FINAL

United States Army Corps of Engineers
New England District

In Situ Stabilization/ Solidification Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils

Operable Unit 14
Area of Contamination 31 – Former Fire Training Area
Former Fort Devens Army Installation
Devens, Massachusetts

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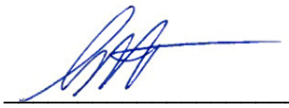
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Area of Concern 31 – Former Fire Training Area
Former Fort Devens Army Installation
Devens, Massachusetts

September 2025

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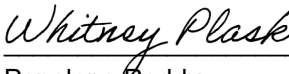
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Acronyms and Abbreviations

µg/kg	microgram per kilogram
%	percent
AF	attenuation factor
AFFF	aqueous film forming foam
AOC 31	Area of Contamination 31
APP	Accident Prevention Plan
Arcadis	Arcadis U.S., Inc.
Arcadis Treatability Laboratory	Arcadis Treatability Laboratory in Durham, North Carolina
Army	United States Army
ASTM	ASTM International
ATSDR	Agency for Toxic Substances and Disease Registry
BERS-Weston	BERS-Weston Services, JVA, LLC
BFS	blast furnace slag cement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOC	dissolved organic carbon
DoD	United States Department of Defense
Fort Devens	Former Fort Devens Army Installation
ft	foot
FTA	fire training area
H&S	health and safety
HASP	Health & Safety Plan
HDPE	high-density polyethylene
IDW	investigation-derived waste
ISS	in situ stabilization/solidification
KGS	KOMAN Government Solutions, LLC
LEAF	Leaching Environmental Assessment Framework
MAAF	Moore Army Airfield
MCL	maximum contaminant level

mm	millimeter
MS/MSD	matrix spike/matrix spike duplicate
ng/L	nanogram per liter or part per trillion
NJDEP	New Jersey Department of Environmental Protection
PFAS	per- and polyfluoroalkyl substances
PFAS6	total of PFDA, PFHpA, PFHxS, PFNA, PFOA, PFOS
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate or perfluorooctane sulfonic acid
PLC	Portland limestone cement
QAPP	quality assurance project plan
RE%	removal efficiency percentage
RI	remedial investigation
RSL	Risk Screening Level
S-A JV	SERES-Arcadis 8(a) Joint Venture 2, LLC
SI	Site inspection
site	former Fort Devens Army Installation (Fort Devens) located in Devens, Massachusetts
SOP	standard operating procedure
SPLP	synthetic precipitation leaching procedure
SSSL	Site-Specific Screening Level
TGI	technical guidance instruction
TOC	total organic carbon
UCS	unconfined compressive strength
USACE	United States Army Corps of Engineers – New England District
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profile
Work Plan	Pilot Test Work Plan

1 Introduction

This Pilot Test Work Plan (Work Plan) has been prepared by the Seres-Arcadis Joint Venture (S-A JV) on behalf of the United States Army Corps of Engineers (USACE) to present the scope and methods for the performance of a field-scale in situ stabilization/solidification (ISS) pilot test for treatment of soils impacted by per- and polyfluoroalkyl substances (PFAS) at Area of Contamination 31 (AOC 31) at the former Fort Devens Army Installation (Fort Devens) located in Devens, Massachusetts (the "site"; Figure 1). This Work Plan summarizes the results of: the September 2023 boring and lysimeter installation event; four vadose zone porewater sampling events; and the bench-scale treatability testing being conducted to evaluate the potential applicability of soil washing and ISS technologies for treatment of PFAS in soils at AOC 31. Based on these results, this Work Plan also outlines the work required to perform a field-scale pilot test to assess the efficacy of ISS to reduce or eliminate leaching of PFAS to groundwater from AOC 31 soils via fixation. The three primary goals of the AOC 31 field-scale pilot test are to: (1) confirm bench-scale treatability test results at field scale; (2) develop key design factors and implementation details that would be required for full-scale implementation of ISS at Fort Devens; and (3) substantially reduce leaching of PFAS from the treated soil.

1.1 Site Background

Fort Devens is located in the towns of Ayer and Shirley in Middlesex County and in the towns of Harvard and Lancaster in Worcester County, Massachusetts, as shown on Figure 1. Fort Devens is approximately 35 miles northwest of Boston, Massachusetts and occupies approximately 9,260 acres. The installation is divided into the North, Main, and South Posts, and the Nashua River runs through these posts. Fort Devens was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 United States Code 9601 et seq.) National Priorities List in November 1989. The installation was listed in the Defense Base Closure and Realignment Act of 1990 and officially closed in March 1996.

A site inspection (BERS-Weston Services, JVA, LLC [BERS-Weston] 2018) and a preliminary site characterization (KOMAN Government Solutions, LLC [KGS] 2021) were conducted at Fort Devens, and PFAS were detected in soil and groundwater in AOC 31. AOC 31 is within Area 3 and comprises the Moore Army Airfield (MAAF) former fire training area (FTA), as shown on Figure 2. The former FTA was a 100-foot by 100-foot, asphalt-topped, 8-inch-thick concrete pad surrounded by a 12-inch-high by 24-inch-wide earthen containment berm. Approximately once each year between 1975 and 1986, the former FTA was used for fire training exercises, which included dousing a shell of a U-8 airplane with fuel and paint thinner and burning it within the bermed area. No discharge of fuel from the FTA was reported. The former FTA was also used to burn fuel samples from the site laboratory once each year (KGS 2017).

The former FTA is no longer in use; however, PFAS contamination from the former FTA has been characterized as migrating in groundwater toward the downgradient Nashua River (KGS 2021). Groundwater flow in overburden in this area is shown on Figure 3. The area now contains small brush, broken-up concrete, and asphalt.

1.2 Site Setting

The geology across Fort Devens consists of major glacial sediment units composed of till, deltaic deposits from former glacial Lake Nashua, and deposits from glacial meltwater streams that overlie a complex series of

sedimentary, igneous, and metamorphic bedrock formations. Post-glacial deposits consist mainly of river terrace sands and gravels, fine alluvial sands, and silts, as well as peat, silt, and sands in swampy areas. In Area 3, the overburden is thickest beneath the former MAAF, where it is approximately 210 feet (ft) thick, and thinnest beneath the Nashua River, where it is approximately 25 ft thick. The depth to bedrock at AOC 31 ranges from approximately 150 to 190 ft below ground surface (bgs) (KGS 2021).

AOC 31 is located on a topographic high at the edge of a glacial kame terrace on the southwest side of the runway in the former MAAF (Figure 2). The former FTA overlays the abandoned east-west-trending runway. For fire training exercises, this area was traditionally doused with fuel/paint thinner, open-burned within a bermed area, and sprayed with aqueous film forming foam (AFFF). The western edge of AOC 31 and the airfield abruptly slope down toward the Nashua River; groundwater flow follows the slope, moving west-southwest toward the river (Figure 3).

1.3 Regulatory Background

Based on the results of a site inspection (BERS-Weston 2018) and the first phase of remedial investigation (RI; KGS 2021), the current conceptual site model indicates that the PFAS present in the soil at elevated concentrations at AOC 31 are a source of PFAS to groundwater. This groundwater is subsequently migrating toward, and discharging to, the Nashua River. The magnitude of PFAS concentrations in soil at AOC 31 is the highest detected at Fort Devens. In response to these data, the Nashua River Watershed Association requested, in a letter dated March 18, 2020 (Nashua River Watershed Association 2020) that the United States Army (Army) take an action to address PFAS at the FTA.

