3',5,6,6'-Heptachlorobiphenyl (179)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6-Heptachlorobiphenyl (181)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6'-Heptachlorobiphenyl (182)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5',6-Heptachlorobiphenyl (183)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6,6'-Heptachlorobiphenyl (184)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,5',6-Heptachlorobiphenyl (185)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6,6'-Heptachlorobiphenyl (186)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6,6'-Heptachlorobiphenyl (188)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,6-Heptachlorobiphenyl (190)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5',6-Heptachlorobiphenyl (191)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5',6-Heptachlorobiphenyl (192)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,5',6-Heptachlorobiphenyl (193)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (194)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (196)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',6,6'-Octachlorobiphenyl (197)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6-Octachlorobiphenyl (198)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6'-Octachlorobiphenyl (199)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (200)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (201)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
2,2',3,4,4',5,5',6-Octachlorobiphenyl (203)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6,6'-Octachlorobiphenyl (204)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5',6-Octachlorobiphenyl (205)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (207)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (208)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Decachlorobiphenyl (209)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Decachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Dichlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Heptachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Hexachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Monochlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Nonachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Octachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Pentachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Tetrachlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Trichlorobiphenyl, Total	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Per- and Poly-fluorinated compounds				
6:2 Fluorotelomer sulfanate (6:2 FTS)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
8:2 Fluorotelomer sulfanate (8:2 FTS)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
N-ethylperfluoro-1-octanesulfonamide (N-EtFOSA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
N-methylperfluoro-1-octanesulfonamide (N-MeFOSA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorobutanesulfonic acid (PFBS)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorobutanoic acid (PFBA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorodecanesulfonate (PFDS)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorodecanoic acid (PFDA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorododecanoic acid (PFDoA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluoroundecanoic acid (PFUnA)	EPA 537	-----------------	------------------	-----------------
Perfluoroheptanesulfonate (PFHpS)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluoroheptanonic acid (PFHpA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorohexadecanoic acid (PFHxDA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorohexanesulfononic acid (PFHxS)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorohexanoic acid (PFHxA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorononaoic acid (PFNA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorooctane sulfonamide (PFOSA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
Perfluorooctanesulfonic acid (PFOS)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorooctanoic acid (PFOA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluoropentanoic acid (PFPeA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorotetradecanoic acid (PFTeDA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluorotridecanoic acid (PFTrDA)	EPA 537 EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)
Perfluoroundecanoic acid (PFUdA)	EPA 537 (Mod.)	EPA 537 (Mod.)	EPA 537 (Mod.) (VAL-PFAS)	EPA 537 (Mod.) (VAL-PFAS)

Accredited Laboratory

A2LA has accredited

VISTA ANALYTICAL LABORATORY

El Dorado Hills, CA

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.1 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).

1978

A2LA

Presented this 5th day of July 2017.

President and CEO
For the Accreditation Council
Certificate Number 3091.01
Valid to September 30, 2019

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

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board
500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TestAmerica ASL
1100 NE Circle Blvd., Suite 310
Corvallis OR 97330

has been assessed by ANAB
and meets the requirements of

ISO/IEC 17025:2005 and DoD-ELAP

while demonstrating technical competence in the field of

TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1485
Certificate Number

ANAB Approval

Certificate Valid: 06/20/2017-09/24/2018
Issued: 06/20/2017

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).

Scope of Accreditation
For
TestAmerica ASL

1100 NE Circle Blvd, Suite 310
Corvallis, OR 97330
Ginger Collins
541-243-0966

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (ANAB MA2007) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM V5) based on the TNI Standard - Environmental Laboratory Sector, Volume 1 – Management and Technical Requirements for Laboratories Performing Environmental Analysis, Sept 2009 (EL-V1-2009); accreditation is granted to **TestAmerica ASL** to perform the following tests:

Accreditation granted through: **September 24, 2018**

Testing - Environmental

Non-Potable Water

Technology	Method	Analyte
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 6010C	Lithium
ICP-AES	EPA 6010B/C	Magnesium
ICP-AES	EPA 6010B/C	Manganese
ICP-AES	EPA 6010B/C	Molybdenum

Non-Potable Water

Technology	Method	Analyte
ICP-AES	EPA 6010B/C	Nickel
ICP-AES	EPA 6010B/C	Potassium
ICP-AES	EPA 6010B/C	Selenium
ICP-AES	EPA 6010C	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 200.8; EPA 6020/6020A	Aluminum
ICP-MS	EPA 200.8; EPA 6020/6020A	Antimony
ICP-MS	EPA 200.8; EPA 6020/6020A	Arsenic
ICP-MS	EPA 200.8; EPA 6020/6020A	Barium
ICP-MS	EPA 200.8; EPA 6020/6020A	Beryllium
ICP-MS	EPA 200.8; EPA 6020/6020A	Cadmium
ICP-MS	EPA 200.8; EPA 6020/6020A	Chromium
ICP-MS	EPA 200.8; EPA 6020/6020A	Cobalt
ICP-MS	EPA 200.8; EPA 6020/6020A	Copper
ICP-MS	EPA 200.8; EPA 6020/6020A	Lead
ICP-MS	EPA 200.8; EPA 6020/6020A	Manganese
ICP-MS	EPA 6020/6020A	Molybdenum
ICP-MS	EPA 200.8; EPA 6020/6020A	Nickel
ICP-MS	EPA 6020/6020A	Selenium
ICP-MS	EPA 200.8; EPA 6020/6020A	Silver
ICP-MS	EPA 200.8; EPA 6020/6020A	Thallium
ICP-MS	EPA 6020/6020A	Vanadium
ICP-MS	EPA 200.8; EPA 6020/6020A	Zinc
CV-AFS	EPA 1631E	Mercury
CVAA	EPA 7470A	Mercury
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	Sulfate

Non-Potable Water		
Technology	**Method**	**Analyte**
Calculation, Auto Analyzer	EPA 353.2	Nitrate as N
Auto Analyzer	EPA 353.2	Nitrite as N
Auto Analyzer	EPA 353.2	Nitrate and Nitrite as N
Colorimetric	EPA 376.2	Sulfide
Colorimetric	SM 4500-S^{2-} D	Sulfide
Colorimetric	EPA 410.4	COD
Probe	SM 4500-H+B	pH
Auto Analyzer	EPA 310.2	Total Alkalinity (as CaCO3)
Titrimetric	EPA 310.1; SM 2320B	Total Alkalinity (as CaCO3)
Auto Analyzer	EPA 335.4; EPA 9012B	Total Cyanide
Auto Analyzer	EPA 350.1	Ammonia as N
Auto Analyzer	EPA 365.4	Total Phosphorous
Auto Analyzer	EPA 9060A	TOC
Gravimetric	EPA 1664B	Oil & Grease
Gravimetric	SM 2510B	Specific Conductance (25°C)
Gravimetric	SM 2540B	Total Solids
Gravimetric	SM 2540C	Total Dissolved Solids at 180° (TDS)
Gravimetric	SM 2540D	Non-Filterable Residue (TSS)
Calculation, ICP	SM 2340B	Hardness
GC/MS	EPA 624; EPA 8260B/C	1,1,1-Trichloroethane
GC/MS	EPA 624; EPA 8260B/C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 624; EPA 8260B/C	1,1,2-Trichloroethane
GC/MS	EPA 624; EPA 8260B/C	1,1-Dichloroethane
GC/MS	EPA 624; EPA 8260B/C	1,1-Dichloroethene
GC/MS	EPA 624; EPA 8260B/C	1,1-Dichloropropene
GC/MS	EPA 624; EPA 8260B/C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 624; EPA 8260B/C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 624; EPA 8260B/C	1,2,3-Trichlorobenzene
GC/MS	EPA 624; EPA 8260B/C	1,2,3-Trichloropropane
GC/MS	EPA 624; EPA 8260B/C	1,2,4-Trichlorobenzene
GC/MS	EPA 624; EPA 8260B/C	1,2,4-Trimethylbenzene
GC/MS	EPA 624; EPA 8260B/C	1,2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 624; EPA 8260B/C	1,2-Dibromoethane (EDB)
GC/MS	EPA 624; EPA 8260B/C	1,2-Dichlorobenzene
GC/MS	EPA 624; EPA 8260B/C	1,2-Dichloroethane
GC/MS	EPA 624; EPA 8260B/C	1,2-Dichloropropane
GC/MS	EPA 624; EPA 8260B/C	1,3,5-Trimethylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C	1,3-Butadiene
GC/MS	EPA 624; EPA 8260B/C	1,3-Dichlorobenzene
GC/MS	EPA 624; EPA 8260B/C	1,3-Dichloropropane
GC/MS	EPA 624; EPA 8260B/C	1,4-Dichlorobenzene
GC/MS	EPA 624; EPA 8260B/C	2,2-Dichloropropane
GC/MS	EPA 624; EPA 8260B/C	2-Butanone (Methyl ethyl ketone MEK)
GC/MS	EPA 624; EPA 8260B/C	2-Chloroethyl vinyl ether
GC/MS	EPA 624; EPA 8260B/C	2-Chlorotoluene
GC/MS	EPA 624; EPA 8260B/C	2-Hexanone
GC/MS	EPA 624; EPA 8260B/C	4-Chlorotoluene
GC/MS	EPA 624; EPA 8260B/C	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 624; EPA 8260B/C	Acetone
GC/MS	EPA 624; EPA 8260B/C	Acrolein
GC/MS	EPA 624; EPA 8260B/C	Acrylonitrile
GC/MS	EPA 624; EPA 8260B/C	Benzene
GC/MS	EPA 624; EPA 8260B/C	Bromobenzene
GC/MS	EPA 624; EPA 8260B/C	Bromochloromethane
GC/MS	EPA 624; EPA 8260B/C	Bromodichloromethane
GC/MS	EPA 624; EPA 8260B/C	Bromoform
GC/MS	EPA 624; EPA 8260B/C	Bromomethane
GC/MS	EPA 624; EPA 8260B/C	Carbon disulfide
GC/MS	EPA 624; EPA 8260B/C	Carbon tetrachloride
GC/MS	EPA 624; EPA 8260B/C	Chlorobenzene
GC/MS	EPA 624; EPA 8260B/C	Chloroethane
GC/MS	EPA 624; EPA 8260B/C	Chloroform
GC/MS	EPA 624; EPA 8260B/C	Chloromethane
GC/MS	EPA 624; EPA 8260B/C	Cyclohexane
GC/MS	EPA 624; EPA 8260B/C	cis-1,2-Dichloroethene
GC/MS	EPA 624; EPA 8260B/C	cis-1,3-Dichloropropene
GC/MS	EPA 624; EPA 8260B/C	Di-isopropylether (DIPE)
GC/MS	EPA 624; EPA 8260B/C	Dibromochloromethane
GC/MS	EPA 624; EPA 8260B/C	Dibromomethane (Methylene Bromide)
GC/MS	EPA 624; EPA 8260B/C	Dichlorodifluoromethane
GC/MS	EPA 624; EPA 8260B/C	Ethylbenzene
GC/MS	EPA 624; EPA 8260B/C	Hexachlorobutadiene
GC/MS	EPA 624; EPA 8260B/C	Hexane
GC/MS	EPA 624; EPA 8260B/C	Isopropylbenzene
GC/MS	EPA 624; EPA 8260B/C	Methyl tert-butyl ether (MTBE)

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 624; EPA 8260B/C	Methylene chloride
GC/MS	EPA 624; EPA 8260B/C	Naphthalene
GC/MS	EPA 624; EPA 8260B/C	n-Butylbenzene
GC/MS	EPA 624; EPA 8260B/C	n-Propylbenzene
GC/MS	EPA 624; EPA 8260B/C	p-Isopropyltoluene
GC/MS	EPA 624; EPA 8260B/C	sec-Butylbenzene
GC/MS	EPA 624; EPA 8260B/C	Styrene
GC/MS	EPA 624; EPA 8260B/C	tert-Amyl methyl ether (TAME)
GC/MS	EPA 624; EPA 8260B/C	tert-Butylbenzene
GC/MS	EPA 624; EPA 8260B/C	trans-1,2-Dichloroethene
GC/MS	EPA 624; EPA 8260B/C	trans-1,3-Dichloropropene
GC/MS	EPA 624; EPA 8260B/C	Tetrachloroethene
GC/MS	EPA 624; EPA 8260B/C	Toluene
GC/MS	EPA 624; EPA 8260B/C	Trichloroethene
GC/MS	EPA 624; EPA 8260B/C	Trichlorofluoromethane
GC/MS	EPA 624; EPA 8260B/C	Vinyl acetate
GC/MS	EPA 624; EPA 8260B/C	Vinyl chloride
GC/MS	EPA 624; EPA 8260B/C	Xylene (total)
GC/MS	EPA 624; EPA 8260B/C	m+p-Xylene
GC/MS	EPA 624; EPA 8260B/C	o-Xylene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Acenaphthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Acenaphthylene
GC/MS	EPA 8270C/D	Aniline
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Anthracene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(a)anthracene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(a)pyrene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(k)fluoranthene
GC/MS	EPA 8270C/D	Benzoic acid
GC/MS	EPA 8270C/D	Benzyl alcohol
GC/MS	EPA 8270C/D	4-Bromophenyl-phenylether
GC/MS	EPA 8270C/D	Butyl benzyl phthalate
GC/MS	EPA 8270C/D	Carbazole
GC/MS	EPA 8270C/D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D	4-Chloroaniline
GC/MS	EPA 8270C/D	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270C/D	bis(2-Chloroethyl)ether

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8270C/D	bis(2-Chloroisopropyl) ether
GC/MS	EPA 8270C/D	2-Chloronaphthalene
GC/MS	EPA 8270C/D	2-Chlorophenol
GC/MS	EPA 8270C/D	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Chrysene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C/D	Dibenzofuran
GC/MS	EPA 8270C/D	Di-n-butylphthalate
GC/MS	EPA 8270C/D	1,2 Dichlorobenzene
GC/MS	EPA 8270C/D	1,3 Dichlorobenzene
GC/MS	EPA 8270C/D	1,4 Dichlorobenzene
GC/MS	EPA 8270C/D	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/D	2,4-Dichlorophenol
GC/MS	EPA 8270C/D	Diethyl phthalate
GC/MS	EPA 8270C/D	2,4-Dimethylphenol
GC/MS	EPA 8270C/D	Dimethyl phthalate
GC/MS	EPA 8270C/D	2,4-Dinitrophenol
GC/MS	EPA 8270C/D	2,4-Dinitrotoluene
GC/MS	EPA 8270C/D	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D	Di-n-octylphthalate
GC/MS	EPA 8270C/D	bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Fluoranthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	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/C-SIM/D-SIM	Indeno(1,2,3, cd)pyrene
GC/MS	EPA 8270C/D	Isophorone
GC/MS	EPA 8270C/D	2-Methyl-4,6-Dinitrophenol
GC/MS	EPA 8270C-SIM/D-SIM	1-Methylnaphthalene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	2-Methylnaphthalene
GC/MS	EPA 8270C/D	2-Methylphenol
GC/MS	EPA 8270C/D	4-Methylphenol (and/or 3-Methylphenol)
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Naphthalene
GC/MS	EPA 8270C/D	2-Nitroaniline
GC/MS	EPA 8270C/D	3-Nitroaniline
GC/MS	EPA 8270C/D	4-Nitroaniline

