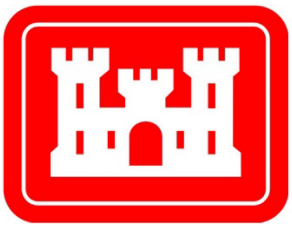
FINAL
UNIFORM FEDERAL POLICY – QUALITY ASSURANCE PROJECT PLAN ADDENDUM

Environmental Remediation Services
Yakima Training Center
Off-Installation Per- and Polyfluoroalkyl Substance Sampling,
Yakima, Washington

May 2023

Prepared for:



United States Army Corps of Engineers
Seattle District
4735 East Marginal Way South
Seattle, Washington 98134-2385

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In Accordance with:

Contract No. W912DW22D1006
Task Order No: W912DW22F2121

Prepared by:

Tanaq-Sundance 8(a)
Joint Venture, LLC

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Anchorage, AK 99503-3971

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LIST OF ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
Army	U.S. Army
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain of Custody
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	Data Quality Objectives
ELAP	Environmental Laboratory Accreditation Program
ELLE	Eurofins Lancaster Laboratories Environmental
EPA	United States Environmental Protection Agency
HA	Health Advisory
IRP	Installation Restoration Program
JBLM	Joint Base Lewis-McChord
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NDAA	National Defense Authorization Act
PA	Preliminary Assessment
PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substance
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PG	Professional Geologist
PM	Project Manager
ppm	Parts per Million
PQAPP	Programmatic Quality Assurance Project Plan
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
ROD	Record of Decision

SOP	Standard Operating Procedure
SI	Site Inspection
TBD	To Be Determined
TO	Task Order
TSJV	Tanaq-Sundance 8(a) Joint Venture
YTC	Yakima Training Center
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command

INTRODUCTION

Tanaq-Sundance 8(a) Joint Venture (TSJV) has prepared this Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) Addendum for the Environmental Remediation Program Services, Off-Installation Per- and Polyfluoroalkyl Substance (PFAS) Sampling project that will be conducted in the vicinity of Yakima Training Center (YTC), located in Yakima County, Washington. This document was prepared under the United States Army Corps of Engineers (USACE) Contract W912DW-22-D-1006, Task Order W912DW22F2121.

YTC is a sub-installation of Joint Base Lewis-McChord (JBLM), operated by the United States Army (Army). Since the early 1940's, YTC has been used for artillery, infantry, and engineering unit training by the Army, Army Reserve, and the Washington National Guard. Prior to 1941, the land was privately owned and used for ranching and mining (USACE, 2012). YTC is located approximately five miles northeast of Yakima, Washington in Yakima County, covering 327,231 acres within Yakima and Kittitas Counties (Figure 1).

The United States Army Environmental Command (USAEC) operates the Installation Restoration Program (IRP) at Yakima Training Center in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Defense Environmental Restoration Program (DERP) 10 USC 160, §2700, et. seq.: Department of Defense (DoD) Manual 4715.20, DERP Management, 9 March 2012; Model Toxics Control Act, November 2007; and Washington Administrative Code 246-290. Regulatory oversight is led by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology.

An Off-Installation Programmatic UFP-QAPP, referred to as the PQAPP herein (SERES-Arcadis, 2021), was developed and finalized in May 2021 to address the general procedures and methods for off-Installation residential drinking water sampling for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) at active U.S. Army installations nationwide. The objectives of the PQAPP and this PQAPP Addendum are to generate project data that are technically defensible and useful in meeting the Army's project goals of identifying presence or absence of PFAS at off-Installation private wells downgradient of areas of potential interest identified during the Preliminary Assessment (PA)/Site Inspection (SI).

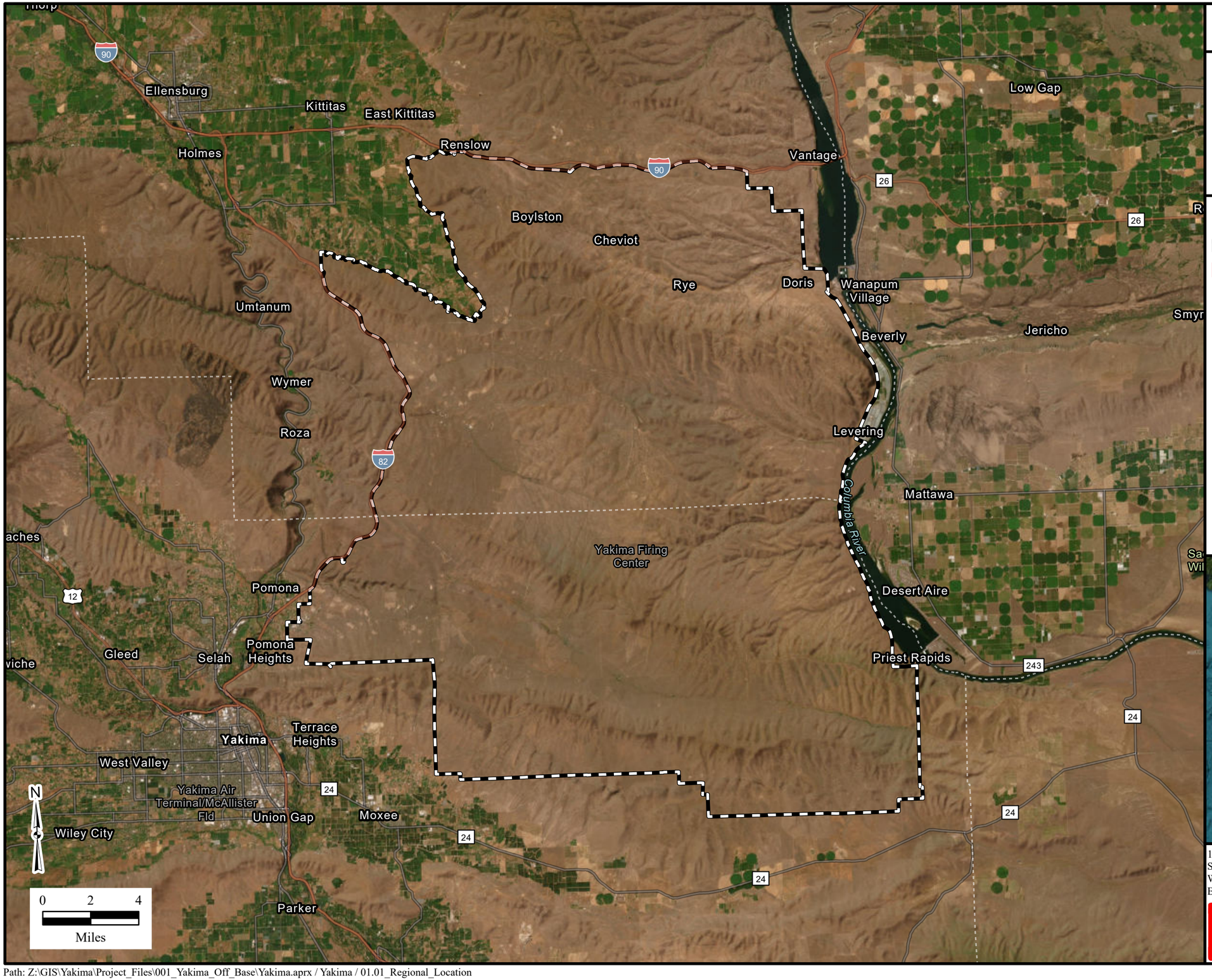
The purpose of this installation-specific PQAPP Addendum is to supplement the nationwide PQAPP, detail the planning processes for collecting data and the sampling design, and describe the implementation of the activities developed under this task order for residential drinking water sampling off-Installation of YTC which includes collection of groundwater samples at private, residential potable wells.

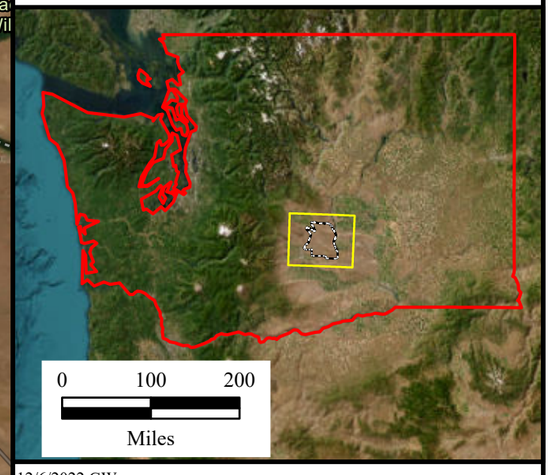
Figure 1
Installation Location Map

Yakima Training Center,
Washington

Legend

- Installation Boundary
- Washington State Boundary





12/6/2022 GW
Source: Tanaq, Earthstar Geographics, City of Yakima, County of Kittitas, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA

Path: Z:\GIS\Yakima\Project_Files\001_Yakima_Off_Base\Yakima.aprx / Yakima / 01.01_Regional_Location

Table 1: Crosswalk: Off-Installation PQAPP to Off-Installation QAPP Addendum

Optimized UFP-QAPP Worksheets		Off-Installation PQAPP	YTC Off-Installation QAPP Addendum
1 & 2	Title and Approval Page	X	X
3 & 5	Project Organization and QAPP Distribution	X	X
4, 7 & 8	Personnel Qualifications and Sign-off Sheet		X
6	Communication Pathways		X
9	Project Planning Session Summary	X	
10	Conceptual Site Model	X	
11	Project/Data Quality Objectives	X	
12	Measurement Performance Criteria	X	
13	Secondary Data Uses and Limitations	X	
14 & 16	Project Tasks & Schedule		X
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	X	
17	Sample Design and Rationale		X
18	Sampling Locations and Methods		X
19 & 30	Sample Containers, Preservation, and Hold Times	X	
20	Field QC	X	
21	Field Standard Operating Procedures (SOPs)	X	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	X	
23	Analytical SOPs		X
24	Analytical Instrument Calibration	X	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	X	
26 & 27	Sample Handling, Custody, and Disposal	X	
28	Analytical Quality Control and Corrective Action	X	
29	Project Documents and Records	X	
31, 32 & 33	Assessments and Corrective Action		X
34	Data Verification and Validation Inputs	X	
35	Data Verification Procedures		X
36	Data Validation Procedures		X
37	Data Usability Assessment	X	

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QAPP ADDENDUM WORKSHEET #1 & #2: TITLE AND APPROVAL PAGE

(UFP-QAPP Manual Section 2.1)

1) Project Identifying Information:
   a) Site Name/Project Name: Environmental Remediation Services, Yakima Training Center Off-Installation Per- and Polyfluoroalkyl Substance Sampling
   b) Site Location: Yakima Training Center, Yakima, Washington
   c) Contract/task order number: Contract No. W912DW22D1006, Task Order W912DW22F2121

2) Lead Organizations: USACE, USAEC, and YTC

   a) USACE Program Manager, Seattle District – Jake Williams

   _____
   Date

   b) Army IRP Manager, JBLM – Mark Mettler

   _____
   Date

   c) Army IRP Manager, YTC – Guadalupe Lara

   _____

   d) USAEC Environmental Command Engineer, San Antonio – Mike Brown

   _____
   Date

3) List plans and reports from previous investigations relevant to this project.

Author/Title	Date
Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, USAEC PFAS PA/SI Active Army Installations, Nationwide, USA, (Arcadis, 2019).	October 2019
Programmatic Uniform Federal Policy-Quality Assurance Project Plan Off-Post Private Well Investigations of Per- and Polyfluoroalkyl Substances (PFAS) In the Cleanup/Restoration Programs at Active Army Installations, Nationwide (SERES-Arcadis, 2021)	May 2021
Uniform Federal Policy-Quality Assurance Project Plan Addendum Off-Post Sampling USAEC Per- and Polyfluoroalkyl Substances Joint Base Lewis McChord – Yakima Training Center, Washington (SERES-Arcadis, 2022)	July 2022

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QAPP ADDENDUM WORKSHEET #3 & #5: PROJECT ORGANIZATION AND QAPP DISTRIBUTION

(UFP-QAPP Manual Section 2.3 and 2.4)

Figure 2 - Project Organizational Chart
Environmental Remediation Yakima Training Center
Off-Installation Per- and Polyfluoroalkyl Substance Sampling
Yakima Training Center, Washington

USACE – Seattle District

Interim Program Manager
Nick Alfino, PE

Program Quality Control Officer
Gerald Zimpfer, PhD

Program Technical Manager
Nick Alfino, PE

Project Manager
Allison Wren

Project Team

Project Chemist/Quality Control – Sampling
Mary Schneider, CMQ/OE, CQA

Field Team Leader/Environmental Engineer
Michelle Schwartz, Ph.D., EI

GIS Specialist
Graham Washburn

Legend

Lines of Authority
Lines of Communication
Tanaq Personnel
Sundance Personnel

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Table 2: Contact Information for Government and JV Team Members

Government Team Members		
Name	**Phone/Email**	**Role/Responsibility**
Jake Williams USACE Seattle	(206) 316-3157 Jacob.a.williams@usace.army.mil	Project Manager/Contracting Officer Representative
Guadalupe Lara Army YTC	(509) 577-3544 guadalupe.a.lara3.civ@army.mil	IRP Program Manager
Mark Mettle Army JBLM	(253) 966-8004 mark.a.mettler2.civ@army.mil	IRP Program Manager
Mike Brown USAEC San Antonio	(210) 793-7896 michael.k.brown2.civ@army.mil	Environmental Command Engineer
Tanaq-Sundance 8a JV Team Members		
Allison Wren	(619) 577-4134 awren@tanaq.com	Project Manager
Nick Alfino, PE	(720) 277-2951 nalfino@tanaq.com	Program Technical Manager
Gerald Zimpfer, Ph.D.	(303) 717-2831 gzimpfer@tanaq.com	Program Quality Control Officer
Mary Schneider, CMQ/OE, CQA	(909) 782-8545 mary.schneider@inyainc.com	Project Chemist
Michelle Schwartz, Ph.D.	(303)525-7108 mschwartz@tanaq.com	Field Team Leader

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Table 3: Personnel Responsibilities and Qualifications Table

Name and Contact Information	Telephone/E-Mail	Roles/Responsibilities
Allison Wren	(619) 577-4134 awren@tanaq.com	**Project Manager** • Project-dedicated POC • Meet contractual obligations • Develop, update, and maintain compliance with project work breakdown structure and schedule • Prepare/submit daily/monthly/weekly progress and cost reporting and required periodic reports • Implement procedures to eliminate conflicts, errors, and omissions and ensure accuracy of output • Maintain communication and coordination with all government stakeholders, including USAEC and USACE • Review all invoices and cost details • Support/implement project controls on a day-to-day basis • Perform day-to-day project communication tasks • Lead day to day coordination of tasks, field work, and deliverables
Nick Alfino, PE	(720) 277-2951 nalfino@tanaq.com	**Technical Manager** • Provide technical input on development of plans, templates, and reports • Perform technical review of all project deliverables and verifying that technical and editorial comments regarding work products have been implemented
Gerald Zimpfer, Ph.D.	(303) 717-2831 gzimpfer@tanaq.com	**Program Quality Control Officer** • Establishing and maintaining the TSJV Quality Program • Serving as a focal point for guidance and coordination for quality matters across all projects, and resolving quality issues • Monitoring QC activities to ensure conformance with contract requirements, rules, regulations, policies, and procedures, and recommending improvements, as necessary • Identifying nonconformances, and verifying and documenting appropriate corrective actions taken • Stopping work or requiring re-performance of any nonconforming activity resulting from improper application of prescribed procedures

Mary Schneider	(909) 782-8545 mary.schneider@inyainc.com	**Project Chemist** • Ensures the project meets objectives from the standpoint of laboratory performance • Provide technical input to the Project Team on data quality and project chemistry • Ensuring appropriate methods are specified for obtaining data of known quality and integrity • Monitors and evaluates performance of off-site laboratories • Reviews laboratory data • Reviews data validation reports • Prepares data quality assessment report to ensure the quality of data meets the intended use of the data • Recommends appropriate laboratory corrective actions
Michelle Schwartz	(303)525-7108 mschwartz@tanaq.com	**Field Team Leader** • Supervises, coordinates, and performs field sampling activities • Ensures that all health and safety requirements applicable to the field work are implemented • Coordinating and overseeing all field activities, including training, equipment maintenance, and recordkeeping • Completing or directing completion of daily field sheets, checklists, log books, and other field documentation • Overseeing implementation and enforcement of the PQAPP and QAPP addendum • Directing field team members during sampling • Identifies and resolves problems in the field; resolves difficulties through consultation with the Project Team; implements and documents corrective actions related to field work; and serves as communication link between the field team and project management

QAPP ADDENDUM WORKSHEET #4, 7 & 8: PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

Organization: USACE, USAEC

Name	Agency	Project Title/Role	Signature*/Date
Jake Williams	USACE Seattle	Project Manager/Contracting Officer Representative	
Guadalupe Lara	Army YTC	IRP Program Manager	
Mark Mettler	Army JBLM	IRP Program Manager	
Mike Brown	Army San Antonio	Environmental Command Engineer	

Organization: Tanaq Sundance 8a JV

Name	Project Title/Role	Education/Experience	Signature*/Date
Allison Wren	PM	B.S. Physical Geography, Environmental Studies, and Methods of Geographical Analysis. 16 years of experience managing DoD Hazardous, Toxic, and Radioactive Waste projects and contracts.	
Nick Alfino	Technical Manager	B.S. Environmental Engineering. 6 years of experience with site characterization and emerging contaminants, including PFAS projects for USACE, USAEC, and Air Force Civil Engineer Center. Professional Engineer: Colorado	
Mary Schneider	Project Chemist	B.S. Chemistry. 33 years of environmental chemistry experience in coordination with Air Force Civil Engineer Center, USACE, and NAVFAC.	
Michelle Schwartz	Field Team Leader	B.S. Environmental Engineering, M.S. Civil and Environmental Engineering, Ph.D. Civil engineering with 5 years of experience in environmental engineering research and sociotechnical design.	

Organization: Eurofins Lancaster Laboratories Environmental (ELLE)

Name	Project Title/Role	Education/Experience	Signature*/Date
Stephen Gordon	Laboratory PM	B.S. Chemistry; 25 years of experience with analytical chemistry, and six years of experience as a project manager with ELLE handling DoD Projects.	
Kenneth Boley	Laboratory Quality Manager	B.S. Chemistry, 21 years of experience in the environmental laboratory.	

*Signatures indicate personnel have read and agree to implement this QAPP as written

QAPP ADDENDUM WORKSHEET #6: COMMUNICATION PATHWAYS

(UFP-QAPP Manual Section 2.4.2)

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathways, etc.)
Technical lead decisions and modifications	USACE	Jake Williams, PM	(206) 316-3157 jacob.a.williams@usace.army.mil	Primary point of contact for USACE and contact for stakeholders, as required. Communicate technical lead decisions and modifications to the USACE and/or JV, as necessary.
Aid in technical decisions and modifications	Army	Guadalupe Lara, YTC IRP Manager Mark Mettler, JBLM IRP Manager Mike Brown, JBLM Environmental Command Engineer	(509) 577-3544 guadalupe.a.lara3.civ@army.mil (253) 966-8004 mark.a.mettler2.civ@army.mil (210) 793-7896 michael.k.brown2.civ@army.mil	Aid in technical decisions and modifications.
Project issues	TSJV	Nick Alfino - Technical Manager Allison Wren, PM	(720) 277-2951 nalfino@tanaq.com (619) 577-4134 awren@tanaq.com	The project team will notify USACE PM and ARMY team of any project issues.
Minor field modifications not affecting data usability or quality	TSJV	see **Worksheet #3 & 5**	see **Worksheet #3 & 5**	Secure same-day verbal approval from the PM.