To gather additional data to pursue a potential voluntary interim remedial action for PFAS at AOC 31, the Army prepared Remedial Investigation Work Plan for PFAS Area 3, Field Sampling Plan, Addendum No.1 (KGS 2022), and the Army's contractor KGS performed additional groundwater and soil sampling in, and adjacent to, AOC 31 to better define concentrations of PFAS in both media. Soils to be used for bench-scale treatability testing were collected from 0 to 20 ft bgs during this field effort. Testing for treatability of soils by ISS and soil washing was performed by the S-A JV and its contractor, ART Engineering. Lysimeters were installed in the AOC 31 vadose zone during September 2023 to sample porewater for PFAS, in accordance with the October 25, 2022 Per- and Polyfluoroalkyl Substances Treatability Study Scope of Work technical memo (S-A JV 2022). Bench-scale treatability testing is being completed, and the Army is proposing to perform a field-scale ISS trial to further evaluate this technology at AOC 31. Results of the lysimeter sampling and bench-scale testing are summarized in this Work Plan.

Activities completed under this Work Plan are subject to and consistent with CERCLA (42 United States Code 9601 et seq.) as amended by the Superfund Amendments and Reauthorization Act of 1986 (99th Congress 1986), and National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations 300) requirements, with regulatory coordination from the Massachusetts Department of Environmental Protection and the United States Environmental Protection Agency (USEPA).

2 Nature and Extent of Contamination

The primary release mechanism of PFAS to the environment at AOC 31 was direct discharge of PFAS-containing AFFF to the ground surface. AFFF also may have impacted nearby soils through aerial deposition from fire training activities.

Since 2017, the Army has been investigating whether PFAS associated with the past use of AFFF by the Army are present in environmental media at AOC 31. Investigation locations for soil and groundwater are shown on Figures 4 and 5, respectively. A timeline of significant events follows:

- 2016 – Investigations related to PFAS at Fort Devens began with a base-wide preliminary assessment to determine whether there were potential historical releases of PFAS associated with Fort Devens. Areas that warranted further investigation based on previous use and disposal of PFAS were identified in the Fort Devens Final PFAS Base-Wide Preliminary Assessment of Perfluoroalkyl Substances (KGS 2017).
- 2017 – The Army conducted a site inspection to determine the presence or absence of PFAS in soil, groundwater, and/or sediment and surface water at selected areas at Fort Devens. Based on the results, performance of an RI was recommended at numerous sites, including AOC 31 (BERS-Weston 2018).
- 2018 to 2020 – Phase I RI field investigations were conducted at locations previously identified as impacted by PFAS to support the CERCLA (42 United States Code 9601 et seq.) decision-making process related to PFAS impacts at Fort Devens. Activities included the sampling of new and existing monitoring wells, the collection of surface water and sediment samples, and vertical groundwater profile sampling or vertical aquifer profiling (KGS 2021).
- 2022 – As part of the Remedial Investigation Work Plan for PFAS Area 3 Field Sampling Plan, Addendum No.1 (KGS 2022) to the Final RI Work Plan for PFAS (KGS 2020), supplemental investigation locations were sampled at AOC 31 and AOC 50 in the summer and fall of 2022. These data were collected to better define the areas where the Army would propose to perform pilot studies in soil and groundwater at AOC 31. An additional 32 soil borings and 28 groundwater sampling locations in AOC 31 were advanced to better characterize PFAS impacts at the former FTA. Results are included in Appendix A.
- 2023 – Lysimeters were installed at AOC 31 to measure porewater concentrations of PFAS at various depths over time (S-A JV 2022). Lysimeter installation and associated sampling are discussed in Section 3.

PFAS concentrations and mixtures in this area indicate:

- PFAS mass in soil at AOC 31 continues to provide a source of PFAS to groundwater. This groundwater subsequently migrates and discharges to the Nashua River. The magnitude of PFAS concentrations in soils at AOC 31 is the greatest detected at Fort Devens. Soil exhibits exceedances of screening levels for perfluorooctane sulfonate (PFOS) down to the water table in some locations; these impacts are well delineated. The concentrations of PFOS in the vadose zone across AOC 31 are shown on Figures 6, 6a, 6b, and 6c. The primary PFAS detected in soil is PFOS, followed by 8:2 Fluorotelomer sulfonic acid (8:2 FTS), perfluorooctanoic acid (PFOA), and perfluorohexanesulfonic acid (PFHxS). The dominant mixtures of PFAS in soil are shown on Figure 7. The locations with the highest detections of PFAS are located within the footprint of the former FTA and to the west of that area, where wind may have carried AFFF, or AFFF may otherwise have been pushed in that direction following training. PFOS and PFHxS are primary ingredients in AFFF. Locations of sampling are shown on Figure 4, and data are included in the table in

Appendix A. The PFAS treatment pilot test discussed in this Work Plan will target soils from 0 to 20 ft bgs in the vicinity of borings 31SB-21-02 and 31SB-21-05, shown on Figures 4, 6, 6a, and 6c.[1]

- The mixture of PFAS compounds beneath AOC 31 varies in concentration vertically depending on the location, as shown on Figure 8:
  - High concentrations of primarily PFOS and PFHxS were detected at the water table (approximately 63 ft bgs). At greater depths perfluorohexanoic acid, PFHxS, and PFOA are dominant, and PFOA and PFHxS become more dominant in the deepest portions of the overburden. These variations in concentrations with depth are common across the vertical aquifer profile (VAP) locations in the AOC 31 area and suggest that groundwater in this area has been impacted by releases in the former FTA as well as by additional upgradient sources (potentially AFFF on runways or near the former MAAF fire station).
  - High PFAS concentrations at 31VP-19-01 (i.e., 10,200 nanograms per liter [ng/L] total of PFAS6 [perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), PFHxS, perfluorononanoic acid (PFNA), PFOA, and PFOS)] at 123 to 127 ft bgs) suggest that PFAS impacts are traveling downgradient from AOC 31 (and upgradient sources) and discharging to the Nashua River. Higher PFAS concentrations in groundwater at VAP locations AFT-B-3 and AFT-B-4, drilled in 2022 at the edge of the airfield downgradient of the FTA, support this observation.
- The PFAS types and concentrations in VAP samples collected at the edge of the Nashua River, as well as their depth relative to where they are detected in upgradient VAP locations, suggest that PFAS-impacted groundwater is discharging to the Nashua River from AOC 31 sources. The highest concentrations of PFAS detected in this area along the riverbank occur in the top 20 ft of the water table, as the vertical hydraulic gradient is upward where groundwater discharges.
- Based on the results of groundwater sampling conducted at 31VP-19-05 on the west side of the Nashua River, it does not appear that underflow of PFAS in groundwater from AOC 31 is occurring; however, this will be evaluated further as part of the upcoming Area 3 RI.

[1] Figure 4 presents PFAS concentrations as compared to the Site-Specific Screening Level (SSSL) of 13 micrograms per kilogram for PFOS (child resident dermal plus ingestion soil exposure value) at the time of sampling; PFAS concentrations will be compared to DoD-accepted risk screening levels at the time of the risk evaluation (https://www.acq.osd.mil/eie/eer/ecc/pfas/pfas101/rsl.html).

3 Lysimeter Installation and Sampling Results

Eight suction lysimeters were installed within the AOC 31 vadose zone from September 11 to September 13, 2023. Locations of the lysimeters are shown on Figure 9. Vadose zone porewater at each lysimeter was sampled to evaluate the concentrations of PFAS in soils at AOC 31 that leach to porewater and the amount of attenuation of these concentrations that occurs between the porewater and groundwater.

Soil samples from each lysimeter boring, corresponding to the lysimeter porewater collection cup depth, were collected for analysis of PFAS in soils by USEPA Draft Method 1633 and for analysis of PFAS in water resulting from the synthetic precipitation leaching procedure (SPLP). Together, these data were collected to understand mass loading from AOC 31 soils to groundwater.