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8270C/D	Nitrobenzene
GC/MS	EPA 8270C/D	2-Nitrophenol
GC/MS	EPA 8270C/D	4-Nitrophenol
GC/MS	EPA 8270C/D	N-Nitrosodimethylamine
GC/MS	EPA 8270C/D	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/D	N-Nitroso-di-n-propylamine
GC/MS	EPA 8270C/D	Pentachlorophenol
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Phenanthrene
GC/MS	EPA 8270C/D	Phenol
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Pyrene
GC/MS	EPA 8270C/D	Pyridine
GC/MS	EPA 8270C/D	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/D	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D	2,4,6-Trichlorophenol
GC/ECD	EPA 8082A	Aroclor 1016
GC/ECD	EPA 8082A	Aroclor 1221
GC/ECD	EPA 8082A	Aroclor 1232
GC/ECD	EPA 8082A	Aroclor 1242
GC/ECD	EPA 8082A	Aroclor 1248
GC/ECD	EPA 8082A	Aroclor 1254
GC/ECD	EPA 8082A	Aroclor 1260
GC/FID	EPA 8015B/D; NWTPH-Gx; AK101	Gasoline Range Organics
GC/FID	EPA 8015B/D; NWTPH-Dx; AK102	Diesel Range Organics
GC/FID	EPA 8015B/D; NWTPH-Dx	Oil Range Organics
GC/FID, GC/TCD	RSK-175	Methane
GC/FID	RSK-175	Ethane
GC/FID	RSK-175	Ethene
GC/TCD	RSK-175	Carbon Dioxide
NA	EPA-821-R-02-012	Atherinops Affinis Acute
NA	EPA-600-R-95-136, Method 1006	Atherinops Affinis Chronic
NA	EPA-821-R-02-012, Method 2000	Pimephales promelas Acute
NA	EPA-821-R-02-013, Method 1000	Pimephales promelas Chronic
NA	EPA-821-R-02-012, Method 2002	Ceriodaphnia dubia Acute
NA	EPA-821-R-02-013, Method 1002	Ceriodaphnia dubia Chronic
NA	EPA-821-R-02-012, Method 2021	Daphnia pulex Acute
NA	EPA-821-R-02-012, Method 2007	Mysidopsis bahia Acute
NA	EPA-821-R-02-014, Method 1007	Mysidopsis bahia Chronic
NA	EPA-821-R-02-012, Method 2006	Menidia berylina Acute

Non-Potable Water

Technology	Method	Analyte
NA	EPA-821-R-02-014, Method 1006	Menidia berylina Chronic
NA	EPA 821-R-02-012, Method 2004	Cyprinodon variegatus Acute
NA	EPA-821-R-02-014, Method 1004	Cyprinodon variegatus Chronic
NA	EPA-821-R-02-013, Method 1003	Selenastrum capricornutum Chronic
Preparation	**Method**	**Type**
Acid Digestion	EPA 3010A	Acid Digestion
Solid Phase Extraction	EPA 3535A	Solid Phase Extraction
Closed System Purge-and-Trap for Volatile Organics	EPA 5030C	Closed System Purge-and-Trap for Volatile Organics
Micro-Cleanup Using Acid Silica Gel and Activated Copper Powder	In-house method SVO31	Micro-Cleanup Using Acid Silica Gel and Activated Copper Powder
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	Separatory Funnel Liquid-Liquid Extraction

Drinking Water

Technology	Method	Analyte
IC	EPA 300.0	Chloride
IC	EPA 300.0	Nitrate as N
IC	EPA 300.0	Nitrite as N
IC	EPA 300.0	Sulfate
Gravimetric	SM 2510B	Specific Conductance (25°C)
Gravimetric	SM 2540C	Total Dissolved Solids at 180°C (TDS)
Probe	SM 4500-H+B	pH
ICP-MS	EPA 200.8	Antimony
ICP-MS	EPA 200.8	Arsenic
ICP-MS	EPA 200.8	Beryllium
ICP-MS	EPA 200.8	Cadmium
ICP-MS	EPA 200.8	Chromium
ICP-MS	EPA 200.8	Copper
ICP-MS	EPA 200.8	Lead
ICP-MS	EPA 200.8	Manganese
ICP-MS	EPA 200.8	Nickel
ICP-MS	EPA 200.8	Thallium
ICP-MS	EPA 200.8	Zinc
GC/MS	EPA 524.2	1,1,1-Trichloroethane
GC/MS	EPA 524.2	1,1,1,2-Tetrachloroethane

Drinking Water

Technology	Method	Analyte
GC/MS	EPA 524.2	1,1,2-Trichloroethane
GC/MS	EPA 524.2	1,1-Dichloroethane
GC/MS	EPA 524.2	1,1-Dichloroethene
GC/MS	EPA 524.2	1,1-Dichloropropene
GC/MS	EPA 524.2	1,1,2,2-Tetrachloroethane
GC/MS	EPA 524.2	1,2,3-Trichlorobenzene
GC/MS	EPA 524.2	1,2,4-Trichlorobenzene
GC/MS	EPA 524.2	1,2,4-Trimethylbenzene
GC/MS	EPA 524.2	1,2-Dichlorobenzene
GC/MS	EPA 524.2	1,2-Dichloroethane
GC/MS	EPA 524.2	1,2-Dichloropropane
GC/MS	EPA 524.2	1,3,5-Trimethylbenzene
GC/MS	EPA 524.2	1,3-Dichlorobenzene
GC/MS	EPA 524.2	1,3-Dichloropropane
GC/MS	EPA 524.2	1,4-Dichlorobenzene
GC/MS	EPA 524.2	2,2-Dichloropropane
GC/MS	EPA 524.2	2-Chlorotoluene
GC/MS	EPA 524.2	4-Chlorotoluene
GC/MS	EPA 524.2	Benzene
GC/MS	EPA 524.2	Bromobenzene
GC/MS	EPA 524.2	Bromochloromethane
GC/MS	EPA 524.2	Bromodichloromethane
GC/MS	EPA 524.2	Bromoform
GC/MS	EPA 524.2	Bromomethane
GC/MS	EPA 524.2	Carbon tetrachloride
GC/MS	EPA 524.2	Chlorobenzene
GC/MS	EPA 524.2	Chloroethane
GC/MS	EPA 524.2	Chloroform
GC/MS	EPA 524.2	Chloromethane
GC/MS	EPA 524.2	cis-1,2-Dichloroethene
GC/MS	EPA 524.2	cis-1,3-Dichloropropene
GC/MS	EPA 524.2	Dibromochloromethane
GC/MS	EPA 524.2	Dibromomethane (Methylene Bromide)
GC/MS	EPA 524.2	Dichlorodifluoromethane
GC/MS	EPA 524.2	Ethylbenzene
GC/MS	EPA 524.2	Hexachlorobutadiene
GC/MS	EPA 524.2	Isopropylbenzene
GC/MS	EPA 524.2	Methyl tert-butyl ether (MTBE)

Drinking Water

Technology	Method	Analyte
GC/MS	EPA 524.2	Methylene chloride
GC/MS	EPA 524.2	Naphthalene
GC/MS	EPA 524.2	n-Butylbenzene
GC/MS	EPA 524.2	n-Propylbenzene
GC/MS	EPA 524.2	p-Isopropyltoluene
GC/MS	EPA 524.2	sec-Butylbenzene
GC/MS	EPA 524.2	Styrene
GC/MS	EPA 524.2	tert-Butylbenzene
GC/MS	EPA 524.2	trans-1,2-Dichloroethene
GC/MS	EPA 524.2	trans-1,3-Dichloropropene
GC/MS	EPA 524.2	Tetrachloroethene
GC/MS	EPA 524.2	Toluene
GC/MS	EPA 524.2	Trichloroethene
GC/MS	EPA 524.2	Trichlorofluoromethane
GC/MS	EPA 524.2	Vinyl chloride
GC/MS	EPA 524.2	Xylene (total)
GC/MS	EPA 524.2	m+p-Xylene
GC/MS	EPA 524.2	o-Xylene

Solid and Chemical Materials

Technology	Method	Analyte
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

Solid and Chemical Materials

Technology	Method	Analyte
ICP-AES	EPA 6010B/C	Nickel
ICP-AES	EPA 6010B/C	Potassium
ICP-AES	EPA 6010B/C	Selenium
ICP-AES	EPA 6010B/C	Silver
ICP-AES	EPA 6010B/C	Sodium
ICP-AES	EPA 6010B/C	Thallium
ICP-AES	EPA 6010B/C	Vanadium
ICP-AES	EPA 6010B/C	Zinc
ICP-MS	EPA 6020/6020A	Aluminum
ICP-MS	EPA 6020/6020A	Antimony
ICP-MS	EPA 6020/6020A	Arsenic
ICP-MS	EPA 6020/6020A	Barium
ICP-MS	EPA 6020/6020A	Beryllium
ICP-MS	EPA 6020/6020A	Cadmium
ICP-MS	EPA 6020/6020A	Chromium
ICP-MS	EPA 6020/6020A	Cobalt
ICP-MS	EPA 6020/6020A	Copper
ICP-MS	EPA 6020/6020A	Lead
ICP-MS	EPA 6020/6020A	Manganese
ICP-MS	EPA 6020/6020A	Molybdenum
ICP-MS	EPA 6020/6020A	Nickel
ICP-MS	EPA 6020/6020A	Selenium
ICP-MS	EPA 6020/6020A	Silver
ICP-MS	EPA 6020/6020A	Thallium
ICP-MS	EPA 6020/6020A	Vanadium
ICP-MS	EPA 6020/6020A	Zinc
CVAA	EPA 7471B	Mercury
IC	EPA 9056A	Chloride
IC	EPA 9056A	Sulfate
IC	EPA 9056A	Nitrate as N
Auto Analyzer	EPA 335.4/EPA 9012B	Total Cyanide
Auto Analyzer	Lloyd Kahn	TOC
GC/MS	EPA 8260B/C	Acetone
GC/MS	EPA 8260B/C	Acrolein
GC/MS	EPA 8260B/C	Acrylonitrile
GC/MS	EPA 8260B/C	TAME
GC/MS	EPA 8260B/C	Benzene
GC/MS	EPA 8260B/C	Bromobenzene
GC/MS	EPA 8260B/C	Bromochloromethane

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C	Bromodichloromethane
GC/MS	EPA 8260B/C	Bromoform
GC/MS	EPA 8260B/C	1, 3 Butadiene
GC/MS	EPA 8260B/C	2-Butanone (MEK)
GC/MS	EPA 8260B/C	n-Butylbenzene
GC/MS	EPA 8260B/C	sec-Butylbenzene
GC/MS	EPA 8260B/C	tert-Butylbenzene
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	2-Chloroethylvinylether
GC/MS	EPA 8260B/C	Chloroform
GC/MS	EPA 8260B/C	2-Chlorotoluene
GC/MS	EPA 8260B/C	4-Chlorotoluene
GC/MS	EPA 8260B/C	Cyclohexane
GC/MS	EPA 8260B/C	1,2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260B/C	Dibromochloromethane
GC/MS	EPA 8260B/C	1,2-Dibromoethane (EDB)
GC/MS	EPA 8260B/C	Dibromomethane
GC/MS	EPA 8260B/C	1,2 Dichlorobenzene
GC/MS	EPA 8260B/C	1,3 Dichlorobenzene
GC/MS	EPA 8260B/C	1,4 Dichlorobenzene
GC/MS	EPA 8260B/C	Dichlorodifluoromethane
GC/MS	EPA 8260B/C	1,1-Dichloroethane
GC/MS	EPA 8260B/C	1,2 Dichloroethane
GC/MS	EPA 8260B/C	1,1-Dichloroethene
GC/MS	EPA 8260B/C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/C	1,2-Dichloropropane
GC/MS	EPA 8260B/C	1,3-Dichloropropane
GC/MS	EPA 8260B/C	2,2-Dichloropropane
GC/MS	EPA 8260B/C	1,1-Dichloropropene
GC/MS	EPA 8260B/C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/C	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/C	Di-isopropylether (DIPE)
GC/MS	EPA 8260B/C	Ethylbenzene
GC/MS	EPA 8260B/C	Hexachlorobutadiene
GC/MS	EPA 8260B/C	Hexane

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/C	2-Hexanone
GC/MS	EPA 8260B/C	Isopropylbenzene
GC/MS	EPA 8260B/C	p-Isopropyltoluene
GC/MS	EPA 8260B/C	Bromomethane
GC/MS	EPA 8260B/C	Chloromethane
GC/MS	EPA 8260B/C	Methylene Chloride
GC/MS	EPA 8260B/C	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 8260B/C	Methyl tert-butyl ether (MTBE)
GC/MS	EPA 8260B/C	Naphthalene
GC/MS	EPA 8260B/C	n-Propylbenzene
GC/MS	EPA 8260B/C	Styrene
GC/MS	EPA 8260B/C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/C	Tetrachloroethene
GC/MS	EPA 8260B/C	Toluene
GC/MS	EPA 8260B/C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/C	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/C	Trichloroethene
GC/MS	EPA 8260B/C	Trichlorofluoromethane
GC/MS	EPA 8260B/C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 8260B/C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/C	Vinyl acetate
GC/MS	EPA 8260B/C	Vinyl chloride
GC/MS	EPA 8260B/C	m+p-Xylene
GC/MS	EPA 8260B/C	o-Xylene
GC/MS	EPA 8260B/C	Xylenes, total
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Acenaphthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Acenaphthylene
GC/MS	EPA 8270C/D	Aniline
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Anthracene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(a)anthracene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(a)pyrene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Benzo(k)fluoranthene

Solid and Chemical Materials

Technology	Method	Analyte
GC/MS	EPA 8270C/D	Benzoic acid
GC/MS	EPA 8270C/D	Benzyl alcohol
GC/MS	EPA 8270C/D	4-Bromophenyl-phenylether
GC/MS	EPA 8270C/D	Butyl benzyl phthalate
GC/MS	EPA 8270C/D	Carbazole
GC/MS	EPA 8270C/D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/D	4-Chloroaniline
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-Chloroiospropyl) ether
GC/MS	EPA 8270C/D	2-Chloronaphthalene
GC/MS	EPA 8270C/D	2-Chlorophenol
GC/MS	EPA 8270C/D	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Chrysene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C/D	Dibenzofuran
GC/MS	EPA 8270C/D	Di-n-butylphthalate
GC/MS	EPA 8270C/D	1,2 Dichlorobenzene
GC/MS	EPA 8270C/D	1,3 Dichlorobenzene
GC/MS	EPA 8270C/D	1,4 Dichlorobenzene
GC/MS	EPA 8270C/D	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/D	2,4-Dichlorophenol
GC/MS	EPA 8270C/D	Diethyl phthalate
GC/MS	EPA 8270C/D	2,4-Dimethylphenol
GC/MS	EPA 8270C/D	Dimethyl phthalate
GC/MS	EPA 8270C/D	2,4-Dinitrophenol
GC/MS	EPA 8270C/D	2,4-Dinitrotoluene
GC/MS	EPA 8270C/D	2,6-Dinitrotoluene
GC/MS	EPA 8270C/D	Di-n-octylphthalate
GC/MS	EPA 8270C/D	bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Fluoranthene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	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/C-SIM/D-SIM	Indeno(1,2,3, cd)pyrene
GC/MS	EPA 8270C/D	Isophorone
GC/MS	EPA 8270C/D	2-Methyl-4,6-Dinitrophenol

Solid and Chemical Materials

Technology	Method	Analyte
GC/MS	EPA 8270C-SIM/D-SIM	1-Methylnaphthalene
GC/MS	EPA 8270C/D/C-SIM/D-SIM	2-Methylnaphthalene
GC/MS	EPA 8270C/D	2-Methylphenol
GC/MS	EPA 8270C/D	4-Methylphenol (and/or 3-Methylphenol)
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Naphthalene
GC/MS	EPA 8270C/D	2-Nitroaniline
GC/MS	EPA 8270C/D	3-Nitroaniline
GC/MS	EPA 8270C/D	4-Nitroaniline
GC/MS	EPA 8270C/D	Nitrobenzene
GC/MS	EPA 8270C/D	2-Nitrophenol
GC/MS	EPA 8270C/D	4-Nitrophenol
GC/MS	EPA 8270C/D	N-Nitrosodimethylamine
GC/MS	EPA 8270C/D	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/D	N-Nitroso-di-n-propylamine
GC/MS	EPA 8270C/D	Pentachlorophenol
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Phenanthrene
GC/MS	EPA 8270C/D	Phenol
GC/MS	EPA 8270C/D/C-SIM/D-SIM	Pyrene
GC/MS	EPA 8270C/D	Pyridine
GC/MS	EPA 8270C/D	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/D	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/D	2,4,6-Trichlorophenol
GC/ECD	EPA 8082A	Aroclor 1016
GC/ECD	EPA 8082A	Aroclor 1221
GC/ECD	EPA 8082A	Aroclor 1232
GC/ECD	EPA 8082A	Aroclor 1242
GC/ECD	EPA 8082A	Aroclor 1248
GC/ECD	EPA 8082A	Aroclor 1254
GC/ECD	EPA 8082A	Aroclor 1260
GC/FID	EPA 8015B/D; NWTPH-Gx; AK101	Gasoline Range Organics
GC/FID	EPA 8015B/D; NWTPH-Dx; AK102	Diesel Range Organics
GC/FID	EPA 8015B/D; NWTPH-Dx	Oil Range Organics
GC/FID	AK103	Residual Range Organics in Soil
NA	ASTM E 1706-05; EPA 600-R-99-064, Method 100.1	Hyallela azteca (10 day)
NA	ASTM E 1706-05; EPA 600-R-99-064, Method 100.2	Chironomid tentans (10 day)
NA	ASTM E 1706-05; EPA 600-R-99-064, Method 100.4	Hyallela azteca (28 day)