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathways, etc.)
Field modifications affecting drinking water data usability or quality	TSJV	see **Worksheet #3 & 5**	see **Worksheet #3 & 5**	Secure same-day verbal approval from the PM and Technical Manager. These will also include notification and/or approval from USACE PM. When the USACE PM cannot be reached for approval in a timely matter as to not affect the field schedule, notification may be sufficient via email and voicemail. The PM will secure approval for modifications to the PQAPP addendum as necessary from USACE. All approved modifications will be included in the amendments to the PQAPP addendum and approved within seven working days.
Field progress reports	TSJV	Michelle Schwartz, Field Team Leader	(303) 525-7108 mschwartz@tanaq.com	Field Team Leader will send field progress reports via email on a daily basis to the USACE and Army POCs.
Stop work due to safety issues	TSJV	Michelle Schwartz, Field Team Leader	(303) 525-7108 mschwartz@tanaq.com	Work may be stopped at any time for any safety concern. Refer to the APP submitted for specifics related to health and safety. Persons other than the responsible entity may also stop work for safety concerns. USACE will be notified by the PM within one hour of any significant safety-related work stoppages and will be consulted prior to re-starting work.
PQAPP and Addendum changes prior to field work	TSJV	Allison Wren, PM	(619) 577-4134 awren@tanaq.com	Submit documented amendments within 10 working days for transmittal to USACE and Army for approval.
PQAPP addendum changes during project execution	TSJV	Allison Wren, PM	(619) 577-4134 awren@tanaq.com	Secure same-day approval from PM. PM will secure approval for modifications to the PQAPP and Addendum as necessary from USACE.

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathways, etc.)
Field corrective actions	TSJV	Michelle Schwartz, Field Team Leader Allison Wren, PM	(303) 525-7108 mschwartz@tanaq.com (619) 577-4134 awren@tanaq.com	The Field Team communicates stop work immediately to the PM by phone followed by inclusion in daily field progress report. Resolution of the corrective action will be determined by the PM in consultation with the USACE and may be documented on a non-conformance and/or corrective action report, depending on significance. Work will be allowed to start once all parties have agreed to the resolution.
Sample receipt variances	ELLE	Stephen Gordon, PM	(724) 597-2027 StephenGordon@EurofinsUS.com	All project field samples variance issues will be reported by the laboratory to the Project Chemist within two business days of identification of the technical concern.
Laboratory QC variances	ELLE	Stephen Gordon, PM	(724) 597-2027 StephenGordon@EurofinsUS.com	All QA/QC issues with project field samples will be reported by the laboratory to the Project Chemist within two business days of identification of the technical concern.
Analytical corrective actions	ELLE	Stephen Gordon, PM	(724) 597-2027 StephenGordon@EurofinsUS.com	The need for laboratory corrective actions will be determined by the Project Chemist and PM and/or Laboratory PM, as appropriate, and will be documented in a memorandum to the Technical Manager. The PM will notify USACE if the changes to the data impact reports/data that have already been submitted. Otherwise, the memorandum will be included with the validated data.

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathways, etc.)
Data verification issues, e.g., incomplete records	ELLE	Stephen Gordon, PM	(724) 597-2027 StephenGordon@EurofinsUS.com	All verification issues will be reported by the laboratory to the Project Chemist via e-mail within 24 hours of identification of the technical concern. The Technical Manager will be notified of the issue by the PM and will take appropriate action, if necessary.
Data validation issues, e.g., non-compliance with procedures	TSJV	INYA, Data Validator Mary Schneider, Project Chemist	626-755-3929 909-782-8545 mary.schneider@inyainc.com	All validation issues will be reported by the Data Validator to the Project Chemist and PM via email within 24 hours of identification of the technical concern. The Technical QC Manager will be notified of the issue by the Data Validator and will take appropriate action, if necessary.
Data review corrective actions	TSJV	INYA, Data Validator Mary Schneider, Project Chemist	626-755-3929 909-782-8545 mary.schneider@inyainc.com	The need for data review corrective actions will be determined by the Project Chemist and Laboratory PM, as appropriate, and will be documented in a memorandum to the PM. The Technical Manager will be notified of the issue by the PM and will take appropriate action, if necessary.

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QAPP ADDENDUM WORKSHEET #14 & 16: PROJECT TASKS & SCHEDULE

(UFP-QAPP Manual Section 2.8.2)

Activity	Responsible Party	Planned Start Date[1]	Planned Completion Date	Deliverables(s)	Deliverable Due Date
Task 1					
Residential Mailings: Sampling Permission Letters (Task 1) (only required for new residences not previous sampled	USACE/Army	May 2023	May 2023	Sampling Permission Letter)	Timed Closely to Public Meeting (if scheduled by the installation)
Drinking Water Well Sampling (Task 1)	TSJV	May 2023	July 2023	Field notes	Included with the Off-Installation Private Well Investigation Annual Report
Data Analysis and Validation (Task 1)	TSJV	August 2023	October 2023	Electronic laboratory results, electronic data deliverables	Up to six weeks, expedited validation if results are greater than the USEPA lifetime HA
Reporting (Task 1)	TSJV	October 2023	November 2023	Electronic interim residential analytical results sheets and Off-Installation Private Well Investigation Letter Report	Upon receipt of validated data
Alternative Drinking Water Provision (Task 1)	TSJV	November 2023	December 2023	Alternative drinking water source provision may include bottled water delivery (and cooler dispenser rental)	Within one week of validated results above the LHA
Task 6a					
Residential Mailings: Sampling Permission Letters (Task 6a) (only required for new residences not previous sampled	USACE/Army	June 2023	July 2023	Sampling Permission Letter	Timed Closely to Public Meeting (if scheduled by the installation)

Activity	Responsible Party	Planned Start Date[1]	Planned Completion Date	Deliverables(s)	Deliverable Due Date
Drinking Water Well Sampling (Task 6a)	TSJV	July 2023	July 2023	Field notes	Included with the Off-Installation Private Well Investigation Annual Report
Data Analysis and Validation (Task 6a)	TSJV	August 2023	October 2023	Electronic laboratory results, electronic data deliverables	Up to six weeks, expedited validation if results are greater than the USEPA lifetime HA
Reporting (Task 6a)	TSJV	October 2023	November 2023	Electronic interim residential analytical results sheets and Off-Installation Private Well Investigation Letter Report	Upon receipt of validated data
Alternative Drinking Water Provision (Task 6a)	TSJV	November 2023	December 2023	Alternative drinking water source provision may include bottled water delivery (and cooler dispenser rental)	Within one week of validated results above the LHA

Notes:
1. Planned start dates are estimated. Exact dates are not established at this time.

QAPP ADDENDUM WORKSHEET #17: SAMPLING DESIGN AND RATIONALE

(UFP-QAPP Manual Section 3.1.1)

The data quality objectives (DQOs) for the off-Installation sampling are described in Worksheet #11 of the PQAPP (SERES-Arcadis, 2021). This worksheet provides the detailed rationale and approach for off-Installation private well sampling at YTC. The planned project schedule to complete the off-Installation private drinking water well sampling for YTC is provided in Worksheet #14 & 16 of this QAPP Addendum. Necessary permission letters, forms, or other project documentation, subcontracts, or project equipment will be procured before mobilization.

JBLM YTC SI Background

The Army conducted a combined PA/SI at YTC from 2018 to 2020 in accordance with CERCLA to assess potential impacts from per- and polyfluoroalkyl substances (PFAS) (Arcadis, 2021). PFOS and PFOA are two pollutants or contaminants included in the larger class of PFAS. The SI sampling at YTC indicated detections of PFOS and PFOA in groundwater at concentrations where analysis of hydrological conditions identified possible impacts to off-Installation drinking water wells. To evaluate possible PFOS/PFOA impacts from YTC to off-Installation drinking water sources, the Army conducted off-Installation sampling at private drinking water wells that appear to be hydrologically connected to groundwater beneath YTC based on the understood groundwater flow direction. The Army conducted three phases of sampling of 295 off-Installation drinking water wells between September 2021 and August 2022. The U.S. Environmental Protection Agency's (USEPA) lifetime health advisory (HA) is 70 nanograms per liter (or parts per trillion) individually or combined if both are detected in drinking water. The results of the sampling indicated that 61 wells (serving 79 locations) had detections of PFOS and/or PFOA which exceeded the USEPA lifetime HA. The Army is currently mitigating exposure to PFOS/PFOA greater than the USEPA lifetime HA in drinking water. Bottled water is being provided as an alternative drinking water source until PFOS/PFOA levels in drinking water from an Army source no longer exceed the USEPA lifetime HA.

Under this contract, drinking water samples will be collected from approximately 470 residential locations be determined prior to each sample event (including Class A and Class B wells).

- Task 1 – Private Residence Well Monitoring - sampling and analysis for up to 350 residential wells identified by the government.
- Task 6a – Quarterly Private Residence Well Monitoring - quarterly sampling and analysis for up to 120 wells identified by the government.

One sample will be collected per well and analyzed for PFAS compounds combined with sufficient quality control samples in accordance with the approved PQAPP (SERES-Arcadis, 2021). Validated sample results with associated data validation reports will be transmitted for government review and approval along with a draft sample results letter for USACE PM signature within 30 calendar days of receiving data. After the USACE PM signs the inspection/sample results letters, the Government will deliver the letter in person while offering bottled water to affected residents, if needed.

Private Residence Well Monitoring Sampling Procedures

Private Residential well monitoring samples will be raw samples collected from a tap or port closest to the well water, prior to the water flowing through a treatment system (if present) and prior to the conveyance lines entering the residence (if practicable) or purging and sampling after field parameters are stabilized using a pump. Samples will be collected in accordance with the field SOPs provided in Appendix B to the PQAPP. Field reagent blanks will also be collected in accordance with the PFAS Field Sampling Guidance. These SOPs were developed in accordance with applicable USEPA and DoD guidance for residential sampling and/or sampling for PFAS. All samples will be collected in laboratory-provided bottleware. Water samples collected from a chlorinated source will be collected in a laboratory provided container with Trizma® preservative.

Components of some SOPs may require modification or be superseded by the PFAS sampling technical guidance instruction (Appendix B to the PQAPP) to accommodate most current PFAS-specific sampling requirements. The sampling methods described in the SOPs establish procedures for containers before sampling; sampling procedures; equipment blank samples and field duplicate collection requirements; and requirements for storing samples to ensure that sample contamination does not occur during collection and transport. A private well sampling log (Attachment 1) will be completed for each sample collected. The sampling procedures include collection of water quality parameters prior to sample collection.

All field activities will be conducted in accordance with the approved Accident Prevention Plan and installation specific Site Safety and Health Plan (TSJV, 2023). A post-activity inspection will be conducted by the field team to ensure each location is left clean. The investigation team will demobilize once sampling is completed. Samples will be submitted for laboratory analysis, and the results will be compiled and summarized in the Sampling Letter Report, Quarterly Report, and Annual Report. The reports will present the validated sampling results, including for QA/QC samples.

Laboratories
ELLE will be the primary laboratory. This laboratory will analyze the drinking water samples for PFAS constituents (including PFOS/PFOA) using USEPA Method 537.1 and in accordance with the DoD Quality Systems Manual (QSM) version 5.4. The TSJV team will validate the data from the laboratory in accordance with DoD General Data Validation Guidelines (DoD, 2019) and DoD Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD, 2020). The data validation reports will be included in the deliverable reports. The validated data will be provided in National Defense Authorization Act (NDAA) Section 345 within 3 days of receiving the validated data packages from the data validator.

QAPP ADDENDUM WORKSHEET #18: SAMPLING LOCATIONS AND METHODS

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)

The residential wells to be sampled have not been identified by the government at this time. Samples for each resident location will be identified using the following scheme:

YTC-OFFI-XXX-DW-MMDDYY where:
YTC – Yakima Training Center, OFFI = Off Installation, XXX = resident location number, DW = drinking water, and MMDDYY = month, day and year of sample collection.

Site Location	Matrix	Sample ID	Sample Method	Sample Type	No. of Samples
Task 1 – Private Residence Well Monitoring					
Resident XXX [1]	Drinking Water	YTC-OFFI-XXX-DW-MMDDYY	TBD [2]	N	1
Task 6 – Quarterly Private Residence Well Monitoring					
Resident XXX [1]	Drinking Water	YTC-OFFI-XXX-DW-MMDDYY	TBD [2]	N	1

Notes:
1. Residential wells to be sampled have not been identified and will be assigned by the USACE and Army prior to each Task event. A three-digit resident location number will be assigned to each well. New sample IDs will begin in sequential order following the last sample ID from the most recent sample event. Repeat samples will use the same three-digit resident location number as previously assigned and the date will designate the sample phase.
2. Sample type to be determined based on the whether a port is available at each location.

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QAPP ADDENDUM WORKSHEET #20: FIELD QC SUMMARY

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)

Primary and QC samples will be collected at the frequencies noted below during field activities. Field duplicates, matrix spike (MS), and matrix spike duplicate (MSD) will be collected at a frequency of 1 per 20 primary samples. Field reagent blank will also be collected at a frequency of 1 per 20 samples.

Matrix	Analytical Group	Environmental Samples	Field Duplicates	MS/MSD	Field Reagent Blanks	Total # of Analyses
Task 1 – Private Residence Well Monitoring						
Drinking Water	PFAS	Up to 350	TBD	TBD	TBD	TBD
Task 6 – Quarterly Private Residence Well Monitoring						
Drinking Water	PFAS	Up to 120	TBD	TBD	TBD	TBD

Notes:

TBD = The number of field QC sample collected will be determined based on the number of environmental samples collected.

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QAPP ADDENDUM WORKSHEET #23: ANALYTICAL SOP REFERENCES

SOP Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix/Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
F-PFAS-WI25232	Perfluorinated Alkyl Substances (PFASs) in Drinking Water by Method 537.1, Version 8, 30 December 2022	Definitive	PFAS-Aqueous	LC/MS/MS	ELLE	N

Note: Copies of the laboratory SOPs are included in Attachment 2

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QAPP ADDENDUM WORKSHEET #31, 32 & 33: ASSESSMENTS AND CORRECTIVE ACTION

Assessments					
Assessment Type	**Responsible Party & Organization**	**Number/Frequency**	**Estimated Dates**	**Assessment Deliverable**	**Deliverable Due Date**
Data validation	TSJV	Per SDG	Following receipt of laboratory report	Data Validation Report	Three weeks after receipt of data.

Assessment Response and Corrective Action					
Assessment Type	**Responsibility for Responding to Assessment Finding**	**Assessment Response Documentation**	**Timeframe for Response**	**Responsibility for Implementing Corrective Action**	**Responsible for Monitoring Corrective Action Implementation**
Review of PQAPP and SOPs with field staff	PM	Field progress report, non-conformance report, or CA report dependent on significance of finding	Within 24 hours	Field Team Leader	PM
Daily logbook and field forms	Field Team Leader	Field progress report, non-conformance report, or CA report dependent on significance of finding	Within 24 hours	Field Team Leader	PM
Laboratory assessment for appropriate certifications and capacity and PQAPP review with laboratory staff	ELLE PM	Response to email	Within 48 hours of notification	PM ELLE PM	Project Chemist

Assessment Type	Responsibility for Responding to Assessment Finding	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for Monitoring Corrective Action Implementation
Field sampling and chain or custody review against QAPP addendum requirements	PM	Response to email	Within 24 hours after sampling	Field Team Leader	PM
Laboratory report deliverables and analytical results review against QAPP addendum requirements	ELLE PM	If required, laboratory reports will be amended, and corrections noted in the case narrative.	Within 72 hours after notification	ELLE PM	INYA
Data verification	ELLE PM	If required, laboratory reports will be amended, and corrections noted in the case narrative and contained within the validation report.	Up to 7 days	ELLE PM	INYA
Data validation	ELLE PM	If required, laboratory reports will be amended, and corrections noted in the case narrative and contained within the validation report.	Up to 7 days	ELLE PM	INYA

QAPP ADDENDUM WORKSHEET #35: DATA VERIFICATION PROCEDURES

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Field logbook	PQAPP	• Verify that records are present and complete for each day of activities. • Verify that all planned samples including QC samples were collected and that sample collection locations are documented. • Verify that meteorological data were provided for each day of field activities. • Verify that changes/exceptions are documented and were reported in accordance with requirements. • Verify that any required field monitoring was performed, and results are documented.	Daily: Field Team Leader
Chain of Custody (COC) forms	PQAPP	• All samples to be analyzed by the laboratory will be shipped via overnight delivery or will be sent via the laboratory courier service. • Upon receipt, the laboratory sample custodian will check the integrity of the custody seals and will sign and date the COC to acknowledge sample receipt. • The laboratory is responsible for verifying that the COC and containers agree and that the sample containers are received in good condition. • The sample receipt form will be sent to the PM prior to preparation for analysis. • The Laboratory Information Management System will provide evidence of sample custody form receipt by the laboratory until appropriate disposal.	Daily: Field Team Leader Upon receipt: ELLE PM

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Laboratory Non-conformance/CA and report procedure	PQAPP	• Routine corrective actions apply to all analytical quality control parameters and analytical system specifications as defined in the laboratory SOPs. • Analysts have full responsibility and authority for performing routine CAs, which are documented as part of the analytical record. • Defective processes, holding time violations, systematic errors and quality defects that occur are to be reported by the analyst to the laboratory supervisor and a non-conformance record initiated. The laboratory PM will then notify the PM and/or Project Chemist. • All notifications must be made in a timely manner. The non-conformance record must become part of the analytical record.	Before release: Kenneth Boley Upon receipt: Mary Schneider
Analytical Data Package – Laboratory	PQAPP Lab QA Manual, Lab SOP	• All data produced by the laboratory will be required to undergo several levels of review, which will include two levels of management review at the laboratory. • The laboratory will review the data packages internally for completeness and verify that all of the required forms and raw data are included for each data package type.	Before release: Stephen Gordon
Analytical Data Package/Laboratory QC	PQAPP Lab QA Manual, Lab SOPs	• The Data Validator will verify that data have been received for all samples sent to the laboratory. • An evaluation of this data will be performed to determine whether the laboratory met the QC requirements as stated in this PQAPP, DoD QSM 5.4, analytical methods and laboratory SOPs.	Stephen Gordon
Laboratory EDD	PQAPP	• The laboratory will provide EDDs. The database manager or designee will review these files for correctness and completeness.	Julianne Ryan

Note: All required data deliverables must be present in the data package to proceed to the next step of data validation (**Worksheet # 36**).

QAPP ADDENDUM WORKSHEET #36: DATA VALIDATION PROCEDURES

(UFP-QAPP Manual Sections 5.2.2)

Data Validator: INYA

Analytical Group/Method:	PFAS/EPA method 537.1
Data deliverable requirements:	Stage 4 Data Package(pdf); SEDD Version 5.2 Stage 4
Analytical specifications:	PFAS per EPA Method 537.1
Measurement performance criteria:	PQAPP Worksheets 12 and 28
Percent of data packages to be validated:	100% (10% Stage IV and 90% Stage 2B)
Percent of raw data reviewed:	10%
Percent of results to be recalculated	10%
Validation procedure:	PQAPP, DoD QSM 5.4, DoD General Data Validation Guidelines, DoD Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15, USACE Engineer Manual 200-1-10

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REFERENCES

Arcadis, 2021. Final Preliminary Assessment and Site Inspection of Per- and Polyfluoroalkyl Substances, Yakima Training Center. October.

Department of Defense (DoD), 2020. Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15. May.

DoD, 2021. Quality System Manual, Version 5.4. December.

SERES-Arcadis 8(a) JV (SERES-Arcadis). 2021. Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Off-Post Private Well Investigation of Per- and Polyfluoroalkyl Substances (PFAS) In the Cleanup/Restoration Programs at Active Army Installations, Nationwide. May.

SERES-Arcadis. 2022. Uniform Federal Policy- Quality Assurance Project Plan Addendum Off-Post Sampling USAEC Per- and Polyfluoroalkyl Substances Joint Base Lewis-McChord – Yakima Training Center, Washington. July 2022.

Tanaq-Sundance 8(a) JV (TSJV), 2023. Final Project Management Plan, Environmental Remediation Services Yakima Training Center Off-Installation Per- and Polyfluoroalkyl Substance Sampling, Yakima, Washington. February.

USACE, 2012. Periodic Review Report, Yakima Training Center, Yakima, Washington. September.

USEPA. 2018. Data Review and Validation Guidelines for PFAS Analyzed Using for EPA Method 537. November.