3.1 Lysimeter Installation

From September 11 to September 13, 2023, eight model 1920 F1 lysimeters manufactured by Soilmoisture Equipment Corporation were installed within the AOC 31 vadose zone (ranging in depths from 2 to 3 ft bgs to 50 to 51 ft bgs) beneath the former FTA at sub-locations adjacent to three former soil borings (31SB-21-01, 31SB-21-02, and 31SB21-04). The depths of the lysimeters correlated with a range of PFOS concentrations detected in soils during the 2022 supplemental sampling performed by KGS (KGS 2022). These concentrations ranged from 35 to 1,400 micrograms per kilogram (µg/kg).

- Lysimeters installed adjacent to soil boring 31SB-21-02 were:
  - Soil boring 31SB-23-01 and the associated 31LS-01 lysimeter (13 to 14 ft bgs);
  - Soil boring 31SB-23-02 and the associated 31LS-02 lysimeter (19 to 20 ft bgs); and
  - Soil boring 31SB-23-03 and the associated 31LS-03 lysimeter (33 to 34 ft bgs).
- Lysimeters installed adjacent to soil boring 31SB-21-01 were:
  - Soil boring 31SB-23-04 and the associated 31LS-04 lysimeter (2 to 3 ft bgs);
  - Soil boring 31SB-23-05 and the associated 31LS-05 lysimeter (13 to 14 ft bgs);
  - Soil boring 31SB-23-06 and the associated 31LS-06 lysimeter (19 to 20 ft bgs); and
  - Soil boring 31SB-23-07 and the associated 31LS-07 lysimeter (50 to 51 ft bgs).
- One lysimeter was installed adjacent to soil boring 31SB-21-04:
  - Soil boring 31SB-23-08 and the associated 31LS-08 lysimeter (11 to 12 ft bgs).

The lysimeters were installed via direct-push technology in accordance with the directions detailed in the S-A JV Technical Guidance Instruction (TGI) – Procedures for Suction Lysimeter Installation and O&M (Rev. #1, January 25, 2023), attached as Appendix B, and as **LY-SOP-01** in the Area 3 Quality Assurance Project Plan (QAPP) Addendum (S-A JV 2024a). The Area 3 QAPP Addendum is an addendum to the Draft Uniform Federal Policy for QAPP for Area 3 – Phase II Remedial Investigation for PFAS (herein referred to as “Area 3 QAPP”; S-A JV 2024b). Borehole drilling was conducted by GeoSearch, Inc. of Sterling, Massachusetts. Lysimeter installation logs are attached as Appendix C. Lysimeter collection cup depths and September 2023 installation purge data are provided in Table 1.

3.2 Methodology

Vadose zone porewater and soil sampling was conducted in accordance with the following standard operating procedures (SOPs):

- Included in the Area 3 QAPP (S-A JV 2024b):
  - **RI-SOP-01**: TGI – PFAS Field Sampling Guidance (Rev. #7, April 18, 2021);
  - **RI-SOP-08**: TGI – Sample Chain of Custody (Rev. #2, April 29, 2020);
  - **RI-SOP-10**: TGI – Groundwater and Soil Sampling Equipment Decontamination (Rev. #1, May 8, 2020);
  - **RI-SOP-12**: TGI – PFAS-Specific Drilling and Monitoring Well Installation (Rev. #0, October 12, 2018); and
  - **RI-SOP-13**: TGI – Soil Description (Rev. #2, February 16, 2018).
- Included under separate cover in Appendix B of this Work Plan and in the Area 3 QAPP Addendum (S-A JV 2024a):
  - **LY-SOP-01**: TGI – Procedures for Suction Lysimeter Installation and O&M (Rev. #1, January 25, 2023).

These SOPs provide procedural guidance in general accordance with industry standards/guidelines and regulatory requirements.

Soil samples collected during lysimeter installation were sent to Eurofins Lancaster Laboratories for analysis. Analysis for PFAS in soil and porewater was conducted in accordance with USEPA 2nd Draft Method 1633, compliant with the United States Department of Defense (DoD) Quality Systems Manual 5.4, Table B-24 (DoD 2021). The circum-neutral SPLP analysis was conducted in accordance with USEPA Method 1312.

3.3 Results

Soil samples were collected from each lysimeter location at the same depth as the ceramic porewater collection cups during the September 2023 lysimeter installation event. Leachate was derived from each soil sample via SPLP. Draft Method 1633 PFAS analyses was conducted on each soil sample and each SPLP-induced leachate sample. Analytical results are shown in Table 2, and the laboratory reports are included in Appendix D.

Four porewater sampling events (on November 3, 2023; December 20, 2023; February 8, 2024; and April 3, 2024) were conducted after the lysimeters were installed. During the November 2023 event, matrix spike/matrix spike duplicate (MS/MSD) samples were collected from a composite of all samples, and a duplicate was collected from lysimeter 31LS-08. During the December 2023 and February 2024 events, MS/MSD samples were collected from lysimeter 31LS-01, and a duplicate sample was collected from lysimeter 31LS-08. During the April 2024 event, MS/MSD samples were collected from a composite of all samples, and a duplicate was collected from lysimeter 31LS-08. Porewater PFAS analytical results are shown in Table 3, and the laboratory reports are included in Appendix D.

Results for PFAS, including those for PFOA, PFOS, and PFHxS, were of greatest interest because these compounds have the greatest concentrations detected in soil and groundwater at AOC 31. Porewater PFOA,

PFOS, and PFHxS concentrations over time are shown graphically on Figures E-1, E-2, and E-3 in Appendix E. Results indicate that concentrations of PFAS in both porewater and SPLP-induced leachate decrease with depth:

- With respect to SPLP-induced leachate concentrations (Table 2), PFOA, PFOS, and PFHxS compounds were detected at every sampled location. However, the highest concentrations were detected in leachate from samples collected at the six collection locations from 0 to 20 ft bgs, where the mean leachate concentrations were 260 percent (%), 630%, and 160% greater than the concentrations detected at the two collection locations from 20 to 51 ft bgs for PFOA, PFOS, and PFHxS, respectively.
- With respect to porewater concentrations (Table 3), PFOA, PFOS, and PFHxS were detected at each lysimeter set location. However, the greatest porewater concentrations were detected in samples from the six lysimeters set from 0 to 20 ft bgs, where the mean concentrations were 225%, 308%, and 122% greater than the mean concentrations detected at the two lysimeters set from 20 to 51 ft bgs for PFOA, PFOS, and PFHxS, respectively.

While no clear statistical correlation was observed between PFAS concentrations in the porewater samples and in the SPLP-induced leachate samples from soils collected adjacent to the lysimeter cups, the order of magnitude of the porewater and SPLP-induced leachate concentrations for PFOS were generally the same. Concentrations of both PFOA and PFHxS in the porewater samples were generally one order of magnitude greater than they were in the SPLP-induced leachate samples.

Laboratory SPLP-induced leachate results are not expected to be equal to leachate results that would be observed under field conditions because the relative amounts of soil and water differ between the laboratory SPLP procedure and natural site conditions (New Jersey Department of Environmental Protection [NJDEP] 2013). Therefore, the SPLP-induced leachate results were corrected to those expected under field conditions at AOC 31, following the process presented in NJDEP's Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Synthetic Precipitation Leaching Procedure Guidance Document (NJDEP 2013). That process is summarized in Appendix E.

The calculation process uses the USEPA Soil Screening Guidance soil-water partition equation (USEPA 1996), which incorporates partitioning to air filled porosity in the vadose zone. Soil air content field data were not available; therefore, a soil air content of 0.18 was assumed for the corrected field leachate calculations. A dimensionless Henry's Law Constant of 1.59×10^{-4} was used for PFOA (Agency for Toxic Substances and Disease Registry [ATSDR] 2021). A dimensionless Henry's Law Constant of 1.38×10^{-7} used for PFOS (Health Canada 2016). A dimensionless Henry's Law Constant of 7.94×10^{-4} was used for PFHxS (Plassman, et al. 2011). The soil mass and leachate volume details for the laboratory SPLP analyses are presented in Exhibit 3-1.