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
NA	ASTM E 1706-05; EPA 600-R-99-064, Method 100.5	Chironomid tentans (20 day)
Preparation	**Method**	**Type**
Acid Digestion	EPA 3050B	Acid Digestion
Ultrasonic Extraction	EPA 3550C	Ultrasonic Extraction
Closed System Purge-and-Trap for Volatile Organics	EPA 5035A	Closed System Purge-and-Trap for Volatile Organics
Micro-Cleanup Using Acid Silica Gel and Activated Copper Powder	In-house method SVO31	Micro-Cleanup Using Acid Silica Gel and Activated Copper Powder

Air and Emissions		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15/TO-15 SIM	Acetone
GC/MS	EPA TO-15	Acrylonitrile
GC/MS	EPA TO-15/TO-15 SIM	Benzene
GC/MS	EPA TO-15/TO-15 SIM	Bromodichloromethane
GC/MS	EPA TO-15/TO-15 SIM	Bromoform
GC/MS	EPA TO-15/TO-15 SIM	1,3-Butadiene
GC/MS	EPA TO-15/TO-15 SIM	2-Butanone (MEK)
GC/MS	EPA TO-15/TO-15 SIM	Carbon disulfide
GC/MS	EPA TO-15/TO-15 SIM	Carbon tetrachloride
GC/MS	EPA TO-15/TO-15 SIM	Chlorobenzene
GC/MS	EPA TO-15/TO-15 SIM	Chloroethane
GC/MS	EPA TO-15/TO-15 SIM	Chloroform
GC/MS	EPA TO-15/TO-15 SIM	Cyclohexane
GC/MS	EPA TO-15/TO-15 SIM	Dibromochloromethane
GC/MS	EPA TO-15/TO-15 SIM	1,2-Dibromoethane (EDB)
GC/MS	EPA TO-15/TO-15 SIM	1,2 Dichlorobenzene
GC/MS	EPA TO-15/TO-15 SIM	1,3 Dichlorobenzene
GC/MS	EPA TO-15/TO-15 SIM	1,4 Dichlorobenzene
GC/MS	EPA TO-15/TO-15 SIM	Dichlorodifluoromethane
GC/MS	EPA TO-15/TO-15 SIM	1,1-Dichloroethane
GC/MS	EPA TO-15/TO-15 SIM	1,2 Dichloroethane
GC/MS	EPA TO-15/TO-15 SIM	1,1-Dichloroethene
GC/MS	EPA TO-15/TO-15 SIM	cis-1,2-Dichloroethene

Air and Emissions

Technology	Method	Analyte
GC/MS	EPA TO-15/TO-15 SIM	1,2-Dichloropropane
GC/MS	EPA TO-15/TO-15 SIM	cis-1,3-Dichloropropene
GC/MS	EPA TO-15/TO-15 SIM	trans-1,3-Dichloropropene
GC/MS	EPA TO-15/TO-15 SIM	1,2-Dichloro-1,1,2,2-tetrafluoroethane
GC/MS	EPA TO-15/TO-15 SIM	trans-1,2-Dichloroethene
GC/MS	EPA TO-15/TO-15 SIM	Ethylbenzene
GC/MS	EPA TO-15/TO-15 SIM	n-Heptane
GC/MS	EPA TO-15/TO-15 SIM	Hexachlorobutadiene
GC/MS	EPA TO-15/TO-15 SIM	Hexane
GC/MS	EPA TO-15/TO-15 SIM	Bromomethane
GC/MS	EPA TO-15/TO-15 SIM	Chloromethane
GC/MS	EPA TO-15/TO-15 SIM	Methylene Chloride
GC/MS	EPA TO-15/TO-15 SIM	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA TO-15/TO-15 SIM	Methyl tert-butyl ether (MTBE)
GC/MS	EPA TO-15/TO-15 SIM	Naphthalene
GC/MS	EPA TO-15	n-Octane
GC/MS	EPA TO-15/TO-15 SIM	Propylene
GC/MS	EPA TO-15/TO-15 SIM	Styrene
GC/MS	EPA TO-15/TO-15 SIM	1,1,2,2-Tetrachloroethane
GC/MS	EPA TO-15/TO-15 SIM	Tetrachloroethene
GC/MS	EPA TO-15/TO-15 SIM	Toluene
GC/MS	EPA TO-15/TO-15 SIM	1,2,4-Trichlorobenzene
GC/MS	EPA TO-15/TO-15 SIM	1,1,1-Trichloroethane
GC/MS	EPA TO-15/TO-15 SIM	1,1,2-Trichloroethane
GC/MS	EPA TO-15/TO-15 SIM	Trichloroethene
GC/MS	EPA TO-15/TO-15 SIM	Trichlorofluoromethane
GC/MS	EPA TO-15/TO-15 SIM	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA TO-15/TO-15 SIM	1,2,4-Trimethylbenzene
GC/MS	EPA TO-15/TO-15 SIM	1,3,5-Trimethylbenzene
GC/MS	EPA TO-15/TO-15 SIM	Vinyl chloride
GC/MS	EPA TO-15/TO-15 SIM	m+p-Xylene
GC/MS	EPA TO-15/TO-15 SIM	o-Xylene
GC/MS	EPA TO-15/TO-15 SIM	Xylenes, total
GC/FID	EPA TO-3; EPA 8015m	TPH Gasoline in Air
GC/MS	EPA TO-3 LL; EPA 8015m LL	TPH Gasoline in Air
GC/TCD	EPA 3C	Oxygen
GC/TCD	EPA 3C	Carbon Dioxide
GC/TCD	EPA 3C	Carbon Monoxide
GC/TCD	EPA 3C	Methane

Notes:

1) This laboratory offers commercial testing service.
2) This scope is formatted as part of a single document including Certificate of Accreditation No. ADE-1485

Vice President

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TestAmerica Laboratories, Inc.
5755 8th Street East
Tacoma WA 98424

has been assessed by ANAB
and meets the requirements of

ISO/IEC 17025:2005 and DoD-ELAP

while demonstrating technical competence in the field of

TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of tests to which this accreditation applies.

L2236
Certificate Number

ANAB Approval

Certificate Valid: 06/14/2017 - 01/19/2019
Issued: 06/14/2017

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).

Scope of Accreditation
For
TestAmerica Laboratories, Inc

5755 8th Street East
Tacoma, WA 98424
Terri Torres
253-922-2310

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM V5) based on the TNI Standard - Environmental Laboratory Sector, Volume 1 – Management and Technical Requirements for Laboratories Performing Environmental Analysis, Sept 2009 (EL-V1-2009); accreditation is granted to **TestAmerica Laboratories, Inc.** to perform the following tests

Accreditation granted through: **January 19, 2019**

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/200.7	Silver
ICP-AES	EPA 6010B/6010C/200.7	Aluminum
ICP-AES	EPA 6010B/6010C/200.7	Arsenic
ICP-AES	EPA 6010B/6010C/200.7	Boron
ICP-AES	EPA 6010B/6010C/200.7	Barium
ICP-AES	EPA 6010B/6010C/200.7	Beryllium
ICP-AES	EPA 6010B/6010C/200.7	Calcium
ICP-AES	EPA 6010B/6010C/200.7	Cadmium
ICP-AES	EPA 6010B/6010C/200.7	Cobalt
ICP-AES	EPA 6010B/6010C/200.7	Chromium
ICP-AES	EPA 6010B/6010C/200.7	Copper
ICP-AES	EPA 6010B/6010C/200.7	Iron
ICP-AES	EPA 6010B/6010C/200.7	Potassium
ICP-AES	EPA 6010B/6010C/200.7	Magnesium
ICP-AES	EPA 6010B/6010C/200.7	Manganese
ICP-AES	EPA 6010B/6010C/200.7	Molybdenum
ICP-AES	EPA 6010B/6010C/200.7	Sodium
ICP-AES	EPA 6010B/6010C/200.7	Nickel

Non-Potable Water

Technology	Method	Analyte
ICP-AES	EPA 6010B/6010C/200.7	Lead
ICP-AES	EPA 6010B/6010C/200.7	Antimony
ICP-AES	EPA 6010B/6010C/200.7	Selenium
ICP-AES	EPA 6010B/6010C/200.7	Silicon
ICP-AES	EPA 6010B/6010C/200.7	Tin
ICP-AES	EPA 6010B/6010C/200.7	Titanium
ICP-AES	EPA 6010B/6010C/200.7	Strontium
ICP-AES	EPA 6010B/6010C/200.7	Thallium
ICP-AES	EPA 6010B/6010C/200.7	Vanadium
ICP-AES	EPA 6010B/6010C/200.7	Zinc
ICP-MS	EPA 6020/6020A/200.8	Silver
ICP-MS	EPA 6020/6020A/200.8	Arsenic
ICP-MS	EPA 6020/6020A/200.8	Barium
ICP-MS	EPA 6020/6020A/200.8	Beryllium
ICP-MS	EPA 6020/6020A/200.8	Cadmium
ICP-MS	EPA 6020/6020A/200.8	Cobalt
ICP-MS	EPA 6020/6020A/200.8	Chromium
ICP-MS	EPA 6020/6020A/200.8	Copper
ICP-MS	EPA 6020/6020A/200.8	Manganese
ICP-MS	EPA 6020/6020A/200.8	Molybdenum
ICP-MS	EPA 6020/6020A/200.8	Nickel
ICP-MS	EPA 6020/6020A/200.8	Lead
ICP-MS	EPA 6020/6020A/200.8	Antimony
ICP-MS	EPA 6020/6020A/200.8	Selenium
ICP-MS	EPA 6020/6020A/200.8	Thallium
ICP-MS	EPA 6020/6020A/200.8	Uranium
ICP-MS	EPA 6020/6020A/200.8	Vanadium
ICP-MS	EPA 6020/6020A/200.8	Zinc
CVAAS	EPA 7470A/245.1	Mercury
GC/MS	EPA 8260B/8260C/624	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C/624	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C/624	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C/624	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C/624	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C/624	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C/624	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C/624	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C/624	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C/624	1,2,4-Trichlorobenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C/624	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C/624	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C/624	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C/624	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C/624	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C/624	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C/624	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C/624	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C/624	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C/624	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C/624	2-Chlorotoluene
GC/MS	EPA 8260B/8260C/624	2-Hexanone
GC/MS	EPA 8260B/8260C/624	4-Chlorotoluene
GC/MS	EPA 8260B/8260C/624	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C/624	Acetone
GC/MS	EPA 8260B/8260C/624	Acetonitrile
GC/MS	EPA 8260B/8260C/624	Acrolein
GC/MS	EPA 8260B/8260C/624	Acrylonitrile
GC/MS	EPA 8260B/8260C/624	Benzene
GC/MS	EPA 8260B/8260C/624	Bromobenzene
GC/MS	EPA 8260B/8260C/624	Bromodichloromethane
GC/MS	EPA 8260B/8260C/624	Bromoform
GC/MS	EPA 8260B/8260C/624	Bromomethane
GC/MS	EPA 8260B/8260C/624	Carbon disulfide
GC/MS	EPA 8260B/8260C/624	Carbon tetrachloride
GC/MS	EPA 8260B/8260C/624	Chlorobenzene
GC/MS	EPA 8260B/8260C/624	Chlorobromomethane
GC/MS	EPA 8260B/8260C/624	Chlorodibromomethane
GC/MS	EPA 8260B/8260C/624	Chloroethane
GC/MS	EPA 8260B/8260C/624	Chloroform
GC/MS	EPA 8260B/8260C/624	Chloromethane
GC/MS	EPA 8260B/8260C/624	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/624	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/624	Dibromomethane
GC/MS	EPA 8260B/8260C/624	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C/624	Ethylbenzene
GC/MS	EPA 8260B/8260C/624	Ethylene Dibromide
GC/MS	EPA 8260B/8260C/624	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C/624	Isopropylbenzene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8260B/8260C/624	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C/624	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C/624	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C/624	Methylene Chloride
GC/MS	EPA 8260B/8260C/624	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C/624	Naphthalene
GC/MS	EPA 8260B/8260C/624	n-Butylbenzene
GC/MS	EPA 8260B/8260C/624	N-Propylbenzene
GC/MS	EPA 8260B/8260C/624	o-Xylene
GC/MS	EPA 8260B/8260C/624	sec-Butylbenzene
GC/MS	EPA 8260B/8260C/624	Styrene
GC/MS	EPA 8260B/8260C/624	tert-Butylbenzene
GC/MS	EPA 8260B/8260C/624	Tetrachloroethene
GC/MS	EPA 8260B/8260C/624	Toluene
GC/MS	EPA 8260B/8260C/624	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/624	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/624	Trichloroethene
GC/MS	EPA 8260B/8260C/624	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C/624	Vinyl Acetate
GC/MS	EPA 8260B/8260C/624	Vinyl chloride
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,1,2-Tetrachloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,2,2-Tetrachloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,2-Trichloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1-Dichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,2-Dichloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,4-Dichlorobenzene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	2-Hexanone
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Benzene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromoform
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Butadiene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Chlorodibromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Chloroform
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	cis-1,2-Dichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	cis-1,3-Dichloropropene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Dibromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromodichloromethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Ethylene Dibromide
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Hexachlorobutadiene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Isopropyl alcohol
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Naphthalene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Tetrachloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	trans-1,3-Dichloropropene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Trichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Vinyl chloride
GC/MS	EPA 8270C/8270D/625	1-Methylnaphthalene
GC/MS	EPA 8270C/8270D/625	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,2-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,3-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,4-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	bis(2-chloroisopropyl)ether
GC/MS	EPA 8270C/8270D/625	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/8270D/625	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dimethylphenol
GC/MS	EPA 8270C/8270D/625	2,4-Dinitrophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dinitrotoluene
GC/MS	EPA 8270C/8270D/625	2,6-Dinitrotoluene
GC/MS	EPA 8270C/8270D/625	2-Chloronaphthalene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D/625	2-Chlorophenol
GC/MS	EPA 8270C/8270D/625	2-Methylnaphthalene
GC/MS	EPA 8270C/8270D/625	2-Methylphenol
GC/MS	EPA 8270C/8270D/625	2-Nitroaniline
GC/MS	EPA 8270C/8270D/625	2-Nitrophenol
GC/MS	EPA 8270C/8270D/625	3 & 4 Methylphenol
GC/MS	EPA 8270C/8270D/625	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/8270D/625	3-Nitroaniline
GC/MS	EPA 8270C/8270D/625	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/8270D/625	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/8270D/625	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/8270D/625	4-Chloroaniline
GC/MS	EPA 8270C/8270D/625	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/8270D/625	4-Nitroaniline
GC/MS	EPA 8270C/8270D/625	4-Nitrophenol
GC/MS	EPA 8270C/8270D/625	Acenaphthene
GC/MS	EPA 8270C/8270D/625	Acenaphthylene
GC/MS	EPA 8270C/8270D/625	Aniline
GC/MS	EPA 8270C/8270D/625	Anthracene
GC/MS	EPA 8270C/8270D/625	1,2-Diphenylhydrazine as Azobenzene
GC/MS	EPA 8270C/8270D/625	Benzo[a]anthracene
GC/MS	EPA 8270C/8270D/625	Benzo[a]pyrene
GC/MS	EPA 8270C/8270D/625	Benzo[b]fluoranthene
GC/MS	EPA 8270C/8270D/625	Benzo[g,h,i]perylene
GC/MS	EPA 8270C/8270D/625	Benzo[k]fluoranthene
GC/MS	EPA 8270C/8270D/625	Benzoic acid
GC/MS	EPA 8270C/8270D/625	Benzyl alcohol
GC/MS	EPA 8270C/8270D/625	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/8270D/625	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/8270D/625	Bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/8270D/625	Butyl benzyl phthalate
GC/MS	EPA 8270C/8270D/625	Carbazole
GC/MS	EPA 8270C/8270D/625	Chrysene
GC/MS	EPA 8270C/8270D/625	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/8270D/625	Dibenzofuran
GC/MS	EPA 8270C/8270D/625	Diethyl phthalate
GC/MS	EPA 8270C/8270D/625	Dimethyl phthalate
GC/MS	EPA 8270C/8270D/625	Di-n-butyl phthalate
GC/MS	EPA 8270C/8270D/625	Di-n-octyl phthalate

