Northwest
Oak Harbor and Coupeville, Washington

Final

Sampling and Analysis Plan
Investigation of Per- and Polyfluoroalkyl Substances in Off-Base Drinking Water
Ault Field, Area 6, and Outlying Landing Field Coupeville

Naval Air Station Whidbey Island
Oak Harbor and Coupeville, Washington

April 2020

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SAP Worksheet #1—Title and Approval Page

Northwest
Oak Harbor and Coupeville, Washington

Final

Sampling and Analysis Plan
Investigation of Per- and Polyfluoroalkyl Substances in Off-Base Drinking Water
Ault Field, Area 6, and Outlying Landing Field Coupeville

Naval Air Station Whidbey Island
Oak Harbor and Coupeville, Washington

April 2020

Prepared for NAVFAC Northwest
by CH2M HILL, Inc.
Bellevue, Washington
Contract N62470-16-D-9000
CTO 4470

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

Approval Signature:

____
Ken Bowers
Naval Facilities Engineering Command Atlantic
Quality Assurance Officer

Other Approval Signatures:

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Kendra Clubb
Naval Facilities Engineering Command Northwest
Remedial Project Manager

____
Chan Pongkamsing
United States Environmental Protection Agency Region 10
Remedial Project Manager

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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 sources impacted by activities at Naval Air Station (NAS) Whidbey Island, near Ault Field and Area 6 in Oak Harbor, Washington, and Outlying Landing Field (OLF) Coupeville, in Coupeville, Washington. PFAS 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.

Based on a review of available data and previous investigations including a preliminary assessment (PA), there are 35 potential PFAS source areas at NAS Whidbey Island – Ault Field (CH2M, 2018d). From November 2016 to June 2017, drinking water samples were collected in three sampling phases, as part of a voluntary sampling program, from residential drinking water wells located downgradient of the Ault Field on-Base sites where AFFF containing PFAS was used or likely to have been used. The wells were sampled to determine whether perfluorooctane sulfonate (PFOS) and/or perfluorooctanoic acid (PFOA) were present above the United States Environmental Protection Agency's (USEPA's) Lifetime Health Advisory of 0.07 microgram per liter (µg/L) combined PFOS/PFOA and whether perfluorobutane sulfonate (PFBS) was above the USEPA Regional Screening Level (RSL) of 400 µg/L for PFBS (USEPA, 2017). The results of this investigation indicated that PFOA and/or PFOS were present above the Lifetime Health Advisory in two off-Base residential drinking water wells. From January to February 2019, in response to PFAS detections above the project action limits (PALs) in a stormwater drain near Hangar 6 and in an associated stormwater drainage system, the Navy conducted a fourth phase of drinking water sampling from drinking water wells within a half-mile north-northeast and south-southeast of the surface water body where PFAS was detected. The results of the Phase 4 investigation indicated that PFAS are not present above the PALs in any of the wells sampled during that phase.

Area 6 is a 260-acre tract in the southeastern corner of Ault Field which operated as a disposal site for regulated and unregulated wastes between 1969 and 1996. Although it is unknown whether AFFF was used or disposed of at Area 6; the historical site use as a disposal area suggests that such is feasible. The Navy conducted drinking water sampling at residences near Area 6 as a part of a November 2017-August 2019 site inspection for PFAS which included sampling of both on-Base and off-Base monitoring wells and drinking water wells. Drinking water sampling results from this investigation indicated that PFAS are present above the PALs in five drinking water wells. In October-November 2019, periodic monitoring of wells with exceedances and adjacent drinking water wells identified an additional drinking water well with PFAS present above the PALs for a total of six drinking water wells with PAL exceedances.

At OLF Coupeville, two of three potential source areas for off-Base drinking water PFAS impacts are on-Base locations of suspected releases of AFFF, and one potential PFAS source area is located off-Base. In November 2016, off-Base residential drinking water wells were sampled under a voluntary sampling program. Based on the results of the first round of sampling, the investigation area was expanded to include residential wells ½-mile downgradient of the initial 1-mile radius. Drinking water samples were collected from November 2016 to June 2017. The results indicate that PFOS and/or PFOA are present above the PALs in eight off-Base drinking water wells.

Between March 2018 and November 2019, the Navy conducted semiannual sampling of all off-Base drinking water wells near Ault Field and OLF Coupeville where PFAS were previously detected, either above or below the PALs, and drinking water wells on parcels adjacent to wells where PFAS exceeded the PALs. For the October-November 2019 sampling event, drinking water wells associated with Area 6, meeting similar criteria, were incorporated into the semiannual, seasonal sampling program. For the October-November 2019 event, the number of PFAS analyzed was updated from PFAS 14 to PFAS 18 to reflect a change in the specified analyte list included in the USEPA drinking water analytical method.

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

- Further evaluate the long-term temporal and spatial variability of PFAS concentrations associated with Ault Field, Area 6, and OLF Coupeville 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, through periodic, semiannual monitoring.
- Determine whether additional off-Base drinking water sampling is warranted as a result of newly identified on-Base PFAS source areas. Should the need for additional off-Base drinking water sampling arise, it will be covered under a future Field Change Request or SAP Addendum.

The proposed investigation activities include continuation of semiannual resampling of all drinking water well locations where PFAS were previously detected (including PAL exceedances and non-exceedances), and sampling of drinking water well locations adjacent to those where PFAS 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) 4470, 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 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)
- *Interim Per- and Polyfluoralkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update* (Navy, 2017).

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 operating procedures (SOPs) are included in **Appendix A**. Department of Defense Environmental Laboratory Accreditation Program Accreditation Letters are included in **Appendix B**. Laboratory SOPs are included in **Appendix C**.

The laboratory information cited in this SAP is specific to Vista Analytical Laboratory. If additional laboratory services are requested requiring modification to the existing SAP, revised SAP worksheets will be submitted to the Navy for approval.

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
AQM	Activity Quality Manager
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	Contaminant of Potential Concern
CTO	Contract Task Order
DL	detection limit
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
FTL	Field Team Leader
GETR	groundwater extraction, treatment, and recharge
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
LOD	limit of detection

LOQ	limit of quantitation
mL	milliliter(s)
MPC	measurement performance criteria
MRL	minimum reporting limit
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NTR	Navy Technical Representative
OLF	Outlying Landing Field
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
QSM	Quality Systems Manual
RI	remedial investigation
RPD	relative percent difference
RPM	Remedial Project Manager
RSL	regional screening level
SAP	Sampling and Analysis Plan
SI	Site Inspection
SME	Subject Matter Expert
SOP	standard operating procedure
SSC	Site Safety Coordinator
STC	Senior Technical Consultant
TBD	to be determined
TCE	trichloroethene
TM	Task Manager
UCL	upper confidence limit
UCMR3	Third Unregulated Contaminant Monitoring Rule
UPLC	ultra performance liquid chromatography
USEPA	United States Environmental Protection Agency

SAP Worksheet #2—SAP Identifying Information

Site Name/Number: Ault Field, Oak Harbor, Washington, Area 6, Oak Harbor, Washington, and Outlying Landing Field (OLF) Coupeville, Coupeville, Washington, Naval Air Station (NAS) Whidbey Island

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) 4470

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)
   - *Interim Per- and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update* (Navy, 2017).
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 RPM and NAVFAC Atlantic Quality Assurance Officer (QAO).
4. List dates of scoping sessions that were held:
   - A scoping session with NAVFAC Northwest, and CH2M was held on October 2, 2019.
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 (CH2M, 2017a)	January 2017
Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water Outlying Landing Field Coupeville (CH2M, 2017b)	January 2017
Final Sampling and Analysis Plan Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water Ault Field and Outlying Landing Field Coupeville (CH2M, 2017c)	November 2017
Final Sampling and Analysis Plan Site Inspection of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement Area 6, Ault Field (CH2M, 2017d)	November 2017
Final Sampling and Analysis Plan Addendum Site Inspection of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement Area 6, Ault Field (CH2M, 2018a)	July 2018

SAP Worksheet #2—SAP Identifying Information (continued)

Final Sampling and Analysis Plan Addendum 2 Site Inspection of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement Area 6, Ault Field (CH2M, 2018b)	August 2018
Final Sampling and Analysis Plan Addendum Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water Ault Field and Outlying Landing Field Coupeville (CH2M, 2018c)	October 2018

6. List organizational partners (stakeholders) and connection with lead organization:
   - NAVFAC Northwest– Remedial Project Manager, Kendra Clubb
   - United States Environmental Protection Agency (USEPA) – Technical Representative/Base stakeholder, Chan Pongkhamsing
   - Island County Public Health – 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.

SAP Worksheet #3—Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Email Address or Mailing Address
Kendra Clubb	RPM/ Task Order Contracting Officer's Representative	NAVFAC Northwest	(360) 396-0022	kendra.clubb@navy.mil
Chan Pongkhamsing	USEPA Project Manager	USEPA Region 10	(206) 553-1806	Pongkhamsing.Chan@epa.gov
Doug Kelly	Island County Hydrogeologist	Island County	(360) 678-7885	D.Kelly@islandcountywa.gov
Jennifer Madsen	Activity Manager (AM)	CH2M	(425) 233-3293	jennifer.madsen@ch2m.com
Eric Cutler	Project Manager (PM)	CH2M	(650) 823-4947	eric.cutler@ch2m.com
Paul Townley	Activity Quality Manager (AQM)	CH2M	(425) 233-5302	paul.townley@ch2m.com
Laura Cook	Senior Technical Consultant (STC)	CH2M	(757) 671-6214	laura.cook@ch2m.com
Nicole Badon	Project Task Manager (TM)	CH2M	(425) 233-3404	nicole.badon@ch2m.com
Janna Staszak	Program SAP Quality Reviewer	CH2M	(757) 518-9666	janna.staszak@ch2m.com
Anita Dodson	Program Chemist/ SAP Reviewer	CH2M	(757) 671-6218	anita.dodson@ch2m.com
Tiffany Hill	Project Chemist (PC)	CH2M	(541) 768-3109	Tiffany.hill@ch2m.com
Doug Weaver	Data Validator	Environmental Data Services (EDS)	(757) 564-0090	dweaver@env-data.com
TBD	Field Team Leader (FTL)	CH2M	TBD	TBD
TBD	Site Safety Coordinator (SSC)	CH2M	TBD	TBD
Martha Maier	Laboratory PM	Vista Analytical	(916) 673-1520	mmaier@vista-analytical.com