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ATTACHMENT 1

Field Forms and Well Inventory Form

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Tailgate/Safety Meeting Attendance Form

Tanaq-Sundance 8(a)
Joint Venture, LLC

Facility Name: _____ Date: _____
Project Number: _____
Project/Task Order Manager: _____
Field Operations Leader: _____
Site Safety and Health Officer: _____
Type of Tasks Being Conducted Today: _____
_____

Item Number	Topic discussed	Presenter	Action Item	Responsible Party (Correction)	Completion Date for Corrective Measure

Comments: _____
_____
_____
_____
_____

ATTENDEE'S NAME	JOB TITLE	AFFILIATION	SIGNATURE

Tanaq-Sundance 8(a)
Joint Venture, LLC

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME		PROJECT NO.:	

Date of Calibration	Instrument Name and Model	Instrument Identification Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

Tanaq-Sundance 8(a)
Joint Venture, LLC

GROUNDWATER LEVEL MEASUREMENTS LOG

Type of organic vapor meter used (circle): PID FID

Well Identification Number	Organic Vapor Information		Water Level Information								
					Depth to Groundwater Information						
	PID/FID Reading (ppm)	Date	Well previously equilibrated? (Yes/No)	If not previously equilibrated, pressure detected when cap removed? (NA/Yes/No)	Time	Date	Depth to Groundwater[1] from Pump Platform or Riser, if present (feet)	Thickness of Pump Platform or Riser, if present (feet)	Depth to Groundwater[1] from Top of PVC Casing (feet)	Depth to Well Bottom from Top of PVC Casing[2] (feet)	Well Diameter and Casing Measurements

Notes: 1 Where bladder pump sampling platform or riser is present, depth to water must be corrected to depth from top of PVC casing.
2 Note if access to well bottom is limited by presence of dedicated bladder pump.

Field Staff: _____ **Field Staff Signature:** _____

Page No.: _____ **Date:** _____

Tanaq-Sundance 8(a)
Joint Venture, LLC

RESIDENTIAL WELL SAMPLING SHEET

Site Name: _____ **Date/Time of Sample Collection:** _____

Well No.: _____ **Sample ID:** _____

Depth to Well Bottom: _____ ft. below TOC **PID Reading TOC (ppm):** _____

Depth to Water: _____ ft. below TOC

Well diameter and casing details: _____

Location of Sample: _____

Minimum Purge Volume Calculation:

[Length of tubing (ft) x 9.5 (mL/ft) + 130mL] / 1000 mL/L = Total required purge volume (L) before collection of parameters

Minimum Purge Volume: _____

Pump Control Box Settings: Refill = _____ Discharge= _____ Throttle= _____

Total Purged: _____ **Purge Rate Goal = 0.5 L/min. Actual purge rate:** _____

PHYSIO-CHEMICAL PARAMETERS DURING PURGING									
Measure in order listed:		**Initial**						**Stabilization Criteria**	**Final**
Time									
Water Level (ft. below TOC)									
Flow (mL/min)									
Temperature (°C)								+/- 1.0 °C	
pH								+/- 0.1	
Spec. Cond. (mS/cm)								+/- 10%	
Turbidity (NTU)								+/- 10%	
ORP (mV)								+/- 10%	
DO (mg/L)								+/- 10%	
Total Volume Purged (L)									

QA/QC Sample Collected Here? ☐ **Duplicate** ☐ **MS/MSD** ☐ **Equipment Blank** ☐ **No QA/QC Sample**

Sample(s) collected by: _____

Comments (odors, colors, sediment): _____

Resident Questionnaire: Well Inventory Update

Contact Information

▪ Contact Name		▪ Email Address		
		▪ Phone Number	cell	home
▪ Property Address City, State, Zip Code		▪ Do you prefer to speak in English, Spanish, or other?		
▪ Are you the property owner or renting?		▪ Would you like a translator for the home site visit?		
▪ If renting, provide the owner's name and phone number		▪ To help plan for the home site visit, indicate your availability (yes or no)	M-F January 23-27, 2023 ☐ Yes ☐ No M-F January 30-Februay 01, 2023 ☐ Yes ☐ No M-F February 6-10, 2023 ☐ Yes ☐ No M-F February 13-17, 2023 ☐ Yes ☐ No	
▪ Number of Full-Time residents living at the property serviced by the well		▪ Number of Part-Time residents living at the property serviced by the well, and what seasons they are present		

Well Information

Note: These questions are presented to the well owner to provide key information that will be used to assist the government in evaluating drinking water solutions at your property. Site visits will be scheduled following receipt of this questionnaire to confirm the information provided and collect any information you might not have an answer to at this time.

Please provide as much detail as possible. If you do not know the detailed information for a specific item, please indicate it as unknown. Unknown information will be collected during the site visit.

▪ Well Location: Describe where your well is located, in relation to your property. For example, "northwest corner, 30 feet (ft) from the home" or draw a diagram of the home and well location. ▪ Where is your pump system located (for example, a pump house, below ground, inside residence)? ▪ Where is your pressure tank located?	
▪ Number of buildings on your property connected to your well (garage or storage buildings with water connection)?	
▪ Number of other properties or parcels connected to your well?	
▪ Year your home was constructed?	
▪ Date your well was originally installed? ▪ Do you have a copy of the Well Completion Report (Log) Form?	
▪ Well Construction: ▪ What is the diameter of your well? ▪ What is the total depth of your well? ▪ What is the screened interval of your well?	 Diameter (in) Depth (ft) Screen interval (ft)
▪ Well Maintenance: ▪ Has your well ever been serviced or inspected? ▪ Has the water level in your well been measured recently? ▪ Is the well accessible for water level gauging?	
▪ What is the best location to collect a water sample from your well? (for example, a hose bib, or sampling port)?	
▪ Do you currently operate any type of water treatment system (ultra-violet light, sediment filter, water softener, etc)? ▪ If treatment is present, is there a spigot or other sampling point available before treatment?	

Resident Questionnaire: Well Inventory Update

Tanaq-Sundance 8(a)
Joint Venture, LLC

Well Information (continued)

▪What is your well yield (gallons per minute)?	
▪What is your well demand and total water use?	
▪Are you satisfied with your water pressure (is your well yield sufficient)?	
▪What is the working pressure of your water system?	
▪Is your well water used for livestock on the property? ▪If well water is used for livestock, what are the types and number of animals on the property?	
▪Is your well water used for agriculture and/or gardening on the property?	

Potential Treatment System Location

Note: These questions do not commit the government to the installation of a treatment system at the residence. These questions are presented to the well owner to provide key information that will be used in part to assist the government in determining if a treatment system is an appropriate solution for your well.

Point of Entry Treatment (POET) Systems generally include a Granular Activated Carbon (GAC) tank, sediment filter, UV filtration, and other large components (such as system piping, water softener, treatment tank, etc.), which collectively encompass approximately 50 square ft (5 ft by 10 ft area).

▪Is there space within a utility room, garage, basement, or another enclosed structure where the system could be installed?	
▪Please provide a detailed description or diagram of the area identified above. If possible, please include the location of the well in the diagram.	
▪Is the area identified above weatherproof and/or temperature controlled (maintained above 50° F)?	
▪What is the distance (in feet) between the location identified above and the well?	
▪Is power available at the location identified?	
▪Is the area easily accessible?	
▪Are there other considerations that the government should be aware of when determining a potential location for a treatment system?	

ATTACHMENT 2

Analytical Laboratory Quality Assurance Plans and SOPs

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SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

EUROFINS LANCASTER LABORATORIES ENVIRONMENT TESTING LLC
2425 New Holland Pike
Lancaster, PA 17601
Kenneth Boley Phone: 717-556-9413

ENVIRONMENTAL

Valid To: November 30, 2024 Certificate Number: 0001.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the laboratory's compliance with the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.4 of the DoD/DOE 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

Atomic Absorption/ICP-AES Spectrometry, ICP-MS Spectrometry, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Misc.-Electronic Probes (pH, F^-, O_2), Oxygen Demand, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, TCLP, Total Organic Carbon, Turbidity, Liquid Chromatography/Mass Spectrometry/Mass Spectrometry, High Resolution Gas Chromatography/Mass Spectrometry

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Demands				
COD	----------	EPA 410.4	EPA 410.4	----------
Total Organic Carbon	----------	EPA 9060A SM 5310C-2014	EPA 9060A SM 5310C-2014	EPA 9060A Lloyd Kahn
Anions				
Ammonia	----------	EPA 350.1	EPA 350.1	SM 4500-NH3 B/C-2011
Fluoride	----------	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A
Nitrate (as N)	----------	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 9056A
Nitrite (as N)	----------	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 9056A

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nitrate Nitrite Total	----------	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056A	EPA 300.0 EPA 9056A
Bromide	----------	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A	----------
Chloride	----------	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A
Sulfate	----------	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A	EPA 300.0 EPA 9056A
Wet Chemistry				
Acid Volatile Sulfide	----------	----------	EPA-821-R-91-100	EPA-821-R-91-100
AVS-SEM Distillation	----------	----------	EPA-821-R-91-100	EPA-821-R-91-100
Alkalinity	----------	SM 2320B-2011	SM 2320B-2011	----------
Biochemical Oxygen Demand (BOD)	----------	SM 5210B-2016	SM 5210B-2016	----------
Carbonaceous Biochemical Oxygen Demand (CBOD	----------	SM 5210B-2016	SM 5210B-2016	----------
Corrosivity	----------	----------	SW-846 Chapter 7	SW-846 Chapter 7
Conductivity	----------	SM 2510B-2011	SM 2510B-2011	----------
Cyanide	----------	EPA 9012B	EPA 9012B	EPA 9012B
Ferrous Iron	----------	SM 3500Fe B-2011	SM 3500Fe B-2011	----------
Filterable Residue (TDS)	----------	SM 2540C-2015	SM 2540C-2015	----------
Flashpoint	----------	EPA 1010A/B	EPA 1010A/B	EPA 1010A/B
Grain Size	----------	----------	----------	ASTM D422 MOD
Hardness	----------	EPA 130.2 SM 2340B-2011 SM 2340C-2011	EPA 130.2 SM 2340B-2011 SM 2340C-2011	----------
HEM (Oil&Grease)	----------	EPA 1664B	EPA 1664B	EPA 9071B
Hexavalent Chromium Digestion	----------	----------	----------	EPA 3060A
Hexavalent Chromium	----------	EPA 218.6 EPA 7196A EPA 7199	EPA 7196A EPA 7199	EPA 7196A EPA 7199
Ignitability	----------	----------	40 CFR 261.21	40 CFR 261.21
Non-filterable Residue (TSS)	----------	SM 2540D-2015	SM 2540D-2015	----------
Orthophosphate	----------	EPA 365.3	EPA 365.3	----------
Paint Filter	----------	----------	----------	EPA 9095B
pH	----------	SM 4500 H+B-2011 EPA 9040B/C	EPA 9040B/C	EPA 9045C/D
Phenol	----------	EPA 9066	EPA 9066	----------
Reactivity Prep	----------	----------	SW-846 Chapter 7.3	SW-846 Chapter 7.3
Reactive Cyanide	----------	----------	EPA 9012B	EPA 9012B
Reactive Sulfide	----------	----------	EPA 9034	EPA 9034

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
SGT-HEM (Total Petroleum Hydrocarbons)	----------	EPA 1664B	EPA 1664B	EPA 9071B
Sulfide	----------	EPA 376.1 EPA 376.2 SM 4500 S2D-2011 SM 4500 S2F-2011	EPA 376.1 EPA 376.2 SM 4500 S2D-2011 SM 4500 S2F-2011	----------
Total Kjeldahl Nitrogen (TKN)	----------	EPA 351.2	EPA 351.2	EPA 351.2
Total Phosphorus	----------	EPA 365.1 SM 4500P F-2011	EPA 365.1 SM 4500P F-2011	EPA 365.1 SM 4500P F-2011
Total Residue	----------	SM 2540B-2015	SM 2540B-2015	SM 2540G-2015
Metals				
Metals Digestion	----------	EPA 3005A	EPA 3005A	EPA 3050B
Aluminum	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Antimony	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Arsenic	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Barium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Beryllium	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Boron	----------	EPA 200.7 EPA 6010D	EPA 6010D	EPA 6010D
Cadmium	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Calcium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Chromium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Cobalt	EPA 200.7	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Copper	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Iron	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Lead	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Lithium	EPA 200.7	EPA 200.7 EPA 6010D	EPA 6010D	EPA 6010D
Molybdenum	----------	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Magnesium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Manganese	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Mercury	EPA 245.1	EPA 245.1 EPA 7470A	EPA 245.1 EPA 7470A	EPA 7471B
Nickel	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Potassium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Selenium	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Silicon	----------	EPA 200.7 EPA 6010D	EPA 6010D	EPA 6010D
Silver	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Sodium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Strontium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Sulfur	EPA 200.7	EPA 200.7 EPA 6010D	EPA 6010D	EPA 6010D
Thallium	EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Thorium	----------	EPA 6010D	EPA 6010D	EPA 6010D
Tin	EPA 200.7	EPA 200.7 EPA 6010D	EPA 6010D	EPA 6010D
Titanium	----------	EPA 200.7 EPA 200.8 EPA 6010D	EPA 6010D	EPA 6010D
Tungsten	----------	EPA 6010D	EPA 6010D	EPA 6010D
Uranium	----------	EPA 200.8 EPA 6020B	EPA 6020B	EPA 6020B
Vanadium	EPA 200.7	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Zinc	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8 EPA 6010D EPA 6020B	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Zirconium	----------	EPA 6010D	EPA 6010D	EPA 6010D
Purgeable Organics (Volatiles)				
Volatile Preparation	----------	EPA 5030C	EPA 5030C	EPA 5035A
Acetone	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Acetonitrile	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Acrolein	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Acrylonitrile	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Allyl chloride	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
tert-Amyl Alcohol	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
tert-Amyl Methyl Ether	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
tert-Butyl Alcohol	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
tert-Butyl Formate	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Benzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Bromobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Bromochloromethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Bromodichloromethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Bromoform	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Bromomethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Butanone	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
n-Butylbenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
sec-Butylbenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
tert-Butylbenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Carbon disulfide	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Carbon tetrachloride	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Chloro-1,3-butadiene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chloroacetonitrile	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chlorobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1-Chlorobutane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chlorodifluoromethane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Chloroethyl Vinyl Ether	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chloroform	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1-Chlorohexane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Chloromethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Chlorotoluene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
4-Chlorotoluene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Cyclohexane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Cyclohexanone	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Di-Isopropyl ether	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Dibromochloromethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2-Dibromo-3-chloropropane	EPA 524.2	EPA 8260C/D EPA 8011	EPA 8260C/D EPA 8011	EPA 8260C/D
Dibromomethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2-Dibromoethane (EDB)	----------	EPA 8260C/D EPA 8011	EPA 8260C/D EPA 8011	EPA 8260C/D

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,2-Dichlorobenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,3-Dichlorobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,4-Dichlorobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
trans-1,4-dichloro-2-butene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Dichlorodi-fluoromethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1-Dichloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2-Dichloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1-Dichloroethene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
cis-1,2-Dichloroethene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
trans-1,2-Dichloroethene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Dichlorofluoromethane	EPA 524.2	----------	----------	----------
1,2-Dichloropropane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,3-Dichloropropane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2,2-Dichloropropane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1-Dichloropropene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
cis-1,3-Dichloropropene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
trans-1,3-Dichloropropene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,4-Dioxane	----------	EPA 8260C/D EPA 8260C/D SIM	EPA 8260C/D EPA 8260C/D SIM	EPA 8260C/D EPA 8260C/D SIM
Ethanol	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Ethylbenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Ethyl ether	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Ethyl Methacrylate	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Ethyl Tert-Butyl Ether	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Freon-113	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Gasoline Range Organics (GRO) [Volatile Petroleum Hydrocarbons (VPH)]	----------	EPA 8015C EPA 8015D EPA 8260C/D NW TPH-Gx MA VPH AK101	EPA 8015C EPA 8015D EPA 8260C/D NW TPH-Gx MA VPH AK101	EPA 8015C EPA 8015D EPA 8260C/D NW TPH-Gx MA VPH AK101
Heptane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Hexane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Hexanone	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Hexachlorobutadiene	EPA 524.2			
Hexachloroethane	EPA 524.2			
Isopropyl Alcohol	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Isopropylbenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,4-Isopropyltoluene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methylacrylonitrile	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methyl Acetate	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Methyl Acrylate	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methyl Iodide	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methylene Chloride	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methyl Methacrylate	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methyl Tert-Butyl Ether	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
4-Methyl-2-pentanone	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Methylcyclohexane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
2-Nitropropane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Naphthalene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Pentachloroethane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Propionitrile	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
n-Propylbenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Styrene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Tert-Amyl Ethyl Ether	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1,1,2-Tetrachloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1,2,2-Tetrachloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Tetrachloroethene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Tetrahydrofuran	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Toluene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2,3-Trichlorobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2,4-Trichlorobenzene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1,1-Trichloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,1,2-Trichloroethane	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Trichloroethene	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Trichlorofluoromethane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2,3-Trichloropropane	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2,4-Trimethylbenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,3,5-Trimethylbenzene	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
130BVinyl Acetate	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Vinyl Chloride	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Xylenes, Total	----------	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,2-Xylene (o-Xylene)	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
1,3+1,4-Xylene (m+p Xylene)	EPA 524.2	EPA 8260C/D	EPA 8260C/D	EPA 8260C/D
Extractable Organics (Semivolatiles)				
Acenaphthene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Acenaphthylene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Acetophenone	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
2-Acetylaminofluorene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Alkylated PAHs	----------	EPA 8270D/E SIM	EPA 8270D/E SIM	EPA 8270D/E SIM
4-Aminobiphenyl	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Amino-4,6-dinitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
4-Amino-2,6-dinitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Aniline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Anthracene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Atrazine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Benzaldehyde	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Benzidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Benzoic acid	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Benzo (a) anthracene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Benzo (b) fluoranthene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Benzo (k) fluoranthene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Benzo (ghi) perylene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Benzo (a) pyrene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Benzo (e) pyrene	----------	EPA 8270D/E SIM	EPA 8270D/E SIM	EPA 8270D/E SIM
Benzyl Alcohol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Biphenyl	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
bis (2-Chloroethoxy) Methane	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
bis (2-Chloroethyl) Ether	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
bis (2-Ethylhexyl) Phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
4-Bromophenylphenyl Ether	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Butyl benzyl Phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Caprolactam	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Carbazole	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Carbon Range Organics C8-C44 (including subsets of this range i.e. HRO, MRO, ORO, RRO)	----------	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D
4-Chloroaniline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Chloro-3-methylphenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Chlorobenzilate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
1-Chloronaphthalene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Chloronaphthalene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Chlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Chlorophenyl phenyl ether	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Chrysene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Cresols (Methyl phenols)	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
cis-/trans-Diallate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4-Diamino-6-nitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
2,6-Diamino-4-nitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Dibenzo (a,h) acridine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Dibenzo (a,h) anthracene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Dibenzofuran	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
1,2-Dichlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,3-Dichlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,4-Dichlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
3,3-Dichlorobenzidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Diesel Range Organics (DRO) [Extractable Petroleum Hydrocarbons (EPH)]	----------	EPA 8015C EPA 8015D NWTPH DX MA EPH TX1005 AK102/103 AK102/103-SV	EPA 8015C EPA 8015D NWTPH DX MA EPH TX1005 AK102/103 AK102/103-SV	EPA 8015C EPA 8015D NWTPH DX MA EPH TX1005 AK102/103
2,4-Dichlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,6-Dichlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Diethyl Phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Dimethoate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
p-Dimethylaminoazobenze	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
7,12-Dimethylbenz (a) anthracene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4-Dimethylphenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Dimethyl Phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
3,3'-Dimethylbenzidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Di-n-butyl Phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Di-n-octyl phthalate	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
3,5-Dinitroaniline	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,3-Dinitrobenzene	----------	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B MOD
1,4-Dinitrobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4-Dinitrophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4-Dinitrotoluene	----------	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B MOD
2,6-Dinitrotoluene	----------	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B MOD
1,4-Dioxane	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Diphenylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Diphenyl ether	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,2-Diphenylhydrazine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Ethyl Methanesulfonate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Fluoroanthene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Fluorene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Hexachlorobenzene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Hexachlorobutadiene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Hexachlorocyclo-pentadiene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Hexachloroethane	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Hexachloropropene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Indeno (1,2,3-cd) Pyrene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Isodrin	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Isophorone	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Isosafrole	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
3-Methycholanthrene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Methyl-4,6-dinitrophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Methyl methane sulfonate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1-Methylnaphthalene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
2-Methylnaphthalene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
2-Methylphenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Methylphenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Naphthalene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
1,4-Naphthoquinone	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
1-Naphthylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Naphthylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Nitroquinoline-1-oxide	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Nitroaniline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
3-Nitroaniline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Nitroaniline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Nitrobenzene	----------	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B	EPA 8270D/E EPA 8330B MOD
Nitroglycerin	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
2-Nitrophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
4-Nitrophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Nitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
3-Nitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
4-Nitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
5-Nitro-o-toluidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitroso-di-n-butylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosodiethylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosodimethylamine	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
n-Nitrosomethylethylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosomorpholine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosodi-n-propylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosodiphenylamine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosopiperidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
n-Nitrosopyrrolidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
2,2-Oxybis (1-chloropropane)	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pentachlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pentachloronitrobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pentachlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pentaerythritol Tetranitrate (PETN)	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Perylene	----------	EPA 8270D/E SIM	EPA 8270D/E SIM	EPA 8270D/E SIM
Phenacetin	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Phenanthrene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Phenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2-Picoline	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pronamide	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Pyrene	----------	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM	EPA 8270D/E EPA 8270D/E SIM
Pyridine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Safrole	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,2,4,5- Tetrachlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,3,4,6-Tetrachlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Tetraethyl dithiopyrophosphate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Tetraethy lead	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Tetryl	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Thionazin	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
o-Toluidine	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,2,4-Trichlorobenzene	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
1,3,5-Trinitrobenzene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
2,4,5-Trichlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4,6-Trichlorophenol	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
O,O,O-Tri-ethylphosphorothioate	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
2,4,6-Trinitrotoluene	----------	EPA 8330B	EPA 8330B	EPA 8330B MOD
Organochlorine Pesticides				
Aldrin	----------	EPA 8081B	EPA 8081B	EPA 8081B
alpha-BHC	----------	EPA 8081B	EPA 8081B	EPA 8081B
beta-BHC	----------	EPA 8081B	EPA 8081B	EPA 8081B
delta-BHC	----------	EPA 8081B	EPA 8081B	EPA 8081B
gamma-BHC (Lindane)	----------	EPA 8081B	EPA 8081B	EPA 8081B
alpha-Chlordane	----------	EPA 8081B	EPA 8081B	EPA 8081B
Chlordane (Technical)	----------	EPA 8081B	EPA 8081B	EPA 8081B
2,4'-DDD	----------	EPA 8081B	EPA 8081B	EPA 8081B
2,4'-DDE	----------	EPA 8081B	EPA 8081B	EPA 8081B
2,4'-DDT	----------	EPA 8081B	EPA 8081B	EPA 8081B
4,4'-DDD	----------	EPA 8081B	EPA 8081B	EPA 8081B
4,4'-DDE	----------	EPA 8081B	EPA 8081B	EPA 8081B
4,4'-DDT	----------	EPA 8081B	EPA 8081B	EPA 8081B
Dieldrin	----------	EPA 8081B	EPA 8081B	EPA 8081B
Dinoseb	----------	EPA 8270D/E	EPA 8270D/E	EPA 8270D/E
Endosulfan I (alpha)	----------	EPA 8081B	EPA 8081B	EPA 8081B
Endosulfan II (beta)	----------	EPA 8081B	EPA 8081B	EPA 8081B
Endosulfan Sulfate	----------	EPA 8081B	EPA 8081B	EPA 8081B
Endrin	----------	EPA 8081B	EPA 8081B	EPA 8081B
Endrin Aldehyde	----------	EPA 8081B	EPA 8081B	EPA 8081B
Endrin Ketone	----------	EPA 8081B	EPA 8081B	EPA 8081B
gamma-Chlordane	----------	EPA 8081B	EPA 8081B	EPA 8081B
Heptachlor	----------	EPA 8081B	EPA 8081B	EPA 8081B
Heptachlor Epoxide	----------	EPA 8081B	EPA 8081B	EPA 8081B
Hexachlorobenzene	----------	EPA 8081B	EPA 8081B	EPA 8081B
Hexachlorocyclopentadiene	----------	EPA 8081B	EPA 8081B	EPA 8081B
Methoxychlor	----------	EPA 8081B	EPA 8081B	EPA 8081B
Mirex	----------	EPA 8081B	EPA 8081B	EPA 8081B
Toxaphene	----------	EPA 8081B	EPA 8081B	EPA 8081B