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D/625	Fluoranthene
GC/MS	EPA 8270C/8270D/625	Fluorene
GC/MS	EPA 8270C/8270D/625	Hexachlorobenzene
GC/MS	EPA 8270C/8270D/625	Hexachlorobutadiene
GC/MS	EPA 8270C/8270D/625	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/8270D/625	Hexachloroethane
GC/MS	EPA 8270C/8270D/625	Indeno[1,2,3-cd]pyrene
GC/MS	EPA 8270C/8270D/625	Isophorone
GC/MS	EPA 8270C/8270D/625	Naphthalene
GC/MS	EPA 8270C/8270D/625	Nitrobenzene
GC/MS	EPA 8270C/8270D/625	N-Nitrosodimethylamine
GC/MS	EPA 8270C/8270D/625	N-Nitrosodi-n-propylamine
GC/MS	EPA 8270C/8270D/625	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/8270D/625	Pentachlorophenol
GC/MS	EPA 8270C/8270D/625	Phenanthrene
GC/MS	EPA 8270C/8270D/625	Phenol
GC/MS	EPA 8270C/8270D/625	Pyrene
GC/MS	EPA 8270C/8270D/625	Pyridine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1,3-Dinitrobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1,4-Dioxane
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4,6-Trichlorophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4-Dinitrophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4-Dinitrotoluene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,6-Dinitrotoluene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Bis(2-chloroethyl)ether
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorobutadiene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorocyclopentadiene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachloroethane
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Nitrobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	N-Nitrosodimethylamine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	N-Nitrosodi-n-propylamine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pentachlorophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
GC-ECD	EPA 8011/504.1	1,2-Dibromoethane
GC-ECD	EPA 8011/504.1	1,2-Dibromo-3-Chloropropane
GC-ECD	EPA 8011/504.1	1,2,3-Trichloropropane

Non-Potable Water		
Technology	**Method**	**Analyte**
GC-ECD	EPA 8081A/8081B/608	4,4'-DDD
GC-ECD	EPA 8081A/8081B/608	4,4'-DDE
GC-ECD	EPA 8081A/8081B/608	4,4'-DDT
GC-ECD	EPA 8081A/8081B/608	Aldrin
GC-ECD	EPA 8081A/8081B/608	alpha-BHC
GC-ECD	EPA 8081A/8081B/608	alpha-Chlordane
GC-ECD	EPA 8081A/8081B/608	beta-BHC
GC-ECD	EPA 8081A/8081B/608	delta-BHC
GC-ECD	EPA 8081A/8081B/608	Dieldrin
GC-ECD	EPA 8081A/8081B/608	Endosulfan I
GC-ECD	EPA 8081A/8081B/608	Endosulfan II
GC-ECD	EPA 8081A/8081B/608	Endosulfan sulfate
GC-ECD	EPA 8081A/8081B/608	Endrin
GC-ECD	EPA 8081A/8081B/608	Endrin aldehyde
GC-ECD	EPA 8081A/8081B/608	Endrin ketone
GC-ECD	EPA 8081A/8081B/608	gamma-BHC (Lindane)
GC-ECD	EPA 8081A/8081B/608	gamma-Chlordane
GC-ECD	EPA 8081A/8081B/608	Heptachlor
GC-ECD	EPA 8081A/8081B/608	Heptachlor epoxide
GC-ECD	EPA 8081A/8081B/608	Methoxychlor
GC-ECD	EPA 8081A/8081B/608	Technical Chlordane
GC-ECD	EPA 8081A/8081B/608	Toxaphene
GC-ECD	EPA 8082/8082A/608	PCB-1016
GC-ECD	EPA 8082/8082A/608	PCB-1221
GC-ECD	EPA 8082/8082A/608	PCB-1232
GC-ECD	EPA 8082/8082A/608	PCB-1242
GC-ECD	EPA 8082/8082A/608	PCB-1248
GC-ECD	EPA 8082/8082A/608	PCB-1254
GC-ECD	EPA 8082/8082A/608	PCB-1260
GC-ECD	EPA 8082/8082A/608	PCB-1262
GC-ECD	EPA 8082/8082A/608	PCB-1268
GC-IT/MS	EPA 8151A MOD	2,4,5-T
GC-IT/MS	EPA 8151A MOD	2,4-D
GC-IT/MS	EPA 8151A MOD	2,4-DB
GC-IT/MS	EPA 8151A MOD	4-Nitrophenol
GC-IT/MS	EPA 8151A MOD	Dalapon
GC-IT/MS	EPA 8151A MOD	Dicamba
GC-IT/MS	EPA 8151A MOD	Dichlorprop
GC-IT/MS	EPA 8151A MOD	Dinoseb

Non-Potable Water		
Technology	**Method**	**Analyte**
GC-IT/MS	EPA 8151A MOD	MCPA
GC-IT/MS	EPA 8151A MOD	Mecoprop
GC-IT/MS	EPA 8151A MOD	Pentachlorophenol
GC-IT/MS	EPA 8151A MOD	Silvex (2,4,5-TP)
GC-FID	EPA 8015B	Gasoline
GC-FID	AK101	Gasoline
GC-FID	NWTPH-Gx	Gasoline
GC-FID	NWVPH	Volatile Petroleum Hydrocarbons
GC-FID	EPA 8015B	Diesel
GC-FID	AK102	Diesel
GC-FID	NWTPH-Dx	Diesel
GC-FID	NWEPH	Extractable Petroleum Hydrocarbons
GC-FID	EPA 8015B	Motor Oil
GC-FID	AK103	Motor Oil
GC-FID	NWTPH-Dx	Motor Oil
Titration	EPA 310.1 / SM 2320B	Alkalinity
Colorimetric / RFA	EPA 353.2	Nitrate
Colorimetric / RFA	EPA 353.2	Nitrite
Colorimetric / RFA	EPA 353.2	Nitrate + Nitrite
Probe	EPA 405.1 / SM 5210B	BOD
Titration	EPA 410.2 SM 5220C	COD
Colorimetric / RFA	SM 5220D 21st Ed	COD
Gravimetric	EPA 1664A	Oil & Grease
Colorimetric/RFA	EPA 9012A	Total Cyanides
Colorimetric	EPA 7196A	Hexavalent Chromium
Ion Chromatography	EPA 300.0/9056A	Bromide
Ion Chromatography	EPA 300.0/9056A	Chloride
Ion Chromatography	EPA 300.0/9056A	Fluoride
Ion Chromatography	EPA 300.0/9056A	Sulfate
Ion Chromatography	EPA 300.0/9056A	Nitrate
Ion Chromatography	EPA 300.0/9056A	Nitrite
TOC Analyzer (IR)	EPA 415.1/9060	TOC
Probe	EPA 9040/9045/150.1	pH
Conductivity meter	EPA 9050A/120.1 SM 2510B	Specific Conductance
Setaflash	EPA 1020A	Flashpoint

Non-Potable Water		
Preparation	**Method**	**Type**
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	Semivolatile and Nonvolatile Organics
Continuous Liquid-Liquid Extraction	EPA 3520C	Semivolatile and Nonvolatile Organics
Purge and Trap	EPA 5030B	Volatile Organic Compounds
Acid Digestion (Aqueous)	EPA 3005A/3010A	Inorganics
TCLP Extraction	EPA 1311	Toxicity Characteristic Leaching Procedure
Florisil Cleanup	EPA 3620B	Cleanup of pesticide residues and other chlorinated hydrocarbons
Silica Gel Cleanup	EPA 3630C	Column Cleanup
Sulfur Cleanup	EPA 3660B	Sulfur Cleanup Reagent
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantization of PCBs

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C	Silver
ICP-AES	EPA 6010B/6010C	Aluminum
ICP-AES	EPA 6010B/6010C	Arsenic
ICP-AES	EPA 6010B/6010C	Boron
ICP-AES	EPA 6010B/6010C	Barium
ICP-AES	EPA 6010B/6010C	Beryllium
ICP-AES	EPA 6010B/6010C	Calcium
ICP-AES	EPA 6010B/6010C	Cadmium
ICP-AES	EPA 6010B/6010C	Cobalt
ICP-AES	EPA 6010B/6010C	Chromium
ICP-AES	EPA 6010B/6010C	Copper
ICP-AES	EPA 6010B/6010C	Iron
ICP-AES	EPA 6010B/6010C	Potassium
ICP-AES	EPA 6010B/6010C	Magnesium
ICP-AES	EPA 6010B/6010C	Manganese
ICP-AES	EPA 6010B/6010C	Molybdenum
ICP-AES	EPA 6010B/6010C	Sodium
ICP-AES	EPA 6010B/6010C	Nickel
ICP-AES	EPA 6010B/6010C	Lead
ICP-AES	EPA 6010B/6010C	Antimony
ICP-AES	EPA 6010B/6010C	Selenium
ICP-AES	EPA 6010B/6010C	Silicon
ICP-AES	EPA 6010B/6010C	Tin

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C	Titanium
ICP-AES	EPA 6010B/6010C	Strontium
ICP-AES	EPA 6010B/6010C	Thallium
ICP-AES	EPA 6010B/6010C	Vanadium
ICP-AES	EPA 6010B/6010C	Zinc
ICP-MS	EPA 6020/6020A	Silver
ICP-MS	EPA 6020/6020A	Arsenic
ICP-MS	EPA 6020/6020A	Barium
ICP-MS	EPA 6020/6020A	Beryllium
ICP-MS	EPA 6020/6020A	Cadmium
ICP-MS	EPA 6020/6020A	Cobalt
ICP-MS	EPA 6020/6020A	Chromium
ICP-MS	EPA 6020/6020A	Copper
ICP-MS	EPA 6020/6020A	Manganese
ICP-MS	EPA 6020/6020A	Molybdenum
ICP-MS	EPA 6020/6020A	Nickel
ICP-MS	EPA 6020/6020A	Lead
ICP-MS	EPA 6020/6020A	Antimony
ICP-MS	EPA 6020/6020A	Selenium
ICP-MS	EPA 6020/6020A	Thallium
ICP-MS	EPA 6020/6020A	Uranium
ICP-MS	EPA 6020/6020A	Vanadium
ICP-MS	EPA 6020/6020A	Zinc
CVAAS	EPA 7471A	Mercury
GC/MS	EPA 8260B/8260C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C	1,2-Dichloropropane

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C	2-Chlorotoluene
GC/MS	EPA 8260B/8260C	2-Hexanone
GC/MS	EPA 8260B/8260C	4-Chlorotoluene
GC/MS	EPA 8260B/8260C	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C	Acetone
GC/MS	EPA 8260B/8260C	Acetonitrile
GC/MS	EPA 8260B/8260C	Acrolein
GC/MS	EPA 8260B/8260C	Acrylonitrile
GC/MS	EPA 8260B/8260C	Benzene
GC/MS	EPA 8260B/8260C	Bromobenzene
GC/MS	EPA 8260B/8260C	Bromodichloromethane
GC/MS	EPA 8260B/8260C	Bromoform
GC/MS	EPA 8260B/8260C	Bromomethane
GC/MS	EPA 8260B/8260C	Carbon disulfide
GC/MS	EPA 8260B/8260C	Carbon tetrachloride
GC/MS	EPA 8260B/8260C	Chlorobenzene
GC/MS	EPA 8260B/8260C	Chlorobromomethane
GC/MS	EPA 8260B/8260C	Chlorodibromomethane
GC/MS	EPA 8260B/8260C	Chloroethane
GC/MS	EPA 8260B/8260C	Chloroform
GC/MS	EPA 8260B/8260C	Chloromethane
GC/MS	EPA 8260B/8260C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Dibromomethane
GC/MS	EPA 8260B/8260C	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C	Ethylbenzene
GC/MS	EPA 8260B/8260C	Ethylene Dibromide
GC/MS	EPA 8260B/8260C	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C	Isopropylbenzene
GC/MS	EPA 8260B/8260C	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C	Methylene Chloride

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C	Naphthalene
GC/MS	EPA 8260B/8260C	n-Butylbenzene
GC/MS	EPA 8260B/8260C	N-Propylbenzene
GC/MS	EPA 8260B/8260C	o-Xylene
GC/MS	EPA 8260B/8260C	sec-Butylbenzene
GC/MS	EPA 8260B/8260C	Styrene
GC/MS	EPA 8260B/8260C	tert-Butylbenzene
GC/MS	EPA 8260B/8260C	Tetrachloroethene
GC/MS	EPA 8260B/8260C	Toluene
GC/MS	EPA 8260B/8260C	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Trichloroethene
GC/MS	EPA 8260B/8260C	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C	Vinyl Acetate
GC/MS	EPA 8260B/8260C	Vinyl chloride
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,1,2-Tetrachloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,2,2-Tetrachloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1,2-Trichloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,1-Dichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,2-Dichloroethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	1,4-Dichlorobenzene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	2-Hexanone
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Benzene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromoform
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Butadiene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Chlorodibromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Chloroform

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	cis-1,2-Dichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	cis-1,3-Dichloropropene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Dibromomethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Bromodichloromethane
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Ethylene Dibromide
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Hexachlorobutadiene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Isopropyl alcohol
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Naphthalene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Tetrachlroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	trans-1,3-Dichloropropene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Trichloroethene
GC/MS SIM	EPA 8260B SIM EPA 8260C SIM	Vinyl chloride
GC/MS	EPA 8270C/8270D	1-Methylnaphthalene
GC/MS	EPA 8270C/8270D	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/8270D	1,2-Dichlorobenzene
GC/MS	EPA 8270C/8270D	1,3-Dichlorobenzene
GC/MS	EPA 8270C/8270D	1,4-Dichlorobenzene
GC/MS	EPA 8270C/8270D	bis(2-chloroisopropyl)ether
GC/MS	EPA 8270C/8270D	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/8270D	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/8270D	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/8270D	2,4-Dichlorophenol
GC/MS	EPA 8270C/8270D	2,4-Dimethylphenol
GC/MS	EPA 8270C/8270D	2,4-Dinitrophenol
GC/MS	EPA 8270C/8270D	2,4-Dinitrotoluene
GC/MS	EPA 8270C/8270D	2,6-Dinitrotoluene
GC/MS	EPA 8270C/8270D	2-Chloronaphthalene
GC/MS	EPA 8270C/8270D	2-Chlorophenol
GC/MS	EPA 8270C/8270D	2-Methylnaphthalene
GC/MS	EPA 8270C/8270D	2-Methylphenol
GC/MS	EPA 8270C/8270D	2-Nitroaniline