One clear outlier in the 24-sample soil-leachate pair dataset was set aside from the statistical evaluation because of an anomalously poor correlation between the soil and SPLP leachate data: the PFHxS result for the SPLP leachate from soil sample 31SB-23-07-50-51.[2] This data point was omitted from all comparisons with respect to corrected field leachate PFHxS concentrations.

[2] The studentized deleted residual for the omitted result point was -8.56; on a t distribution, the probability of this residual occurring was 6.99×10^{-5}, which supported elimination of the data point from the linear regression as a statistical outlier (Neter et al. 1990).

Exhibit 3-1. SPLP Soil Mass and Leachate Volume Details

Sample Boring ID / Lysimeter ID	Soil Collection Depth (ft bgs)	Soil Mass for SPLP (kg)	Volume of SPLP-Induced Leachate Generated (L)
31SB-23-01-13-14 / 31LS-01	13-14	0.43366	0.4337
31SB-23-02-19-20 / 31LS-02	19-20	0.42411	0.4241
31SB-23-03-33-34 / 31LS-03	33-34	0.42874	0.4287
31SB-23-04-2-3 / 31LS-04	2-3	0.42253	0.4225
31SB-23-05-13-14 / 31LS-05	13-14	0.43972	0.4397
31SB-23-06-19-20 / 31LS-06	19-20	0.04997	0.05
31SB-23-07-50-51 / 31LS-07	50-51	0.43624	0.4362
31SB-23-08-11-12 / 31LS-08	11-12	0.42951	0.4295

For each lysimeter location, corrected field leachate PFOA, PFOS, and PFHxS concentrations were plotted against the concentrations of these analytes in the corresponding soil sample. Log_{10} linear regression analysis was conducted to assess the correlation between corrected field leachate concentrations and vadose zone soil concentrations. The corrected field leachate versus soil concentration plots and log_{10} linear regression trendlines are shown on Figures E-4, E-5, and E-6 in Appendix E. The trendline equations and R^2 of fit are summarized in Exhibit 3-2. The R^2 values demonstrate correlation between soil concentrations and corrected field leachate concentrations for PFOA, PFOS, and PFHxS.

Exhibit 3-2. AOC 31 Former FTA Vadose Zone Corrected Field Leachate to Soil PFOA, PFOS, and PFHxS Concentration Relationships

PFAS Compound	Trendline Equation	R^2	Number of Data Points
PFOA	Y = 1.2991X + 1.7259	0.9068	8
PFOS	Y = 0.9892X + 1.5982	0.9959	8
PFHxS	Y = 0.9958X + 1.7435	0.9509	7

Notes:
R^2 = proportion of the variation in the dependent variable that is predictable from the independent variable
Y = log_{10} corrected field leachate concentration (ng/L)
X = log_{10} soil concentration (µg/kg)

As stated in Section 3.3, no clear statistical correlation was observed between PFAS concentrations in the porewater samples and in the SPLP-induced leachate samples from soils collected adjacent to the lysimeter cups. However, in lieu of additional data, it is assumed that the trendline equations developed for SPLP-induced leachate concentrations are also applicable to porewater concentrations.

Because the vadose zone beneath AOC 31 is approximately 70 ft thick, Site specific simple attenuation factors (AFs) for PFOA, PFOS, and PFHxS were introduced to account for attenuation of the vadose zone porewater

concentrations via migration with respect to top-of-saturated-zone groundwater concentrations. The three simple AFs were calculated by dividing the mean top-of-saturated-zone groundwater concentration at locations 31VP-21-01, 31VP-21-02, and 31VP-P21-04 (located directly below soil borings 31SB-21-01, 31SB-21-02, and 31SB-21-04, respectively; Figure 9) by the mean vadose zone porewater concentration detected from all four porewater sampling events from all eight lysimeters. The mean top-of-saturated-zone groundwater concentrations were 22 ng/L, 250 ng/L, and 75 ng/L for PFOA, PFOS, and PFHxS, respectively, and the mean vadose zone porewater concentrations were 1306 ng/L, 4453 ng/L, and 3241 ng/L for PFOA, PFOS, and PFHxS, respectively. Calculated AFs were: 0.017 (or 0.85:50) for PFOA; 0.056 (or 2.80:50) for PFOS; and 0.023 (or 1.15:50) for PFHxS. These AF ratios indicate, for example, that PFOA at a concentration of 50 ng/L in vadose zone porewater may attenuate to a concentration of 0.85 ng/L in top-of-saturated-zone groundwater. These site-specific relationships between the concentration of PFAS in soils, the concentration of PFAS in vadose zone porewater, and the resulting concentration of PFAS detected in shallow groundwater may be used as evaluation criteria in the future when considering what areas at Fort Devens may require active treatment for PFAS.

4 Bench-Scale Treatability Work

Bench-scale treatability tests were developed and executed to evaluate soil washing and ISS as viable remedial technologies to treat PFAS impacts at AOC 31. The scope of work for each test was included in the October 25, Per- and Polyfluoroalkyl Substances Treatability Study Scope of Work technical memo (S-A JV 2022).

4.1 Field Sampling

Soil samples were collected for use in bench-scale treatability testing from 0 to 20 ft bgs at locations 31MW-21-01 (Figure 5) and 31SB-21-01 (Figure 4); location 31SB-21-01 was advanced approximately 5 ft from 31MW-21-01. Sample collection locations and depths are provided in Exhibit 4-1 below. Samples were placed in 5-gallon high-density polyethylene (HDPE) United Nations- (UN-) compliant (shipping standard UN1H2/Y30/S) buckets. Following collection, samples were shipped to the Arcadis U.S., Inc. (Arcadis) Treatability Laboratory in Durham, North Carolina (Arcadis Treatability Laboratory) under chain-of-custody protocols. At the laboratory, the soil was combined and homogenized and three composite soil samples were collected to establish a “baseline” or “untreated” PFAS concentration of the soil. The baseline PFAS concentration was used to evaluate treatment performance.

Exhibit 4-1. Sample Collection Locations & Depths

Bucket Number	Sample Location	Sample Collection Depth (ft bgs)
1	31MW-21-01	0 - 5
2	31SB-21-01	0 - 5
3	31SB-21-01	0 - 5
4	31SB-21-01	5 - 10
5	31MW-21-01	5 - 10
6	31MW-21-01	10 - 15
7	31MW-21-01	15 - 20
8	31SB-21-01	15 - 20

4.2 Soil Washing

Arcadis and ART Engineering performed a joint bench-scale PFAS soil washing treatability study using soil from AOC 31. The full treatability study report is presented in Appendix F. The soil was classified as gravelly sand and consisted of 21.1% oversize material (> 2.0 millimeters [mm], 76.5% sand (0.063 to 2.0 mm) and 2.4% fines (<0.063 mm). During the treatment process, the bulk soil was segregated into the following fractions: 1) washed oversize (gravel); 2) sand; and 3) fines.

Soil washing generally operates using a volume reduction approach to treat the coarse-grained soil fraction (gravel and sand) and separate the fine-grained fraction for secondary management or alternative treatment (e.g.,

stabilization or landfilling). The low percentage of fines and high percentage of sand and gravel at AOC 31 make this soil an ideal candidate for soil washing.

Two rounds of treatability testing were conducted. Round 1 utilized water-based physical separation of the soil fractions. Round 2 included additional treatment tests using proprietary methods and additives to further enhance the overall contaminant removal efficiency. Within each round, multiple treatment tests were conducted on the same soil fraction (e.g., in Round 2, four tests on the sand fraction were conducted [Sand Tests 1, 2, 3, and 4]). These represent different process conditions tested on the same size soil fraction.