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SAP Worksheet #4—Project Personnel Sign-off Sheet

Name	Organization/Title/Role	Telephone Number	Signature/Email receipt	Date SAP Read
Jennifer Madsen	CH2M/AM	(425) 233-3293		
Eric Cutler	CH2M/PM	(650) 823-4947		
Paul Townley	CH2M/AQM	(425) 233-5302		
Laura Cook	CH2M/STC	(757) 671-6214		
Nicole Badon	CH2M/Project TM	(425) 233-3404		
Janna Staszak	CH2M/Program SAP Quality Reviewer	(757) 671-6256		
Anita Dodson	CH2M/Program Chemist/SAP Reviewer	(757) 671-6218		
Tiffany Hill	CH2M/PC	(541) 768-3109		
Doug Weaver	EDS/Data Validator	(757) 564-0090		
TBD	FTL	CH2M		
TBD	SSC	CH2M		
Martha Maier	Vista Analytical/Laboratory PM	(916) 673-1520		

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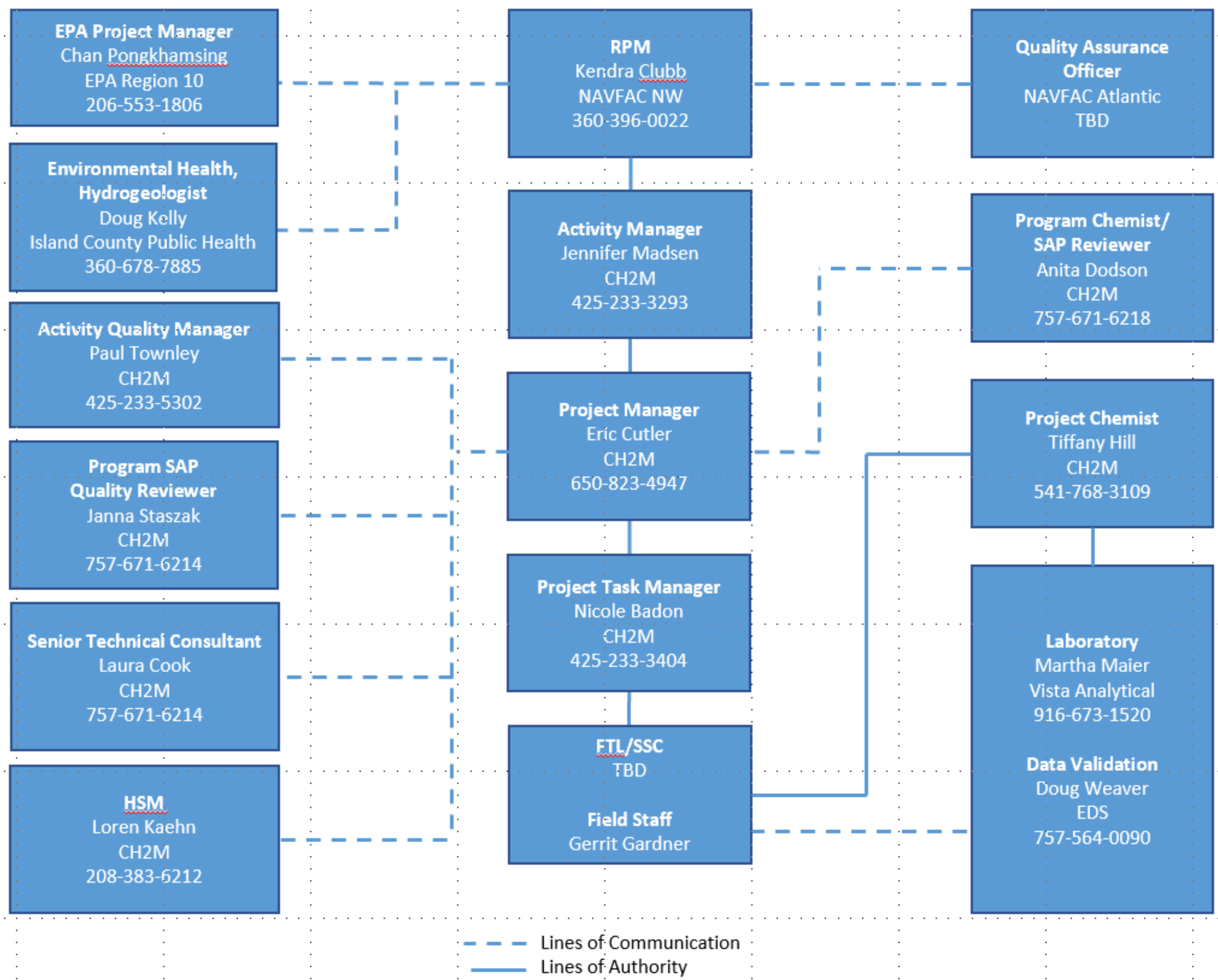
SAP Worksheet #5—Project Organizational Chart



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SAP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Communication with Base, NTR, CH2M PM/AM, USEPA RPM, and other stakeholders	RPM	Kendra Clubb	kendra.clubb@navy.mil (360) 396-0022	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	Eric Cutler	eric.cutler@ch2m.com (650) 823-4947	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 Senior Technical Consultant (STC).
Technical communications for project implementation and data interpretation	CH2M STC	Laura Cook	laura.cook@ch2m.com (757) 671-6214	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 before Base and Navy discussions and reporting review.
Health and safety (H&S)	CH2M Health and Safety Manager (HSM)	Loren Kaehn	loren.kaehn@ch2m.com (208) 383-6212	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.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Stop Work Order	CH2M PM CH2M FTL/SSC Field Team Members	Eric Cutler TBD TBD	eric.cutler@ch2m.com (650) 823-4947 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 the STC and/or AQM) in field logbooks; provide daily progress reports to PM.
Reporting laboratory data quality issues	Vista Analytical	Martha Maier	mmaier@vista-analytical.com (916) 673-1520	All quality assurance (QA)/quality control (QC) issues with project field samples will be reported within 2 days to the PC by the laboratory. In the event of serious analytical issues the RPM will be contacted, who at their discretion, may wish to consult with the Navy chemist.
Communication regarding SAP changes	CH2M Program Chemist	Anita Dodson	Anita.dodson@ch2m.com (757) 671-6218	Changes to the project that would prompt a SAP change that would require Navy QAO approval include: the addition of an analytical suite not previously included in the SAP, the addition of an environmental matrix not previously included in the SAP, laboratory accreditation to a new Department of Defense (DoD) Quality System Manual (QSM) version, inclusion of a new laboratory into the SAP, or updates to the Conceptual Site Model (CSM) that prompt new Data Quality Objectives (DQO)s. Updated laboratory limit of quantitation (LOQ), limit of detection (LOD), and detection limit (DL) values will not prompt a SAP update for Navy QAO approval unless those updates negatively impact the ability to meet project action levels.

SAP Worksheet #6—Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Analytical corrective actions (CAs)	PC	Tiffany Hill Travis Pitts Ginger Collins	travis.pitts@ch2m.com (541) 768-3109 tiffany.hill@ch2m.com (541) 768-3109 ginger.collins@ch2m.com (514) 768-3615	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. In the event of serious analytical issues, the CH2M PM will contact the RPM, who at their discretion, may wish to consult with the Navy chemist.
Data tracking from field collection to database upload Release of analytical data	PC	Tiffany Hill Travis Pitts Ginger Collins	travis.pitts@ch2m.com (541) 768-3109 tiffany.hill@ch2m.com (541) 768-3109 ginger.collins@ch2m.com (514) 768-3615	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 (PQOs) or would cause significant delay in project schedule.
Reporting data quality issues	Data validation (DV)	Doug Weaver	dweaver@env-data.com (757) 564-0090	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 Eric Cutler Nicole Badon	TBD eric.cutler@ch2m.com (650) 823-4947 nicole.badon@ch2m.com (425) 233-3404	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 Clubb	RPM	NAVFAC Northwest	Oversees project for Navy and provides base-specific information, and coordination with NAS Whidbey Island.
Jennifer Madsen	AM	CH2M	Oversees and manages NAS Whidbey Island projects and activities.
Eric Cutler	PM	CH2M	Oversees and manages project activities and tasks.
Paul Townley	AQM	CH2M	Oversees project delivery and execution.
Laura Cook	STC	CH2M	Provides senior technical support for project approach and execution.
Nicole Badon	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.
Travis Pitts	PC	CH2M	Data management: Performs data evaluation and QA oversight, is the POC with laboratory and validator for analytical issues.
Tiffany Hill	Alternate PC	CH2M	Data management: Performs data evaluation and QA oversight, is the POC with laboratory and validator for analytical issues.
Ginger Collins	Alternate 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.
Bahar Amiri	Laboratory QAO	Vista Analytical	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—Project Scoping Session Participants Sheet

Project Name: Investigation of Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water **Projected Date(s) of Sampling:** April 2020 **PM:** Eric Cutler			**Site Name**: Area 6, Ault Field, and OLF Coupeville **Site Location:** Oak Harbor, Washington and Coupeville, Washington	
Date of Session: November 13, 2019 **Scoping Session Purpose:** To obtain consensus on the approach for continued periodic drinking water sampling under CTO 4470.				
Name	**Title/Project Role**	**Affiliation**	**Phone #**	**Email Address**
Kendra Clubb	RPM	NAVFAC Northwest/NAS Whidbey Island	(360) 396-0022	kendra.clubb@navy.mil
Jennifer Madsen	AM	CH2M	(425) 233-3293	Jennifer.madsen@ch2m.com
Eric Cutler	PM	CH2M	(650) 823-4947	eric.cutler@ch2m.com

Comments

The purpose of the scoping session was to obtain consensus on the proposed updates for the continuation of off-Base drinking water monitoring at private or community drinking water wells under CTO 4470. The overall sampling strategy for continued semiannual sampling has not changed from the previous SAP (*Final Sampling and Analysis Plan Addendum Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water, Ault Field, Outlying Landing Field Coupeville*) (CH2M, 2018c). A summary of topics discussed is provided below.