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
PCBs (Aroclors)				
PCB-1016 (Arochlor)	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1221	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1232	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1242	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1248	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1254	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1260	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1262	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB-1268	----------	EPA 8082A	EPA 8082A	EPA 8082A
PCB congeners (209)	----------	EPA 1668A EPA 1668C	EPA 1668A EPA 1668C	EPA 1668A EPA 1668C
Herbicides				
2,4,5-T	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4,5-TP (Silvex)	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-D	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-DB	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dalapon	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dicamba	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dichlorprop	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dinoseb	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPA	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPP	----------	EPA 8151A	EPA 8151A	EPA 8151A
Pentachlorophenol	----------	EPA 8151A	EPA 8151A	EPA 8151A
PCB Homologues				
Monochlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Dichlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Trichlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Tetrachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Pentachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Hexachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Heptachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Octachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Nonachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Decachlorobiphenyls	----------	EPA 680	EPA 680	EPA 680
Dioxins/Furans				
2,3,7,8-TCDD	EPA 1613B	EPA 8290A	EPA 8290A	EPA 8290A
2,3,7,8-TCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,7,8-PeCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
2,3,4,7,8-PeCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,7,8-PeCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,4,7,8-HxCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,6,7,8-HxCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
2,3,4,6,7,8-HxCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,7,8,9-HxCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,4,7,8,-HxCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,2,3,6,7,8-HxCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,7,8,9-HxCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,4,6,7,8-HpCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,4,7,8,9-HpCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
1,2,3,4,6,7,8-HpCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
OCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
OCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total HpCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total HpCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total HxCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total HxCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total PeCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total PeCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total TCDD	----------	EPA 8290A	EPA 8290A	EPA 8290A
Total TCDF	----------	EPA 8290A	EPA 8290A	EPA 8290A
Misc. Headspace Analysis				
Carbon dioxide	----------	RSK-175	RSK-175	----------
Ethane	----------	RSK-175	RSK-175	----------
Ethene	----------	RSK-175	RSK-175	----------
Methane	----------	RSK-175	RSK-175	----------
Acetylene	----------	RSK-175	RSK-175	----------
Propane	----------	RSK-175	RSK-175	----------
Hazardous Waste Characteristics				
Toxicity Characteristic Leaching Procedure	----------	----------	EPA 1311	EPA 1311
Synthetic Precipitation Leaching Procedure	----------	----------	EPA 1312	EPA 1312
ASTM Leaching Procedure	----------	----------	ASTM D3987-12	ASTM D3987-12
Other				
Perchlorate	----------	EPA 6850	EPA 6850	EPA 6850
Hydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
Formaldehyde	----------	----------	EPA 8315A	EPA 8315A
Methylhydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
1,1-Dimethylhydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
Acetic Acid	----------	EPA 8015D	EPA 8015D	----------
Butryic acid	----------	EPA 8015D	EPA 8015D	----------
Lactic Acid	----------	EPA 8015D	EPA 8015D	----------
Propionic Acid	----------	EPA 8015D	EPA 8015D	----------
Pyruvic Acid	----------	EPA 8015D	EPA 8015D	----------
Citric Acid	----------	EPA 8015D	EPA 8015D	----------
Formic Acid	----------	EPA 8015D	EPA 8015D	----------
Oxalic Acid	----------	EPA 8015D	EPA 8015D	----------
Quinic Acid	----------	EPA 8015D	EPA 8015D	----------
Succinic Acid	----------	EPA 8015D	EPA 8015D	----------

Parameter/Analyte	Drinking Water	Non-Potable Water	Solid Hazardous Waste	
			Aqueous	Solid
Tartaric Acid	----------	EPA 8015D	EPA 8015D	----------
Volatile Preparation	----------	EPA 5030C	EPA 5030C	EPA 5035A
Organic Extraction/Cleanup	----------	EPA 3510C EPA 3511 EPA 3660B, 3620C, 3665A	EPA 3510C EPA 3511 EPA 3660B, 3620C, 3665A	EPA 3546 EPA 3550C EPA 3660B, 3620C, 3665A, 3640A

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste	Tissue
Per and Polyfluoroalkyl Substances (PFAS)				
N-ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	EPA 537 EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
N-methyl perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	EPA 537 EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorobutanesulfonic Acid (PFBS)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorodecanoic Acid (PFDA) CASRN: 335-76-2	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorododecanoic Acid (PFDoA)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoroheptanoic Acid (PFHpA) CASRN: 375-85-9	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorohexanesulfonic Acid (PFHxS) CASRN: 355-46-4	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste	Tissue
Perfluorohexanoic Acid (PFHxA)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorononanoic Acid (PFNA)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorooctanesulfonic Acid (PFOS)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorooctanoic Acid (PFOA)	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorotetradecanoic Acid (PFTeDA) CASRN: 376-06-7	EPA 537 EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorotridecanoic Acid (PFTrDA) CASRN: 72629-94-8	EPA 537 EPA 537.1	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoroundecanoic Acid (PFUnA) CASRN: 2058-94-8	EPA 537 EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Hexafluoropropylene oxide dimer acid (HF- PODA)	EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
4,8-Dioxa-3*H*-perfluorononanoic acid (ADONA)	EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste	Tissue
9-Chlorohexadecafluoro-3-oxanonane-1- sulfonic acid (9Cl-PF3ONS)	EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
11-Chloroeicosafluoro-3-oxaundecane-1- sulfonic acid (11Cl-PF3OUdS)	EPA 537.1 EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorobutanoic Acid (PFBA)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoropentanoic Acid (PFPeA) CASRN: 2706-90-3	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2FTS)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS) CASRN: 39108-34-4	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoropentanesulfonic Acid (PFPeS)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS) CASRN: 27619-97-2	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoroheptanesulfonic Acid (PFHpS) CASRN: 375-92-8	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste	Tissue
Perfluorononanesulfonic Acid (PFNS)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorodecanesulfonic Acid (PFDS)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
10:2 Fluorotelomersulfonic Acid (10:2-FTS)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	----------
Perfluorododecanesulfonic Acid (PFDoS)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluorohexadecanoic Acid (PFHxDA)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	----------
Perfluorooctadecanoic Acid (PFODA)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15	----------
Perfluorooctanesulfonamide (PFOSA)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE) CASRN: 24448-09-7	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
N-methyl perfluorooctanesulfonamide (NMeFOSA)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste	Tissue
N-ethylperfluorooctanesulfonamide (NEtFOSA)	----------	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoro-3-methoxypropanoic acid (PFMPA) CASRN: 377-73-1	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoro-4-methoxybutanoic acid (PFMBA)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	EPA 533	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
3-Perfluoropropylpropanoic acid (3:3 FTCA) CASRN: 356-02-5	---	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
2*H*,2*H*,3*H*,3*H*-Perfluorooctanoic acid (5:3 FTCA)	---	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633
3-Perfluoroheptylpropanoic acid (7:3 FTCA) CASRN: 812-70-4	---	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	PFAS by LCMSMS Compliant with QSM 5.3/5.4 Table B-15 EPA Draft Method 1633	EPA Draft Method 1633

End of DoD ELAP section of scope

In addition, 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, and for the test methods applicable to Kentucky Statute KRS 224.60-130(2)(a), and for the test methods applicable to the Wyoming Storage Tank Remediation Laboratory Accreditation Program), 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

Atomic Absorption/ICP-AES Spectrometry, ICP-MS Spectrometry, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Misc.-Electronic Probes (pH, F^-, O_2), Oxygen Demand, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, TCLP, Total Organic Carbon, Turbidity, Liquid Chromatography/Mass Spectrometry/Mass Spectrometry, High Resolution Gas Chromatography/Mass Spectrometry

Parameter/Analyte	Tissue	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Other				
Perchlorate	Food & Food Products EPA 6850	EPA 6850	EPA 6850	EPA 6850
Hydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
Methylhydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
1,1-Dimethylhydrazine	----------	EPA 8315A MOD	EPA 8315A MOD	EPA 8315A MOD
Volatile Preparation	----------	EPA 5030C	EPA 5030C	EPA 5035A
Organic Extraction/ Cleanup	EPA 3546 EPA 3550C EPA 3660B EPA 3620C EPA 3665A EPA 3640A	EPA 3510C EPA 3511 EPA 3660B EPA 3620C EPA 3665A	EPA 3510C EPA 3511 EPA 3660B EPA 3620C EPA 3665A	EPA 3546 EPA 3550C EPA 3660B EPA 3620C EPA 3665A EPA 3640A

Parameter/Analyte	Tissue	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Kentucky UST Program				
Metals				
Arsenic	----------	----------	EPA 6010B	EPA 6010B
Barium	----------	----------	EPA 6010B	EPA 6010B
Cadmium	----------	----------	EPA 6010B	EPA 6010B
Chromium	----------	----------	EPA 6010B	EPA 6010B
Lead	----------	----------	EPA 6010B	EPA 6010B
Mercury	----------	----------	EPA 7470A	EPA 7471A
Selenium	----------	----------	EPA 6010B	EPA 6010B
Silver	----------	----------	EPA 6010B	EPA 6010B
Purgeable Organics (Volatiles)				

Parameter/Analyte	Tissue	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Diesel Range Organics (DRO)	----------	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D
Gasoline Range Organics (GRO)	----------	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D	EPA 8015C EPA 8015D
Wyoming Storage Tank Program				
Metals				
Cadmium	----------	----------	EPA 6010C	EPA 6010C
Chromium	----------	----------	EPA 6010C	EPA 6010C
Chromium (Total, hexavalent)	----------	----------	EPA 7196A	EPA 7196A
Lead	----------	----------	EPA 6010C	EPA 6010C
Purgeable Organics (Volatiles)				
Volatile Preparation	----------	----------	EPA 5030C	EPA 5035A
Benzene	----------	----------	EPA 8260D	EPA 8260D
1,2-Dichloroethane	----------	----------	EPA 8260D	EPA 8260D
1,2-Dibromoethane	----------	----------	EPA 8011	EPA 8011
Diisopropyl Ether	----------	----------	EPA 8260D	EPA 8260D
Ethyl Benzene	----------	----------	EPA 8260D	EPA 8260D
Ethyl tert-butyl Ether	----------	----------	EPA 8260D	EPA 8260D
Methyl tert-butyl Ether	----------	----------	EPA 8260D	EPA 8260D
Naphthalene	----------	----------	EPA 8260D	EPA 8260D
Toluene	----------	----------	EPA 5030C EPA 8260D	EPA 8260D
Tert-amyl Methyl Ether	----------	----------	EPA 8260D	EPA 8260D
Tert-butyl Alcohol	----------	----------	EPA 8260D	EPA 8260D
Xylenes, total	----------	----------	EPA 8260D	EPA 8260D
Gasoline Range Organics (GRO C6-C10)	----------	----------	EPA 8260D	EPA 8260D
Extractable Organics (Semivolatiles)				
Diesel Range Organics (DRO C10-C32)	----------	----------	EPA 8015C w/ EPA 3630 cleanup	EPA 8015C w/ EPA 3630 cleanup

End of KY, WY, and ISO 17025 section of scope

In recognition of the successful completion of the A2LA evaluation process, including an assessment of the laboratory's compliance with ISO/IEC 17025:2017 accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and, in the analyte, categories identified below:

Food and Feed (WHO 29)	**Food/Feed**
2,3,7,8-TCDD	EPA 1613B
2,3,7,8-TCDF	EPA 1613B
1,2,3,7,8-PeCDF	EPA 1613B
2,3,4,7,8-PeCDF	EPA 1613B
1,2,3,7,8-PeCDD	EPA 1613B
1,2,3,4,7,8-HxCDF	EPA 1613B
1,2,3,6,7,8-HxCDF	EPA 1613B
2,3,4,6,7,8-HxCDF	EPA 1613B
1,2,3,7,8,9-HxCDF	EPA 1613B
1,2,3,4,7,8-HxCDD	EPA 1613B
1,2,3,6,7,8-HxCDD	EPA 1613B
1,2,3,7,8,9-HxCDD	EPA 1613B
1,2,3,4,6,7,8-HpCDF	EPA 1613B
1,2,3,4,7,8,9-HpCDF	EPA 1613B
1,2,3,4,6,7,8-HpCDD	EPA 1613B
OCDF	EPA 1613B
OCDD	EPA 1613B
Food and Feed (WHO 29)	**Food/Feed**
6 marker PCBs (PCB28, PCB52, PCB101, PCB138, PCB153, and PCB180)	EPA 1668C
(PCB77, PCB81, PCB105, PCB114, PCB118, PCB123, PCB126, PCB156, PCB157, PCB167, PCB169, and PCB189)	EPA 1668C

Parameter/Analyte	**Tissue**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
12 Dioxin-like PCBs (dl-PCBs)/coplanar PCBs (PCB77, PCB81, PCB105, PCB114, PCB118, PCB123, PCB126, PCB156, PCB157, PCB167, PCB169, & PCB189)	EPA 1668C	----------	----------	----------

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste
Per and Polyfluoroalkyl Substances (PFAS)			
N-ethyl perfluorooctane-sulfonamidoacetic acid (NetFOSAA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
N-methyl perfluoroctane-sulfonamidoacetic acid (NMeFOSAA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorobutanesulfonic acid (PFBS)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorodecanoic acid (PFDA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorododecanoic acid (PFDoDA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoroheptanoic acid (PFHpA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorohexanesulfonic acid (PFHxS)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorohexanoic acid (PFHxA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorononanoic acid (PFNA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorooctanesulfonic acid (PFOS)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorooctanoic acid (PFOA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorotetradecanoic acid (PFTeDA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorotridecanoic acid (PFTrDA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoroundecanoic acid (PFUnDA)	EPA 537 Ver. 1.1 EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (HFPODA)	EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	EPA 537.1	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoro-n-butanoic acid (PFBA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoro-n-pentanoic acid (PFPeA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod

Parameter/Analyte	Drinking Water	Nonpotable Water	Solid Haz.Waste
8:2 Fluorotelomersulfonic acid (8:2FTS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
4:2 Fluorotelomersulfonic acid (4:2-FTS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoropentanesulfonic acid (PFPeS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
6:2 Fluorotelomersulfonic acid (6:2-FTS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluoroheptanesulfonic acid (PFHpS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorononanesulfonic acid (PFNS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorodecanesulfonic acid (PFDS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
10:2 Fluorotelomersulfonic acid (10:2-FTS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorododecanesulfonic acid (PFDoDS)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorohexadecanoic acid (PFHxDA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorooctadecanoic acid (PFODA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
Perfluorooctanesulfonamide (PFOSA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol (NMePFOSAE)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
N-methylperfluoro-1-octanesulfonamide (NMePFOSA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (NEtPFOSAE)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod
N-ethylperfluoro-1-octanesulfonamide (NEtPFOSA)	----------	EPA 537 Ver.1.1 Mod	EPA 537 Ver.1.1 Mod

Accredited Laboratory

A2LA has accredited

EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC

Lancaster, PA

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 5.4 of the DoD/DOE 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 21st day of November 2022.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1.01
Valid to November 30, 2024

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

eurofins	Always check on-line for validity. **Perfluorinated Alkyl Substances (PFASs) in Drinking Water by Method 537.1 Version 1.0**	Level: **Work Instruction**
Document number: **T-PFAS-WI25232**		
Old Reference:		
Version: **8**		Organisation level: **5-Sub-BU**
Approved by: **XL3S** Effective Date: **30-DEC-2022**	Document users: **5_EUUSLA_PFAS_Manager, 6_EUUSLA_PFAS_Analyst, 6_EUUSLA_PFAS_Data_Reviewers, 6_EUUSLA_PFAS_Management_Team, 6_EUUSLA_PFAS_Sample_Prep**	Responsible: **5_EUUSLA_PFAS_Manager**

Revision Log

Revision:	8	**Effective date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement	Removed revision logs up to the previous version
Header	Enhancement	Updated company name to Eurofins Lancaster Laboratories Environment Testing, LLC
Cross reference	Enhancement	Add *G-DC-FRM23907*

Revision:	8	**Effective date:** This version
Section	**Justification**	**Changes**
Apparatus and Equipment	Enhancement	Add note about 9mm vial cap testing to #19. added promochrom unit,
Reagents and Standards	Reflect current practice	expiration of 20mM ammonium acetate solution is 1 week. not 48 hours. updated attachments 5-7 to reflect current prep
Procedure	Reflect current practice	Add promochrom option, spike changes for is/ss

Revision:	7	**Effective date:** 11-JAN-2022
Section	**Justification**	**Changes**
Revision Log	Formatting requirement	Removed revision logs up to the previous version
Reagents and standards/referenced attachments	Reflect current procedure	Updated SMT to Reagent in all instances, added option for syringes to prepare standards
Procedure	Enhancement	A.19. update to reconstitute, then add the 10ul of IS

Reference

1. Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LCMSMS), USEPA Method 537.1 Version 1, November 2018.