Soil samples were sent to Pace Analytical Gulf Coast in Baton Rouge, Louisiana for analysis of PFAS. All samples were analyzed via USEPA Draft Method 1633. Additionally, the triplicate baseline samples were evaluated using Modified USEPA Method 537. Results are presented in Appendix F and summarized in this section.

Results of the treatability testing are presented in Exhibits 4-2 and 4-3 for the three PFAS that have been detected at the highest concentrations in AOC 31: PFOS, PFOA, and PFHxS. These exhibits show the different soil fractions and soil washing processes that were tested. PFOS was the dominant PFAS, with an untreated concentration of 126.33 µg/kg. More than 99% PFOS removal was achieved using the Round 1 treatment process for the sand fraction using Sand Test 2 (post-treatment PFOS concentration of 0.79 µg/kg). The other soil fractions also reported high removal PFOS efficiencies. The remaining PFAS compounds are discussed further in Appendix F.

Exhibit 4-2. Round 1 Soil Washing Treatability Results

Soil Fraction	PFOS		PFOA		PFHxS	
	µg/kg	RE%	µg/kg	RE%	µg/kg	RE%
Untreated	**126.33**		**2.17**		**4.15**	
Washed Oversize	8.56	93%	0.134	94%	0.272	93%
Sand Test 1	4.15	97%	0.122	94%	0.131	97%
Sand Test 2	0.788	99%	0.037	98%	0.061	98%
Fines	192	52%	1.71	21%	4.19	-1%

Abbreviation:
RE% = removal efficiency percentage

Exhibit 4-3. Round 2 Soil Washing Treatability Results

Soil Fraction	PFOS		PFOA		PFHxS	
	µg/kg	RE%	µg/kg	RE%	µg/kg	RE%
Untreated	**126.33**		**2.17**		**4.15**	
Washed Oversize	28.0	78%	2.30	-6%	2.90	30%
Washed Oversize Test 1	1.90	98%	0.19 U	-	0.12	97%
Washed Oversize Test 2	3.60	97%	0.20 U	-	0.30	93%
Sand Test 1	0.60	99%+	0.20 U	-	0.04	99%
Sand Test 2	0.46	99%+	0.20 U	-	0.20 U	-
Sand Test 3	0.19	99%+	0.20 U	-	0.20 U	-
Sand Test 4	0.83	99%+	0.21 U	-	0.21 U	-

Abbreviations:
RE% = removal efficiency percentage
U = result below laboratory detection limit
- = RE% was not calculated because result was below the laboratory detection limit.

The Round 2 results showed a step-wise improvement compared to the Round 1 process due to the additional treatment steps. In Round 2, a total PFAS removal efficiency of greater than 99% was achieved for the combined oversize and sand fractions (coarse-grained fraction) through water-based separation followed by secondary treatment with proprietary additives. In the washing process, the bulk of the PFAS mass was transferred into the water phase, with elevated levels of PFAS also contained in the fines fraction (<0.063 mm) due to the high adsorption capacity of fine particles.

The treatability test showed that soil washing could successfully achieve high levels of PFAS mass removal, resulting in treatment of the coarse-grained soil to very low concentrations. The fine-grained soil would likely require alternative treatment/management. Given that the fines represent 2.4% of the total soil profile at AOC 31, results indicate that more than 97% of the soil could be beneficially reused onsite following soil washing.

Due to the costs associated with mobilizing a soil washing system to AOC 31 in comparison with conducting a pilot-scale trial for ISS, and the small volume of soil that would be treated by a soil washing field pilot, a pilot-scale demonstration for soil washing will not be conducted.

4.3 Soil Stabilization and Solidification

The Arcadis Treatability Laboratory performed a bench-scale ISS treatability study. The full treatability study report is presented in Appendix F (*ISS Treatability Report to be completed December in 2024*). The purpose of the study was to evaluate and optimize an ISS remedy mix design to be piloted at the field scale. The specific objectives of the treatability evaluation were to:

- Screen chemical PFAS fixants (RemBind® 100X and FLUORO-SORB® 100) to determine the type and dose of fixant most effective at stabilizing PFAS molecules in AOC 31 soils.

  - RemBind® 100x is manufactured by RemBind, Pty Ltd., a subsidiary of Ziltek, Pty Ltd. (Australia).
  - FLUORO-SORB® 100 is manufactured by Colloid Environmental Technologies Co. (CETCO), a division of Minerals Technologies Inc. (USA).
- Screen cement types and doses to determine the most effective way to solidify the study soil and encapsulate PFAS. In particular, the treated soil matrix must have suitable physical properties to withstand anticipated current and future site activities and surface/subsurface loads without settling or deteriorating. The targeted unconfined compressive strength (UCS) of the treated soil matrix will be greater than 50 pounds per square inch. The required UCS will be developed based on results of geotechnical investigation and evaluation of the existing soils and current/future site use.
- Evaluate the ability of selected admixtures to achieve reduction in the hydraulic conductivity of the soil matrix resulting from treatment. The target hydraulic conductivity for the treated soil matrix following addition of a cement mixture will be determined after collection of in situ field data, but it is anticipated to be $1x10^{-6}$ centimeters per second or less.
- Evaluate the extent to which the ISS-treated soil encapsulates PFAS present in site soil, and the extent to which the cement mixture immobilizes the PFAS, as determined by the monolith leaching method.
- Provide data for use in assessing whether stabilization with a fixant is adequate or if stabilization and solidification offer PFAS remedial performance enhancement.

Using a composite soil collected from 0 to 20 ft bgs, the Arcadis Treatability Laboratory conducted batch isotherm testing to evaluate the performance of RemBind 100X and FLUORO-SORB 100 over a range of dosages between 1% and 4% (by soil dry mass). Batch isotherm testing was conducted by combining PFAS-impacted site soil, unimpacted water, and varying doses of stabilization amendments (RemBind 100X and FLUORO-SORB 100) to create test reactors. The reactors were gently mixed for 72 hours to facilitate contact between reactor components. The results of this testing are shown in Exhibits 4-4 and 4-5 for FLUORO-SORB 100 and RemBind 100X, respectively. All addition rates of both RemBind 100X and FLUORO-SORB 100 reduced aqueous PFAS concentrations by greater than 99.9% when compared with the control. It was determined that a 1% addition rate of either RemBind 100X or 1% FLUORO-SORB 100 offered adequate fixation for the PFAS present in the AOC 31 soil homogenate.

Exhibit 4-4. FLUORO-SORB 100 Stabilization Testing Results

% of FLUORO-SORB 100	PFOS		PFOA		PFHxS	
	ng/L	RE%	ng/L	RE%	ng/L	RE%
Control	**48,000**		**1,300**		**2,600**	
1%	6.7	99%+	1.1	99%+	0.46	99%+
2%	4.2	99%+	1	99%+	1	99%+
2.5%	7.7	99%+	1	99%+	0.18	99%+
3%	3.4	99%+	0.97	99%+	0.97	99%+
4%	35	99%+	0.46	99%+	0.76	99%+

Abbreviation:
RE% = removal efficiency percentage

Exhibit 4-5. RemBind 100X Stabilization Testing Results

% of RemBind 100X	PFOS		PFOA		PFHxS	
	ng/L	RE%	ng/L	RE%	ng/L	RE%
Control	**48,000**		**1,300**		**2,600**	
1%	6.1	99%+	1.1	99%+	0.26	99%+
2%	5	99%+	1	99%+	1	99%+
2.5%	3	99%+	1.3	99%+	1.3	99%+
3%	17	99%+	0.68	99%+	0.4	99%+
4%	9.4	99%+	1	99%+	0.21	99%+

Abbreviation:
RE% = removal efficiency percentage

Type IL Portland limestone cement (PLC), ground-granulated blast furnace slag cement (BFS), and bentonite were then evaluated for their ability to impart desirable geotechnical performance to the composite soil. Geotechnical performance goals were to achieve at least 50 pounds per square inch UCS and hydraulic conductivity of less than 1 x 10^{-6} centimeters per second. Individual test mixes were created in a Hobart planetary mixer using soil, site mixing water, and cement/bentonite doses that were added on a dry soil weight basis. PLC was evaluated alone and in combination with varying doses of BFS and bentonite. PLC addition rates tested were 7.5%, 10%, and 12.5% (soil dry mass). Cement blends evaluated were 2.5% PLC + 5% BFS and 3.3% PLC + 6.7% BFS. Blends of PLC, BFS, and bentonite evaluated were 2.5% PLC + 5% BFS + 1% bentonite and 3.3% PLC + 6.7% BFS + 1% bentonite.