- Analysis of 18 PFAS
  - The number of PFAS to be analyzed will increase from 14 to 18 for the future events under CTO 4470.
- New SAP
  - Due to modifications to the data quality objectives for drinking water sampling under CTO 4041, which resulted in the development of the 2018 SAP Addendum (CH2M, 2018c) and subsequent Field Change Request 1 and Field Change Request 2, a new SAP is to be created under CTO 4470 which incorporates the latest contact information, laboratory methods, and rationale from the previous SAP documents.
  - The new SAP will not include any changes to rationale or sampling and will be developed for future use.

Action Item

CH2M will begin preparing the SAP.

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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**). Area 6 is located within the southern portion of Ault Field. **Figure 2** presents the site layout of Ault Field including Area 6. **Figure 3** presents the site layout of OLF Coupeville. Description and background summaries of Ault Field, Area 6, and OLF Coupeville, are presented in **Tables 10-1** through **10-3**, respectively.

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

Site Name	Ault Field, NAS Whidbey Island, 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 35 suspected or confirmed source areas at Ault Field, including the current and former firefighting schools, flight line area, and the onsite drainage areas through Clover Valley (CH2M, 2018d). Other source areas may be identified in the future as part of the site inspection (SI) work currently underway.
Study Area Investigation History	Drinking water wells were identified within 1 mile downgradient of the Ault Field source areas where AFFF containing PFAS was likely used, and sampled for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutane sulfonate (PFBS), 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 were above the USEPA Lifetime Health Advisory in one off-Base drinking water well located south of the current Firefighting School. Based on these results and other information made available to the Navy, the drinking water investigation area was extended an additional ½ mile downgradient (toward the south) from the current Firefighting School and included additional parcels east of the runway, and runway ditches on the eastern 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 were above the Lifetime Health Advisory in one additional off-Base drinking water well located east of the Ault Field runway, and the investigation area was extended a ½ 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 Lifetime Health Advisory exceedances are shown on **Figure 2**. In October 2017, follow-up monitoring was conducted. Nine drinking water well samples were collected from locations where PFOS and/or PFOA were previously detected (above or below the Lifetime Health Advisories) and at properties located adjacent to properties with PFOS and/or PFOA exceedances of the Lifetime Health Advisories. For this event, the analytical suite was expanded to include 11 additional PFAS for a total of 14 analytes. The results of the October 2017 sampling confirmed the Lifetime Health Advisory exceedances in the two off-Base drinking water wells. There were no locations at which PFOS and/or PFOA concentrations exceeded the Lifetime Health Advisories that had not exceeded the Lifetime Health Advisories in previous sampling. In October 2018, PFAS was detected above the Lifetime Health Advisory in stormwater runoff collected from a stormwater drain near Hangar 6 on Ault Field, and from an associated stormwater drainage system that empties into Clover Valley Stream and Dugualla Bay. Surface water is assumed to be hydraulically connected to groundwater used for drinking water in parcels adjacent to Clover Valley Stream and Dugualla Bay. In response, the Navy conducted a fourth phase of sampling for drinking water wells located within ½ mile to the north-northeast and south-southeast of Clover Valley Stream and Dugualla Bay. The Phase 4 sampling area included 206 properties, from which 41 drinking water well samples were collected from January through April 2019. The results of the Phase 4 sampling showed that PFOS and/or PFOA were detected at three drinking water well locations, at concentrations below the Lifetime Health Advisories. One of the three detections was from a drinking water well located within the Phase 1 sampling area; however, it had not previously been sampled during the Phase 1 sampling event and was sampled at the same time as the Phase 4 event.

SAP Worksheet #10—Conceptual Site Model (continued)

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

Study Area Investigation History (continued)		Between April 2018 and November 2019, semiannual, seasonal sampling was conducted for all drinking water well locations where PFAS were previously detected (including Lifetime Health Advisory exceedances and non-exceedances) and for drinking water well locations adjacent to those where PFAS previously exceeded Lifetime Health Advisories. For the October-November 2019 event, the analytical suite was expanded to include 4 additional PFAS for a total of 18 analytes.
Current Use		The area surrounding Ault Field is a low-density residential area. Drinking water is primarily supplied by private or community drinking water wells.
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 form the overlying confining layer. One 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 southwestern 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 (**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, 503 parcels are located downgradient of Ault Field within the Phase 1, 2, 3, and 4 sampling areas, of which 140 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 (Island County, 2005). Nine parcels have been confirmed with no private wells. It is unknown whether the remaining parcels are served by private wells.
Contaminants of Potential Concern (COPCs)		18 PFAS (listed in **Worksheet #15**).
Nature and Extent		Two of the 148 drinking water wells sampled contain PFOS and/or PFOA above the project action limits (PALs) (**Figure 2**). The other drinking water wells contained PFOA, PFOS, and/or PFBS below the detection limits or below the PALs. An SI associated with PFAS on Ault Field is in progress.

SAP Worksheet #10—Conceptual Site Model (continued)

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

Migration Pathways	The following migration pathways are relevant to this investigation. Additional migration pathways will be investigated during the planned SI: • Transport via advection within groundwater flow • Discharge of surface water to groundwater • Discharge of groundwater to surface water • Intentional or inadvertent discharge of PFAS to surface and/or subsurface soil, which may migrate to groundwater via infiltration in soil • Overland flow of PFAS in stormwater runoff to downgradient areas including soil, drainage ditches, and surface water bodies • Direct release of PFAS to drainage ditches • Leaching of PFAS from soil to groundwater
Potential Receptors/ Exposure Routes[1]	Current and future users of drinking water (ingestion)

Notes:
[1] Other potentially complete exposure pathways to humans and ecological receptors may be present at Ault Field and the surrounding area. However, the focus of this investigation is human exposure to PFAS in drinking water.

Table 10-2. Area 6 Area Description and Background
Area 6, Ault Field, NAS Whidbey Island, Oak Harbor, Washington

Site Name	Area 6, Ault Field, NAS Whidbey Island, Oak Harbor, Washington (**Figures 1** and **2)**
Study Area Description	Area 6 is a 260-acre tract in the southeastern corner of Ault Field. Area 6 is bordered by Ault Field Road to the north, State Highway 20 to the east, and the Oak Harbor landfill on the south and southwest (**Figure 2**). Privately owned forested or logged land, and a commercial sand and gravel quarry operation, are located immediately west of Area 6. Various businesses such as auto repair shops, an auto salvage yard, storage facilities, the Auld Holland Inn, and a mobile home park are located west and south of Area 6. Private residences are located to the east, west, and south of Area 6.
Potential Sources	There are two areas within Area 6 where wastes are known to have been disposed: • The former industrial waste disposal area (Site 55): This feature consisted of an acid disposal pit and an oily sludge pit (Foster Wheeler, 2002). The acid disposal pit received approximately 300,000 to 700,000 gallons of acids caustics, and solvents in the 1970s and 1980s. The oily sludge pit received approximately 100,000 to 600,000 gallons of liquid sludge between 1969 and the mid-1970s. • The Area 6 landfill: This feature included 23 cut-and-fill trenches with native materials in between and received Navy waste from 1969 through the mid-1990s (Foster Wheeler, 1997; URS Consultants, 1993; URS-AECOM, 2016). The landfill received both sanitary solid and industrial wastes (which may have contained hazardous constituents) from 1969 to 1983; Navy waste through 1992; yard waste and construction debris during 1993; and soil and sediments classified as nonhazardous (from other remedial actions) in 1995 and 1996 (Foster Wheeler, 1997; URS Consultants, 1993). There is no known disposal of regulated wastes since 1983 (URS Consultants, 1993). Although it is unknown whether AFFF was used or disposed of at Area 6; the historical site use as a disposal area and the use of AFFF on Ault Field suggest that such is feasible.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-2. Area 6 Area Description and Background
Area 6, Ault Field, NAS Whidbey Island, Oak Harbor, Washington

Study Area Investigation History		As part of the Area 6 SI, samples were collected for analysis of PFAS from 30 on- and off-Base groundwater monitoring wells and the groundwater extraction, treatment, and recharge (GETR) system influent/effluent between 2017 and 2019. PFBS, PFOA and/or PFOS were detected in samples from 11 of the 19 on-Base groundwater monitoring wells and from 7 of the 11 off-Base groundwater monitoring wells sampled. PFBS, PFOA and/or PFOS were also detected in the GETR influent/effluent. PFOA exceeded the Lifetime Health Advisory in one on-Base groundwater monitoring well. Analytical results did not exceed the Lifetime Health Advisory in the off-Base groundwater monitoring wells. A total of 24 drinking water and/or private groundwater well samples were collected between February 2018 and November 2019. Fourteen single-resident drinking water wells, six community drinking water wells, and four private groundwater wells (irrigation or inactive) were sampled. PFBS, PFOA, and/or PFOS were detected in samples from 9 of the 24 private wells. The sum of PFOA and PFOS exceeded the Lifetime Health Advisory at six locations. PFAS detections were primarily from shallow aquifer groundwater monitoring and private wells; however, a limited number of intermediate aquifer wells were sampled. Low-level PFOA (0.00107 J microgram per liter [µg/L]) was detected from one on-Base intermediate aquifer groundwater monitoring well. Groundwater monitoring and private drinking water wells with exceedances of the Lifetime Health Advisories are completed in the shallow aquifer. In fall 2019, off-Base drinking water wells associated with Area 6 where PFOA/PFOS were detected (above or below the Lifetime Health Advisories) and drinking water wells on parcels adjacent to exceedance parcels were incorporated into the semiannual sampling program for Ault Field and OLF Coupeville. Beginning with this event, the analytical suite was expanded to include 4 additional PFAS for a total of 18 analytes.
Current Use		The off-Base land surrounding Area 6 is used for a combination of residential and commercial purposes.
Site Status		The Area 6 landfill cap was constructed as part of the remedial action to prevent infiltration through the landfill that may result in leaching of contaminants to groundwater (Foster Wheeler, 1997). An interim soil removal action was completed in 2001 at the former industrial waste disposal area (Site 55) to reduce the mass of trichloroethene (TCE) in the vadose zone source area; however, confirmation samples indicated that elevated concentrations of TCE in soil remain in place post-excavation (Foster Wheeler, 2002).
Site Conditions	**Physical Characteristics**	Whidbey Island lies within the Puget lowland, a topographic and structural depression between the Olympic Mountains and the Cascade Range.
	Geology and Hydrogeology	Four glacial units have been identified at Area 6 and include, from youngest to oldest: the Vashon Recessional Outwash (thin and discontinuous layer of sand and gravel with some silt only present in the eastern part of Area 6 at the ground surface overlying the Vashon Till [CTI-URS, 2017]), which is interpreted as being predominantly unsaturated in Area 6 based on published cross-sections (URS-AECOM, 2016); Vashon Till (laterally extensive layer of silty, fine sand with some gravel, containing localized layers of clay or silt typically present and ground surface); Vashon Advance Outwash (coarse, gravelly sand that gradually becomes finer grained with depth with local layers of silty sand, silt, or clay); and Whidbey Formation Units 1 through 4 (alternating finer-grained and coarser-grained materials). More detailed descriptions of the units can be found in CTI-URS, 2017 and URS, 2013. The U.S. Geological Survey has identified up to five major hydrostratigraphic units (aquifers) above bedrock in Island County, where NAS Whidbey Island is located, (Jones, 1985; Sapik et al., 1988). The existing aquifer units are composed of sand or sand and gravel, while the adjacent confining layers are composed of till, glaciomarine drift, or nonglacial clay and silt. Perched, saturated zones may exist locally above noncontinuous areas of till or other clay-rich units. Three of these five upper aquifers have been identified at Area 6: • The shallow aquifer is an unconfined groundwater unit found in the Vashon Advance Outwash beneath Area 6. The former industrial waste disposal pits (Site 55) discharged directly into this unit.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-2. Area 6 Area Description and Background
Area 6, Ault Field, NAS Whidbey Island, Oak Harbor, Washington