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D	2-Nitrophenol
GC/MS	EPA 8270C/8270D	3 & 4 Methylphenol
GC/MS	EPA 8270C/8270D	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/8270D	3-Nitroaniline
GC/MS	EPA 8270C/8270D	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/8270D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/8270D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/8270D	4-Chloroaniline
GC/MS	EPA 8270C/8270D	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/8270D	4-Nitroaniline
GC/MS	EPA 8270C/8270D	4-Nitrophenol
GC/MS	EPA 8270C/8270D	Acenaphthene
GC/MS	EPA 8270C/8270D	Acenaphthylene
GC/MS	EPA 8270C/8270D	Aniline
GC/MS	EPA 8270C/8270D	Anthracene
GC/MS	EPA 8270C/8270D	1,2-Diphenylhydrazine as Azobenzene
GC/MS	EPA 8270C/8270D	Benzo[a]anthracene
GC/MS	EPA 8270C/8270D	Benzo[a]pyrene
GC/MS	EPA 8270C/8270D	Benzo[b]fluoranthene
GC/MS	EPA 8270C/8270D	Benzo[g,h,i]perylene
GC/MS	EPA 8270C/8270D	Benzo[k]fluoranthene
GC/MS	EPA 8270C/8270D	Benzoic acid
GC/MS	EPA 8270C/8270D	Benzyl alcohol
GC/MS	EPA 8270C/8270D	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/8270D	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/8270D	Bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/8270D	Butyl benzyl phthalate
GC/MS	EPA 8270C/8270D	Carbazole
GC/MS	EPA 8270C/8270D	Chrysene
GC/MS	EPA 8270C/8270D	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/8270D	Dibenzofuran
GC/MS	EPA 8270C/8270D	Diethyl phthalate
GC/MS	EPA 8270C/8270D	Dimethyl phthalate
GC/MS	EPA 8270C/8270D	Di-n-butyl phthalate
GC/MS	EPA 8270C/8270D	Di-n-octyl phthalate
GC/MS	EPA 8270C/8270D	Fluoranthene
GC/MS	EPA 8270C/8270D	Fluorene
GC/MS	EPA 8270C/8270D	Hexachlorobenzene
GC/MS	EPA 8270C/8270D	Hexachlorobutadiene

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/8270D	Hexachloroethane
GC/MS	EPA 8270C/8270D	Indeno[1,2,3-cd]pyrene
GC/MS	EPA 8270C/8270D	Isophorone
GC/MS	EPA 8270C/8270D	Naphthalene
GC/MS	EPA 8270C/8270D	Nitrobenzene
GC/MS	EPA 8270C/8270D	N-Nitrosodimethylamine
GC/MS	EPA 8270C/8270D	N-Nitrosodi-n-propylamine
GC/MS	EPA 8270C/8270D	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/8270D	Pentachlorophenol
GC/MS	EPA 8270C/8270D	Phenanthrene
GC/MS	EPA 8270C/8270D	Phenol
GC/MS	EPA 8270C/8270D	Pyrene
GC/MS	EPA 8270C/8270D	Pyridine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1,3-Dinitrobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1,4-Dioxane
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4,6-Trichlorophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4-Dinitrophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,4-Dinitrotoluene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2,6-Dinitrotoluene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	3,3’-Dichlorobenzidine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	4-Chloroaniline
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Bis(2-chloroethyl)ether
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorobutadiene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachlorocyclopentadiene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Hexachloroethane
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Nitrobenzene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	N-Nitrosodimethylamine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	N-Nitrosodi-n-propylamine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pentachlorophenol
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
GC-ECD	EPA 8011	1,2-Dibromoethane
GC-ECD	EPA 8011	1,2-Dibromo-3-Chloropropane
GC-ECD	EPA 8011	1,2,3-Trichloropropane

Solid and Chemical Materials

Technology	Method	Analyte
GC-ECD	EPA 8081A/8081B	4,4'-DDD
GC-ECD	EPA 8081A/8081B	4,4'-DDE
GC-ECD	EPA 8081A/8081B	4,4'-DDT
GC-ECD	EPA 8081A/8081B	Aldrin
GC-ECD	EPA 8081A/8081B	alpha-BHC
GC-ECD	EPA 8081A/8081B	alpha-Chlordane
GC-ECD	EPA 8081A/8081B	beta-BHC
GC-ECD	EPA 8081A/8081B	delta-BHC
GC-ECD	EPA 8081A/8081B	Dieldrin
GC-ECD	EPA 8081A/8081B	Endosulfan I
GC-ECD	EPA 8081A/8081B	Endosulfan II
GC-ECD	EPA 8081A/8081B	Endosulfan sulfate
GC-ECD	EPA 8081A/8081B	Endrin
GC-ECD	EPA 8081A/8081B	Endrin aldehyde
GC-ECD	EPA 8081A/8081B	Endrin ketone
GC-ECD	EPA 8081A/8081B	gamma-BHC (Lindane)
GC-ECD	EPA 8081A/8081B	gamma-Chlordane
GC-ECD	EPA 8081A/8081B	Heptachlor
GC-ECD	EPA 8081A/8081B	Heptachlor epoxide
GC-ECD	EPA 8081A/8081B	Methoxychlor
GC-ECD	EPA 8081A/8081B	Technical Chlordane
GC-ECD	EPA 8081A/8081B	Toxaphene
GC-ECD	EPA 8082/8082A	PCB-1016
GC-ECD	EPA 8082/8082A	PCB-1221
GC-ECD	EPA 8082/8082A	PCB-1232
GC-ECD	EPA 8082/8082A	PCB-1242
GC-ECD	EPA 8082/8082A	PCB-1248
GC-ECD	EPA 8082/8082A	PCB-1254
GC-ECD	EPA 8082/8082A	PCB-1260
GC-ECD	EPA 8082/8082A	PCB-1262
GC-ECD	EPA 8082/8082A	PCB-1268
GC-IT/MS	EPA 8151A MOD	2,4,5-T
GC-IT/MS	EPA 8151A MOD	2,4-D
GC-IT/MS	EPA 8151A MOD	2,4-DB
GC-IT/MS	EPA 8151A MOD	4-Nitrophenol
GC-IT/MS	EPA 8151A MOD	Dalapon
GC-IT/MS	EPA 8151A MOD	Dicamba
GC-IT/MS	EPA 8151A MOD	Dichlorprop
GC-IT/MS	EPA 8151A MOD	Dinoseb

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC-IT/MS	EPA 8151A MOD	MCPA
GC-IT/MS	EPA 8151A MOD	Mecoprop MCPP
GC-IT/MS	EPA 8151A MOD	Pentachlorophenol
GC-IT/MS	EPA 8151A MOD	Silvex (2,4,5-TP)
GC-FID	EPA 8015B	Gasoline
GC-FID	AK101	Gasoline
GC-FID	NWTPH-Gx	Gasoline
GC-FID	NWVPH	Volatile Petroleum Hydrocarbons
GC-FID	EPA 8015B	Diesel
GC-FID	AK102	Diesel
GC-FID	NWTPH-Dx	Diesel
GC-FID	NWEPH	Extractable Petroleum Hydrocarbons
GC-FID	EPA 8015B	Motor Oil
GC-FID	AK103	Motor Oil
GC-FID	NWTPH-Dx	Motor Oil
Colorimetric/RFA	EPA 9012A	Total Cyanides
Ion Chromatography	EPA 300.0/9056A	Bromide
Ion Chromatography	EPA 300.0/9056A	Chloride
Ion Chromatography	EPA 300.0/9056A	Fluoride
Ion Chromatography	EPA 300.0/9056A	Sulfate
Ion Chromatography	EPA 300.0/9056A	Nitrate
Ion Chromatography	EPA 300.0/9056A	Nitrite
TOC Analyzer (IR)	EPA 9060	TOC
Probe	EPA 9040/9045	pH/Corrosivity
Conductivity meter	EPA 9050A	Specific Conductance
Setaflash	EPA 1020A	Flashpoint
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	Semivolatile and Nonvolatile Organics
Continuous Liquid-Liquid Extraction	EPA 3520C	Semivolatile and Nonvolatile Organics
Microwave Extraction	EPA 3546	Semivolatile and Nonvolatile Organics
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Solvent Dilution	EPA 3580A	Semivolatile and Nonvolatile Organics
Waste Dilution	EPA 3585	Volatile Organic Compounds
Purge and Trap	EPA 5030B	Volatile Organic Compounds
Purge and Trap	EPA 5035A	Volatile Organic Compounds

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
Acid Digestion (Aqueous)	EPA 3005A/3010A	Inorganics
Acid Digestion (Sediments, Sludges, Soils)	EPA 3050B	Inorganics
TCLP Extraction	EPA 1311	Toxicity Characteristic Leaching Procedure
Florisil Cleanup	EPA 3620B	Cleanup of pesticide residues and other chlorinated hydrocarbons
Silica Gel Cleanup	EPA 3630C	Column Cleanup
Sulfur Cleanup	EPA 3660B	Sulfur Cleanup Reagent
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantitation of PCBs

This accreditation covers testing performed at the main laboratory listed above, and a mobile laboratory (VIN# 1GDJP32K0L3500707, State of Alaska License # GLF522) for the tests indicated below.

Solid and Chemical Materials		
Technology	**Method**	**Type**
GC-MS	AK101	Gasoline
GC-FID	AK102	Diesel
GC-FID	AK103	Motor Oil
GC-ECD	EPA 8082/8082A	PCB-1016
GC-ECD	EPA 8082/8082A	PCB-1221
GC-ECD	EPA 8082/8082A	PCB-1232
GC-ECD	EPA 8082/8082A	PCB-1242
GC-ECD	EPA 8082/8082A	PCB-1248
GC-ECD	EPA 8082/8082A	PCB-1254
GC-ECD	EPA 8082/8082A	PCB-1260
GC-ECD	EPA 8082/8082A	PCB-1262
GC-ECD	EPA 8082/8082A	PCB-1268
GC/MS	EPA 8260B/8260C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C	1,2,4-Trichlorobenzene

Solid and Chemical Materials

Technology	Method	Type
GC/MS	EPA 8260B/8260C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C	2-Chlorotoluene
GC/MS	EPA 8260B/8260C	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C	2-Hexanone
GC/MS	EPA 8260B/8260C	4-Chlorotoluene
GC/MS	EPA 8260B/8260C	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C	Acetone
GC/MS	EPA 8260B/8260C	Acetonitrile
GC/MS	EPA 8260B/8260C	Acrolein
GC/MS	EPA 8260B/8260C	Acrylonitrile
GC/MS	EPA 8260B/8260C	Benzene
GC/MS	EPA 8260B/8260C	Bromobenzene
GC/MS	EPA 8260B/8260C	Bromodichloromethane
GC/MS	EPA 8260B/8260C	Bromoform
GC/MS	EPA 8260B/8260C	Bromomethane
GC/MS	EPA 8260B/8260C	Carbon disulfide
GC/MS	EPA 8260B/8260C	Carbon tetrachloride
GC/MS	EPA 8260B/8260C	Chlorobenzene
GC/MS	EPA 8260B/8260C	Chlorobromomethane
GC/MS	EPA 8260B/8260C	Chlorodibromomethane
GC/MS	EPA 8260B/8260C	Chloroethane
GC/MS	EPA 8260B/8260C	Chloroform
GC/MS	EPA 8260B/8260C	Chloromethane
GC/MS	EPA 8260B/8260C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Dibromomethane
GC/MS	EPA 8260B/8260C	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C	Ethylbenzene
GC/MS	EPA 8260B/8260C	Ethylene Dibromide
GC/MS	EPA 8260B/8260C	Hexachlorobutadiene

Solid and Chemical Materials

Technology	Method	Type
GC/MS	EPA 8260B/8260C	Isopropylbenzene
GC/MS	EPA 8260B/8260C	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C	Methylene Chloride
GC/MS	EPA 8260B/8260C	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C	Naphthalene
GC/MS	EPA 8260B/8260C	n-Butylbenzene
GC/MS	EPA 8260B/8260C	N-Propylbenzene
GC/MS	EPA 8260B/8260C	o-Xylene
GC/MS	EPA 8260B/8260C	sec-Butylbenzene
GC/MS	EPA 8260B/8260C	Styrene
GC/MS	EPA 8260B/8260C	tert-Butylbenzene
GC/MS	EPA 8260B/8260C	Tetrachloroethene
GC/MS	EPA 8260B/8260C	Toluene
GC/MS	EPA 8260B/8260C	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Trichloroethene
GC/MS	EPA 8260B/8260C	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C	Vinyl Acetate
GC/MS	EPA 8260B/8260C	Vinyl chloride
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene

Solid and Chemical Materials

Technology	Method	Type
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
Preparation	**Method**	**Type**
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantitation of PCBs
Purge and Trap	EPA 5035A	Volatile Organic Compounds
Microwave Extraction	EPA 3546	Semivolatile and Nonvolatile Organics
Silica Gel Cleanup	EPA 3630C	Column Cleanup

This accreditation covers testing performed at the main laboratory listed above, and a mobile laboratory (VIN# 4AG3U30D0RC019385, State of Alaska License # 9643SR) for the tests indicated below.

Solid and Chemical Materials

Technology	Method	Type
GC-MS	AK101	Gasoline
GC-FID	AK102	Diesel
GC-FID	AK103	Motor
GC-ECD	EPA 8082/8082A	PCB-1016
GC-ECD	EPA 8082/8082A	PCB-1221
GC-ECD	EPA 8082/8082A	PCB-1232
GC-ECD	EPA 8082/8082A	PCB-1242
GC-ECD	EPA 8082/8082A	PCB-1248
GC-ECD	EPA 8082/8082A	PCB-1254
GC-ECD	EPA 8082/8082A	PCB-1260
GC-ECD	EPA 8082/8082A	PCB-1262

Solid and Chemical Materials

Technology	Method	Type
GC-ECD	EPA 8082/8082A	PCB-1268
GC/MS	EPA 8260B/8260C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C	2-Chlorotoluene
GC/MS	EPA 8260B/8260C	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C	2-Hexanone
GC/MS	EPA 8260B/8260C	4-Chlorotoluene
GC/MS	EPA 8260B/8260C	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C	Acetone
GC/MS	EPA 8260B/8260C	Acetonitrile
GC/MS	EPA 8260B/8260C	Acrolein
GC/MS	EPA 8260B/8260C	Acrylonitrile
GC/MS	EPA 8260B/8260C	Benzene
GC/MS	EPA 8260B/8260C	Bromobenzene
GC/MS	EPA 8260B/8260C	Bromodichloromethane
GC/MS	EPA 8260B/8260C	Bromoform
GC/MS	EPA 8260B/8260C	Bromomethane
GC/MS	EPA 8260B/8260C	Carbon disulfide
GC/MS	EPA 8260B/8260C	Carbon tetrachloride
GC/MS	EPA 8260B/8260C	Chlorobenzene
GC/MS	EPA 8260B/8260C	Chlorobromomethane

Solid and Chemical Materials

Technology	Method	Type
GC/MS	EPA 8260B/8260C	Chlorodibromomethane
GC/MS	EPA 8260B/8260C	Chloroethane
GC/MS	EPA 8260B/8260C	Chloroform
GC/MS	EPA 8260B/8260C	Chloromethane
GC/MS	EPA 8260B/8260C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Dibromomethane
GC/MS	EPA 8260B/8260C	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C	Ethylbenzene
GC/MS	EPA 8260B/8260C	Ethylene Dibromide
GC/MS	EPA 8260B/8260C	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C	Isopropylbenzene
GC/MS	EPA 8260B/8260C	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C	Methylene Chloride
GC/MS	EPA 8260B/8260C	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C	Naphthalene
GC/MS	EPA 8260B/8260C	n-Butylbenzene
GC/MS	EPA 8260B/8260C	N-Propylbenzene
GC/MS	EPA 8260B/8260C	o-Xylene
GC/MS	EPA 8260B/8260C	sec-Butylbenzene
GC/MS	EPA 8260B/8260C	Styrene
GC/MS	EPA 8260B/8260C	tert-Butylbenzene
GC/MS	EPA 8260B/8260C	Tetrachloroethene
GC/MS	EPA 8260B/8260C	Toluene
GC/MS	EPA 8260B/8260C	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Trichloroethene
GC/MS	EPA 8260B/8260C	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C	Vinyl Acetate
GC/MS	EPA 8260B/8260C	Vinyl chloride
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene

Solid and Chemical Materials

Technology	Method	Type
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
Preparation	**Method**	**Type**
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantitation of PCBs
Purge and Trap	EPA 5035A	Volatile Organic Compounds
Microwave Extraction	EPA 3546	Semivolatile and Nonvolatile Organics
Silica Gel Cleanup	EPA 3630C	Column Cleanup

This accreditation covers testing performed at the main laboratory listed above, and a mobile laboratory (VIN# 4AG3U30D9RC019532, State of Alaska License # 9644SR) for the tests indicated below.