The mixes were blended until visually homogenous and then transferred to plastic cylindrical geotechnical molds to cure. Curing occurred in plastic Ziploc bags to prevent unrepresentative desiccation. The UCS of each mix was tested at Day 7 and at Day 28 by ASTM International (ASTM) D1633. Hydraulic conductivity measurements were

made on selected mixes at 28+ days of curing time by ASTM D5084. PLC/BFS blends achieved greater UCS than PLC alone and comparable total cement addition rates. The inclusion of bentonite did not result in a significant decrease in hydraulic conductivity beyond that offered by PLC/BFS blends. The 2.5% PLC + 5% BFS blend was selected as the best combination of stabilization performance and cost efficiency.

A final phase of bench-scale testing was conducted to confirm geotechnical and stabilization performance of optimal blends of admixtures and to evaluate PFAS leachability from these mix formulations using USEPA's Leaching Environmental Assessment Framework (LEAF). Specifically, two LEAF methods were used during this evaluation:

- LEAF 1314 – Liquid-Solid Partitioning as a Function of Liquid-Solid Ratio for Constituents in Solid Materials Using an Up-Flow Percolation Column Procedure
- LEAF 1315 – Mass Transfer Rates of Constituents in Monolithic or Compacted Granular Materials Using a Semi-Dynamic Tank Leaching Procedure

Three unsolidified mixes and three solidified mixes were evaluated during this bench-scale testing phase. As with previous phases of testing, all admixture addition rates were by soil dry mass. Unsolidified mixes evaluated for PFAS leachability by LEAF Method 1314/USEPA Method 1633 were:

- Soil-only control (no adsorptive media)
- 1% RemBind 100X
- 1% FLUORO-SORB 100

Solidified mixes evaluated for UCS by ASTM D1633, hydraulic conductivity by ASTM D5084, and PFAS leachability by LEAF Method 1315/USEPA Method 1633 were:

- 2.5% PLC + 5% BFS
- 2.5% PLC + 5% BFS + 1% RemBind 100X
- 2.5% PLC + 5% BFS + 1% FLUORO-SORB 100

Exhibit 4-6 summarizes the geotechnical performance results for the final cement-amended test mixes. UCS values observed at 28 days of curing were generally similar to those observed during the preliminary cement ranging trials and further revealed no significant impact on strength development associated with the inclusion of either RemBind 100X or FLUORO-SORB 100. The hydraulic conductivity values measured in each mix were also similar to those observed in the 2.5% PLC + 5% BFS preliminary test mix, with the mix receiving 1% FLUOROSORB 100 having the lowest hydraulic conductivity of the three mixes.

Exhibit 4-6. Geotechnical Performance of Final Cement-Amended Mixes

Mix Description	Day 7 UCS	Day 28 UCS			Hydraulic Conductivity
		Duplicate 1	Duplicate 2	Average	
	psi	psi			cm/sec
2.5% PLC + 5% BFS + 1% FLUORO-SORB 100	210.5	351.4	380.1	365.7	6.3E-07
2.5% PLC + 5% BFS + 1% RemBind 100X	212.6	259.0	357.4	308.2	1.7E-06
2.5% PLC + 5% BFS	161.9	328.9	316.5	322.7	2.3E-06

Abbreviations:
cm/sec = centimeters per second
psi = pounds per square inch

The degree to which the admixtures prevented PFAS leachability from amended soils was determined by comparing the total PFAS mass leached from each test mix during the leaching program to the mass of PFAS originally present in the soil subjected to leaching. These calculations are described in greater detail in the Bench-Scale ISS Treatability Testing Report provided in Appendix F (*ISS Treatability Report to be completed December 2024*). The mass of PFAS originally present in the samples subjected to leaching was determined by multiplying the mass of soil subjected to leaching by the PFAS concentrations in the baseline composite soil sample. For the LEAF 1314 leaching program (applied to unsolidified samples), the leached PFAS mass was then determined by multiplying the PFAS concentration in leachate samples by the volume of leachate produced at each leaching interval and summing the results. For the LEAF 1315 leaching program (applied to solidified samples), the leachate concentrations obtained from non-contiguous leaching cycles were used to estimate daily rates of PFAS leaching. The daily rates of PFAS mass leached were plotted against the 63-day LEAF 1315 leaching program results, and the resultant trendline equation was used to calculate the total PFAS mass leached during the entire testing interval. These calculations were performed for the following PFAS: HFPO-DA, PFBS, PFHxS, PFOS, PFHpA, PFOA, PFNA, and PFDA.

Exhibits 4-7 and 4-8 present the calculated percent of total PFAS mass leached from each parent sample. HFPO-DA was not detected on a total soil basis in the composite soil or in any of the analyzed leachate samples. When performing the trendline calculations used to project mass leached by LEAF 1315 in the solidified mixes, the method detection limit was used for the mass estimate when one or more leaching intervals returned detectable PFAS but PFAS were not detected in other leaching intervals from the same sample.

The greatest degree of PFAS leaching was observed from the unamended control soil sample and the solidified mix that did not receive a sorptive admixture. Generally, all mixes amended with either 1% RemBind 100X or 1% FLUORO-SORB 100 were found to significantly reduce the leachability of PFAS when compared with the unamended control soil sample and the solidified sample that received only cement. The greatest mass of PFAS leached from sorptive admixture-amended samples was from the sample that received 1% RemBind 100X and was leached by LEAF 1314. However, the majority of this PFAS mass was in a single leachate fraction and may have resulted from the inadvertent incorporation of PFAS-bearing particulate into the final methanol extraction