Site Conditions (continued)	**Geology and Hydrogeology (continued)**	• The intermediate aquifer is a moderately continuous groundwater body found in the sandy unit that corresponds to the Whidbey Formation Unit 2. Near Area 6, this aquifer is confined below the silt and clay of Whidbey Formation Unit 1, which acts as an aquitard. • The deep aquifer is also a nearly continuous confined groundwater body found near Area 6. This aquifer is confined below the silt and clay of Whidbey Formation Unit 3 (which acts as an aquitard) and occupies a thick sand layer in Whidbey Formation Unit 4.
		Based on potentiometric maps presented in the Annual 2016-2017 Groundwater Long-term Monitoring Report (Sealaska, 2017), the groundwater flow direction in the Vashon Advance Outwash (shallow aquifer) underlying Area 6 is predominantly to the south. There is a potential local southwesterly component of groundwater flow in the northwestern corner of Area 6. Groundwater flow direction in the Whidbey Formation Unit 2 (intermediate aquifer) is predominantly to the southeast; however, measurements from a subset of Area 6 monitoring wells (6-I-01, 6-I-03, and 6-I-08) suggest a local component of groundwater flow to the northeast (URS Consultants, 1993). Groundwater elevation data from wells completed in the Whidbey Formation Unit 4 (deep aquifer) suggest groundwater flow directions ranging from southeast to southwest (URS Consultants, 1993). Downward vertical hydraulic gradients exist at the site, with differences in groundwater elevations between the shallow and intermediate aquifer ranging from 5 to 20 feet and approximately 50 feet between the shallow and deep aquifer (CTI-URS, 2017). The majority of monitoring infrastructure at Area 6 is completed within the shallow aquifer. There is limited readily available information regarding the subsurface characteristics of the off-Base area surrounding Area 6. Regionally, Whidbey Island consists of a thick sequence of glacial and interglacial deposits overlying lower permeability bedrock. The relatively continuous lithologic/hydrostratigraphic units described above likely extend off-Base.
COPCs		18 PFAS (listed in **Worksheet #15**).
Nature and Extent		Drinking water well and/or private groundwater well samples were collected from 24 locations between February 2018 and November 2019. Samples included 14 single-resident drinking water wells, 6 community drinking water wells, and 4 private groundwater wells (irrigation or inactive). PFBS, PFOA, and/or PFOS were detected in samples from 9 of the 24 private wells sampled, with the sum of PFOA and PFOS exceeding the Lifetime Health Advisory at six locations.
Migration Pathways		The following migration pathways are relevant to this investigation. Additional migration pathways will be investigated during the planned SI: • Transport via advection within groundwater flow • Intentional or inadvertent discharge of PFAS to surface and/or subsurface soil, which may migrate to groundwater via infiltration in soil • Leaching of PFAS from soil to groundwater
Potential Receptors/ Exposure Routes[1]		Current and future users of drinking water wells in areas near Area 6 (ingestion)

Notes:

[1] Other potentially complete exposure pathways to humans and ecological receptors may be present at Area 6 and the surrounding area. However, the focus of this investigation is human exposure to PFAS in drinking water.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-3. Outlying Field Coupeville Area Description and Background
OLF Coupeville, Coupeville, Washington

Site Name	OLF Coupeville, NAS Whidbey Island, 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. The runway and storage buildings located east of the runway are also suspected source areas, based on the potential for AFFF to have been stored, used, or released at these locations during Navy operations.
Study Area Investigation History	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 Lifetime 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 from the Base boundary to initiate off-Base drinking water sampling. Well construction records for the water supply well at Building 2807 show 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. Due to the absence of confirmed or suspected potential PFAS source areas at the time, drinking water wells were identified within 1-mile of Building 2807 at OLF Coupeville, and sampled for PFOS, PFOA, and PFBS, 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. PFOS and/or PFOA were above the Lifetime Health Advisories in seven off-Base drinking water wells located south of the OLF runway. Based on these results, the investigation area was extended an additional ½-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, and analyzed for PFOS, PFOA, and PFBS. Of those nine samples, the PFAS constituents 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 Lifetime Health Advisory exceedances are shown on **Figure 3**. In October 2017, follow-up monitoring was conducted. Twenty-six drinking water well samples (from 25 wells) were collected from locations where PFOS and/or PFOA were previously detected (above or below the Lifetime Health Advisory) and at properties located adjacent to properties with PFOS and/or PFOA exceedances. For this event, the analytical suite was expanded to include 11 additional PFAS for a total of 14 analytes. The results of the October 2017 follow-up sampling confirmed the Lifetime Health Advisory exceedances in the seven off-base drinking water wells, and in one of two newly-sampled locations south of OLF, resulting in a total of eight off-base wells with PFAS concentrations above the Lifetime Health Advisory. There were no locations at which PFOS and/or PFOA concentrations exceeded the lifetime health advisory that were sampled and had not exceeded the Lifetime Health Advisory in previous sampling.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-3. Outlying Field Coupeville Area Description and Background
OLF Coupeville, Coupeville, Washington

Study Area Investigation History (continued)		Between April 2018 and November 2019, semiannual, seasonal sampling was conducted for all drinking water well locations where PFAS were previously detected (including Lifetime Health Advisory exceedances and non-exceedances) and for drinking water well locations adjacent to those where PFAS were previously exceeded Lifetime Health Advisories. For the October-November 2019 event, the analytical suite was expanded to include 4 additional PFAS for a total of 18 analytes. Additionally, drinking water well samples were collected from six parcels located south of OLF Coupeville, north of State Route 20, and east of Keystone Hill Road to verify that no other parcels in the vicinity of ongoing waterline construction were above the lifetime health advisory. Of these six additional samples, there were no locations at which PFOS and/or PFOA concentrations exceeded the lifetime health advisory.
Current Use		The area surrounding OLF Coupeville is a low-density residential area. Drinking 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 sampling 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 1 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 is being studied during a SI currently in progress.

SAP Worksheet #10—Conceptual Site Model (continued)

Table 10-3. Outlying Field Coupeville Area Description and Background
OLF Coupeville, Coupeville, Washington

COPCs	18 PFAS (listed in **Worksheet #15**).
Nature and Extent	Eight of the 113 drinking water wells sampled contained PFOA and/or PFOS above the PALs (**Figure 3**). Two of the eight drinking water wells with exceedances were multi-party wells that serve two parcels. The other drinking water wells contained PFOA, PFOS, and/or PFBS below detection limits or below the PALs. An SI associated with PFAS on OLF Coupeville is in progress.
Migration Pathways	The following migration pathways are relevant to this investigation. Additional migration pathways will be investigated during the planned SI: • Transport via advection within groundwater flow • Intentional or inadvertent discharge of PFAS to surface and/or subsurface soil, which may migrate to groundwater via infiltration in soil • Leaching of PFAS from soil to groundwater
Potential Receptors/ Exposure Routes[1]	Current and future users of drinking water (ingestion)

Notes:

[1] Other potentially complete exposure pathways to humans and ecological receptors may be present at OLF Coupeville and the surrounding area. However, the focus of this investigation is human exposure to PFAS in drinking water.