Solid and Chemical Materials

Technology	Method	Type
GC-MS	AK101	Gasoline
GC-FID	AK102	Diesel
GC-FID	AK103	Motor Oil
GC-ECD	EPA 8082/8082A	PCB-1016
GC-ECD	EPA 8082/8082A	PCB-1221
GC-ECD	EPA 8082/8082A	PCB-1232
GC-ECD	EPA 8082/8082A	PCB-1242
GC-ECD	EPA 8082/8082A	PCB-1248
GC-ECD	EPA 8082/8082A	PCB-1254
GC-ECD	EPA 8082/8082A	PCB-1260
GC-ECD	EPA 8082/8082A	PCB-1262
GC-ECD	EPA 8082/8082A	PCB-1268
GC/MS	EPA 8260B/8260C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C	2-Chlorotoluene
GC/MS	EPA 8260B/8260C	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C	2-Hexanone
GC/MS	EPA 8260B/8260C	4-Chlorotoluene
GC/MS	EPA 8260B/8260C	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C	Acetone

Solid and Chemical Materials

Technology	Method	Type
GC/MS	EPA 8260B/8260C	Acetonitrile
GC/MS	EPA 8260B/8260C	Acrolein
GC/MS	EPA 8260B/8260C	Acrylonitrile
GC/MS	EPA 8260B/8260C	Benzene
GC/MS	EPA 8260B/8260C	Bromobenzene
GC/MS	EPA 8260B/8260C	Bromodichloromethane
GC/MS	EPA 8260B/8260C	Bromoform
GC/MS	EPA 8260B/8260C	Bromomethane
GC/MS	EPA 8260B/8260C	Carbon disulfide
GC/MS	EPA 8260B/8260C	Carbon tetrachloride
GC/MS	EPA 8260B/8260C	Chlorobenzene
GC/MS	EPA 8260B/8260C	Chlorobromomethane
GC/MS	EPA 8260B/8260C	Chlorodibromomethane
GC/MS	EPA 8260B/8260C	Chloroethane
GC/MS	EPA 8260B/8260C	Chloroform
GC/MS	EPA 8260B/8260C	Chloromethane
GC/MS	EPA 8260B/8260C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Dibromomethane
GC/MS	EPA 8260B/8260C	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C	Ethylbenzene
GC/MS	EPA 8260B/8260C	Ethylene Dibromide
GC/MS	EPA 8260B/8260C	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C	Isopropylbenzene
GC/MS	EPA 8260B/8260C	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C	Methylene Chloride
GC/MS	EPA 8260B/8260C	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C	Naphthalene
GC/MS	EPA 8260B/8260C	n-Butylbenzene
GC/MS	EPA 8260B/8260C	N-Propylbenzene
GC/MS	EPA 8260B/8260C	o-Xylene
GC/MS	EPA 8260B/8260C	sec-Butylbenzene
GC/MS	EPA 8260B/8260C	Styrene
GC/MS	EPA 8260B/8260C	tert-Butylbenzene
GC/MS	EPA 8260B/8260C	Tetrachloroethene
GC/MS	EPA 8260B/8260C	Toluene
GC/MS	EPA 8260B/8260C	trans-1,2-Dichloroethene

Solid and Chemical Materials

Technology	Method	Type
GC/MS	EPA 8260B/8260C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Trichloroethene
GC/MS	EPA 8260B/8260C	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C	Vinyl Acetate
GC/MS	EPA 8260B/8260C	Vinyl chloride
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
Preparation	**Method**	**Type**
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantitation of PCBs

Solid and Chemical Materials

Technology	Method	Type
Purge and Trap	EPA 5035A	Volatile Organic Compounds
Microwave Extraction	EPA 3546	Semivolatile and Nonvolatile Organics
Silica Gel Cleanup	EPA 3630C	Column Cleanup

Notes:

1) This laboratory offers commercial testing service.
2) This scope is formatted as part of a single document including Certificate of Accreditation No. L2236.

R.D.

Vice President

Appendix C

Project Scoping Session Meeting Minutes

Project Name: PFC Exposure Follow-Up Monitoring and Evaluation

PM: Rebecca Maco

Date of Session: August 2, 2017

Scoping Session Purpose: Development of expedited Sampling and Analysis Plans (SAP), including for follow-up off-Base drinking water monitoring approach, was discussed during the August 2, 2017 scoping session.

Name	Title/Project Role	Affiliation
Kendra Leibman	Remedial Project Manager	NAVFAC Northwest
Laura Himes	Technical Representative	NAVFAC Northwest
Judy Solomon	Technical Representative	NAVFAC Atlantic
Rebecca Maco	Project Manager	CH2M
Tiffany Hill	Project Chemist	CH2M
Rachel Clennon	Task Manager	CH2M
Joe Hauser	Task Manager	CH2M
Heather Perry	Task Manager	CH2M
Kat Brown	Task Manager	CH2M
Doug Kelly	Geologist	Island County, Washington

The project team reviewed and discussed the follow-up sampling for the continued per- and polyfluoroalkyl substances (PFAS) exposure evaluation and rapid response (if necessary) based on results of initial exposure sampling conducted from November 2016 through June 2017 at Ault Field and Outlying Field (OLF) Coupeville.

The following tasks were discussed for the path forward on development of the SAP:

- The collection of follow-up off-Base drinking water samples is the priority for this investigation. The scope for the upcoming off-Base drinking water sampling will be similar to the previous investigation, but will now include 14 PFAS compounds, sampled in a limited area. Samples will be collected at well locations where previous results for PFAS (specifically perfluorooctane sulfonate [PFOS] and/or perfluorooctanoic acid [PFOA]) exceeded the project action limit (PAL), which is the United States Environmental Protection Agency (USEPA) Lifetime Health Advisory (LHA); where PFOS, PFOA, or perfluorobutane sulfonate (PFBS) were detected; or at any well locations adjacent to locations where results previously exceeded the LHA.
- The sampling scope will also include additional outreach to property owners adjacent to exceedance locations that have not previously responded to requests for sampling.
- The follow-up sampling will also include collection of additional parameters, such as metals/ cations, anions, geochemical parameters, and water quality parameters, at sample locations where PFAS were previously detected or exceeded the LHA. This additional data will support evaluation of long-term solutions, such as filter performance or treatability, at these sample locations.
- The full list of additional analytes is in development, and will be discussed internally by CH2M, after which a proposed analyte list will be sent to Kendra Liebman for review and approval. The analyte list will seek to gather information on the presence of compounds that could be absorbed by or interfere with granular activated carbon filters, or could cause biofouling or scaling.

- Eventually, samples will be collected at select locations which will be use in a pilot study of drinking water filtration systems.
- If PFAS are detected in drinking water above the PALs at new locations (where not previously detected or detected below the LHA), then an alternate drinking water source will be supplied. Drinking water will continue to be supplied at sample locations where PFAS previously exceeded the LHA.

Appendix D
Laboratory SOPs

Vista
Analytical Laboratory

SOP 64	**Revision: 3**	**Supersedes: 2**
PREPARATION AND ANALYSIS FOR THE DETERMINATION OF PER and POLY-FLUORINATED COMPOUNDS IN DRINKING WATER		
Analyst Review:		
Management: Martha Maier		
Quality Assurance:		
Effective Date: June 14, 2017		

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Revision No.	Revision Date	Description of Revision
0	10/14/2016	NEW SOP
1	12/08/2016	Replaced any reference to Table 5 to correctly indicate Table 3. Added section 2.2. Added section 4, Modifications.
2	06/06/2017	General revisions of all sections to expand the compound's list.
3	06/14/2017	New sections: 18; 19; 20.

1. PURPOSE

1.1 This SOP outlines and describes the preparative and analytical techniques used for the determination of per and poly-fluorinated compounds (PFAS).

2. SCOPE

2.1 All differences between EPA 537 and actual laboratory techniques have been developed to reduce interference and increase sensitivity.

2.2 Any modifications made are per section 1.6 of EPA Method 537.

2.3 Data determined to be out-of-control from criteria stated within this SOP, is handled according to procedures addressed within the applicable section.

Compound	**CAS Registry No.***
Perfluorobutanesulfonic acid (PFBS)	375-73-5
Perfluoroheptanoic acid (PFHpA)	375-85-9
Perfluorohexanesulfonoic acid (PFHxS)	355-46-4
Perfluorohexanoic acid (PFHxA)	307-24-4
Perfluorooctanesulfonic acid (PFOS)	1763-23-1
Perfluorooctanoic acid (PFOA)	355-67-1
Perfluorononaoic acid (PFNA)	375-95-1
Perfluoroundecanoic acid (PFUnA)	2058-94-8
Perfluorodecanoic acid (PFDA)	335-76-2
Perfluorododecanoic acid (PFDoA)	307-55-1
Perfluorotridecanoic acid (PFTrDA)	72629-94-8
Perfluorotetradecanoic acid (PFTeDA)	376-06-7
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	2991-50-6
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	2355-31-9

*Chemical Abstract Service

3. SUMMARY OF METHOD

3.1 This procedure uses ultra performance liquid chromatography/tandem mass spectrometry (UPLC/MS/MS) for detection and quantitation of per and poly-fluorinated compounds, commonly referred to as PFAS.

3.2 All differences between the method and actual laboratory techniques have been developed to reduce interferences and increase sensitivity.

4. MODIFICATIONS

4.1 All LC conditions and mobile phases were optimized for peak shape, resolution and to increase sensitivity.

5. CONTAMINATION AND INTERFERENCES

5.1 Solvents, reagents, glassware and other sample processing hardware may yield discrete artifacts or elevated baselines that may cause misinterpretation of the chromatographic data. All of these materials must be demonstrated to be free from interfering substances under the conditions of analysis by performing laboratory method blanks. Analysts should avoid using materials containing PTFE, where possible.

5.2 All differences between EPA 537 and actual laboratory techniques have been developed to reduce interference and increase sensitivity.

5.3 The use of high purity reagents and solvents helps to minimize interference problems.

5.4 Interferants co-extracted from the sample will vary considerably from matrix to matrix.

6. DEFINITIONS

6.1 Definitions are presented in the Glossary.

7. SAFETY

7.1 Procedures shall be carried out in a manner that protects the health and safety of all Vista employees.

7.2 Each chemical compound should be treated as a potential health hazard. Exposure to these compounds should be reduced to the lowest possible level. All compounds or reagents should be handled only by highly trained personnel thoroughly familiar with handling and cautionary procedures and the associated risks.

7.3 Additional health and safety information can be obtained from safety data sheets (SDSs) available to all personnel involved in these analyses.

7.4 In the event of a known or potential compromise to the health and safety of a Vista associate, all work must stop and the incident reported immediately to management.

7.5 Contamination of the laboratory will be minimized by conducting most of the manipulations in a hood

7.6 The toxicity or carcinogenicity of each chemical used in this method has not been precisely determined; however, each compound should be treated as a potential health hazard. Exposure to these compounds should be reduced to the lowest possible level. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of MSDS should also be made available to all personnel involved in these analyses.

8. APPARATUS AND MATERIALS

Note: All materials used should be suitable for LC work, and comparable brand materials can be substituted where specific brands are mentioned.

8.1 Analytical balances capable of reading to 0.01g and 0.0001g;

8.2 Solid Phase Extraction Manifold [redacted]

8.3 [redacted]

8.4 Silicone tubing 1/16” diameter, various lengths [redacted]

8.5 Screw top polypropylene LC vials [redacted]

8.6 HDPE Bottle various sizes [redacted]

8.7 Screw caps with pre-slit polypropylene septa, for [redacted]

8.8 Disposable polypropylene Pasteur pipets, various sizes;

8.9 Chlorine test strips [redacted], or equivalent);

8.10 Organomation 24-Station N-Evaporator with water bath capable of heating to 65°C;

8.11 Polypropylene centrifuge tubes, 13 mm x 100 mm;

8.12 Wiretrol II Precision Disposable Micropipettes;

8.13 Sonicator VWR Model 150T;

8.14 Eppendorf Centrifuge Model 5804;

8.15 [redacted]

8.16 [redacted]

8.17 Acquity Ultra Performance LC (Waters);

8.18 Lenovo computer work station with MassLynx Software;

8.19 Shimadzu Nexera X2 UHPLC LC System (Shimadzu USA);

8.20 Dell Optiplex XE2 computer work station with Analyst and MultiQuant Software;

8.21 4000 Q Trap (Sciex);

8.22 Waters Quattro Premier XE Tandem Quadrupole Mass Spectrometer (QT™Q) MS/MS

8.23 AB SCIEX API 4000 Triple Quadrupole Mass Spectrometer;

8.24 Waters Mass Spectrometer (TQ™S micro) MS/MS

9. REAGENTS, SOLVENTS AND STANDARDS

9.1 Reagents (HPLC grade or above)

- 9.1.1 Trizma pre-set crystals [redacted]
- 9.1.2 Ammonium Acetate, HPLC grade
- 9.1.3 Ultra-pure nitrogen gas
- 9.1.4 Ultra-pure argon gas
- 9.1.5 [redacted]

9.2 Solvents (HPLC Grade or above)

- 9.2.1 Reagent Water
- 9.2.2 Acetonitrile (ACN)
- 9.2.3 Hexane (for cleaning)
- 9.2.4 Methanol (MeOH)
- 9.2.5 Isopropyl Alcohol (IPA)

9.3 Standards

- 9.3.1 All analytical standards are obtained from a certified vendor.
- 9.3.2 See SOP 15 and the current spike sheet for more information.

10. COLLECTION, PRESERVATION, AND HANDLING

10.1 HDPE or polypropylene bottles and jars must be used for collection.

10.2 Trizma is added to the sample bottles prior to the collection of drinking water samples in the amount of 5.0g/L.

10.3 Aqueous samples must be extracted within 14 days of collection and analyzed within 28 days of extraction.

10.4 Store at < 6°C.

11. QUALITY CONTROL

11.1 Each time a modification is made to this method and the detection limit will be affected by the change, the laboratory is required to demonstrate that the MDL is lower than one-third the regulatory compliance level or one-third the method reporting limit (MRL) in the method, whichever is higher.

11.2 Method Blank (MB): Method blank is a matrix preparation that is free of native analyte that has been prepared and analyzed using the same procedures followed for the rest of the analytical batch. Simulate as close as possible the matrix to be extracted.

- 11.2.1 Daily or with each extraction batch of up to 20 samples, (whichever is more frequent).
- 11.2.2 For the determination of native PFAS, the levels measured in the method blank of all method analytes must be below 1/3 the MRL.

11.2.3 If amount found is greater than the minimum level or one-third the regulatory compliance limit, whichever is greater; or if any potentially interfering compound is found in the blank at or above the minimum level for each congener, the data must be evaluated to determine whether the batch shall be re-extracted or the data are qualified appropriately.

11.2.4 If there is evidence of contamination within the MB, then the source of the contamination must be located. The data must be evaluated to determine whether the batch shall be re-extracted or the data is qualified appropriately.

11.3 Ongoing Precision and Recovery Samples (OPR): An ongoing precision and recovery sample is prepared by adding a known quantity of native standards to an interferant free matrix and used to assess method performance (precision and recovery).

11.3.1 Add the appropriate amount of native spike. The native spikes contain the compounds listed in Table 1.

11.3.2 The native spike is rotated between a low, medium and high concentration per batch.

11.3.3 An OPR is analyzed with every analytical batch of 20 samples or less.

11.3.4 The OPR % recoveries for native and surrogates must be within the limits shown in Table 3.

11.4 Matrix Spike (MS/MSD): A matrix spike sample is prepared by adding the appropriate quantity of native standards to a sample matrix prior to extraction. MS/MSD's are performed in every batch.

11.4.1 The native spike for MS/MSDs should be rotated between a low, medium and high concentration per batch.

11.4.2 Analyte recoveries for MS/MSDs fortified at a medium or high concentration should be between 70-130%. For those fortified at a concentration of 2x the MDL or lower, recoveries of 50-150% are acceptable.

11.4.3 If the recovery of the MDL does not meet criteria, but the CCC recoveries are acceptable, the data is evaluated and qualified appropriately.

11.4.4 The relative percent difference (RPD) between MS/MSD samples should be ≤ 30%.

11.4.5 If the concentration is within a factor of 2 of the MRL, the relative percentage difference (RPD) must be ≤ 50%

11.4.6 If RPD does not meet the acceptance criteria, the data is evaluated and qualified appropriately.

11.5 Duplicate Samples: Duplicate samples are two separate aliquots taken from the same source. Duplicate samples are analyzed independently to assess laboratory precision. Duplicate samples are performed by client request.