2. Manual for the Certification of Laboratories Analyzing Drinking Water, EPA-815-R-05-004 (January 2005). (*G-EXT-FRM23905*)

3. *Chemical Hygiene Plan*, current version.

Cross Reference

Document	Document Title
T-PEST-WI9847	Common Equations Used During Chromatographic Analyses
G-DC-FRM23907	Redacted SOPs
G-EXT-FRM23905	EPA Drinking Water Manual
QA-SOP11892	Determining Method Detection Limits and Limits of Quantitation
Q-EQA-FRM6830	Sampling Collection Instructions

Scope

The method is applicable for the determination of PFAS compounds in drinking water samples. The compounds analyzed in this method are listed below. The most current MDLs and LOQs are listed in the LIMS.

Analyte	Acronym	CAS#
Hexafluoropropylene oxide dimer acid	HFPODA	13252-13-6
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorododecanoic acid	PFDoDA	307-55-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluoroundecanoic acid	PFUnDA	2058-94-8
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9 *
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1 *
4,8-dioxa-3H-perfluorononanoic acid	DONA **	919005-14-4 *

*These are the CAS numbers for the free acid form of the analyte.
**DONA is the Acronym for the free acid form of this analyte.

Basic Principles

A 250-mL aqueous sample fortified with surrogates is passed through a solid phase extraction (SPE) cartridge to extract the method analytes and surrogates. The resulting solution is analyzed by LC/MS/MS operated in negative electrospray ionization (ESI) mode for detection and quantification of the analytes. Quantitative analysis is performed using internal standard method.

Interferences

Compounds which have similar structures to the compounds of interest, and similar molecular weights would potentially interfere. Method interferences may be caused by coeluting peaks, contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE

(polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, etc. A laboratory reagent water blank is performed with each batch of samples to demonstrate that the extraction system is free of contaminants.

Precaution to minimize method interference:

1. Proprietary Content.

2. Proprietary Content.

3. PFAS standards, extracts and samples should not come in contact with any glass containers as these analytes can potentially adsorb to glass surfaces. PFAS analytes and internal standards commercially purchased in glass ampules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be stored in polypropylene containers.

4. All equipment used for sample extraction and analysis must be meticulously cleaned. The equipment must not be covered with aluminum foil because perfluorinated carboxylic acids can be potentially transferred from the aluminum foil to the glassware.

Safety Precautions and Waste Handling

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. Health advisories have been issued for both PFOA and PFOS. Each chemical must be treated as a potential health hazard, and exposure to these chemicals must be minimized. Exposure to these chemicals must be reduced to the lowest possible level by whatever means available, such as fume hoods, lab coats, safety glasses, and gloves. Gloves, lab coats, and safety glasses must be worn when preparing standards and handling samples. Avoid inhaling solvents and chemicals and getting them on the skin. Wear gloves when handling neat materials. When working with acids and bases, take care not to come in contact, and to wipe any spills. Always add acid to water when preparing reagents containing concentrated acids. Gloves and safety glasses must be worn at all times.

All solvent waste and extracts are collected in approved solvent waste containers in the laboratory and subsequently emptied by personnel trained in hazardous waste disposal into the lab-wide disposal facility. All samples, standards, and extracts must be collected for incineration. HPLC vials are disposed of in the lab container for waste vials, and subsequently lab packed. Any solid waste material (disposable pipettes and broken glassware, etc.) may be disposed of in the normal solid waste collection containers.

Personnel Training and Qualifications

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC).

Each chemist performing the extraction must work with an experienced employee for a period of time until they can independently perform the extraction. Also, several batches of sample extractions must be performed under the direct observation of another experienced chemist to assure the trainee is capable of independent preparation. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

Each LC/MS/MS analyst must work with an experienced employee for a period of time until they can independently calibrate the LC/MS/MS, review and process data, and perform maintenance procedures. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

The IDOC is performed to meet the requirements listed in sections 9.2.3 and 9.2.4 of the method (four LFBs spiked near the midrange of the calibration, 70-130% mean recovery, and %RSD <20%). In addition, the IDOC includes the preparation (Extraction chemist) and analysis (LC/MS/MS analyst) of a 7 replicate MDL study.

The DOC consist of four laboratory control samples (or alternatively, one blind sample) that is carried through all steps of the extraction and meets the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation.

Sample Collection, Preservation, and Handling

A. Sample Collection

1. The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles.

NOTE: PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

2. Collect samples in 250-mL polyethylene bottles fitted with a polypropylene screw cap containing 1.25 grams of Trizma, resulting in a Trizma concentration of 5.0 g/L. Samples do not need to be collected headspace-free. Keep the sample sealed from time of collection until extraction.

3. A field reagent blank must be collected with each sample set. See *Q-EQA-FRM6830* for sampling instructions.

B. Sample Storage and Shipment

1. Samples must be chilled during shipment and must not exceed 10°C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10°C when the samples are received at the laboratory. If samples are received with a temperature above 10°C, the samples are rejected and the client must recollect and resubmit samples to the laboratory.

2. When samples are received, a pH check is performed. The pH must be 7 ± 0.5. This is performed by the sample storage group prior to bottles being available to the lab for analysis. If samples are received with a pH outside of the 7 ± 0.5 pH range, the samples are rejected and the client must recollect and resubmit samples to the laboratory.

3. Samples stored in the lab must be held at or below 6°C until extraction, but must not be frozen.

4. Water samples must be extracted within 14 days. Extracts must be analyzed within 28 days after extraction. Store extracts at room temperature.

Apparatus and Equipment

1. Centrifuge tubes – 15-mL conical polypropylene with polypropylene screw caps; Fisher Scientific, Cat. No. 05-539-5 or equivalent

2. 10-mL polypropylene volumetric flask, Class A – Fisher Scientific, Cat. No. S02288, or equivalent.

3. Polypropylene bottles for reagent storage: 1000-mL, Fisher; Cat. No. 02896F.

4. Analytical Balance – Capable of weighing to 0.0001 g

5. Top-Loading Balance – Capable of weighing to 0.01 g

6. Solid phase extraction (SPE) cartridge, styrene divinylbenzene polymetric sorbent - Agilent Mega Bond Elut Plexa, 6 cc cartridge, 500 mg Sorbent per cartridge, Cat. No. 12259506,or equivalent.

7. SPE vacuum extraction manifold – "Resprep" 24-port manifold; Restek Corp catalogue # 26080, or equivalent.

8. Polypropylene SPE delivery needles – Agilent; Cat. No. 12234511.

9. Polypropylene SPE Reservoirs, 25-mL – Sigma Aldrich Cat. No. 24258-U.

10. Centrifuge – "Q-Sep 3000"; Restek Corp. Cat. No. 26230, or equivalent, capable of 3000 rpm.

11. Disposable polyethylene pipette – Fisher Scientific, Cat. No. S30467-1 or equivalent

12. Auto Pipettes – Eppendorf; capable of accurately dispensing 10µl – 1000µl.

13. Polypropylene pipette tips: 0-200µl. Fisher; Cat. No. 02-681-135

14. Polypropylene pipette tips: 101-1000µl. Fisher, Cat. No. 02-707-508

15. Pipettes – Disposable transfer. Fisher Scientific, Cat. No. 13-711-7M

16. Vortex mixer, variable speed, Fisher Scientific or equivalent

17. N-Evap sample extract concentrator with N_2 supply and water bath for temperature control.

18. Reagent Water Purification System: Capable of producing ultrapure "Type 1/Milli-Q"-grade water from in-house deionized water system. Millipore SAS; Cat. No. FTPF08831.

19. Thermo Target PP Polyspring inserts, catalog number C4010-630P

20. Waters 9mm vial kit pack, catalog number 186005660CV, or equivalent (Note: Caps are tested to show they are PFAS free by soaking in Mehtanol and analyzing for PFAS.)

21. Centrifuge tubes – 50-mL conical polypropylene with polypropylene screw caps; Fisher Scientific, Cat. No. 06-443-21 or equivalent

22. Polypropylene bottles for standard storage - 4 mL; Fisher Scientific, Cat. No. 2006-9125

23. 250-mL HDPE bottle with 1.25g Trizma added, Scientific Specialties Catalog # 334008-1.25Triz.

24. Promochrom sample extraction system

25. Bottle; HDPE; natural; wide mouth; QC; 125 ml; 38-415; 48 EA, Environmental sampling supply inc. cat#0125-1060-QC

26. AB Sciex Triple Quad 4500 Turbo V Ion Source or AB Sciex API 4000 Turbo V Ion Source LC/MS/MS or equivalent

    ExionLC Controller
    ExionLC AC Pump
    ExionLC AC Autosampler
    Exion AC Column Oven
    Data system – Analyst 1.6.3

27. HPLC columns

a. Proprietary Content
b. Proprietary Content

Reagents and Standards

All solvents, acids, and bases are stored in glass bottles in flammable proof cabinets or pressure resistant steel drums. Solvents, acids, and bases are stored at ambient temperature for up to 1 year. All non-solvents are stored according to manufacturer's storage conditions.

A. Reagents

1. Methanol – Honeywell, Chromasolv LC-MS or equivalent.

2. Milli-Q Water

3. Ammonium acetate – Sigma Aldrich or equivalent.

4. 20 mM ammonium acetate solution – Weigh 1.54 ± 0.01 g ammonium acetate into a 1-L bottle. Add 1 L Milli-Q water and mix well. Ammonium acetate is volatile and this solution must be replaced weekly or more frequently if degradation is observed. This solution may be prepared in larger or smaller volumes as long as final concentrations are equivalent. Store at room temperature.

5. 20 mM ammonium acetate solution in 0.5% Milli-Q water/methanol – Weigh 1.54 ± 0.01g ammonium acetate into a 2-L glass mobile phase bottle. Add 5 mL of Milli-Q water to dissolve the Ammonium Acetate. Bring up to 1 L with methanol and mix well. Store at room temperature for up to one week or until degredation is observed. Different volumes can be prepared as long as final concentrations are equivalent.

6. Trizma Pre-set crystals - Sigma catalog # T-7193 or equivalent, reagent grade or equivalent.

B. Standards Preparation

Standards are prepared using calibrated syringes or pipettes, polypropylene microcentrifuge tubes, polypropylene bottles, and 10 ml Class A PP volumetric flasks to create solutions at desired concentrations. The concentrated solution is injected below the surface of the diluting solvent. After preparation is completed, standards should be vortexed to ensure complete mixing. Measurement of volumes less than 5 µl should be avoided in routine production operations.

Calibration standards and intermediate solutions are stored at room temperature in labeled 4-mL polypropylene bottles or 15-mL polypropylene centrifuge tubes with screw caps.

Expiration dates are managed through TALS Reagent. All stocks transferred from sealed glass ampules to screw-capped vials are given expiration dates of 1 year from the date opened or the expiration date provided by the vendor, whichever occurs sooner. All intermediate solutions are given an expiration date of 6 months from the preparation date, or the expiration date from the ampule provided by the vendor, whichever occurs sooner. Working calibration standards are given an expiration date of 1 month, or the expiration date of the solutions used to prepare the working solution, whichever occurs sooner. Standards are prepared prior to the expiration date if degradation is observed.

Working native and labeled (surrogate and internal standard) compound spiking solutions are given an expiration date of 2 months, or the expiration date of the solutions used to prepare the working solution, whichever occurs sooner. The solutions are stored in labeled polypropylene (PP) screw-top vials or PP centrifuge tubes at room temperature. When these solutions are prepared they must be tested prior to use in the PFAS extraction lab and verified monthly until

they are consumed by operations or expire. Records of the standard verification are stored in TALS Reagent. Prior to use, the working spiking solution must meet recovery windows of 85-115% for all compounds that will be analyzed using that solution. Should a standard fail to meet these criteria, it should be reanalyzed in duplicate on a second LC/MS/MS system. If the reanalysis meets acceptance criteria, the solution can be used. If the reanalysis does not meet acceptance criteria, the solution must be discarded, re-prepared, and analyzed.

1. Standard Solutions and Ordering information

   Attachment 4 describes the required standard solutions and associated ordering information. The primary/preferred standard vendor is Wellington Laboratories, Inc. Ontario, Canada. Listed catalog numbers are taken from Wellington product lists. Equivalent standards may be substituted, if the listed standards are unavailable. The solution concentration listed is as presented on the certificate of analysis and includes adjustment for purity and the salt form of the compound used.

   NOTE: The concentrations referenced for the sulfonate salts, (for example PFBS, PFHxS and PFOS) have already been corrected to the acid form by the standards supplier as noted in the example Certificate of Analysis (CofA). See *Attachment 8*.

   If the compound purity is assayed to be 96% or greater, weight can be used without correction to calculate concentrations. Ampules are stored in the refrigerator.

2. TALS Reagent database:

   Log purchased standards into TALS Reagent. Select the solution category SOURCE for purchased mixes and/or single-compound ampules. TALS Reagent system will assign formatted names to the purchased standard solutions. The automatically-generated name can be overwritten with a manually created name if desired. Use labels printed through the TALS Reagent to identify and track standard solutions after transfer from original ampule to storage vial. The CofA for the ampulated stock standard is attached in TALS Reagent for reference.

3. Preparation of intermediate-concentration solution mixes is necessary to prepare the working initial calibration standards. *Attachment 5* describes the Intermediate solutions required for preparation of working calibration standards, ICV, and linear branched standard solutions. Enter the appropriate information into TALS Reagent as the intermediate solutions are prepared.

4. All working calibration solutions are prepared in 96% methanol/water and are stable for at least 1 month if stored at room temperature. The working calibration standards are prepared using ampulated stocks(see *Attachment 4*), as well as the intermediate solutions (see *Attachment 5*) The preparation of the working calibration standards are described in *Attachment 6*.

   Calibration standards consist of five levels of increasing native-compound concentration and constant concentrations of mass-labeled compounds functioning as internal standards. Also included in the initial calibration are: a Method Detection Limit (MDL)-level standard, a linear and branched standard for T-PFOA, and an Initial Calibration Verification (ICV) standard. The ICV should be from an alternate vendor ("2nd source"), if possible, other than the primary source. For PFAS analysis, it is common to use mixes from the same vendor (Wellington Labs), but from a separate/different manufactured lot number.

   The following represents an example of standard naming/codes generated from TALS Reagent for an initial 5-point (level) PFAS calibration, with MDL, linear and branched standard for T-PFOA, and ICV standards:

   537_DW-B_MDL_00051 (MDL)
   537_DW-B_CAL1_00051 (CAL1)
   537_DW-B_CAL2_00051 (CAL2)
   537_DW-B_CAL3_00051 (CAL3)
   537_DW-B_CAL4_00051 (CAL4)
   537_DW-B_CAL5_00051 (CAL5)
   537_DW-B_ICV_00051 (ICV)

5. Preparation of working native spike solutions (for spiked batch QC; LLFB/LFB/LFBD; LFSM/LFSMD), mass-labeled surrogate spike solution, and internal spike solution are described in *Attachment 7*.

Preparation of Glassware
Not applicable

Calibration
See Procedure section B.4 through B.5.

Procedure
A. Manual Sample Extraction

1. Weigh full sample container on a calibrated top loading balance and record the first reading in the automated prep entry system.

2. Use a 250ml HDPE bottle with 1.25g Trizma added(see Apparatus and Equipment 23.) for the extraction blank and the LFB. Fill each bottle with 250 +/- 0.4 grams of Milli-Q water.

3. Assemble the SPE extraction apparatus and attach the SPE cartridges. Label each cartridge with the appropriate sample number.

4. Condition each SPE cartridge with 15 mL methanol followed by 18 mL of Milli-Q water. Discard the eluent. Add 4-5 mL of reagent water to each cartridge. Do not let the cartridge go dry at any point during the conditioning process.

5. Vortex all spike solutions prior to use.

6. Spike QC samples (LFB/LFBD/LFSM/LFSMD) with 40 µl of native spike. Rotate the native spike for each batch prepped between the mid-level(537_SW-B_MID_), and high-level(537_SW-B_High_) spikes. Spike QC and all samples with 1ml of surrogate spike(537_DW-B_SURL_). Vortex to thoroughly mix.

7. Spike LLFB with 20 µl of Low-Level Native Spike(537_DW-B_LOW_) and 1 mL of surrogate spike(537_DW-B_SURL_). Vortex to thoroughly mix.

8. Attach a 25-mL SPE adaptor to each cartridge. Load the spiked samples/QC to the respective cartridges. Allow full volume to pass the each cartridge by gravity, if possible. Apply light vacuum if necessary. The flow rate should be approximately 10-15 mL per minute.

9. After the sample has fully eluted, rinse the sample bottle with 7.5 mL of Milli-Q water and add to the cartridge. Rinse the sample bottle with a second 7.5 mL of Milli-Q water and add to the cartridge.

10. After full volume and water rinses have passed through the cartridges, discard all waste from the reservoir.

11. Wipe each SPE needle with a Kim-wipe/methanol.

12. Dry cartridges with vacuum. No more than 15" Hg for approximately five minutes. Inspect the cartridge to ensure it is dry. Use of a visual standard is done to ensure that the cartridge has reached dryness.

13. Place labeled 15-mL polypropylene centrifuge collection tubes under each respective SPE cartridge.

14. Add 4 mL of methanol to each empty sample bottles and shake well.

15. Transfer the methanol from the bottles to the SPE reservoir.

16. Elute each cartridge with the 4 mL of methanol. Collect the 4 mL into the polypropylene centrifuge tubes. Repeat steps 13 and 14 a second time.

17. Repeat steps 14 - 16 a second time, collecting into the same polypropylene centrifuge tubes.

18. Concentrate on the N-Evap at no more than 40°C to dryness.

19. Add 1 mL of internal standard spike(537_DW-B_ISL_) to each extract. Extracts should be stored at room temperature in polypropylene centrifuge tubes until analysis.

20. Place each empty sample bottle on the top-loading balance and weigh. Record the second reading in the automated prep entry system. The prep entry system will calculate the sample weight. Record the calculated weight as the sample volume on the batchlog.

B. Automated Sample Extraction using Promochrom

This procedure can be used in place of the manual extraction described above.

1. Weigh full sample container on a calibrated top loading balance and record the first reading in the automated prep entry system.

2. Use a 250ml HDPE bottle with 1.25g Trizma added(see Apparatus and Equipment 23.) for the extraction blank and the LFB. Fill each bottle with 250 +/- 0.4 grams of Milli-Q water.
3. Fill the bottle on top of the promochrom with methanol and water, select clean sys from drop down menu, press the green check mark then select start. A window showing how much of each solvent that is needed will pop up, select ok.

4. Vortex all spike solutions prior to use.

5. Spike QC samples (LFB/LFBD/LFSM/LFSMD) with 40 µl of native spike. Rotate the native spike for each batch prepped between the mid-level(537_SW-B_MID_), and high-level(537_SW-B_High_) spikes. Spike QC and all samples with 1ml of surrogate spike(537_DW-B_SURL_). Vortex to thoroughly mix.