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

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

Objective	Environmental Question(s)	General Investigation Approach	PQOs
Evaluate the long-term temporal and spatial variability of PFAS concentrations associated with Ault Field, Area 6, and OLF Coupeville in drinking water wells on off-Base parcels where they were previously detected, in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances, and in drinking water wells adjacent to waterline installation activities, through semiannual monitoring.	Have PFAS concentrations increased or decreased temporally? Have PFAS concentrations shifted spatially over time? Have PFAS concentrations shifted spatially due to waterline construction and/or reduced pumping in nearby wells?	Drinking water samples will be collected semiannually during wet and dry seasons, 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. Drinking water samples will be collected semiannually during wet and dry seasons, from drinking water wells in adjacent parcels (whether previously sampled or not) where PFAS were previously detected above the PALs, to evaluate spatial variability. Additionally, drinking water samples will be collected semiannually during wet and dry seasons, from parcels with drinking water wells adjacent to waterline installation activities, to monitor PFAS movement resulting from reduced pumping in nearby wells. Proposed locations are shown on **Figures 4a**, **4b,** and **5**. Drinking water samples will be collected from these wells (**Worksheet #17**) and analyzed via USEPA Method 537.1 for the 18 PFAS listed in **Worksheet #15**. The duration of the monitoring period will be at least 5 years, to allow for sufficient data collection so that an evaluation of the PFAS data for temporal and spatial trends can be conducted after 5 years of sampling.	If samples collected during this investigation indicate PFAS concentrations are significantly higher or lower than those collected in a different season, temporal variability is likely and sampling frequency may be increased to further evaluate temporal trends and monitor protectiveness. If PFAS concentrations are not significantly higher or lower than those collected in a different season, temporal variability will not be accounted for in determining sampling frequency of timing. If PFAS concentrations exceed the PALs, an alternate drinking water source will be (or will continue to be) provided. If PFAS concentrations at a residence have increased to above PALs, an alternate drinking water source will be provided, and long-term solutions will be evaluated. If PFAS are detected above PALs at locations adjacent to those with previous PFAS exceedances or at locations adjacent to waterline installation activities, the sampling area will be expanded to include parcels adjacent to the new exceedances.
Determine whether additional off-Base drinking water sampling is warranted as a result of new information or changing conditions.	Have any new on-Base PFAS source areas been identified that may impact drinking water wells that may not have been previously sampled? Do temporal or spatial changes (e.g. groundwater flow, pumping conditions) warrant resampling of the existing sampling area?	Sampling and/or resampling of previously sampled wells will be conducted at off-Base drinking water wells located within 1 mile downgradient of any newly identified on-Base PFAS source areas or off-Base sample locations with new PFAS detections, to identify any new residential drinking water impacts, in accordance with the procedures outlined in this SAP. Additionally, resampling of previously sampled wells within the existing sampling area may be conducted if temporal or spatial changes (e.g. groundwater flow, pumping conditions) indicate potential PFAS plume migration toward wells not captured by the periodic drinking water sampling network may have occurred.	If no new PFAS source areas are identified, periodic drinking water sampling will continue as outlined in this SAP. If a new, on-Base source or sources of PFAS is identified, additional samples may be collected based on stakeholder agreement in accordance with procedures outlined in this SAP. If PFOA and/or PFOS are not detected in newly identified off-Base private drinking water wells, or are detected below the PAL, then no further action is warranted. If PFOA and/or PFOS concentrations exceed the Lifetime Health Advisory in newly identified off-Base private drinking water wells, an alternate drinking water source will be provided within 24 hours of receipt of the preliminary data and the sampling area will be expanded to include additional private drinking water wells in parcels adjacent to the new exceedances. Once sampled, the newly identified off-Base drinking water wells will be incorporated into the semiannual sampling program, as described in the first objective. If temporal or spatial changes are observed that indicate potential PFAS plume migration to wells not captured by the current periodic drinking water sampling network, resampling of previously sampled drinking water wells, up to all wells sampled within previous phases of drinking water sampling, may be conducted.

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

Problem Definition, Environmental Questions, and Project Quality Objectives

PFOA and PFOS have been detected in on-Base groundwater and off-Base drinking water wells located downgradient of Ault Field, Area 6, and OLF Coupeville. To accurately assess the temporal and spatial variability of PFAS in drinking water, a more extensive evaluation is required.

The investigation objectives, environmental questions, general investigation approach, and PQOs are presented in **Table 11-1**. **Figures 4a**, **4b,** and **5** present the proposed sampling locations for monitoring covered under this SAP for Ault Field, Area 6, and OLF Coupeville.

What are the Project Action Limits?

- USEPA Lifetime Health Advisory for PFOA and PFOS: 0.07 µg/L, unless both chemicals are detected, then 0.07 µg/L is the Lifetime Health Advisory for the cumulative concentration of the two chemicals
- USEPA Regional Screening Level (RSL) for PFBS: 40 µg/L (based on a hazard quotient [HQ] = 0.1). The RSL will not be used as screening value for drinking water in this SAP; no actions will be taken if the results exceed the RSL. This value is provided for informational purposes only.
- PALs currently do not exist for the remaining 15 PFAS. At the time of drafting this SAP, there were no USEPA RSLs or any state regulatory screening levels available. Per Navy policy, data need to be collected for all 18 analytes listed in USEPA Method 537.1 rev. 1.0 (Nov. 2018).

For what will the data be used?

The data will be used to answer the environmental questions discussed in **Table 11-1**.

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

Data types include:

- PFAS analytical results for drinking water samples as listed in **Worksheet #15**.
- All sampling locations are shown on **Figures 4a**, **4b,** 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?

All offsite laboratory analytical data will be technically sound and defensible with respect to the aforementioned project objectives. Additionally, laboratory-specific limits of detection (LOD) will be less than the USEPA Lifetime Health Advisory for PFOA and PFOS of 0.07 µg/L for the sum of the two chemicals. QC sample requirements are detailed in **Worksheet #20**. For action decisions, the laboratory will follow the Measurement Performance Criteria (MPC) in **Worksheets #24** and **#28** for laboratory QC samples. These MPC are consistent with USEPA Method 537.1.

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

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

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

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

Matrix: Drinking Water
Analytical Group: PFAS
Concentration Level: Low

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	MPC
Matrix Spike (MS)/Matrix Spike Duplicate (MSD)	PFAS	One per 20 samples	Accuracy/Precision	See **Worksheet #28**.
Field Duplicate (FD)	PFAS	One per 10 samples	Precision	Relative percent difference (RPD) less than 30%
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 reanalyzed; however, decision making and/or action (i.e., providing an alternate drinking water source) may proceed in advance of the resampling and reanalysis
Cooler Temperature Indicator	PFAS	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
UCMR3 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. *Final Technical Memorandum, Results of Investigation of Per- and Polyfluoroalkyl Substances in Off-Base Drinking Water— OLF Coupeville*. 2019	Analytical results for off-Base drinking water well sampling performed at OLF Coupeville from November 2016 through June 2017.	Identify impacted off-Base drinking water sources	None
Off-Base Drinking Water Results	CH2M. *Final Technical Memorandum, Results of Investigation of Per- and Polyfluoroalkyl Substances in Off-Base Drinking Water— Ault Field*. 2019	Analytical results for off-Base drinking water well sampling performed at Ault Field from November 2016 through June 2017.	Identify impacted off-Base drinking water sources	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/pacific/fecs/northwest/about_us/northwest_documents/environmental-restoration/pfas-groundwater-and-drinking-water-investigation/nswi_pfas.html	Analytical results for off-Base drinking water well sampling performed at Ault Field and Coupeville from October 2019 through April 2020.	Identify impacted off-Base drinking water sources	None

UCMR3 = Third Unregulated Contaminant Monitoring Rule

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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 an outside tap or spigot prior to any treatment or filtering system installed by the homeowner. If no outdoor location is possible, then samples will be collected from an inside sink without a filter. 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.
  - Prior to delivery of samples to the analytical laboratory, samples will be managed, preserved, and shipped in accordance with SOPs listed in **Worksheet #21**.

Analyses and Testing Tasks

- The subcontracted analytical laboratory will process and prepare samples for analyses and will analyze all samples for the 18 PFAS 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.

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 for review and approval.

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

- Property owners will be provided preliminary results within 30 days of sampling via telephone for detections below the health advisory. For exceedances, property owners will be notified in person, if possible, and provided a hard copy of their preliminary results and bottled water. Upon completion of data validation, results letters will be prepared and mailed to property owners within 30 days of completion of data validation.

Assessment/Audit Tasks

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

SAP Worksheet #15—Reference Limits and Evaluation Table

Matrix: Drinking Water
Analytical Group: PFAS (USEPA Method 537.1)

Analyte	Chemical Abstract Service (CAS) Number	USEPA Lifetime Health Advisory (µg/L)	RSLs Tapwater HQ = 0.1 (October 2019) (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	0.003	0.0015	**70**	**130**	**30**
Perfluoro-n-octanoic acid (PFOA)	335-67-1	0.07	--	0.035	0.01	0.003	0.0015	70	130	30
Perfluorobutane sulfonate (PFBS)	375-73-5	--	40	20	0.01	0.003	0.0015	70	130	30
Perfluorohexanoic acid (PFHxA)	307-24-4	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluoroheptanoic acid (PFHpA)	375-85-9	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorohexane sulfonate (PFHxS)	355-46-4	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorononanoic acid (PFNA)	375-95-1	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorodecanoic acid (PFDA)	335-76-2	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluoroundecanoic acid (PFUnA)	2058-94-8	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorododecanoic acid (PFDoA)	307-55-1	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--	--	--	0.01	0.003	0.0015	70	130	30
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	--	--	--	0.01	0.003	0.0015	70	130	30
N-Ethylperfluoro-1-octancesulfonamidoacetic acid (EtFOSAA)	2991-50-6	--	--	--	0.01	0.003	0.0015	70	130	30
N-Methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	--	--	--	0.01	0.003	0.0015	70	130	30
Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6	--	--	--	0.01	0.003	0.0015	70	130	30
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	--	--	--	0.01	0.003	0.0015	70	130	30
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-58-9	--	--	--	0.01	0.003	0.0015	70	130	30
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic (9Cl-PF3ONS)	756426-58-1	--	--	--	0.01	0.003	0.0015	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 537.1 per Navy policy.

[3] Limits for spikes >LOQ, 50 to 150 percent for spikes at or below the LOQ. These limit requirements follow USEPA Method 537.1.

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

DL = detection limit; LCL = lower control limit; LCS = laboratory control sample; LOD = limit of detection; MS/MSD = matrix spike/matrix spike duplicate; UCL = upper control limit

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SAP Worksheet #16—Project Schedule/Timeline Table[1]

Activities	Organization	Dates (MM/DD/YY)		Deliverable
		Anticipated Date of Initiation	Anticipated Date of Completion	
SAP Schedule				
Draft SAP preparation	CH2M	11/14/19	01/06/20	Draft SAP
Navy SAP review	NAVFAC Northwest	01/07/20	01/27/20	Comments
Draft Final SAP preparation	CH2M	01/28/20	02/17/20	Draft Final SAP
Stakeholder review	Various	02/18/20	03/19/20	Comments
Final SAP	CH2M	03/20/20	04/03/20	Final SAP
Sampling Schedule				
Off-Base Drinking Water Sampling	CH2M	TBD	TBD	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	TBD	TBD	N/A
Reporting	CH2M	TBD	TBD	Results Technical Memorandum

1 Future sampling events will follow a similar schedule.

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SAP Worksheet #17—Sampling Design 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	PFAS USEPA Method 537.1	49[a]	Samples will be collected from off-Base drinking water wells (**Figures 4a, 4b,** and **5**) on off-Base parcels where PFAS were previously detected, in drinking water wells on parcels adjacent to those wells with prior PFAS exceedances, and in drinking water wells adjacent to waterline construction, through semiannual monitoring to evaluate spatial and temporal variability. Samples will be collected from off-Base drinking water wells located downgradient of any newly identified on-Base PFAS source areas and may include drinking water wells that have not been previously sampled. Samples may be collected from previously sampled drinking water wells, including up to all wells sampled within previous phases of drinking water sampling, if temporal or spatial changes are observed that indicate it is necessary.