11.5.1 The relative percent difference between duplicate samples should be ≤ 30%

11.5.2 If the concentration is within a factor of 2 of the MRL, the relative percentage difference (RPD) must be ≤ 50%

11.5.3 If the RPD does not meet the acceptance criteria, the data are evaluated and qualified appropriately.

11.6 Field Reagent Blank (FRB): A field reagent blank is a matrix preparation that is free of native analyte transported to the field in sealed containers and returned with the samples.

11.6.1 Analysis of the FRB is only necessary if a Field Sample contains a method analyte at or above the MRL.

11.7 Second source standard: Analytes from a different source than that of the calibration standards. This is prepared and analyzed in the same way as a CCC.

11.7.1 This is analyzed at least quarterly, or whenever a new set of standards are made.

11.7.2 The calculated value for the second source standard must be within ±30% of the true value.

12. EXTRACTION PROCEDURES

12.1 Aqueous Samples

12.1.1 All samples are preserved, collected, and stored as presented in Section 10. All field and QC samples, including the LRB, LFB, and FRB, must contain Trizma, as listed in Section 10.2.

12.1.2 Record the combined weight of the bottle, cap and sample for each sample to be extracted. After the sample has been removed from the bottle, allow it to drain overnight and reweigh it and the cap to determine the amount of sample extracted.

12.1.3 For the method blank (MB) and OPR(s), transfer ~250mL of reagent water into a bottle for each.

12.1.4 Add the appropriate volume of Surrogate standard (SUR) solution to all samples and QCs and the appropriate volume of Native Standard (NS) solution to OPR, MS and/or MSD. Allow the spiked samples to equilibrate for at least 1 hour before extraction.

12.2 SPE Cleanup

12.2.1 Assemble the SPE apparatus and attach the SPE cartridges as shown in the appendix A, Figure 1.

12.2.1.1 Rinse the cartridge with [redacted] Discard eluant.

12.2.1.2 Condition the cartridge with 18mL reagent water. Discard eluant.

12.2.1.3 Load sample onto cartridge by way of siphon, maintaining a flow rate of ~10mL/min at 5” Hg.

12.2.1.4 Once sample has passed through, rinse bottle with 15mL reagent water and re-siphon.

12.2.2 [redacted]

12.3 Cartridge Elution

12.3.1 Rinse the bottle with 4mLs of methanol and re-siphon, followed by another [redacted]. Collect extracts eluted from the column into a clean test tube.

12.4 Adjustment to Final Volume

12.4.1 Concentrate extract to dryness under a gentle stream of nitrogen and a water bath [redacted]

12.4.2 Reconstitute with 96:4 MeOH to H_2O and the appropriate amount of Internal Standard (IS).

13. LC/MS ANALYSIS

13.1 Establish the necessary conditions. The LC conditions may be optimized for compound separation and sensitivity. Once optimized, the same LC conditions must be used for the analysis of all standards, blanks, OPR aliquots, and samples. The following LC operating conditions are guidance and adjustments may be required.

13.1.1 **Instrument:** Aquity UPLC/ Waters Quattro Premier XE

Column: Waters BEH C18, 100mm x 2.1 mm i.d., 1.7 µm particle size
Ionization: [redacted]
Acquisition: MRM mode, unit resolution
Injection Volume: 5-15µL

General LC Conditions	
Column Temp	60°C
Max Pressure	15,000 psi
Autosampler Tray Temp.	18°C
MS Conditions	
Source Temp.	150°C
Desolvation Temp.	[redacted]
Cone/Desolvation Gas Rate	25 L/hr 850 L/hr

LC Gradient Program			*LC Gradient Program*	Gradient
Time (min)	Flow Mixture*			
0.00	90%A	10%B	0.400	
5.00	10%A	90%B	0.400	6
8.00	6%A	94%B	0.400	6
8.10	1%A	99%B	0.400	6
10.00	1%A	99%B	0.400	6
10.10	90%A	10%B	0.400	1
11.40	90%A	10%B	0.400	6

- Solvent A = 2mM NH$_4$Oac 5mM 1-MP in 95:5 HPLC water:MEOH
- Solvent B = 2mM NH$_4$Oac 5mM 1-MP in 70:20:5 MEOH:ACN:H2O

13.1.2 **Instrument:** Shimadzu DGU-20Asr/Sciex 4000 Q trap

Column: [redacted]

Ionization: Negative Ion Electrospray
Acquisition: MRM mode, unit resolution
Injection Volume: 1-5 µL

General LC Conditions	
Column Temp	60°C
Max Pressure	15,000 psi
Autosampler Tray Temp.	18°C
MS Conditions	
Cur.	20.00
CAD	High
IS	-4000.00
MS Conditions	
TEM	[redacted]
GS1	40.00
GS2	60.00
ihe	ON
EP	-10.00

LC Gradient Program			*LC Gradient Program*	**Parameter**	
Time (min)	**Flow Mixture***				Events
0.00	90%A	10%B	0.400	NA	NA
5.00	10%A	90%B	0.400	90	Pump B Conc.
8.00	6%A	94%B	0.400	94	Pump B Conc.
8.10	1%A	99%B	0.400	99	Pump B Conc.
9.8	1%A	99%B	0.400	99	Pump B Conc.
9.9	90%A	10%B	0.400	10	Pump B Conc.
9.9	90%A	10%B	0.400	-10	Pump B Curv.
11.40	90%A	10%B	0.400	NA	Stop

- Solvent A = 2mM NH$_4$Oac 5mM 1-MP in 95:5 HPLC water:MeOH
- Solvent B=2mM NH4Oac 5mM 1-MP in 70:20:5 MeOH:ACN:H2O

13.1.3 **Instrument:** Aquity UPLC/ Waters TQS-Micro

Column: Waters BEH C18, 100mm x 2.1 mm i.d., 1.7 µm particle size
Ionization: Negative Ion Electrospray
Acquisition: MRM mode, unit resolution
Injection Volume: 1-5µL

General LC Conditions	
Column Temp	80°C
Max Pressure	15,000 psi
Autosampler Tray Temp.	15°C
MS Conditions	
Source Temp.	150°C
Desolvation Temp.	320°C
Cone/Desolvation Gas Rate	25 L/hr 850 L/hr

LC Gradient Program			***LC Gradient Program***	**Gradient**
Time (min)	**Flow Mixture***			
0.00	95%A	5%B	0.250	
5.00	50%A	50%B	0.250	6
8.00	20%A	80%B	0.250	6
8.10	2%A	98%B	0.250	6
10.00	2%A	98%B	0.250	6
10.10	95%A	5%B	0.250	1
11.40	95%A	5%B	0.250	6

- Solvent A = 2mM NH_4OAc 5mM 1-MP in 95:5 HPLC water:IPA
- Solvent B = 2mM NH_4OAc 5mM 1-MP in 70:20:5 IPA:ACN:H2O

13.2 Initial Calibration (ICAL)

13.2.1 An initial calibration curve is created using the internal standard technique. Either a linear or quadratic regression is used, consisting of at least 5 or 6 points, respectively.

13.2.2 This curve must be forced through zero.

13.2.3 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed and repeated at the beginning, whenever a new set of spiking calibration standards is created or whenever the continuing calibration falls outside the acceptance criteria.

13.2.4 The peak asymmetry factor for the first two eluting compounds must be calculated each time a new calibration curve is generated, using a mid-level calibration point. The factor must fall into the range of 0.8 – 1.5.

13.2.5 Each calibration point for each analyte must be within 70-130% of its true value, except for the lowest calibration point, which must be within 50-150% of its true value.

13.2.6 To evaluate whether there is any suppression during calibration, an RPD must be calculated between the high and the low IS areas. The RPD must be <20% for each IS, or recalibrate with lower concentrations.

13.2.7 Establish the operating conditions suggested in Section 13.1

13.2.8 The curve may be concentration weighted at the analysts discretion.

13.2.9 The coefficient of determination for all native compounds must be greater than or equal to 0.99.

13.2.10 RSD requirements are ≤20% for all internal standards.

13.3 Continuing Calibration

13.3.1 A continuing calibration check (CCC) must be analyzed at the beginning, after every 10 field samples and at the end of each analytical run.

13.3.2 The continuing calibration verification is acceptable if the following criteria are met:

13.3.2.1 The LC peak representing each native and labeled compound must be present with a S/N ≥10.

13.3.2.2 The percent recovery for native standards and the internal standards must be within the limits shown in Table 3.

13.3.2.3 The absolute areas of the ISs must be within 70-140% of the most recent CCAL and within 50-150% of the current ICAL.

13.3.2.4 If one or more analytes exceed the limits for the CCC, but those method analytes are not found in the samples above the MRL, reanalysis is not required.

13.4 Qualitative Determination

13.4.1 The signal to noise ratio (S/N) at the LC peak maximum for each native compound must be greater than or equal to 3 for each compound detected in a sample extract.

13.4.2 The retention time of the peak for a native compound must be within ±15 seconds of its RT in the most recent CCC standard.

13.5 Quantitative Determination

13.5.1 Native compounds should have a retention time within 0.1 mins. of its equivalent internal standard.

13.5.2 Recovery of each surrogate standard must be within the limits shown in Table 3.

13.5.3 Recoveries below the limits may be accepted if the signal to noise is >10:1. If the signal to noise is not >10:1, samples must be re-extracted and re-analyzed or the data must be qualified.

13.5.4 If the concentration of one or more analytes is above the highest calibration point, a dilution must be analyzed.

13.5.5 PFHxS, PFOA and PFOS have both linear and branched isomers. All chromatographic peaks for these compounds are integrated and the areas totaled. Technical mixtures are referenced when available.

14. CALCULATIONS

14.1 The concentration of each internal standard is calculated as follows:

$$C_{Samp} = \frac{A_x Q_y}{A_y RRF\, S_v}$$

Where:

C_{Samp} = *Concentration of compound in sample*
A_x = *Area of the quantitation ion for the IS compound in sample*
A_y = *Area of the quantitation ion for the RS compound in sample*
Q_y = *Quantity, in pg, of Internal Standard in sample*
S_v = *Sample volume in liters*
RRF = *Relative response factor, a sum of the response factors* (RF):

$$\sum RF = \frac{A_n C_l}{A_l C_n}$$

Where:

C_l = *Internal Standard Concentration at the curve point*
A_x = *Area of daughter m/z for IS compound*
A_l = *Area of daughter m/z for RS compound*
C_n = *Concentration of IS at the curve point*

14.2 Internal standard recoveries are calculated by using the formula:

$$\%Rec = \frac{(A_{IS})(Q_{RS}) \times 100}{(A_{RS})(Q_{IS})(RRF_{IS})}$$

Where:

A_{IS} = *Area of the quantitation ion for the internal standard.*
A_{RS} = *Area of the quantitation ion for the recovery standard.*
Q_{IS} = *Quantity of the internal standard.*
Q_{RS} = *Quantity of the recovery standard.*
RRF_{IS} = *Calculated relative response factor for the internal std. analyte.*

14.3 RRF for labeled analytes (RRFIS):

$$RRF_{IS} = \frac{(A_{IS})(Q_{RS})}{(Q_{IS})(A_{RS})}$$

Where:

A_{IS} = *Sum of the integrated ion abundances of the quantitation ions for the labeled standards*
A_{RS} = *Sum of the integrated ion abundances of the quantitation ions for the labeled recovery standards*
Q_{IS} = *Quantity of internal standard injected (pg)*
Q_{RS} = *Quantity of recovery standard injected (pg)*
Q_X = *Quantity of unlabeled analyte injected (pg)*

14.4 The RPD is calculated as follows:

$$RPD = \frac{(H - L)}{(H + L)/2} * 100$$

Where:
RPD = *Relative Percentage Difference*
H = *Highest area*
L = *Lowest area*

14.5 The Peak Asymmetry factor is calculated as follows:

$$A_s = \frac{b}{a}$$

Where:
A_S = *peak asymmetry factor*
b = *width of the back half of the peak, measured at 10% peak height*
a = *width of the front half of the peak, measured at 10% peak height*

14.6 The LC/MS/MS workstation uses Micromass TargetLynx software to process raw data used to calculate the calibration curves and sample analyte concentrations. If the regression is linear and forced through zero, use the following formula:

$$C_{Samp} = \frac{(A_x)(C_{is})}{(A_{is})(a)(v_s)}$$

Where:
C_{Samp} = *Concentration of compound in sample*
A_x = *Area of the quantitation ion for the native compound in sample*
A_{is} = *Area of the quantitation ion for the internal standard in sample*
C_{is} = *Quantity, in ng, of Internal Standard in sample*
V_s = *Sample volume in liters*
a = *Slope of the calibration line*

15. POLLUTION PREVENTION

15.1 The solvent evaporation techniques used in this method are amenable to solvent recovery, and the laboratory shall recover solvents wherever feasible.

15.2 Standards should be prepared in volumes consistent with laboratory use to minimize disposal of standard.

16. WASTE MANAGEMENT

16.1 Waste generated in the procedure must be segregated and disposed according to the facility hazardous waste procedures. Safety officer should be contacted if additional information is required.

16.2 The laboratory waste management is in compliance with all federal, state, and local regulations to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations

17. METHOD PERFORMANCE

17.1 This SOP is based on methods noted as references (Section 18).

18. EQUIPMENT/INSTRUMENT MAINTENANCE

18.1 Equipment/Instrument maintenance is performed in accordance with SOP 10 “Instrument Maintenance Logbooks and Schedule”.

18.2 Records of maintenance are kept in instrument logbooks.

19. COMPUTER HARDWARE AND SOFTWARE

19.1 MassLynx

19.2 Analyst 1.6.2

20. TROUBLESHOOTING

20.1 Troubleshooting is performed in accordance with Instrument Manuals:

20.1.1 ACQUITY UPLC system maintenance (Waters)

20.1.2 Waters Micromass Quattro Premier XE Mass Spectrometer Operator’s guide

20.1.3 MassLynx 4.1 Manual and Documents

20.1.4 SHIMADZU LC-30AD Instruction Manual

20.1.5 SHIMADZU System Guide

20.1.6 SHIMADZU CTO-20A, 20AC Instruction Manual

20.1.7 SHIMADZU DGU-20A3R, 20A5R Instruction Manual

20.1.8 Line adjustment Transformer Instruction Manual

20.1.9 Eppendorf operating manual for Multipipet M4, Repeater M4

20.1.10 AB SCIEX API 4000 Triple Quadrupole Mass Spectrometer (Q-3) 2017

20.1.11 Waters Acquity Mass Spectrometer (TQTMS) MS/MS Q-4 2017

20.1.12 Eppendorf operating manual for Multipipet M4, Repeater M4

21. REFERENCES

21.1 Method 537, Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Version 1.1, September 2009.

Table 1
Calibration Curve Concentration (pg/μL)

Compound	**CS(-2)**	**CS(-1)**	**CS0**	**CS1**	**CS2**	**CS3**	**CS4**	**CS5**
PFBS	0.885	1.77	4.42	8.85	22.1	44.2	66.3	88.4
PFHpA	1.0	2.0	5.0	10	25	50	75	100
PFHxS	0.91	1.82	4.56	9.12	22.8	45.6	68.4	91.2
PFOS	0.924	1.85	4.62	9.24	23.1	46.2	69.3	92.4
PFOA	1.0	2.0	5.0	10	25	50	75	100
PFHxA	1.0	2.0	5.0	10	25	50	75	100
PFDA	1.0	2.0	5.0	10	25	50	75	100
PFNA	1.0	2.0	5.0	10	25	50	75	100
PFUnA	1.0	2.0	5.0	10	25	50	75	100
PFDoA	1.0	2.0	5.0	10	25	50	75	100
PFTrDA	1.0	2.0	5.0	10	25	50	75	100
PFTeDA	1.0	2.0	5.0	10	25	50	75	100
N-EtFOSAA	1.0	2.0	5.0	10	25	50	75	100
N-MeFOSAA	1.0	2.0	5.0	10	25	50	75	100
Internal Standard	**CS(-2)**	**CS(-1)**	**CS0**	**CS1**	**CS2**	**CS3**	**CS4**	**CS5**
13C2-PFHxA	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
13C2-PFDA	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
13C2-PFOA	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
13C4-PFOS	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
d5-N-EtFOSAA	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
d3-N-MeFOSAA	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Table 2
Exact Masses Monitored

Compound	Native Parent-Daughter
PFBS	299-80
PFHxA	313-269
PFHpA	363-319
PFHxS	399-80
PFOS	499-80
PFOA	413-369
PFNA	463-419
PFDA	513-468
PFUnA	563-519
PFDoA	613-319
PFTrDA	663-619
PFTeDA	713-669
N-EtFOSAA	584-419
N-MeFOSAA	570-419
Surrogate Standards	
$^{13}C_2$-PFHxA	315-270
$^{13}C_2$-PFDA	515-470
d5-N-EtFOSAA	589-419
Internal Standards	
$^{13}C_2$-PFOA	415 -370
$^{13}C_4$-PFOS	503- 80
d3-N-MeFOSAA	573-419

Table 3
Acceptance Criteria for Performance Tests

Compound	CCC	IPR		OPR %	Labeled compound recovery in samples %
		RSD %	Ave %		
PFBS	70-130	20	70-130	70-130	NA
PFHpA	70-130	20	70-130	70-130	NA
PFHxS	70-130	20	70-130	70-130	NA
PFOA	70-130	20	70-130	70-130	NA
PFOS	70-130	20	70-130	70-130	NA
PFHxA	70-130	20	70-130	70-130	NA
PFDA	70-130	20	70-130	70-130	NA
PFNA	70-130	20	70-130	70-130	NA
PFUnA	70-130	20	70-130	70-130	NA
PFDoA	70-130	20	70-130	70-130	NA
PFTrDA	70-130	20	70-130	70-130	NA
PFTeDA	70-130	20	70-130	70-130	NA
N-EtFOSAA	70-130	20	70-130	70-130	NA
N-MeFOSAA	70-130	20	70-130	70-130	NA
$^{13}C_2$-PFHxA	70-130	20	70-130	70-130	70-130
$^{13}C_2$-PFDA	70-130	20	70-130	70-130	70-130
d5-N-EtFOSAA	70-130	20	70-130	70-130	70-130

Table 4
Reporting Limits

Compound	RL Aqueous (ng/L)
PFBS	20.0
PFHpA	20.0
PFHxS	20.0
PFOS	20.0
PFOA	20.0
PFHxA	20.0
PFDA	20.0
PFNA	20.0
PFUnA	20.0
PFDoA	20.0
PFTrDA	20.0
PFTeDA	20.0
N-EtFOSAA	20.0
N-MeFOSAA	20.0

*RLs based on 250 mLs and 1mL final volume.