6. Spike LLFB with 20 µl of Low-Level Native Spike(537_DW-B_LOW_) and 1 mL of surrogate spike(537_DW-B_SURL_). Vortex to thoroughly mix.

7. Remove clean cartridges and attach the cartridges that will be used when running the samples. Disconnect the clean bottles then attach the sample bottle being sure to twist the bottle and not the cap, then place sample bottle upside down in corresponding numbered location on shaker. Poke two holes into the lip of each bottle. Load labeled centrifuge tubes in the moving tray beneath the cartridges.

8. Select EPA 537 from drop down menu, press the green check mark, and then press start. Select okay on pop-up menu after assuring there is enough of the solvents needed.

9. Once the cycle is complete remove centrifuge tubes and discard the used cartridges and bottles. Reattach clean bottles and cartridges, select clean sys from menu, select start (this must be done between each batch and the beginning and end of the day).
10. Concentrate on the N-Evap at no more than 40°C to dryness.

11. Add 1 mL of internal standard spike(537_DW-B_ISL_) to each extract. Extracts should be stored at room temperature in polypropylene centrifuge tubes until analysis.

12. Place each empty sample bottle on the top-loading balance and weigh. Record the second reading in the automated prep entry system. The prep entry system will calculate the sample weight. Record the calculated weight as the sample volume on the batchlog.

C. LC/MS/MS Analysis

Tuning and calibration for the LC/MS/MS: Refer to the instrument manufacturer's instructions for tuning and conditions. These values are stored in the tune file for future reference, and may not need to be changed unless loss of response is noted.

1. Chromatographic conditions

   Below are the recommended chromatographic conditions for the reversed-phase separation. Modifications to these conditions can be made at the discretion of the analyst to improve resolution or the chromatographic process. Proprietary Content

2. Example acquisition method: See *Proprietary Content*

3. Load sample vials containing standards, quality control samples, and sample extracts into autosampler tray. Allow the instrument adequate time to equilibrate to ensure the mass spec

and LC have reached operating conditions (approximately 5 minutes) before the first injection. Analyze several solvent blanks to clean the instrument prior to sample acquisition. An example sequence would be:

Initial Calibration Sequence:

1. Solvent
2. Solvent
3. Solvent
4. Solvent
5. CAL1
6. CAL2
7. CAL3
8. CAL4
9. CAL5
10. Solvent
11. MDL
12. ICV
13. L+B CAL3
14. CCC-CAL3

If the initial calibration passes, schedule a solvent blank followed by batch QC and samples.

Sample Sequence:

1. Solvent
2. Solvent
3. Solvent
4. Solvent
5. CCC1-CAL1
6. Method Blank (LRB)
7. LFB
8. LFBD
9. LLFB
10. LFSM
11. LFSMD
12. Sample
13. Sample
14. Sample
15. Sample
16. Sample
17. CCC2-CAL3

CCC's are acquired after every 10 samples. See C.6.a for more information.

Solvent = 96% methanol in water

If the system is acquiring data overnight, schedule four solvent blanks at the end of the sequence prior to the system going into standby mode

4. Initial Calibration

   a. Inject a minimum of 5 calibration standards. The low concentration standard must be at or near the MRL (See *Attachment 3*). The curve must be forced through zero and may be concentration weighted 1/x.

   b. Back calculated concentrations for each analyte in each calibration level must be within 70% to 130% of its true value with the exception of the low calibration standard, CAL 1, where the back calculated concentration must be within 50% to 150% of its true value.

c. The relative percent difference (RPD) between the high and low areas for each internal standard must be <20%.

d. Analyze a Linear and Branched-standard that contains linear and branch chained isomers of PFOA. The analysis of this standard is used to demonstrate where the branch chained isomers elute and not included in the calibration curve. This will assist the chemist in identifying and properly integrating these compounds in samples.

e. Peak asymmetry factor: Must be calculated with each ICAL. The factor for the first two eluting peaks in the mid-level CAL standard must fall in the range of 0.8-1.5.

f. See *Attachment 2* for relationship between injection standard, extraction standard, and native compound.

g. After the initial calibration, inject a solvent blank to demonstrate that there is no carryover.

5. Calibration confirmation by second source standards

   Once the calibration curve has been established, analyze second source mid-level standard as QCS to confirm the validity of the calibration curve/standard. A different lot of the standard or standard from a second vendor could be used. The calculated amount for each analyte must be ± 30% of the true value

6. Continuing calibration check

   a. The continuing accuracy must be verified by analysis of a continuing calibration Check (CCC) standard up to every ten samples and at the beginning and the end of each group of analyses. The opening CCC of the sequence must be at or below the MRL (See *Attachment 3*) in order to verify instrument sensitivity prior to sample analysis. All subsequent CCCs should alternate between the medium and high concentration CAL standards.

   b. The absolute areas of the quantitation ions for the internal standards (IS) must be within 70%-140% of the areas measured in the most recent CCC and within ±50% of the average areas measured during the most recent ICAL.

   c. The calculated amount for each target analyte and surrogate must be within ±30% of the true value for all CCCs except the low concentration CCC. For the low concentration CCC, each target compound must be within ±50% of the true value and each surrogate percent recovery must be within ±30% of the true value.

   d. Samples that are not bracketed by acceptable CCC runs must be reanalyzed. If the CCC recoveries are running high indicating increased sensitivity, and no detections of target analytes are observed, the data may be reported with a comment.

7. Sample analysis

   a. Usually the LFB and matrix spike samples are analyzed at the beginning of the analytical set, samples are analyzed next. Bracket each set of up to ten samples with a continuing calibration Check (CCC) standard.

   b. Process each sample and review the chromatogram closely. Evaluate all integrations, baseline anomalies, and retention time differences.

   c. All internal standard recoveries in QC and field samples must be within 70%-140% of the response in the most recent CCC and within ± 50% difference of the average response from the most recent ICAL. If the internal standard areas do not meet these criteria, a second aliquot of the sample may be analyzed. If the analysis of the second aliquot is acceptable, report those results. If the analysis of the second aliquot still yields internal standard responses that do not meet criteria, the sample may need reextracted if it is still within holding time or flagged with a comment on the analysis report.

d. All surrogate recoveries in QC and field samples must within the range of 70%-130%. If the recoveries fall outside this range the sample must be re-extracted.

e. Evaluate laboratory reagent blank (LRB). No target analytes can be detected above the MDL, which is less than 1/3 the MRL. If there are positive detections in the LRB but no detections in the associated samples the data may be reported. If there are positive detections in the LRB above the MDL, and detections of the same target analytes in the associated samples, the samples must be re-extracted.

f. Evaluate the laboratory fortified blank (LFB). All native recoveries should be within 70%-130% except the low fortified LFB. The acceptance criteria for the low fortified LFB is 50%-150%. If recoveries fall outside these acceptance ranges for the LFB (native recoveries), re-inject all samples with the LFB. If issue persists, further evaluation of the system and possible re-extraction may be required. If re-extraction is required, all associated samples must also be re-extracted.

g. Evaluate the laboratory fortified sample matrix and matrix duplicate (LFSM/LFSMD). All native recoveries should be within 70%-130%. The RPD's should be less than or equal to 30%.

h. If any targets are detected above the reporting limit in a sample, evaluate the field reagent blank (FRB). If any targets found in the field samples are also found in the FRB at concentrations > 1/3 the MRL, all field samples associated with the FRB must be recollected and reanalyzed. If a FRB is not submitted with a field sample, a comment will be added to the analysis report. The FRB must contain the same lot number of Trizma as the associated sample set.

Calculations

1. Internal standards

Calculating the %D

%D for CAL standards = ((IS Area – AVG Area from the Calibration)/AVG Area from the Calibration) * 100

For samples:

%Recovery IS =(((IS Area –IS area CCC)/ IS Area CCC) + 1) * 100

Where CCC = most recent/opening bracket CCC

2. Surrogate Standards; Target Compounds

Combo factor = Dilution factor * Prep factor * (Sample Volume/Sample Weight)

Note: Prep factor = 1

SUR Actual Concentration = Expected Concentration (for a sample with a final volume of 1 mL) * Combo factor

Calculated Concentration = (Area Ratio/Slope of the curve) * IS Conc * DF

For surrogates: Slope of the curve = Average area from the calibration standards

IS Conc varies depending on the associated IS: 13C2-PFOA = 10 ng/mL, 13C4-PFOS = 28.68 ng/mL, d3-NMeFOSAA = 40 ng/mL.

Sample Result = Calculated Concentration * Combo factor

% REC for surrogates = [((Sample Result-SUR Actual Concentration)/SUR Actual Concentration)+1] *100

See *T-PEST-WI9847* for details on all calculations/equations used to evaluate the initial and continuing calibration and QC samples.

Statistical Information/Method Performance

The LFB should contain all compounds of interest. LFB, MS/Ds, surrogate standard recoveries, and RPD are compared to the limits stored in the LIMS. These limits are defined in the method. Historical data for MS/Ds, LFD/Ds, measurement of uncertainty, is reviewed at least annually. Reporting limits including method detection limits (MDLs) and limits of quantitation (LOQs) are set according to EPA method requirements and are evaluated annually. Refer to *QA-SOP11892* for specific guidelines and procedures. Updates to the LIMS are made as needed by the QA Department and only as directed by the supervisor.

The initial demonstration of capability for this method has been carried out as listed in Section 9.2 of the reference method. See below for items not addressed elsewhere in the SOP.

1. Initial Demonstration of Low System Background - Performed any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets and autosampler vials are used.

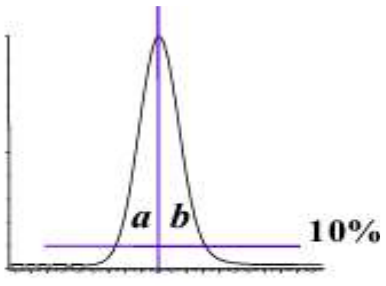
    a. No peaks are present within the retention time window of any analyte that would prevent the determination of that analyte. If any peaks are present, determine the source of the contamination and eliminate the interference before sample analysis.

    b. Background from method analytes must be below 1/3 of the MRL.

2. Initial Demonstration of Peak Asymmetry factor- Performed during the IDC and every time a new calibration curve is generated.

    a. Calculate the peak asymmetry factors for the first two eluting peaks in a mid-level CAL standard using the following equation:

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



where:

A_s = peak asymmetry factor

B = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex

a = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

    b. Peak asymmetry factors must fall in the range of 0.8 to 1.5

    c. If the criteria are not met, corrective action must be taken prior to sample analysis.

3. Minimum Reporting Level (MRL) confirmation

   a. Fortify, extract, and analyze seven replicate LFBs at the proposed MRL concentration.

   b. Calculate the mean measured concentration and standard deviation of the replicates.

   c. Determine the Half Range for the prediction interval of results (HR_{PIR}) using the equation below:

$$HR_{PIR} = 3.963s$$

where

s = the standard deviation
3.963 = a constant value for seven replicates.

   d. The Upper PIR limit must be less than or equal to 150% recovery using the equation below:

$$\frac{Mean + HR_{PIR}}{Fortified\,Concentration} \times 100\% \leq 150\%$$

   e. The Lower PIR Limit must be greater than or equal to 50% recovery using the equation below:

$$\frac{Mean - HR_{PIR}}{Fortified\,Concentration} \times 100\% \geq 50\%$$

   f. The MRL is validated if both the Upper and Lower PIR limits meet the criteria

   g. If the criteria is not met, the MRL is too low and must be determined again at a higher concentration.

Quality Assurance/Quality Control

For each batch of samples extracted, an LRB, an LLFB (Milli-Q water spiked with all compounds to be determined carried through the entire procedure spiked at the MRL), an LFB (Milli-Q water spiked with all compounds to be determined carried through the entire procedure), and an LFSM/LFSMD must be extracted. If there is limited sample that prevents the preparation of an LFSM/LFSMD then an LFBD may be prepared instead. However, the final report must then include a comment indicating the method specified LFSM/LFSMD was not analyzed due to insufficient sample submission. A batch is defined as the samples to be extracted on any given day, but not to exceed 20 field samples. If more than 20 samples are prepared in a day, an additional batch must be prepared. A field reagent blank (FRB) must be analyzed for each set of client samples submitted. This is to ensure no PFAS compounds are being introduced in the field. If one is not submitted, a comment will be added to the analysis report.

Note: If residual chlorine is present in regulated drinking water samples from PA, the sample is rejected.

If any client, state, or agency has more stringent QC or batching requirements, these must be followed instead.

Attachment:
Attachment 1 – Proprietary Content
Attachment 2 - IS-SS-Target Compound Associations (.docx)

Attachment 3 - MRLs (.doc)
Attachment 4 - Ampulated Standards (.doc)
Attachment 5 - Intermediate Solutions (.doc)
Attachment 6 - Working Calibration Standards (.doc)
Attachment 7 - Spiking Solutions (.doc)
Attachment 8 - Example CofA (.pdf)

11892 Determining Method Detection Limits and Limits of Quantitation
23905 EPA Drinking Water Manual
23907 Redacted SOPs
6830 Sampling Collection Instructions
9847 Common Equations Used During Chromatographic Analyses
Attachment: Attachment 1 – Proprietary Content
Attachment: Attachment 2 - IS-SS-Target Compound Associations (docx)
Attachment: Attachment 3 - MRLs (doc)
Attachment: Attachment 4 - Ampulated Standards (doc)
Attachment: Attachment 5 - Intermediate Solutions (doc)
Attachment: Attachment 6 - Working Calibration Standards (doc)
Attachment: Attachment 7 - Spiking Solutions (doc)
Attachment: Attachment 8 - Example CofA (pdf)

End of document

Version history

Version	Approval	Revision information	
6	16.NOV.2020		
7	28.DEC.2021		
8	30.DEC.2022		

Attachment 2

Internal Standards
13C2-PFOA
13C4-PFOS
d3-NMeFOSAA

Surrogates	Internal Standard
13C2-PFHxA	13C2-PFOA
13C2-PFDA	13C2-PFOA
13d5-NEtFOSAA	d3-NMeFOSAA
13C3-HFPODA	13C2-PFOA

Target Compounds

Target Compound	Internal Standard
PFHxA	13C2-PFOA
PFHpA	
PFOA	
PFNA	
PFDA	
PFUnDA	
PFDoDA	
PFTrDA	
PFTeDA	
HFPODA	
DONA	
PFBS	13C4-PFOS
PFHxS	
PFOS	
9CI-PF3ONS	
11CI-PF3OUdS	
NMeFOSAA	d3-NMeFOSAA
NEtFOSAA	

Attachment 3

List of MRLs for Method Constituents

Compound	MRL (ng/l)
NEtFOSAA	2
NMeFOSAA	2
PFBS	2
PFDA	2
PFDoDA	2
PFHpA	2
PFHxA	2
PFHxS	2
PFNA	2
PFOA	2
PFOS	2
PFTeDA	2
PFTrDA	2
PFUnDA	2
HFPODA	2
DONA	2
9Cl-PF3ONS	2
11Cl-PF3OUdS	2

Attachment 4

Single compound Ampulated solutions (natives)

Analyte (Wellington Cat. #)	CAS No	Conc. (µg/mL)	Acronym
N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA)	2355-31-9	50	NMeFOSAA
N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA)	2991-50-6	50	NEtFOSAA
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	83329-89-9	47.1	11Cl-PF3OUdS
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	958445-44-8	47.1	DONA
Hexafluoropropylene oxide dimer acid (HFPODA)	13252-13-6	50	HFPODA
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	73606-19-6	46.6	9Cl-PF3ONS

NATIVE BRANCHED/LINEAR ISOMERS

Single-compound ampoulated solutions

Analyte (Wellington Cat. #)	CAS No	Conc. (µg/mL)
Technical Ammonium Perfluorooctanoate (T-PFOA)	95328-99-7TG	50

Attachment 4

Mixture ampoulated solutions

Native PFAS Primary Dilution Standard(PDS) Mix, Wellington Cat. #: EPA-537PDS-R1.

This 1.2 ml ampoulated mix contains the following Native PFCA/PFAS compounds:

Analyte (Wellington Cat. #)	CAS No	Conc. (ng/mL)	Acronym
N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA)*	2991-50-6	2000	NEtFOSAA
N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA)*	2355-31-9	2000	NMeFOSAA
Potassium perfluoro-1-butanesulfonate (PFBS)	375-73-5	1770	PFBS
Perfluoro-n-decanoic acid (PFDA)	335-76-2	2000	PFDA
Perfluoro-n-dodecanoic acid (PFDoDA)	307-55-1	2000	PFDoDA
Perfluoro-n-heptanoic acid (PFHPA)	375-85-9	2000	PFHpA
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	2000	PFHxA
Sodium perfluoro-1-hexanesulfonate (PFHxS)*	355-46-4	1824	PFHxS
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	2000	PFNA
Perfluoro-n-octanoic acid (PFOA)	335-67-1	2000	PFOA
Sodium perfluoro-1-octanesulfonate (PFOS)*	1763-23-1	1851	PFOS
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	2000	PFTeDA
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	2000	PFTrDA
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	2000	PFUnDA
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	83329-89-9	1860	11Cl-PF3OUdS
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	958445-44-8	1890	DONA
Hexafluoropropylene oxide dimer acid (HFPODA)	13252-13-6	2000	HFPODA
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	73606-19-6	1860	9Cl-PF3ONS

*Note: NEtFOSAA, NMEFOSAA, PFHxS, and PFOS concentration includes the branched and linear isomers.

Attachment 4

MASS-LABELED SURROGATE STOCKS

Single-compound ampoulated solutions

Analyte (Wellington Cat. #)	CAS No	Conc. (µg/mL)	Acronym
Perfluoro-n-[1,2-13C2]decanoic acid (MPFDA)	335-76-2L	50	13C2-PFDA
N-ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (d5-N-EtFOSAA)	2991-50-6L	50	d5-NEtFOSAA
Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid (MPFHxA)	307-24-4L	50	13C2-PFHxA
2,3,3,3,-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-13C3-propanoic Acid (M3HFPO-DA)	13252-13-6LC3	50	13C3-HFPODA

MASS-LABELED INTERNAL STANDARD STOCKS

Single-compound ampoulated solutions

Analyte (Wellington Cat. #)	CAS No	Conc. (µg/mL)	Acronym
N-methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (d3-N-MeFOSAA)	2355-31-9L	50	d3-NMeFOSAA
Sodium perfluoro-1-[1,2,3,4-13C4]-octanesulfonate (MPFOS)	1763-23-1L	50	13C8-PFOS
Perfluoro-n-[1,2-13C2]octanoic acid (M2PFOA)	335-67-1L	50	13C8-PFOA

Attachment 4

NATIVE PERFLUOROALKYLCARBOXYLIC ACIDS

(Used for preparation of Initial Calibration Verification (ICV) standard)

Wellington Cat. #: PFC-MXA 1.2ml

Analytes in Wellington Cat #: PFC-MXA(1.2ml)	CAS No	Conc. (ug/mL)	Acronym
Perfluoro-n-hexanoic acid	307-24-4	2	PFHxA
Perfluoro-n-heptanoic acid	375-85-9	2	PFHpA
Perfluoro-n-octanoic acid	335-67-1	2	PFOA
Perfluoro-n-nonanoic acid	375-95-1	2	PFNA
Perfluoro-n-decanoic acid	335-76-2	2	PFDA
Perfluoro-n-undecanoic acid	2058-94-8	2	PFUnDA
Perfluoro-n-dodecanoic acid	307-55-1	2	PFDoDA
Perfluoro-n-tridecanoic acid	72629-94-8	2	PFTrDA
Perfluoro-n-tetradecanoic acid	376-06-7	2	PFTeDA
Perfluoro-n-butanoic acid	375-22-4	2	PFBA
Perfluoro-n-pentanoic acid	2706-90-3	2	PFPeA

NATIVE PERFLUOROALKYLSULFONATES

(Used for preparation of Initial Calibration Verification (ICV) standard)

Wellington Cat. #: PFS-MXA 1.2 ml

Analytes in Wellington Cat. # PFS-MXA (1.2 ml)	CAS No	Conc. (ug/mL)	Acronym
Potassium perfluoro-1-butanesulfonate	375-73-5	1.77	PFBS
Sodium perfluoro-1-hexanesulfonate	355-46-4	1.89	PFHxS
Sodium perfluoro-1-octanesulfonate	1763-23-1	1.91	PFOS

Attachment 5

Intermediate solutions

537 Drinking water Intermediate (DW-AB_PDSL_)

1. Using a calibrated syringe or an autopipette with a PP tip, add add 1.8 ml 96% methanol/water to a 4ml polypropylene (PP) bottle.
2. Using a calibrated syringe or an autopipette with a PP tip, add 0.2 ml (200ul) of 537_DW-B_High (see Attachment 7) to the PP bottle.
3. Invert several times to mix.
4. Vortex to mix thoroughly. Store at room temperature. Stable for 6 months unless degredation is observed.