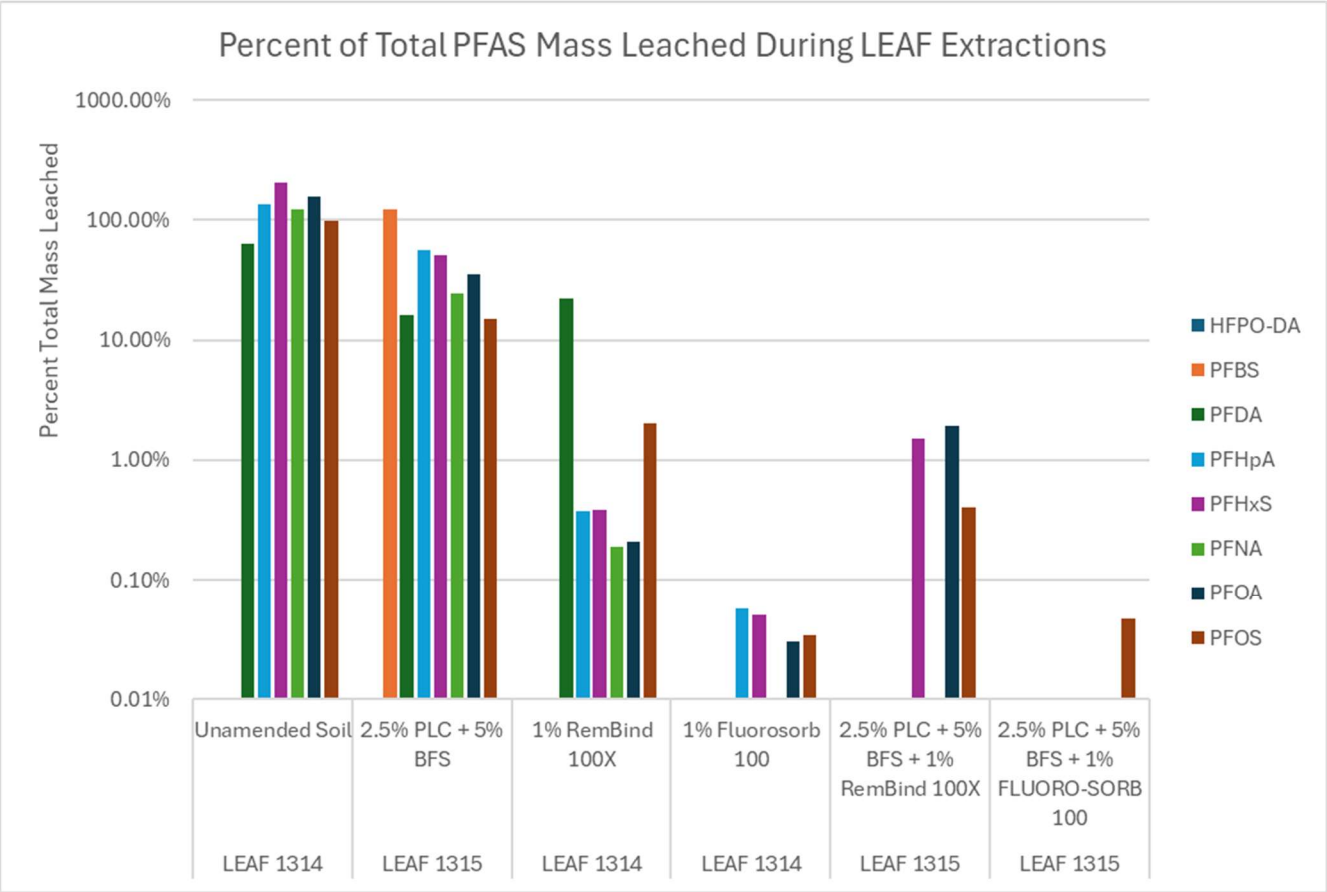
step of this test interval. PFAS concentrations were significantly lower in leachate samples from the preceding and subsequent test intervals for this soil sample.

Exhibit 4-7. PFAS Mass Leached During LEAF Leaching Tests

Percent of Total PFAS Mass Leached During LEAF Leaching Tests						
Leaching Method	**LEAF 1314**	**LEAF 1315**	**LEAF 1314**	**LEAF 1314**	**LEAF 1315**	**LEAF 1315**
Sample Description	**Unamended Soil**	**2.5% PLC + 5% BFS**	**1% RemBind 100X**	**1% FLUORO-SORB 100**	**2.5% PLC + 5% BFS + 1% RemBind 100X**	**2.5% PLC + 5% BFS + 1% FLUORO-SORB 100**
HFPO-DA	N/A	41.03%	N/A	N/A	N/A	N/A
PFBS	N/A	121.28%	N/A	N/A	N/A	N/A
PFDA	63.71%	16.14%	22.05%	N/A	N/A	N/A
PFHpA	17.25%	55.86%	0.37%	0.06%	N/A	N/A
PFHxS	207.73%	51.31%	0.38%	0.05%	1.50%	N/A
PFNA	123.78%	24.54%	0.19%	N/A	N/A	N/A
PFOA	157.77%	35.64%	0.21%	0.03%	1.91%	N/A
PFOS	98.02%	15.11%	2.02%	0.03%	0.41%	0.05%

Note:
N/A = Calculation not performed because PFAS were not detected in the leachate sample.

Exhibit 4-8. PFAS Mass Leached During LEAF Leaching Tests



Overall, the leachability testing results indicate that a mix formulation of 2.5% PLC, 5% BFS, and either 1% FLUORO-SORB 100 or 1% RemBind 100X would offer the best performance in reducing target PFAS leaching from AOC 31 vadose zone soils. Sections 5 and 6 of this Work Plan describe ISS and the planned activities to field-scale pilot this technology at AOC 31.

FLUORO-SORB® 100 was selected for field pilot testing at AOC 31 based on better performance in the bench-scale study. As shown in Exhibit 4-8, PFOS was the only constituent of the eight included in the assessment to leach at a detectable concentration from the stabilized soil sample amended with 1% FLUORO-SORB 100 (at concentrations of 1.3 ng/L at Day 2, 1.9 ng/L at Day 7, and non-detect [<0.95 ng/L] at Day 63 of the 63-day LEAF 1315 leaching program); whereas PFHxS, PFOA, and PFOS all leached at detectable concentrations from the stabilized soil sample amended with 1% RemBind 100X.

The bench scale treatability study evaluated the effectiveness of FLUORO-SORB® 100 for ISS in a laboratory environment following prescriptive quality assurance / quality control guidelines through the evaluation process. The next step is to evaluate the performance of FLUORO-SORB® 100 during the pilot test field program. Long-term monitoring and performance results generated during the field pilot study will be compared with the laboratory treatability study results to further understand the short-term and long-term effectiveness of FLUORO-SORB® 100 for ISS in a field application.

5 In Situ Soil Stabilization/Solidification Description

ISS is a well-established source area sequestration/encapsulation technology that has been successfully demonstrated for numerous soil contaminants. ISS incorporates two mechanisms intended to eliminate vadose zone leaching and the mobility of PFAS to groundwater. The first mechanism is stabilization, which relies on a physiochemical interaction between the contaminant and a reagent additive to reduce and/or eliminate the leaching pathway. Chemical fixation of PFAS utilizes the unique electrostatic and hydrophobic characteristics of ionic surfactants and their affinity for the high surface tension at a phase of interfaces. The second mechanism is solidification, which uses cement-based amendments to encapsulate material within a low-permeability monolith and decreases the surface area exposed to infiltrating water, further limiting the leaching pathway and increasing the strength and overall bearing capacity of the treated soils.

6 Pilot Test Objectives, Design, and Implementation

To further evaluate the feasibility of ISS, a field-scale pilot test will be performed. Information from the pilot test program will be used to develop and assess ISS as a potential remedy for full-scale application at AOC 31 and elsewhere at Fort Devens, if/where appropriate. Pilot test results will be incorporated into the analysis and recommendations to be summarized in a pilot test summary report for AOC 31.

The objectives of the ISS pilot test are to:

- Confirm the observations of the 2023/2024 laboratory bench-scale tests described in Section 4;
  - Soils used in the bench-scale tests were collected at locations 31MW-21-01 (Figure 5) and 31SB-21-01 (Figure 4). The locations of 31MW-21-01 and 31SB-21-01 with respect to the proposed locations of ISS pilot Test Cells No. 1 and No. 2 are presented on Figure 10 and the Contract Drawings included as Appendix G. Location 31MW-21-01 is approximately 28 ft east of the proposed eastern edge of ISS pilot Test Cell No. 2 and approximately 31 feet south of the proposed southern edge of ISS pilot Test Cell No. 1. Location 31SB-21-01 is approximately 23 ft east of the proposed eastern edge of ISS pilot Test Cell No. 2 and approximately 25 ft south of the proposed southern edge of ISS pilot Test Cell No. 1.
- Develop key design factors for full-scale ISS implementation at the site (i.e., time necessary to mix, time necessary for the mix to react, performance of the dosing recipe, and volume increase);
- Identify adjustments for full-scale implementation, if any, to the mix recommended by the bench-scale treatability testing;
- Modify, if necessary, site-specific health and safety (H&S) precautions related to the ISS mixing process;
- Identify potential site-specific limitations of this remedial methodology; and
- Determine site-specific logistics and costs for full-scale implementation of this remedial technology.