Notes:

[a] Additional samples may be collected under this SAP in accordance with the PQOs in **Worksheet #11**.

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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
Area 6 - Community and Private Wells						
WI-A06-RW03	WI-A06-RW03-MMYY	Drinking water[a]	N/A	PFAS	2 (FD)	**Worksheet #21**
	WI-A06-RW03P-MMYY					
WI-A06-RW05	WI-A06-RW05-MMYY				3 (MS/MSD)	
	WI-A06-RW05-MMYY-MS					
	WI-A06-RW05-MMYY-MSD					
WI-A06-RW08	WI-A06-RW08-MMYY				1	
WI-A06-RW14	WI-A06-RW14-MMYY				1	
WI-A06-RW18	WI-A06-RW18-MMYY				1	
WI-A06-RW19	WI-A06-RW19-MMYY				1	
WI-A06-RW20	WI-A06-RW20-MMYY				1	
WI-A06-RW24	WI-A06-RW24-MMYY				1	
WI-A06-RWXX[b]	WI-A06-RWXX-MMYY				Up to 5	
WI-A06-RWXX	WI-A06-RWXX-MMYY-MS				TBD[c] (MS/MSD)	
	WI-A06-RWXX-MMYY-MSD					
WI-A06-RWXX	WI-A06-RWXXP-MMYY				TBD[c] (FD)	
Ault Field - Community and Private Wells						
WI-AF-1RW01	WI-AF-1RW01-MMYY	Drinking water[a]	N/A	PFAS	1	**Worksheet #21**
WI-AF-1RW11	WI-AF-1RW11-MMYY				1	
WI-AF-1RW12	WI-AF-1RW12-MMYY				2 (FD)	
	WI-AF-1RW12P-MMYY					
WI-AF-1RW22	WI-AF-1RW22-MMYY				1	

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-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-1RW63	WI-AF-1RW63-MMYY				1	
WI-AF-1RW68	WI-AF-1RW68-MMYY				1	
WI-AF-1RW77	WI-AF-1RW77-MMYY				1	
WI-AF-3RW41	WI-AF-3RW41-MMYY				2 (FD)	
	WI-AF-3RW41P-MMYY					
WI-AF-1RWXX[b]	WI-AF-1RWXX-MMYY				Up to 5	
WI-AF-1RWXX	WI-AF-1RWXX-MMYY-MS				TBD[c] (MS/MSD)	
	WI-AF-1RWXX-MMYY-MSD					
WI-AF-1RWXX	WI-AF-1RWXXP-MMYY				TBD[c] (FD)	
Coupeville - Community and Private Wells						
WI-CV-1RW01	WI-CV-1RW01-MMYY	Drinking water[a]	N/A	PFAS	1	**Worksheet #21**
WI-CV-1RW07	WI-CV-1RW07-MMYY				2 (FD)	
	WI-CV-1RW07P-MMYY					
WI-CV-1RW09	WI-CV-1RW09-MMYY				1	
WI-CV-1RW14	WI-CV-1RW14-MMYY				1	
WI-CV-1RW22	WI-CV-1RW22-MMYY				1	
WI-CV-1RW23	WI-CV-1RW23-MMYY				1	
WI-CV-1RW24	WI-CV-1RW24-MMYY				1	
WI-CV-1RW25	WI-CV-1RW25-MMYY				1	

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-CV-1RW26	WI-CV-1RW26-MMYY				2 (FD)	
	WI-CV-1RW26P-MMYY					
WI-CV-1RW27	WI-CV-1RW27-MMYY				1	
WI-CV-1RW34	WI-CV-1RW34-MMYY				3 (MS/MSD)	
	WI-CV-1RW34-MMYY-MS					
	WI-CV-1RW34-MMYY-MSD					
WI-CV-1RW37	WI-CV-1RW37-MMYY				1	
WI-CV-1RW40	WI-CV-1RW40-MMYY				1	
WI-CV-1RW53	WI-CV-1RW53-MMYY				1	
WI-CV-1RW60	WI-CV-1RW60-MMYY				1	
WI-CV-1RW67	WI-CV-1RW67-MMYY				1	
WI-CV-1RW72	WI-CV-1RW72-MMYY				1	
WI-CV-1RW89	WI-CV-1RW89-MMYY				1	
WI-CV-1RW90	WI-CV-1RW90-MMYY				2 (FD)	
	WI-CV-1RW90P-MMYY					
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-3RW04	WI-CV-3RW04-MMYY				3 (MS/MSD)	
	WI-CV-3RW04-MMYY-MS					
	WI-CV-3RW04-MMYY-MSD					
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-3RW17	WI-CV-3RW17-MMYY				1	

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-CV-3RW18	WI-CV-3RW18-MMYY				1	
WI-CV-1RWXX[b]	WI-CV-1RWXX-MMYY				Up to 5	
WI-CV-1RWXX	WI-CV-1RWXX -MMYY-MS				TBD[c] (MS/MSD)	
	WI-CV-1RWXX -MMYY-MSD					
WI-CV-1RWXX	WI-CV-1RWXXP-MMYY				TBD[c] (FD)	
Quality Control						
WI-A06-QC	WI-A06-FB03-MMYY	QC	N/A	PFAS	1	**Worksheet #21**
	WI-A06-FB05-MMYY				1	
	WI-A06-FB05-MMYY				1	
	WI-A06-FB08-MMYY				1	
	WI-A06-FB14-MMYY				1	
	WI-A06-FB18-MMYY				1	
	WI-A06-FB19-MMYY				1	
	WI-A06-FB20-MMYY				1	
	WI-A06-FB24-MMYY				1	
	WI-A06-FBXX-MMYY				Up to 23 total	
WI-AF-QC	WI-AF-1FB01-MMYY				1	
	WI-AF-1FB11-MMYY				1	
	WI-AF-1FB12-MMYY				1	
	WI-AF-1FB22-MMYY				1	
	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-1FB63-MMYY				1	

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-1FB68-MMYY				1	
	WI-AF-1FB77-MMYY				1	
	WI-AF-3FB41-MMYY				1	
	WI-AF-1FBXX-MMYY				Up to 5	
WI-CV-QC	WI-CV-1FB01-MMYY				1	
	WI-CV-1FB07-MMYY				2 (FD)	
	WI-CV-1FB09-MMYY				1	
	WI-CV-1FB14-MMYY				1	
	WI-CV-1FB22-MMYY				1	
	WI-CV-1FB23-MMYY				1	
	WI-CV-1FB24-MMYY				1	
	WI-CV-1FB25-MMYY				1	
	WI-CV-1FB26-MMYY				2 (FD)	
	WI-CV-1FB27-MMYY				1	
	WI-CV-1FB34-MMYY				3 (MS/MSD)	
	WI-CV-1FB37-MMYY				1	
	WI-CV-1FB40-MMYY				1	
	WI-CV-1FB53-MMYY				1	
	WI-CV-1FB60-MMYY				1	
	WI-CV-1FB67-MMYY				1	
	WI-CV-1FB72-MMYY				1	
	WI-CV-1FB89-MMYY				1	
	WI-CV-1FB90-MMYY				2 (FD)	
	WI-CV-2FB02-MMYY				1	
	WI-CV-2FB04-MMYY				1	
	WI-CV-2FB06-MMYY				1	

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-CV-3FB04-MMYY				3 (MS/MSD)	
	WI-CV-3FB07-MMYY				1	
	WI-CV-3FB10-MMYY				1	
	WI-CV-3FB11-MMYY				2 (FD)	
	WI-CV-3FB17-MMYY				1	
	WI-CV-3FB18-MMYY				1	
	WI-CV-1FBXX-MMYY				Up to 5	
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-1FB01-MMYY				1	
	WI-AF-3FB41-MMYY				1	
	WI-AF-1FB22-MMYY				1	
	WI-AF-1FB11-MMYY				1	
	WI-AF-1FBXX-MMYY[b]				Up to 5	
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-1FB22-MMYY					
	WI-CV-1FB27-MMYY				1	
	WI-CV-1FB34-MMYY				1	
	WI-CV-1FB37-MMYY				1	
	WI-CV-1FB14-MMYY					

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-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-1FB40-MMYY				1	
	WI-CV-3FB04-MMYY				1	
	WI-CV-1FB60-MMYY				1	
	WI-CV-1FB72-MMYY				1	
	WI-CV-1FB24-MMYY				1	
	WI-CV-1FB25-MMYY				1	
	WI-CV-1FB26-MMYY				1	
	WI-CV-1FB27-MMYY				1	
	WI-CV-3FB17-MMYY				1	
	WI-CV-1FBXX-MMYY[b]				Up to 4	

Notes:

[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. Sample count also includes locations that were within the original sampling radius but were not sampled during the Phases 1 through 3 sampling events, due to no response or to later requests by residents.

[c] Field duplicates will be collected at a rate of 1 per 10 samples; MS/MSDs will be collected at a rate of 1 per 20 samples.

FD = field duplicate

ID = identification

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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 537.1/ SOP 64	2 x 250 milliliters (mL) polypropylene	250 mL	Trizma (5.0 grams per liter); ≤10°C at laboratory receipt, storage in the laboratory ≤6°C, but not frozen	14 days/ 28 days

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 – Community and Private Wells								
Drinking Water	PFAS	13 up to 18	2	1/1	-	13 up to 18	-	30 up to 40
OLF Coupeville – Community and Private Wells								
Drinking Water	PFAS	28 up to 37	4	2/2	-	32 up to 37	-	72 up to 82
Area 6 – Community and Private Wells								
Drinking Water	PFAS	8 up to 13	1 up to 2	1/1	-	8 up to 13	-	19 up to 30
Overall Sample Totals – Community and Private Wells								
Drinking Water	PFAS	49 up to 68	7 up to 8	4/4	-	53 up to 68	-	121 up to 152

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, properties adjacent to previous exceedances, and properties adjacent to waterline installation activities.