Analyte	CAS No	Conc. (ppb)
N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA)*	2991-50-6	50
N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA)*	2355-31-9	50
Potassium perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	44.25
Perfluoro-n-decanoic acid (PFDA)	335-76-2	50
Perfluoro-n-dodecanoic acid (PFDoDA)	307-55-1	50
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	50
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	50
Sodium perfluoro-1-hexansulfonic acid(PFHxS)*	355-46-4	45.6
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	50
Perfluoro-n-octanoic acid (PFOA)	335-67-1	50
Sodium perfluoro-1-octanesulfonic acid (PFOS)*	1763-23-1	46.28
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	50
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	50
Perfluoro-n-undecanoic acid (PFUnDA)	2058-94-8	50
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	763051-92-9	46.5
4,8-dioxa-3H-perfluorononanoic acid (DONA)	919005-14-4	47.25
Hexafluoropropylene oxide dimer acid (HFPODA)	13252-13-6	50

Analyte	CAS No	Conc. (ppb)
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	73606-19-6	46.5

*Note: NEtFOSAA, NMEFOSAA, PFHxS, and PFOS concentrations includes the branched and linear isomers.

537 Drinking Waters Linear Branched PFOA Intermediate (537_DW_B_TI)

1. Using a calibrated syringe or an autopipette with a PP tip, add 1.98 ml of 96% methanol/water to a 4 ml polypropylene (PP) bottle.

2. Using a calibrated syringe or an autopipette with a PP tip, add 0.02 ml (20 ul) of Technical Ammonium Perfluorooctanoate (T-PFOA) stock to the polypropylene bottle. (final volume of solutions is 2ml)

3. Mix thoroughly. Store at room temperature. Stable for 6 months unless degredation is observed.

Compound	Concentration (ppb)
T-PFOA	500

537 Drinking Water ICV intermediate A (537_DW-B_ICVI_)

1. Using a calibrated syringe or an autopipette with a PP tip, add 0.44 ml of 96% methanol/water to 4 ml polypropylene (PP) bottle. Using a calibrated syringe or an autopipette with a PP tip, add the following solutions to the same bottle.

Stock Solution	Volume (ml)
11CI-PF3OUdS stock	0.01
9CI-PF3ONS stock	0.01
DONA stock	0.01
HFPODA stock	0.01
NEtFOSAA stock	0.01
NMeFOSAA stock	0.01
PFC-MXA	0.25
PFS-MXA	0.25

2. Invert several times to mix.

3. Vortex to mix thoroughly. Store at room temperature. Stable for 6 months unless degredation is observed.

Compound	Concentration (ppb) in intermediate standard
NEtFOSAA	500
NMeFOSAA	500
PFBS	442.25
PFDA	500
PFDoDA	500
PFHpA	500
PFHxA	500
PFHxS	472.75
PFNA	500
PFOA	500
PFOS	478
PFTeDA	500
PFTrDA	500
PFUnDA	500
11Cl-PF3OUdS	471
9Cl-PF3ONS	466
DONA	471
HFPODA	500

Attachment 6

Working initial calibration standards

All standards are prepared using calibrated syringes or an autopipette with a PP tip. All standards are prepared in 4 ml polypropylene (PP) bottles using 96% methanol/water. Final volume(s) for all /each standard(s) is 2 ml.

A. Calibration Standards-Volumes

Solution	Calibration Standards - Volumes (mL)					
	MDL	CAL1	CAL2	CAL3	CAL4	CAL5
537 Drinking water intermediate	0.005	0.02	0.04	NA	NA	NA
537_DW-B_High	NA	NA	NA	0.01	0.02	0.08
Surrogate (537_DW-B_SUR_)	0.02	0.02	0.02	0.02	0.02	0.02
Internal Standard (537_DW-B_IS_)	0.02	0.02	0.02	0.02	0.02	0.02
96% methanol/water	1.955	1.94	1.92	1.95	1.94	1.88

B. Calibration Standards-Concentrations

Compound	Calibration Standards – Concentrations (ppb)					
	MDL	CAL1	CAL2	CAL3	CAL4	CAL5
NEtFOSAA	0.125	0.5	1	2.5	5	20
NMeFOSAA	0.125	0.5	1	2.5	5	20
PFBS	0.111	0.443	0.885	2.21	4.42	17.7
PFDA	0.125	0.5	1	2.5	5	20
PFDoDA	0.125	0.5	1	2.5	5	20

Attachment 6

Compound	Calibration Standards – Concentrations (ppb)					
	MDL	CAL1	CAL2	CAL3	CAL4	CAL5
PFHpA	0.125	0.5	1	2.5	5	20
PFHxA	0.125	0.5	1	2.5	5	20
PFHxS	0.114	0.456	0.912	2.28	4.56	18.24
PFNA	0.125	0.5	1	2.5	5	20
PFOA	0.125	0.5	1	2.5	5	20
PFOS	0.116	0.463	0.926	2.31	4.63	18.51
PFTeDA	0.125	0.5	1	2.5	5	20
PFTrDA	0.125	0.5	1	2.5	5	20
PFUnDA	0.125	0.5	1	2.5	5	20
11Cl-PF3OUdS	0.116	0.465	0.93	2.325	4.65	18.6
DONA	0.118	0.4725	0.945	2.363	4.725	18.9
HFPODA	0.125	0.5	1	2.5	5	20
9Cl-PF3ONS	0.116	0.465	0.93	2.325	4.65	18.6
13C2-PFDA	10	10	10	10	10	10
13C2-PFHxA	10	10	10	10	10	10
d5-NEtFOSAA	40	40	40	40	40	40
13C2-PFOA	10	10	10	10	10	10
13C4-PFOS	28.68	28.68	28.68	28.68	28.68	28.68
d3-NMeFOSAA	40	40	40	40	40	40

C. Linear and Branched Standard (537_DW-B_LB_) – Volumes

Solution	Linear and Branched Standard Volumes (mL)
537 Drinking water Linear and Branched PFOA intermediate (537_DW-B_TI_)	0.01
Surrogate (537_DW-B_SUR_)	0.02
Internal Standard (537_DW-B_IS_)	0.02
96% methanol/water	1.95

D. Linear and Branched Standard – concentrations

Compound	Concentration (ppb)
13C2-PFDA	10
13C2-PFHxA	10
d5-NEtFOSAA	40
13C2-PFOA	10
13C4-PFOS	28.68
d3-NMeFOSAA	40
T-PFOA	2.5
13C3-HFPODA	10

E. ICV(537_DW-B_ICV_) - Volumes

Solution	ICV Volumes (mL)
537 drinking water ICV intermediate B (537_DW-B_ICVI_)	0.01
Surrogate (537_DW-B_SUR_)	0.02
Internal Standard (537_DW-B_IS_)	0.02
96% methanol/water	1.95

F. ICV- Concentrations

Compound	Concentration (ppb)
NEtFOSAA	2.5
NMeFOSAA	2.5
PFBS	2.21
PFDA	2.5
PFDoDA	2.5
PFHpA	2.5
PFHxA	2.5
PFHxS	2.36
PFNA	2.5
PFOA	2.5
PFOS	2.39
PFTeDA	2.5
PFTrDA	2.5

Attachment 6

Compound	Concentration (ppb)
PFUnDA	2.5
11Cl-PF3OUdS	2.355
9Cl-PF3ONS	2.33
DONA	2.355
HFPODA	2.5
13C2-PFDA	2.5
13C2-PFHxA	2.5
d5-NEtFOSAA	40
13C2-PFOA	10
13C4-PFOS	28.68
d3-NMeFOSAA	40

Preparation of Working Native Spike Solution (for spiked batch QC; LFB/LFBD; LFSM/LFSMD)

Working Native Spike Solutions

These are prepared using the Native PFAS PDS Mix (CAT # EPA-537PDS-R1).

Method requires alternating between low-, mid- and high-level spike concentrations for Native compounds.

A. **Low-Level Native Spike** (537_DW-B_LOW_):

1) Using a calibrated syringe or an autopipette with a PP tip, add 1.976 ml of 96% methanol/water to a 4 mL polypropylene(PP) vial with a screw cap.

2) Using a calibrated syringe or an autopipette with a PP tip, add 0.024 ml Native PFAS PDS Mix to the PP container.

3) Invert several times to mix.

4) Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Compound	Concentration (ppb)
PFOA	24
PFNA	24
PFDA	24
PFUnDA	24
PFDoDA	24
PFTrDA	24

Compound	Concentration (ppb)
PFOA	24
PFNA	24
PFDA	24
PFTeDA	24
PFHxA	24
PFHpA	24
PFBS	21.24
PFHxS	21.89
PFOS	22.21
NEtFOSAA	24
11Cl-PF3OUdS	22.32
9Cl-PF3ONS	22.32
DONA	22.68
HFPODA	24
NMeFOSAA	24

B. **Mid-Level Native Spike** (537_DW-B_MID_):

1) Using a calibrated syringe or an autopipette with a PP tip, add 2.808 ml of 96% methanol/water to a 4 mL polypropylene(PP) vial with a screw cap.

2) Using a calibrated syringe or an autopipette with a PP tip, add 0.192 ml Native PFAS PDS Mix to the PP container.

3) Invert several times to mix.

4) Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Compound	Concentration (ppb)
PFOA	128
PFNA	128
PFDA	128
PFUnDA	128
PFDoDA	128
PFTrDA	128
PFTeDA	128
PFHxA	128
PFHpA	128
PFBS	113.28
PFHxS	116.74
PFOS	118.46
NEtFOSAA	128
11Cl-PF3OUdS	119.04
9Cl-PF3ONS	119.04
DONA	120.96
HFPODA	128
NMeFOSAA	128

C. **High-Level Native Spike** (537_DW-B_High_):

1) Using a calibrated syringe or an autopipette with a PP tip, add 1.5 ml of 96% methanol/water to a 4 mL polypropylene(PP) vial with a screw cap.

2) Using a calibrated syringe or an autopipette with a PP tip, add 0.5 ml Native PFAS PDS Mix to the PP container.

3) Invert several times to mix.

4) Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Attachment 7

Compound	Concentration (ppb)
PFOA	500
PFNA	500
PFDA	500
PFUnDA	500
PFDoDA	500
PFTrDA	500
PFTeDA	500
PFHxA	500
PFHpA	500
PFBS	442.5
PFHxS	456
PFOS	462.75
NEtFOSAA	500
11Cl-PF3OUdS	465
9Cl-PF3ONS	465
DONA	472.5
HFPODA	500
NMeFOSAA	500

Preparation of Intermediate Mass-Labeled Surrogate Spike Solution (537_DW-B_SUR_).

1) Using a PP transfer pipette, add approximately 5-6ml 96% methanol/water to a 10ml Class A polypropylene (PP) volumetric flask.

2) Using a calibrated syringe or an autopipette with a PP tip, add the following aliquots of the stocks listed in the table below to the flask.

Compound	Aliquot of Stock (ml)	Concentration (ppb)
d5-NEtFOSAA	0.8	4000
13C2-PFHxA	0.2	1000
13C2-PFDA	0.2	1000
13C3-HFPODA	0.2	1000

3) Bring the flask to volume using 96% methanol/water. Invert several times to mix.

4) Transfer to a labeled 15 mL polypropylene centrifuge tube with a screw cap. Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Preparation of Working Mass-Labeled Surrogate Spike Solution (537_DW-B_SURL_).

This solution is added to all samples and batch QC; LFB/LFBD; LFSM/LFSMD.

1) Using a PP transfer pipette, add approximately 50-60ml 96% methanol/water to a 100ml Class A volumetric flask.

2) Using a calibrated syringe or an autopipette with a PP tip, add 1 mL of Intermediate Mass-Labeled Surrogate Spike Solution (537_SW-B_SUR_) to the flask.

3) Bring the flask to volume using 96% methanol/water. Invert several times to mix.

4) Transfer to a labeled 125 mL polypropylene bottle. Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Compound	Concentration (ppb)
d5-NEtFOSAA	40
13C2-PFHxA	10
13C2-PFDA	10
13C3-HFPODA	10

Preparation of Intermediate Internal Standard Spike (537_DW-B_IS_):

1) Using a PP transfer pipette, add approximately 5-6ml 96% methanol/water to a 10ml Class A PP volumetric flask.

2) Using a calibrated syringe or an autopipette with a PP tip, add the following aliquots of the stocks listed in the table below to the flask.

Compound	Aliquot of Stock (ml)	Concentration (ppb)
d3-NMeFOSAA	0.8	4000
13C2-PFOA	0.2	1000
13C4-PFOS	0.6	2868

3) Bring the flask to volume using 96% methanol/water. Invert several times to mix.

4) Transfer to a labeled 15 mL polypropylene centrifuge tube with a screw cap. Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Preparation of Working Internal Standard Spike (537_DW-B_ISL_):

This solution is added to all extracts prior to analysis/injection on the LC/MS/MS system.

1) Using a PP transfer pipette, add approximately 50-60ml 96% methanol/water to a 100ml Class A volumetric flask.

2) Using a calibrated syringe or an autopipette with a PP tip, add 1 mL of Intermediate Internal Standard Spike(537_DW-B_IS_) to the flask.

3) Bring the flask to volume using 96% methanol/water. Invert several times to mix.

4) Transfer to a labeled 125 mL polypropylene bottle. Vortex to thoroughly mix. Store at room temperature. Stable for 2 months unless degredation is observed.

Compound	Concentration (ppb)
d3-NMeFOSAA	4000
13C2-PFOA	1000
13C4-PFOS	2868

5/6/2021

WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS
DOCUMENTATION

A-1 410-1337460

A2 410-1484801

B 410-1304922

410-1346475

EPA-537PDS-R1

Native PFAS Primary Dilution Standard Solution/Mixture

PRODUCT CODE:	EPA-537PDS-R1
LOT NUMBER:	537PDSR10119
SOLVENT(S):	Methanol/ Water (<1%)
DATE PREPARED: (mmldd/yyyy)	02/14/2019
LAST TESTED: (mmlddlyyyy)	02/10/2021
EXPIRY DATE: (mm/ddlyyyy)	02/10/2024
RECOMMENDED STORAGE:	Refrigerate ampoule
DESCRIPTION:	

EPA-537PDS-R1 is a solution/mixture of native linear perfluoroalkylcarboxylic acids (PFCAs; C_6-C_{14}), native perfluoroalkylsulfonates (PFSAs; C_6 linear; C_6 and C_8 linear and branched), native N-substituted perfluorooctanesulfonamidoacetic acids (N-MeFOSAA and N-EtFOSAA; linear and branched), GenX (HFPO-DA), the main components of F-53B (9Cl-PF3ONS and 11Cl-PF3OUdS), and the sodium salt of ADONA (NaDONA). The components and their concentrations are given in Table A.

The components of this solution/mixture all have chemical purities of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Table B: Isomeric Components and Percent Composition of N-MeFOSAA
Table C: Isomeric Components and Percent Composition of N-EtFOSAA
Table D: Isomeric Components and Percent Composition of PFHxSK
Table E: Isomeric Components and Percent Composition of PFOSK
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

See page 2 for further details.
Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acids to their respective methyl esters.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA
519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS/ CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, *u/y),* of a value *y* and the uncertainty of the independent parameters $x,, x_{2}, \cdots x''$ on which it depends is:

$$uc(y(x_1,x_2,\ldots x.)) = \sum_{i=1} u(y,xY$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAi Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ACCREDITED REFERENCE MATERIAL. PAOOUCEA

For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

Table A: **EPA-537PDS-R1; Components and Concentrations (± 5% in methanol/water (<1%))**

Compound	Acronym	Concentration* (ng/ml)	Peak Assignment in Figure 1
Perfluoro-n-hexanoic acid	PFHxA	2000	B
Perfluoro-n-heptanoic acid	PFHpA	2000	D
Perfluoro-n-octanoic acid	PFOA	2000	H
Perfluoro-n-nonanoic acid	PFNA	2000	I
Perfluoro-n-decanoic acid	PFDA	2000	M
Perfluoro-n-undecanoic acid	PFUdA	2000	R
Perfluoro-n-dodecanoic acid	PFDoA	2000	T
Perfluoro-n-tridecanoic acid	PFTrDA	2000	U
Perfluoro-n-tetradecanoic acid	PFTeDA	2000	V
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid	HFPO-DA	2000	C
N-methylperfluorooctanesulfonamidoacetic acid '	N-MeFOSM: linear isomer	1520	0
	N-MeFOSM: I: branched isomers	480	N
N-ethylperfluorooctanesulfonamidoacetic acid b	N-EtFOSAA: linear isomer	1550	Q
	N-EtFOSAA: I: branched isomers	450	P

Compound	Acronym	Concentration* (ng/ml)		Peak Assignment in Figure 1
		as the salt	as the acid	
Potassium perfluoro-1-butanesulfonate	L-PFBS	2000	1770	A
Potassium perfluorohexanesulfonate '	PFHxSK: linear isomer	1620	1480	G
	PFHxSK: I: branched isomers	378	345	F
Potassium perfluorooctanesulfonate d	PFOSK: linear isomer	1580	1460	K
	PFOSK: I; branched isomers	422	392	J
Sodium dodecafluoro-3H-4,8-dioxanonanoate	NaDONA	2000	1890	E
Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	9Cl-PF30NS	2000	1870	L
Potassium 11-chloroeicosafluoro-3-oxaundecane-1-sulfonate	11Cl-PF3OUdS	2000	1890	S

* Concentrations have been rounded to three significant figures.

' See Table B for percent composition of linear and branched N-MeFOSAA isomers.
b See Table C for percent composition of linear and branched N-EtFOSAA isomers.
' See Table D for percent composition of linear and branched PFHxSK isomers.
d See Table E for percent composition of linear and branched PFOSK isomers.

Table B: **N-MeFOSAA; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{1}•F-NMR	
1	N-methylperfluoro-1-octanesulfonamidoacetic acid	$CF_3(CF_2)_7SO_2NCH_2CO_2H$ CH_3	76.0	76.0
2	N-methylperfluoro-3-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_3CF(CF_2)_2SO_2NCH_2CO_2H$ CF_3 CH_3	0.7	24.0
3	N-methylperfluoro-4-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_2CF(CF_2)_3SO_2NCH_2CO_2H$ CF_3 CH_3	2.0	
4	N-methylperfluoro-5-methylheptanesulfonamidoacetic acid	$CF_3CF_2CF(CF_2)_4SO_2NCH_2CO_2H$ CF_3 CH_3	6.0	
5	N-methylperfluoro-6-methylheptanesulfonamidoacetic acid	$CF_3CF(CF_2)_5SO_2NCH_2CO_2H$ CF_3 CH_3	14.0	
6	N-methylperfluoro-5,5-dimethylhexanesulfonamidoacetic acid	$CF_3C(CF_2)_4SO_2NCH_2CO_2H$ CF_3 CH_3	0.2	
7	Other Unidentified Isomers		1.1	

* Percent of total N-methylperfluorooctanesulfonamidoacetic acid isomers only.