Glossary

Analyte — Compound of interest. The analytes are listed in Table 1.

Calibration Standard — A solution prepared from a stock solution and used to calibrate the response of the HPLC/MSMS.

Calibration Verification Standard (CCC) — Calibration Standard containing a known concentration of native analytes, internal standard and recovery standards. This is analyzed to verify the accuracy of the existing calibration for those analytes.

Field Reagent Blank — A field reagent blank is a matrix preparation that is free of native analyte transported to the field in sealed containers and returned with the samples

Internal Standard – A labeled compound used as a reference for quantitation of other labeled and native compounds.

IPR — Initial precision and recovery; four aliquots of a reference material spiked with analytes of interest are analyzed to establish the ability of the laboratory to generate acceptable precision and recovery. An IPR is performed anytime the method or instrumentation is modified.

Isotope dilution quantitation – Determination of a naturally occurring (native) compound by reference to the same compound in which one or more atoms has been isotopically enriched. This method employs ^{2}H or ^{13}C labeled analogs which are spiked into each sample

LC – Liquid chromatography

Labeled Compound – A molecule in which one or more of the atoms is isotopically enriched, thereby increasing the mass of the molecule

Laboratory Blank — See method blank.

May — This action, activity, or procedural step is neither required nor prohibited.

May Not — This action, activity, or procedural step is prohibited.

Method Blank — An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The method blank is used to determine if analytes or interferences are present in the laboratory environment, the reagents, or the apparatus.

Method Detection Limit (MDL) — The lowest concentration at which an analyte can be detected under routine operating conditions (see 40 CFR 136, Appendix B).

MS — Mass spectrometer or mass spectrometry.

Must — This action, activity, or procedural step is required.

Native Compound – A molecule in which all atoms have naturally occurring isotopic abundances

OPR — Ongoing precision and recovery sample (OPR); a laboratory blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in this method for precision and recovery.

Reagent Water — Water demonstrated to be free from the analytes of interest and potentially interfering substances at the method detection limit for the analyte.

Relative Standard Deviation (RSD) — The standard deviation times 100 divided by the mean. Also termed "coefficient of variation."

RPD – Relative Percent Difference shown

RF — Response factor.

RRF — Relative response factor.

Should — Although this action, activity, or procedural step is suggested, it is not required.

SICP — Selected ion current profile; the line described by the signal at an exact m/z.

Signal-to-noise ratio (S/N) – The height of the signal as measured from the mean of the noise to the peak maximum divided by the width of the noise.

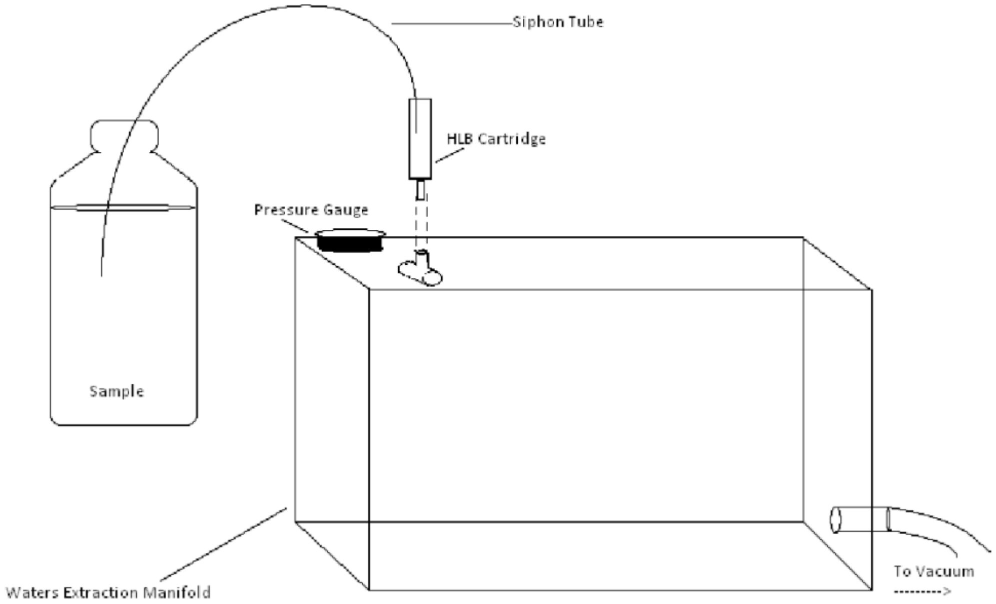
SPE — Solid-phase extraction; an extraction technique in which an analyte is extracted from an aqueous sample by passage over or through a material capable of reversibly adsorbing the analyte.

Stock Solution — A solution containing an analyte that is prepared using a reference material traceable to EPA, the National Institute of Science and Technology (NIST), or a source that will attest to the purity and authenticity of the reference material.

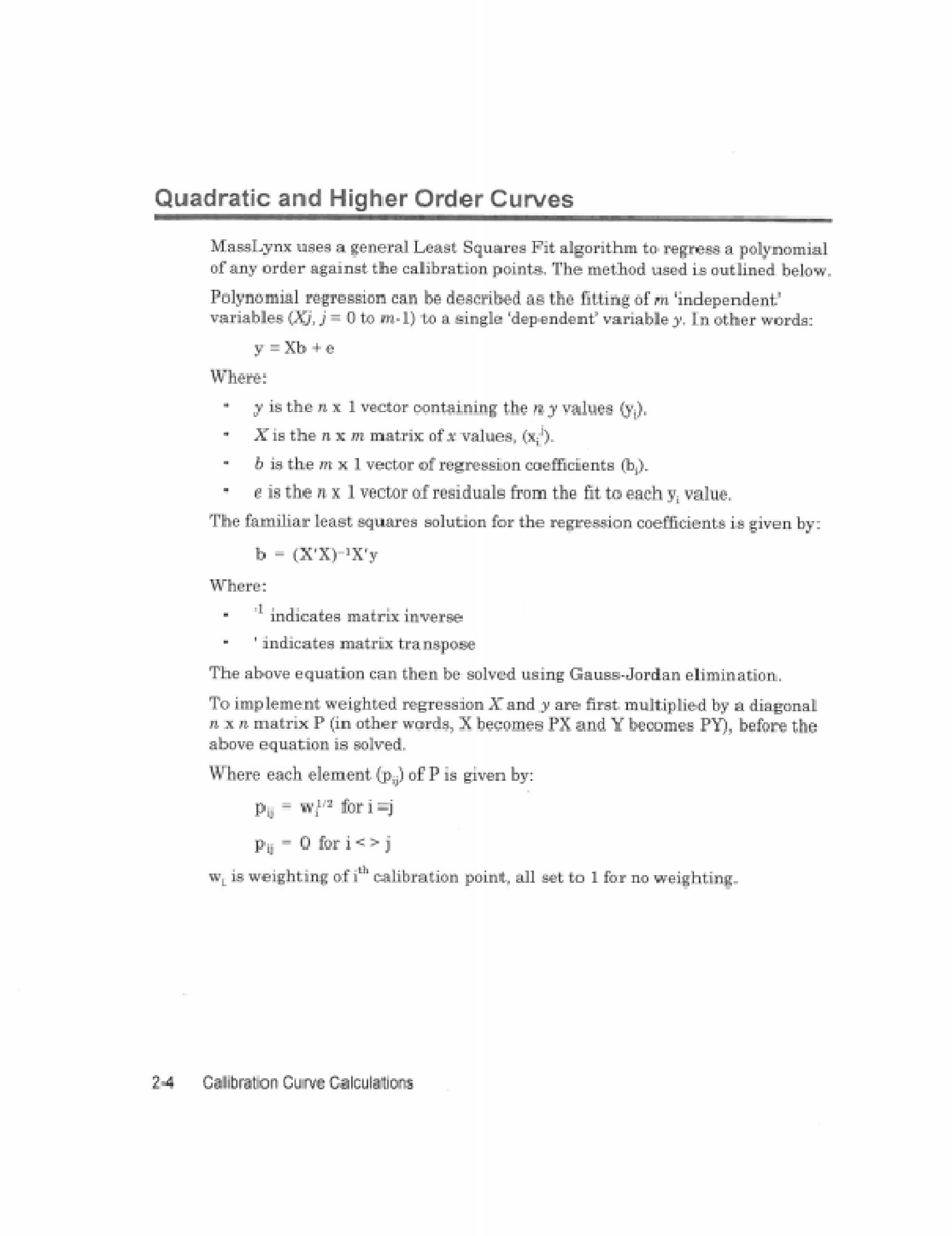
UPLC — Ultra performance liquid chromatography

Appendix A

21.2 Figure 1. Extraction Manifold Set-up



Appendix B:



Quadratic and Higher Order Curves

MassLynx uses a general Least Squares Fit algorithm to regress a polynomial of any order against the calibration points. The method used is outlined below.

Polynomial regression can be described as the fitting of m 'independent' variables (Xj, $j = 0$ to m-1) to a single 'dependent' variable y. In other words:

$$y = Xb + e$$

Where:

- y is the n x 1 vector containing the n y values (y_i).
- X is the n x m matrix of x values, (x_i^j).
- b is the m x 1 vector of regression coefficients (b_j).
- e is the n x 1 vector of residuals from the fit to each y_i value.

The familiar least squares solution for the regression coefficients is given by:

$$b = (X'X)^{-1}X'y$$

Where:

- $^{-1}$ indicates matrix inverse
- ' indicates matrix transpose

The above equation can then be solved using Gauss-Jordan elimination.

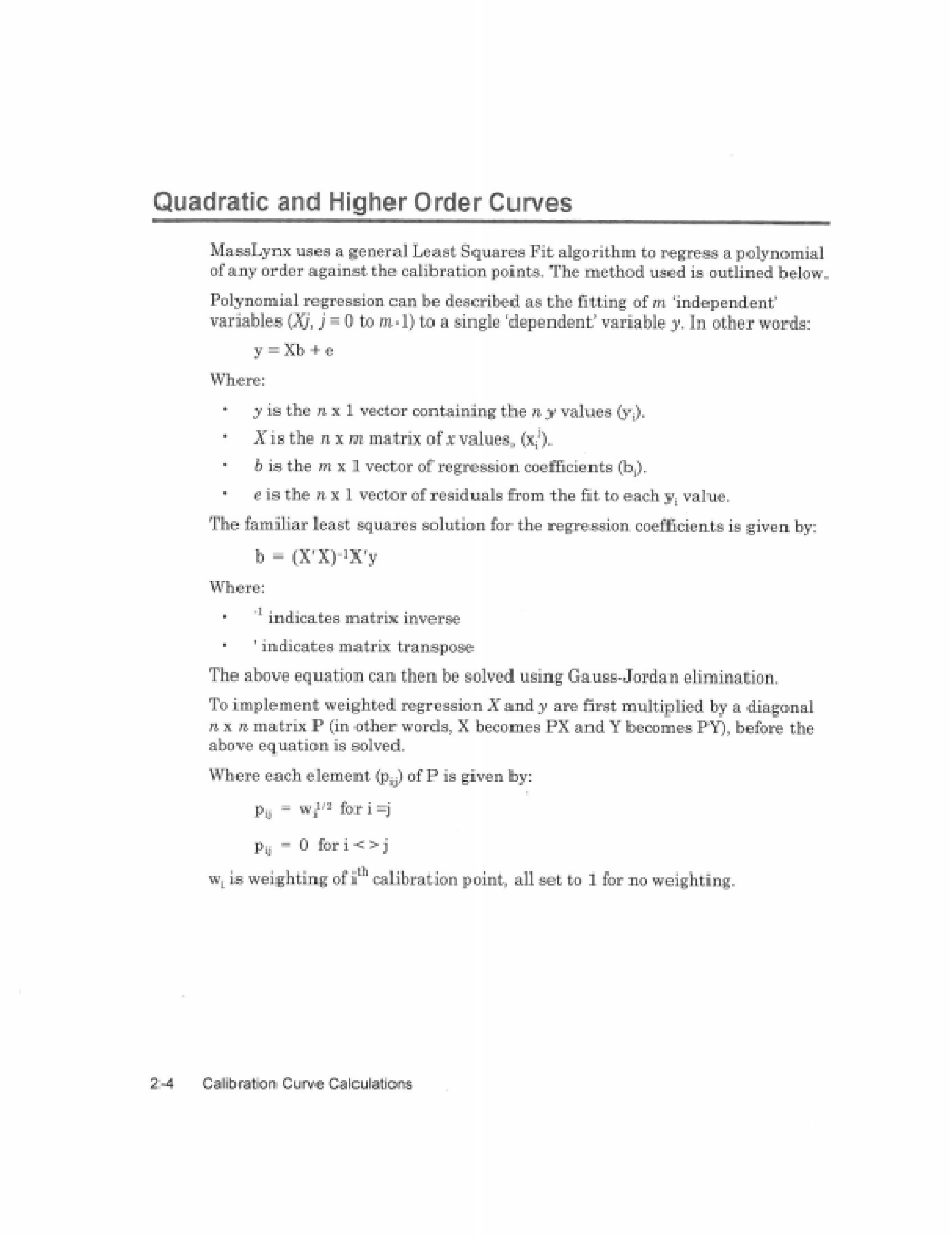
To implement weighted regression X and y are first multiplied by a diagonal n x n matrix P (in other words, X becomes PX and Y becomes PY), before the above equation is solved.

Where each element (p_{ij}) of P is given by:

$$p_{ij} = w_i^{1/2} \text{ for } i = j$$

$$p_{ij} = 0 \text{ for } i <> j$$

w_i is weighting of ith calibration point, all set to 1 for no weighting.



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Where each element (p_{ij}) of P is given by:

$$p_{ij} = w_i^{1/2} \text{ for } i = j$$

$$p_{ij} = 0 \text{ for } i <> j$$

w_i is weighting of i^{th} calibration point, all set to 1 for no weighting.