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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 CH2M-1	Chain-of-Custody, rev. 01/2020	CH2M	Chain-of-custody form	No	
SOP CH2M-2	Preparing Field Log Books, rev. 01/2020	CH2M	Loose leaf paper without waterproof coating	Yes	No Teflon components, acceptable substitutes would be a sewn notebook without a plastic cover or loose-leaf paper
SOP CH2M-3	Drinking Water Sampling when Analyzing for Per- and Polyfluoroalkyl Substances (PFAS), rev. 10/2019	CH2M	Drinking water sample bottles (Polypropylene bottle with Polypropylene screw cap), laboratory pre-filled Polypropylene bottles containing field blank water, loose leaf paper without waterproof coating, clip board, pen (not Sharpie), nitrile or latex gloves	Yes	No Teflon components, PFAS-free shipping materials
SOP CH2M-4	Packaging and Shipping Procedures for Low-Concentration Samples, rev. 01/2020	CH2M	Laboratory-supplied coolers, plastic bags, ice, tape	Yes	No Teflon supplies, no Blue Ice. Samples will be kept on ice and samples shipped to laboratory via FedEx.

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

No field equipment requiring calibration, maintenance, testing, and inspection will be used for this project.

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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; 07/05/19; rev. 19*		N/A	Drinking Water/ PFAS	N/A	Vista Analytical Laboratory	N	N
14	*Bottle Order Preparation; 10/04/17; rev. 5, reviewed 12/11/19*		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; 03/20/19; rev. 6*		Definitive	Drinking Water/ PFAS	UPLC/MS/MS	Vista Analytical Laboratory	N	N

Notes:

QSM = Quality Systems Manual

UPLC = ultra performance liquid chromatography

Department of Defense (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, 2021.

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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	Initial Calibration (ICAL)	Initial calibration prior to sample analysis	Minimum 5 point linear regression or quadratic calibration curve forced through zero for each analyte. The lowest calibration point must be at or below the minimum reporting limit (or LOQ). Each target compound within each calibration level must be within 70 to 130% of the true value, except for the lowest point of the curve which must be within 50 to 150% of the true value. Surrogate concentrations must be within 70 to 130% of the true value.	Evaluate standards, chromatography, and mass spectrometer response. If problem found with above, correct as appropriate, then repeat initial calibration.	Lab Manager/ Analyst	64
	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.		
	Retention Time Windows	Prior to sample analysis	Retention time windows should be based on measurements of actual retention time variation for each method analyte over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the initial demonstration of capability can be used to calculate a suggested retention time window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.	Dilute extract and reanalyze. Recalibrate if necessary to reestablish retention times.		
	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.		
	Continuing Calibration Verification (CCV)	Verify initial calibration by analyzing a low level (at the LOQ or below) CCV prior to analyzing samples. CCVs are then injected after every 10 samples and after the last sample, rotating concentrations to cover the calibrated range of the instrument.	Recovery for each analyte and surrogate must be within 70-130% of the true value for all but the lowest level of calibration. Recovery for each analyte in the lowest CAL level CCV must be within 50-150% of the true value and the surrogate must be within 70-130% of the true value.	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.		

Notes:
± = plus or minus
amu = atomic mass unit
CCV = continuing calibration verification
ICAL = initial calibration
MRL = minimum reporting limit

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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 537.1	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 **Worksheet #24** and IS recovery within acceptance criteria on **Worksheet #28**	Recalibrate and/or perform the necessary equipment maintenance. Check the calibration standards. Reanalyze the affected data.	Analyst/Supervisor	SOP 64

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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
Sample Custody and Storage (Personnel/Organization): Sample Receiving – Vista Analytical
Sample Preparation (Personnel/Organization): Vista Analytical
Sample Determinative Analysis (Personnel/Organization): Vista Analytical
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
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 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.
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 537.1/SOP 64

QC Sample	Frequency/Number	Method/ SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	MPC
Method Blank	One per prep. batch of up to 20 samples.	For the determination of native PFAS, the levels measured in the method blank of all method analytes must be below 1/3 the 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
Laboratory Control Sample (LCS)	One LCS is required for each extraction batch of up to 20 Field Samples. Rotate the fortified concentrations between low, medium and high amounts.	Results of LCS analyses must be 70-130% of the true value for each method analyte for all fortified concentrations except the lowest CAL point. Results of the LCSs corresponding to the lowest CAL point for each method analyte must be 50-150% of the true value.	Correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analytes. If reanalysis cannot be performed, the data must be qualified and explained in the case narrative.		Accuracy/Bias	
Matrix Spike (MS)	Analyze one MS per extraction batch (20 samples or less) fortified with method analytes at a concentration close to but greater than the native concentration, if known.	Recoveries at mid and high levels must be within 70-130% and within 50-150% at the low-level fortified amount (near the LOQ).	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when lab error is suspected, otherwise qualify data with narrative.		Accuracy/Bias	
Matrix Spike Duplicate (MSD)	Analyze one MSD per extraction batch (20 samples or less) fortified with method analytes at a concentration close to but greater than the native concentration, if known.	Recoveries at mid and high levels must be within 70-130% and within 50-150% at the low-level fortified amount (near the LOQ). Method analyte RPDs for the MSD or field duplicate must be ≤30% at mid and high levels of fortification and ≤50% near the LOQ.	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when lab error is suspected, otherwise qualify data with narrative.		Precision/ Accuracy/Bias	
Internal Standards (IS)	Every field sample, standard, blank, and QC sample.	Peak area counts for all ISs in all injections must be within ± 50% of the average peak area calculated during the initial calibration and 70-140% from the most recent CCV. If ISs do not meet this criterion, corresponding target results are invalid.	If peak areas are unacceptable, analyze a second aliquot of the extract or sample if enough extract remains. If there is not enough extract, reanalyze the first aliquot. If second analysis meets acceptance criteria, report the second analysis. If it fails, either analysis may be reported with the appropriate flags.		Accuracy	
Surrogates	Every field sample, standard, blank, and QC sample	Within 70 to 130% of true value	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, reanalysis may not be necessary. Qualify all applicable data if acceptance criteria are not met, and explain in case narrative.		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 Locations and Sampling Plan • Sampling Notes • Sample Receipt, Chain of Custody, and Tracking Records • Standard Traceability Logs • Sample Preparation Logs • Run Logs • Equipment Maintenance, Testing, and Inspection Logs • 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 • Laboratory QA Plan	• Field data deliverables (e.g., logbooks entries, chains-of-custody, air bills, and EDDs) will be kept on CH2M's network server. • 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 537.1	14 Calendar Days	Vista Analytical Laboratory 1104 Windfield Way, El Dorado Hills, CA 95762 Contact: Martha Maier (916)-673-1520	Battelle 141 Longwater Drive, Suite 202 Norwell, MA 02061 Contact: Jonathan Thorn (781) 681-5565

Notes:

[a] Should the backup laboratory be needed for sample analysis, laboratory SAP worksheets will be submitted to the Navy QAO for review prior to sample collection.

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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 Observation Report (SOR)	SOR Form	HSM CH2M	Within 1 week of safe behavior observation	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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____
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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—Safety Observation 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)
Safety Observation Report	Once per week per field staff during sampling event	TBD	FTL SSHO PM	Included in project files

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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 not included in the laboratory SOP and therefore not included in the DoD ELAP Accreditation letter, will be discussed and approved by the Navy QAO. 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). If discrepancies are found, a 25 percent check of the EDD against the hardcopy will be carried out on the SDG in which the discrepancy was found, if additional discrepancies are found a 100 percent check will be completed.	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	100 percent Stage 4 review of raw data to confirm laboratory calculations and manual integrations. For a recalculated result, the DV attempts to recreate the reported numerical value. The laboratory is asked for clarification if a discrepancy is identified which cannot reasonably be attributed to rounding. In general, this is outside 5% difference.	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

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

Data Review Input	Description[a]	Responsible for Verification or Validation	Step I/IIa/IIb[b]	Internal/ External[c]
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Data Validator	Step IIa	External
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 in drinking water	Analytical methods and laboratory SOPs will be evaluated against QA/QC criteria to ensure compliance, as presented in this SAP. QA/QC criteria for field QC samples are presented in **Worksheet #12**. LOQs, LODs, and DLs are presented in **Worksheet #15**. QA/QC criteria for calibrations are presented in Laboratory SOPs (referenced in **Worksheet #23**). QA/QC criteria for laboratory QC samples are presented in **Worksheet #28**. Data may be qualified if QA/QC exceedances have occurred. Guidance and qualifiers from “United States Department of Defense General Data Validation Guidelines” (DoD, 2018) and reference “EPA Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFASs) Analyzed Using EPA Method 537” (USEPA, 2018) will be applied as appropriate and may also reference “Per- and Polyfluoroalkyl Substances (PFAS): Reviewing Analytical Methods Data for Environmental Samples” (USEPA, 2019). As specific modules for the analytical methods in this project are published, the data validators will refer to those modules for guidance. In the meantime, if specific guidance is not given for these methods in the General Data Validation Guidelines, the data validator may adapt the guidance from “USEPA National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.4)” (540-R-2017-002; January 2017).	Data Validator	Step IIa and IIb	External

Notes:

[a] 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.

[b] 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 MPC in the SAP (both sampling and analytical).

[c] 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.
  - X = Result recommended for rejection by data validator.
  - R = Rejected result, project team decision. 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 100-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.

CH2M. 2017a. *Final Sampling and Analysis Plan Investigation of Perfluorinated Compounds in Drinking Water, Naval Air Station Whidbey Island.* January.

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

CH2M. 2017c. *Final Sampling and Analysis Plan Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water, Ault Field and Outlying Landing Field, Coupeville.* November.

CH2M. 2017d. *Final Sampling and Analysis Plan Investigation of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement, Area 6, Ault Field.* November.

CH2M. 2018a. *Final Sampling and Analysis Plan Addendum Site Inspection of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement, Area 6, Ault Field.* July.