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Table C: **N-EtFOSAA; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{1}•F-NMR	
1	N-ethylperfluoro-1-octanesulfonamidoacetic acid	$CFiCF_2I?SO_2NCH_2C0_2H$ C2Hs	**77.5**	**77.5**
2	N-ethylperfluoro-3-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_3CF(CF_2)_2SO_2NCH_2CO_2H$ CF_3 C2H5	2.3	**22.5**
3	N-ethylperfluoro-4-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_2CF(CF_2hSO_2NCH_2CO_2H$ CF_3 C2H5	2.2	
4	**N-ethylperfluoro-5-methylheptanesulfonamidoacetic acid**	$CF_3CF_2CF(CF_2)_4SO_2NCH_2CO_2H$ CF_3 C2H5	5.4	
5	N-ethylperfluoro-6-methylheptanesulfonamidoacetic acid	$CF_3yF(CF_2)_5SO_2\ CH_2CO_2H$ CF_3 C2H5	10.4	
6	N-ethylperfluoro-5,5-dimethylhexanesulfonamidoacetic acid	$CF_3C(CF_2)_4SO_2NCH_2CO_2H$ CF_3 C2H5	0.3	
7	N-ethylperfluoro-4,5-dimethylhexanesulfonamidoacetic acid	$CF_3CFCF(CF_2)_3SO_2NCH_2CO_2H$ CF_3 C2H5	0.3	
8	N-ethylperfluoro-3,5-dimethylhexanesulfonamidoacetic acid	$CF_3CFCF_2CF(CF_2)_2S0_2NCH_2C0_2H$ CF_3 C2H5	0.3	
9	Other Unidentified Isomers		1.3	

• Percent of total N-ethylperfluorooctanesulfonamidoacetic acid isomers only.

Table D: **PFHxSK; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	Potassium perfluoro-1-hexanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF_2SO_3$-K+	81.1	81.1
2	Potassium 1-trifluoromethylperfluoropentanesulfonate**	$CF_3CF_2CF_2CF_2CFSO_3$-K+ (CF3 branch)	2.9	18.9
3	Potassium 2-trifluoromethylperfluoropentanesulfonate	$CF_3CF_2CF_2CFCF_2so_3$-K+ (CF3 branch)	1.4	
4	Potassium 3-trifluoromethylperfluoropentanesulfonate	$CF_3CF_2CFCF_2CF_2So_3$-K+ (CF3 branch)	5.0	
5	Potassium 4-trifluoromethylperfluoropentanesulfonate	$CF_3CFCF_2CF_2CF_2SO_3$-K+ (CF3 branch)	8.9	
6	Potassium 3,3-di(trifluoromethyl)perfluorobutanesulfonate	$CF_3CCF_2CF_2So_3$-K+ (two CF3 branches)	0.2	
7	Other Unidentified Isomers		0.5	

* Percent of total perfluorohexanesulfonate isomers only.
** Systematic Name: Potassium perfluorohexane-2-sulfonate.

Attachment 8

Table E: **PFOSK; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

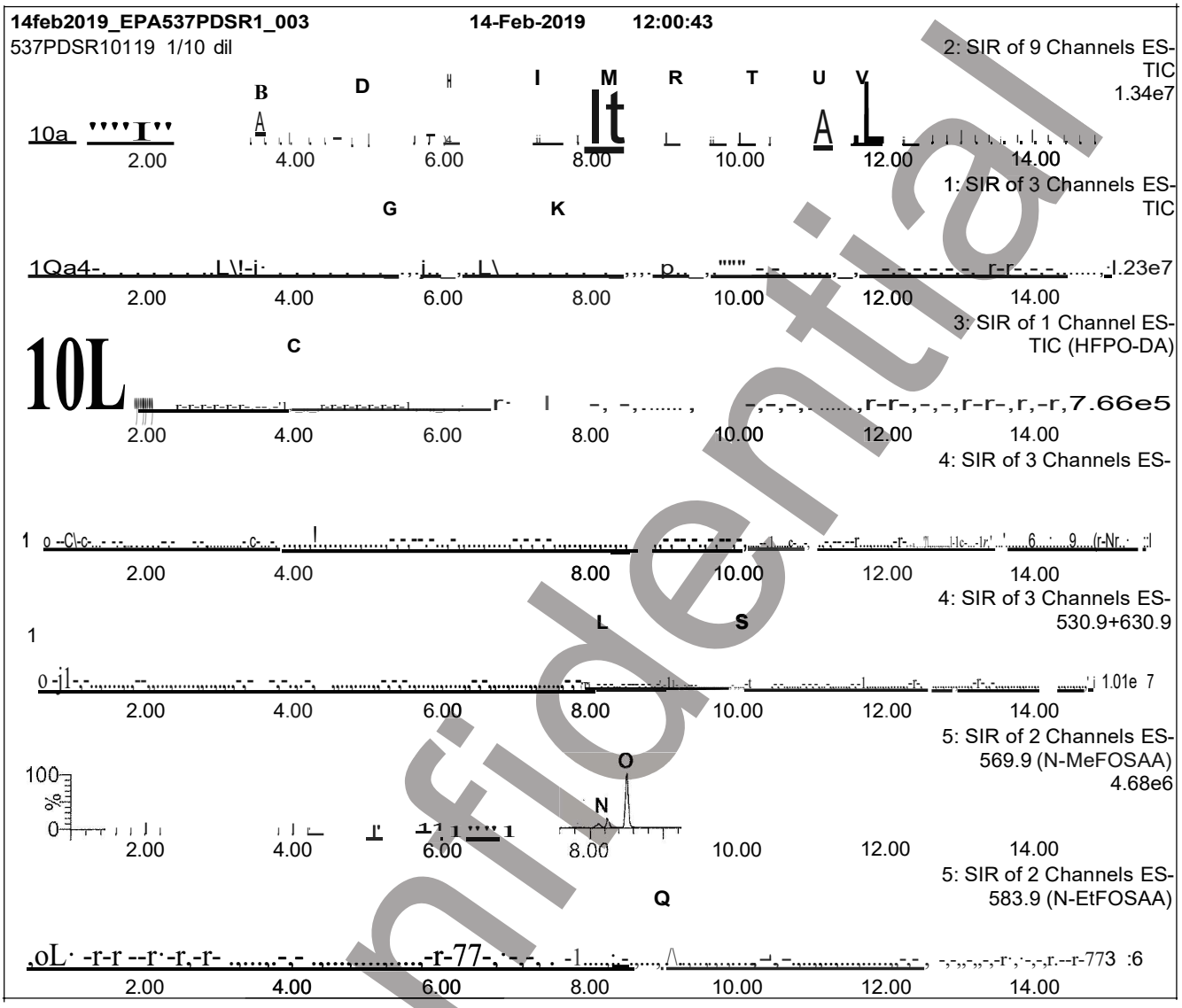
Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	Potassium perfluoro-1-octanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF_2CF_2CF_2SO_3$-K+	78.8	78.8
2	Potassium 1-trifluoromethylperfluoroheptanesulfonate**	$CF_3CF_2CF_2CF_2CF_2CF_2CF(CF_3)SO_3$-K+	1.2	21.1
3	Potassium 2-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF(CF_3)CF_2SO_3$-K+	0.6	
4	Potassium 3-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF_2CF(CF_3)CF_2CF_2SO_3$-K+	1.9	
5	Potassium 4-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF(CF_3)CF_2CF_2CF_2SO_3$•K+	2.2	
6	Potassium 5-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF(CF_3)CF_2CF_2CF_2CF_2So_3$-K+	4.5	
7	Potassium 6-trifluoromethylperfluoroheptanesulfonate	$CF_3CF(CF_3)CF_2CF_2CF_2CF_2CF_2So_3$-K+	10.0	
8	Potassium 5,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CF_2CF_2CF_2CF_2SO_3$-K+ (C(CF3)2 at position 5)	0.2	
9	Potassium 4,4-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CF_2CF_2CF_2CF_2So_3$-K+ (C(CF3)2 at position 4)	0.03	
10	Potassium 4,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CFCFCF_2CF_2CF_2SO_3$·K+ (CF3 at positions 4 and 5)	0.4	
11	Potassium 3,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CFCF_2CFCF_2CF_2SO_3$•K+ (CF3 at positions 3 and 5)	0.07	

* Percent of total perfluorooctanesulfonate isomers only.
** Systematic Name: Potassium perfluorooctane-2-sulfonate.

Certified By: - **Date:** 02/11/2021 (mmldd/yyyy)

B.G. Chittim, General Manager

Figure 1: EPA-537PDS-R1; LC/MS Data (SIR)



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP 18
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 60% H,O / 40% (80:20 MeOH:ACN)
(both with 10 mM NHpAc buffer)
Ramp to 70% organic over 7 min then ramp to 90% organic over 4.5 min and hold for 1.5 min before returning to initial conditions in 0.5 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.00
Cone Voltage (V) = Variable (2-74)
Desolvation Temperature (°C) = 325
Desolvation Gas Flow (L/hr) = 1000

Figure 2: **EPA-537PDS-R1; LC/MS/MS Data (Selected MRM Transitions)**

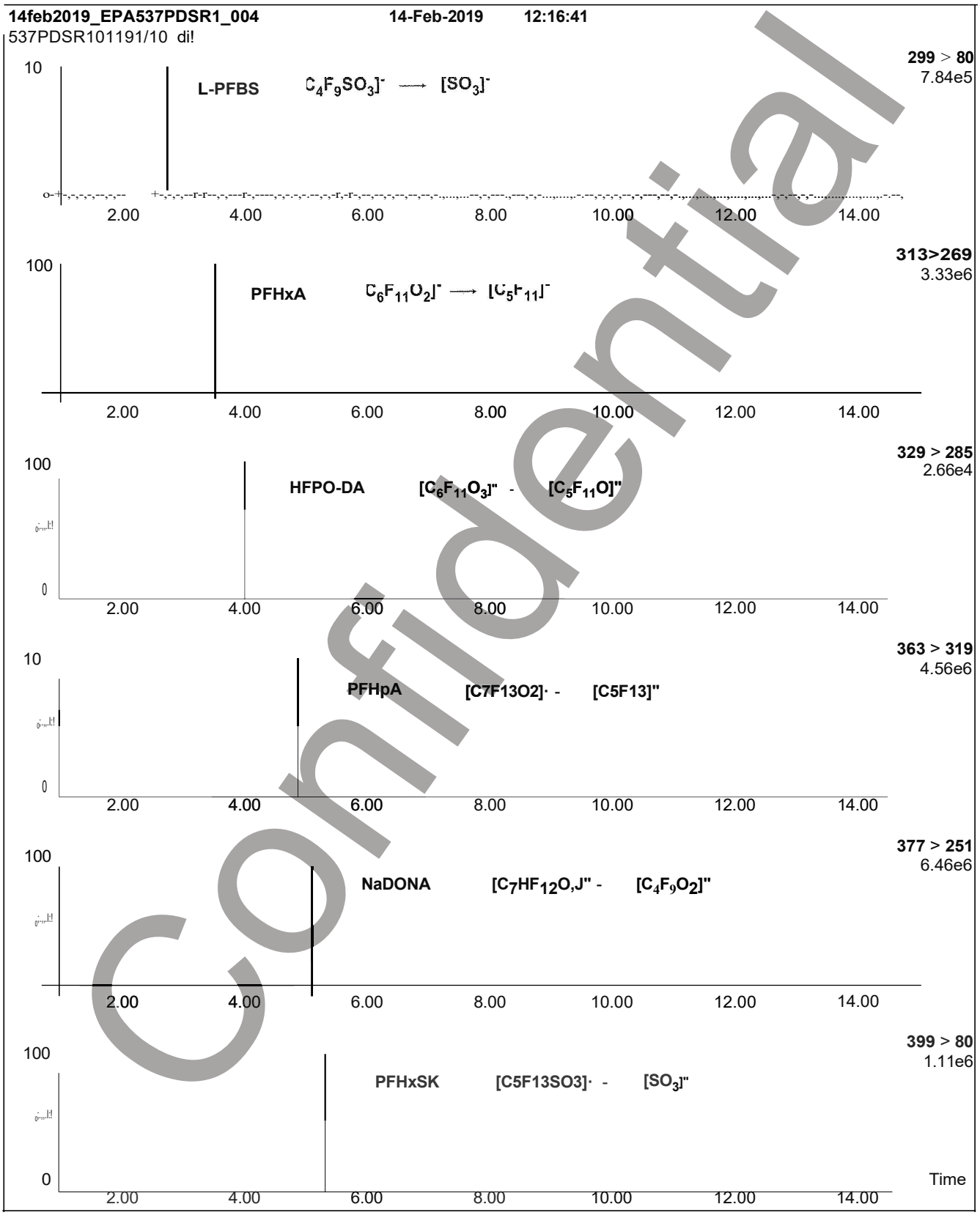


Figure 2: **EPA-537PDS-R1; LC/MS/MS Data (Selected MRM Transitions)**

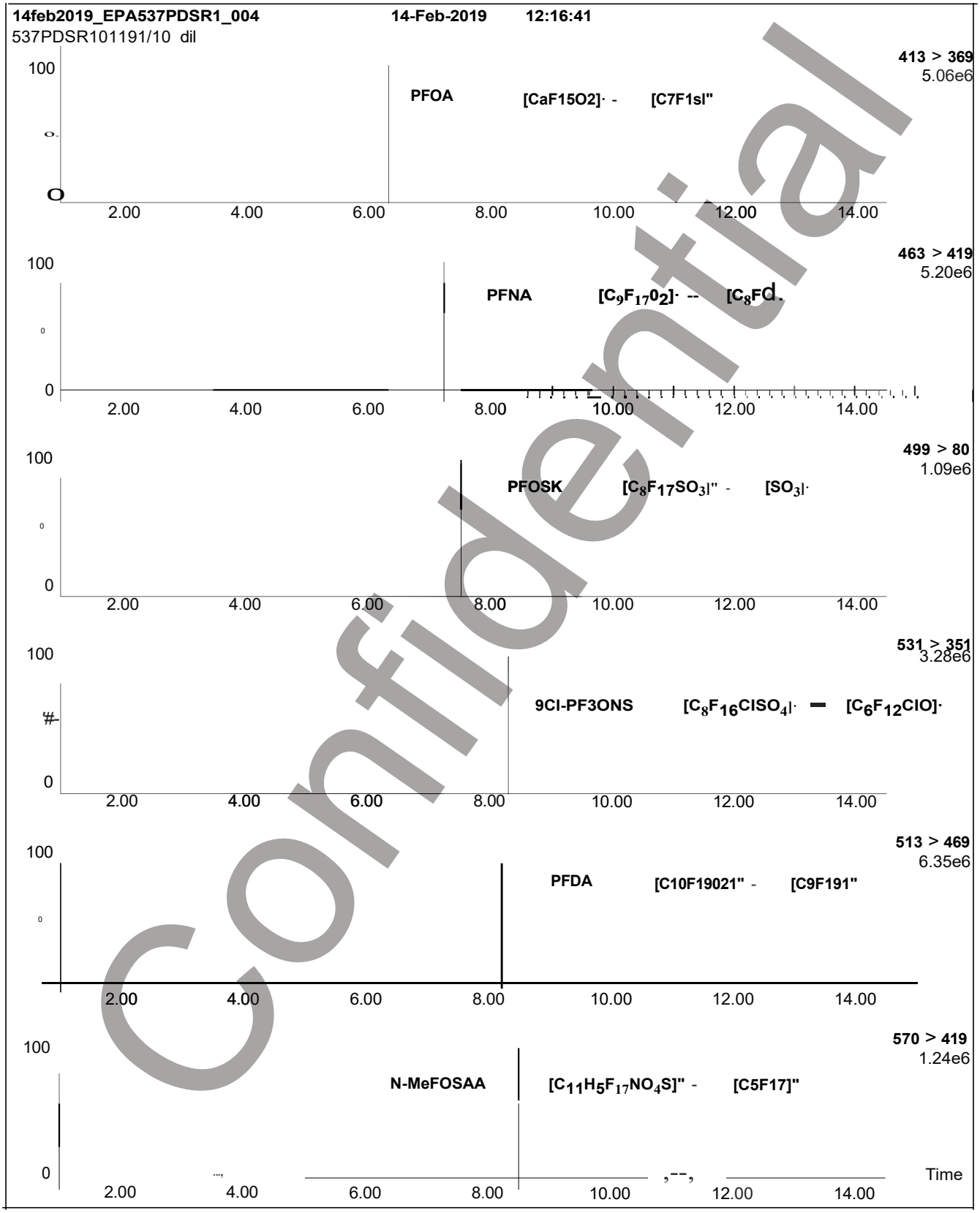
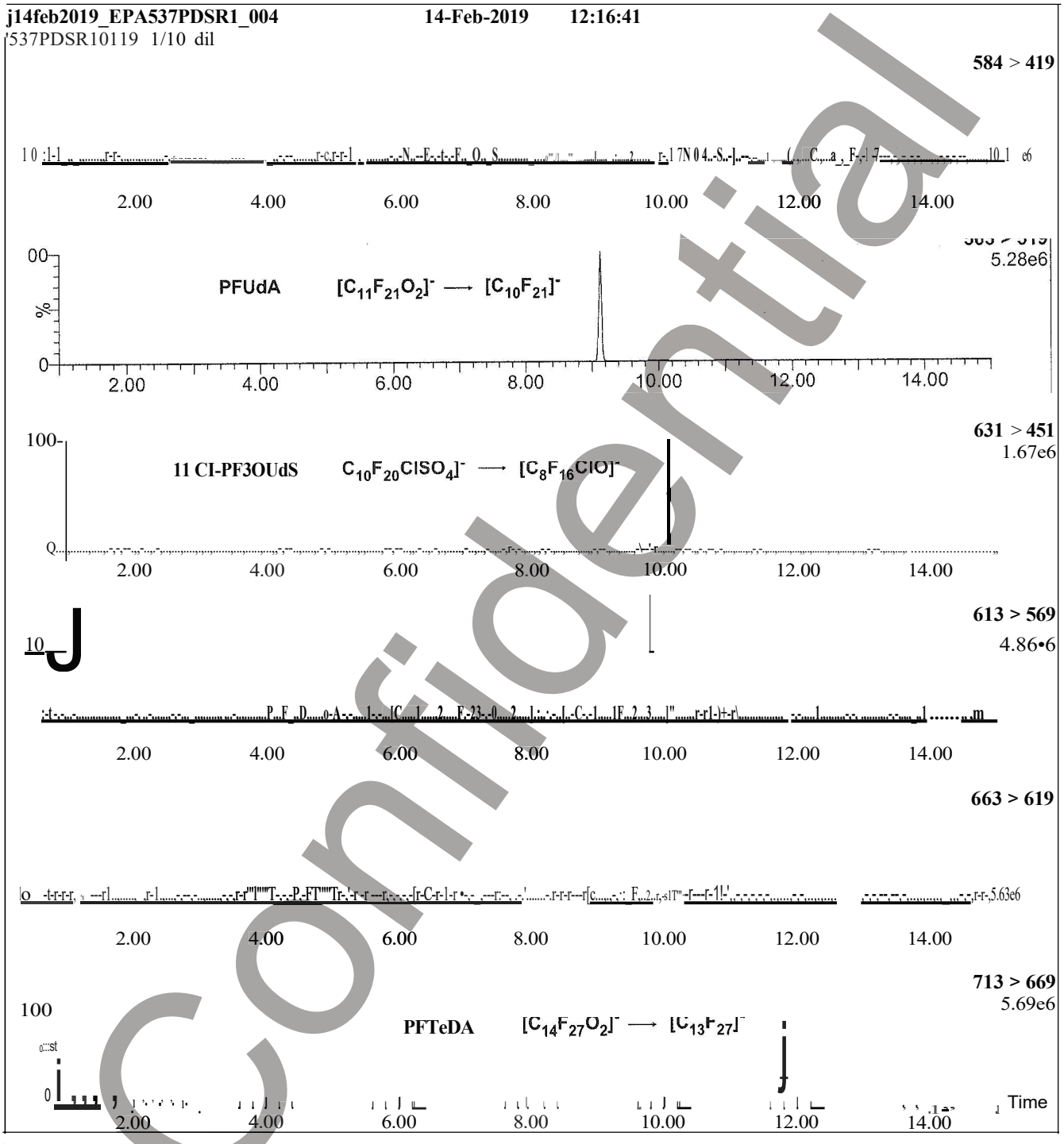


Figure 2: **EPA-537PDS-R1; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (EPA-537PDS-R1)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:

Collision Gas (mbar) = 2.90e-3

Collision Energy (eV) = 4-64 (variable)

Attachment 8