CH2M. 2018b. Final Sampling and Analysis Plan Addendum 2 *Site Inspection of Per- and Polyfluoroalkyl Substances and Additional Characterization of 1,4-Dioxane and Vinyl Chloride in Groundwater and Drinking Water for Remedial Design Refinement, Area 6, Ault Field.* August.

CH2M. 2018c. *Final Sampling and Analysis Plan Addendum Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water, Ault Field, Outlying Landing Field Coupeville*. October.

CH2M. 2018d. *Final Preliminary Assessment for Per- and Polyfluoroalkyl Substances Ault Field, Naval Air Station Whidbey Island.* November.

CTI-URS JV LLC (CTI-URS). 2017. *Draft 30 Percent Basis of Design Report for Southern and Western GETR System Remedial Designs Area 6*, Naval Air Station Whidbey Island, Oak Harbor, Washington. February.

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. 2017. *Interim Per- and Polyfluoralkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update.* September.

Foster Wheeler Environmental Corporation (Foster Wheeler). 1997. *Final Remedial Action Report Volume 1; Operable Unit 1; Naval Air Station, Whidbey Island, Washington.* August.

Foster Wheeler. 2002. *Final Interim Removal Action Report, Site Characterization and Interim Removal Action at Area 6 Landfill, Site 55; Naval Air Station, Whidbey Island, Washington.* January.

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

Jones, M.A. 1985*. Occurrence of Groundwater and Potential for Seawater Intrusion, Island County, Washington.* U.S. Geological Survey Water-Resources Investigations Open-File Report 85-4046.

Sapik, D.B., G.C. Bortleson, B.W. Drost, M.A. Jones, and E.A. Prych. 1988. *Groundwater Resources and Simulation of Flow in Aquifers Containing Fresh Water and Seawater, Island County, Washington.* U.S. Geological Survey Water-Resources Investigations Report 87-4182.

Sealaska Environmental Services, LLC (Sealaska). 2017. *Annual 2016-2017 Groundwater Long-Term Monitoring Report for Operable Unit 1 Area 6 and Operable Unit 5 Area 31.* Naval Air Station Whidbey Island, Oak Harbor, Washington. June.

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

URS Consultants, Inc. (URS Consultants). 1993. *Remedial Investigation, Operable Unit, 1 Naval Air Station Whidbey Island, Oak Harbor, Washington*. Poulsbo, Washington. June 1993.

URS Group, Inc. (URS). 2015. Data Gap Sampling Results, Area 6, Naval Air Station Whidbey Island. Delivery Order 0055. June 2015.

URS Group, Inc., a subsidiary of AECOM (URS-AECOM). 2016. DRAFT Focused Feasibility Study, Area 6, Naval Air Station Whidbey Island, Oak Harbor, Washington. Delivery Order 0055. May 2016.

Figures

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Legend

- City
- Secondary Road
- Local Connecting Road
- Important Local Road
- Base Boundary

NAS - Naval Air Station
OLF - Outlying Landing Field

N

0 1 2 Miles

1 inch = 2 miles

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

For Official Use Only

Sampling and Analysis Plan
Investigation of Per- and Polyfluoroalkyl Substances in
Off-Base Drinking Water Ault Field, Area 6, and
Outlying Landing Field Coupeville
Naval Air Station Whidbey Island
Oak Harbor and Coupeville, Washington

NOTIFICATION: FIGURE 2 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 6 (5 USC 552(b)(6))
Personal Information Affecting an Individual's Privacy

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Oak Harbor and Coupeville, Washington

NOTIFICATION: FIGURE 3 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

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Oak Harbor and Coupeville, Washington

NOTIFICATION: FIGURE 4A CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

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NOTIFICATION: FIGURE 4B CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

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Outlying Landing Field Coupeville
Naval Air Station Whidbey Island
Oak Harbor and Coupeville, Washington

NOTIFICATION: FIGURE 5 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

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Appendix A
CH2M Field Standard Operating Procedures

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.

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.

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 – Name of project site.
- Sample Identification - The unique sample number identifying this sample.
- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 05/21/17).
- 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 or initials of the sampler.
- Remarks - Any pertinent additional information.

The field team should always follow the sample ID system prepared by the Project Chemist and reviewed by the Project Manager.

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.

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.)

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 and 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

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 HILL
APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD 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 ☐

OF CONTAINERS

LAB TEST CODES

ANALYSES REQUESTED

SHADED AREA– FOR LAB USE ONLY

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

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

Sampled By & Title (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	Relinquished By (Please sign and print name)	Date/Time
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		

QC Level: 1 2 3 Other: ____

COC Rec	ICE
Ana Req	TEMP
Cust Seal	Ph

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

Appendix B
Department of Defense Environmental Laboratory Accreditation Program Accreditation Letters

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

VISTA ANALYTICAL LABORATORY
1104 Windfield Way
El Dorado Hills, CA 95762
Brianna Davis Phone: 916-673-1520
bdavis@vista-analytical.com

ENVIRONMENTAL

Valid To: September 30, 2021 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 17025:2017, the 2009 TNI Environmental Testing Laboratory Standard, the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.3 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	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
Dioxins/Furans			
Clean Up Method	3620C	3620C	3620C
1,2,3,4,6,7,8-Heptachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,4,7,8,9-Heptachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,4,7,8-Hexachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,7,8,9-Hexachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	EPA 1613B EPA 8290	EPA 1613B EPA 8290	EPA 1613B EPA 8290

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

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste	Tissue
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
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
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

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste	Tissue
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
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
2,3,3',4',5-Pentachlorobiphenyl (107)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste	Tissue
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
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	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
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

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
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

Parameter/Analyte	Potable Water	Aqueous Film Forming Foams (AFFF)	Non Potable Water	Solid Hazardous Waste (Liquids and Solids)	Tissue
Per-and Polyfluoroalkyl Substances (PFAS)					
6:2 Fluorotelomer sulfanate (6:2 FTS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
8:2 Fluorotelomer sulfanate (8:2 FTS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Potable Water**	**Aqueous Film Forming Foams (AFFF)**	**Non Potable Water**	**Solid Hazardous Waste (Liquids and Solids)**	**Tissue**
N-ethylperfluoro-1-octanesulfonamide (N-EtFOSA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
N-methylperfluoro-1-octanesulfonamide (N-MeFOSA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorobutanesulfonic acid (PFBS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorobutanoic acid (PFBA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorodecanesulfonate (PFDS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorodecanoic acid (PFDA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Potable Water**	**Aqueous Film Forming Foams (AFFF)**	**Non Potable Water**	**Solid Hazardous Waste (Liquids and Solids)**	**Tissue**
Perfluorododecanoic acid (PFDoA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluoroheptanesulfonate (PFHpS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluoroheptanonic acid (PFHpA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorohexadecanoic acid (PFHxDA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorohexanesulfononic acid (PFHxS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorohexanoic acid (PFHxA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorononaoic acid (PFNA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorooctane sulfonamide (PFOSA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorooctanesulfonic acid (PFOS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Potable Water**	**Aqueous Film Forming Foams (AFFF)**	**Non Potable Water**	**Solid Hazardous Waste (Liquids and Solids)**	**Tissue**
Perfluorooctanoic acid (PFOA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluoropentanoic acid (PFPeA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorotetradecanoic acid (PFTeDA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorotridecanoic acid (PFTrDA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluoroundecanoic acid (PFUdA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Hexafluoropropylene oxide dimer acid (HFPO-DA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Potable Water**	**Aqueous Film Forming Foams (AFFF)**	**Non Potable Water**	**Solid Hazardous Waste (Liquids and Solids)**	**Tissue**
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorononane sulfonic acid (PFNS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluorooctadecanoic acid (PFODA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Perfluoropentane sulfonic acid (PFPeS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
4,4,5,5,6,6,6-Heptafluorohexanoic acid (3:3 FTCA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
2H,2H,3H,3H-Perfluorodecanoic acid (7:3 FTCA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Potable Water**	**Aqueous Film Forming Foams (AFFF)**	**Non Potable Water**	**Solid Hazardous Waste (Liquids and Solids)**	**Tissue**
Potassium perfluoro-4-ethylcyclohexanesufonate (PFecHS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Sodium perfluoro-1-propanesulfonate (PFPrS)_	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15
Sodium perfluoro-1-dodecanesulfonate (PFDoS)	EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3 Table B-15

Parameter/Analyte	**Air**
Dioxins/Furans	
1,2,3,4,7,8-HxCDD	EPA TO-9A
1,2,3,6,7,8-HxCDD	EPA TO-9A
1,2,3,7,8,9-HxCDD	EPA TO-9A
1,2,3,4,7,8-HxCDF	EPA TO-9A
1,2,3,6,7,8-HxCDF	EPA TO-9A
1,2,3,7,8,9-HxCDF	EPA TO-9A
2,3,4,6,7,8-HxCDF	EPA TO-9A
1,2,3,4,6,7,8-HpCDD	EPA TO-9A
1,2,3,4,6,7,8-HpCDF	EPA TO-9A
1,2,3,4,7,8,9-HpCDF	EPA TO-9A
OCDD	EPA TO-9A
OCDF	EPA TO-9A
1,2,3,7,8-PeCDD	EPA TO-9A
1,2,3,7,8-PeCDF	EPA TO-9A
2,3,4,7,8-PeCDF	EPA TO-9A
2,3,7,8-TCDD	EPA TO-9A
2,3,7,8-TCDF	EPA TO-9A
Total HPCDD	EPA TO-9A
Total HPCDF	EPA TO-9A
Total HxCDD	EPA TO-9A
Total HxCDF	EPA TO-9A
Total TCDD	EPA TO-9A
Total TCDF	EPA TO-9A
Total PCDF	EPA TO-9A
Total PCDD	EPA TO-9A

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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 17025:2017, 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 5.3 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 *April 2017*).

Presented this 11th day of July 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3091.01
Valid to September 30, 2021

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

Appendix C
Laboratory SOPs

Sampling and Analysis Plan
Investigation of Per- and Polyfluoroalkyl Substances in
Off-Base Drinking Water Ault Field, Area 6, and
Outlying Landing Field Coupeville
Naval Air Station Whidbey Island
Oak Harbor and Coupeville, Washington

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