Contract drawings and specifications for the field-scale pilot test are included as Appendix G. These drawings and specifications provide depictions and cross-sectional views of the two ISS test cells and describe the materials, products, and steps required to perform the ISS mixing work.

6.1 In Situ Soil Stabilization and Solidification Pilot

6.1.1 Project Organization and Planning

The ISS pilot program will involve working with subcontractors to implement the test program. The S-A JV will be the lead contractor, will supervise all field activities, and will develop a comprehensive bid package to select a qualified subcontractor (that will contract directly to the S-A JV) to support various roles or tasks associated with the pilot program.

Tasks and site operations that will be performed as part of the pilot program include:

- Premobilization:
  - Selection and contracting of engineering subcontractor.
  - Coordination, review, and approval with subcontractor of specific individuals who will be in the field, certifications, and safety protocols.

  - Review and approval of engineering deliverables, which will include:
    - Construction work plan;
    - Site-specific Health & Safety Plan (HASP); and
    - Detailed construction schedule.
  - Onsite meeting to discuss access coordination and site restoration with MassDevelopment, subcontractor, and S-A JV.
  - Online construction kickoff meeting with USACE, S-A JV, and subcontractor.
  - Online meeting(s) with USACE, S-A JV, and other stakeholders to coordinate and discuss plans and/or progress, as desired or required by USACE and/or stakeholders.
  - Identification, sampling, and analysis of local water source to be used for the pilot program.

- Site Mobilization and Preparation:
  - Completion of private utility clearance.
  - Establishment of work areas and H&S protocols.
  - Establishment of best management practices, including:
    - Erosion and sediment control;
    - Dust control;
    - Investigation-derived waste (IDW) staging and control; and
    - Equipment/material delivery, support, inspection and approval.
  - Survey and lay out of treatment areas.
  - Creation of perimeter berms.

- ISS Implementation:
  - Installation of two ISS test cells – each cell will be 15 ft long by 15 ft wide by 20 ft deep:
    - Test Cell No. 1:
      - This test cell will be completely solidified to test a conservative approach that minimizes percolation through the monolith.
      - Entire cell (approximately 167 cubic yards) will be amended with PLC, BFS, and FLUORO-SORB 100.
      - Further details are presented in Sections 6.1.6 and 6.1.7.
    - Test Cell No. 2:
      - This test cell will not be solidified in the lower portion (10 to 20 ft bgs) to test a non-conservative approach that allows more percolation through the monolith. This test cell will be solidified in the upper portion (0 to 10 ft bgs) only to provide geotechnical stability to the surface following mixing.
      - Entire cell (approximately 167 cubic yards) will be stabilized with FLUORO-SORB 100.
      - Upper 10 ft portion of cell (approximately 84 cubic yards) will be solidified with PLC and BFS.
      - Further details are presented in Sections 6.1.6 and 6.1.7.

  - One lysimeter will be installed beneath each test cell. Further details are presented in Section 6.1.8.

- Post-treatment survey.
- Site restoration and subcontractor demobilization.
- Performance monitoring and reporting.

Appropriate waste characterization sampling will be completed, and waste will be managed and disposed of in accordance with the base-wide Fort Devens Investigation-Derived Waste Plan for PFAS Remedial Investigations (S-A JV 2024c).

6.1.2 Project Schedule

A preliminary schedule and estimated duration of construction activities for the ISS pilot implementation follows:

- 2 to 3 months – Request for Proposal:
  - Contract documents, construction drawings, and technical specification development; and
  - Bid process, evaluation, and contractor procurement (notice of award).
- 1 month – Notice to Proceed, Submittal Process, and Material Ordering.
- 1 day – Premobilization Water Supply Source Sampling (field).
- 2 to 3 weeks – ISS Pilot Implementation (field):
  - 1 day private utility clearance;
  - 2 days mobilization to site and site preparation (temporary fencing, erosion and sediment control, dust control, IDW staging and control, and equipment/material delivery, support, inspection);
  - 1 day of excavation support system installation for Test Cell No. 1;
  - 2 days of ISS mixing for Test Cell No. 1 – further detailed in Section 6.1.7;
  - 1 day of excavation support system installation for Test Cell No. 2;
  - 2 days of ISS mixing for Test Cell No. 2 - further detailed in Section 6.1.7;
  - 3 days of demobilization and site restoration; and
  - 1 day of IDW removal from site.
- 1 to 2 weeks – Post-ISS Pilot Implementation Installation and Development of Two Lysimeters (field):
  - 1 day of private utility clearance;
  - 1 day of lysimeter installation;
  - 1 day of lysimeter development; and
  - 1 day of IDW removal from site.
- 2 years – ISS Pilot Performance Monitoring and Reporting.

6.1.3 Health and Safety

The S-A JV will develop a site-specific HASP to amend and support the existing Accident Prevention Plan (APP) for Environmental Remediation Services at Fort Devens (S-A JV 2020) new activity hazard analyses will be completed and incorporated. All work will be conducted in accordance with the site-specific HASP, the APP, the USACE Safety and Health Requirements Manual (EM 385-1-1; USACE 2024), and all applicable federal, state, and local H&S requirements.

The site-specific HASP will also be prepared in accordance with S-A JV's SOPs and TGIs. Specific attention will be given to mitigation procedures associated with the hazards inherent in heavy equipment operation, soil mixing, slide-rail system installation and removal, handling of amendments, and general site constraints. An emergency response plan that will address potential emergencies at the site and how they will be mitigated, a list of all site personnel and their contact information, and a list of all appropriate governmental emergency contact personnel and their contact information will be included.

A personnel and equipment decontamination plan to address the decontamination procedures to be followed will be included. These procedures will include pressure washing of the excavator bucket and mixing arm at the end of each workday or when the mixing cell is complete and decontamination of the shoring system following removal. The decontamination process will be performed in a dedicated decontamination area. Water and sediment generated from the decontamination process will be containerized, characterized, and properly disposed off-site.[3]

6.1.4 Mobilization and Deployment

Heavy equipment, including a skid steer, an excavator (CAT 352 or similar), and a water trailer, will be mobilized to the site. Excavator attachments on site will include a standard bucket, a skeleton bucket, and a mixer/mulcher. A slide-rail shoring system will be mobilized to the site and utilized to shore the upper soils at both test cells. Other onsite equipment will include a water meter (with backflow preventer), lay-flat hoses, and a portable restroom. Onsite materials will include temporary fencing, straw wattles, safety supplies, decontamination supplies, and treatment amendments (PLC, BFS, and FLUORO-SORB 100). Treatment amendments will be shipped directly to the site, then staged and covered with a secured tarp for protection from the weather.

Upon their arrival at the site, all machines and equipment will be inspected for damage or malfunction and equipped with spill response kits and fire extinguishers. Equipment will be inspected and decontaminated (as required) to move about the site and between the two ISS test cells.

Existing utilities will be verified prior to the start of work. Prior to the start of subsurface intrusive activities, Dig Safe will be notified and all necessary permitting will be completed. There are no known utilities within the planned test cell areas.

6.1.5 Pre-ISS Pilot Implementation Source Water Sampling

Prior to ISS pilot implementation, the source water to be used in the ISS process will be sampled and submitted for analysis of PFAS via USEPA Draft Method 1633. Three primary source samples, one field duplicate, and one field blank will be acquired and analyzed. Source water sampling and analysis details are presented in Table 5.

6.1.6 Baseline Characterization

Two baseline composite soil samples from each cell (one from the upper portion and one from the lower portion) will be collected and analyzed (i.e., a total of four samples) to determine baseline PFAS and organic carbon concentrations. The baseline composite soil samples will be analyzed for PFAS via USEPA Draft Method 1633 and for total organic carbon (TOC) via Method Lloyd Kahn. The baseline composite soil samples will also undergo

[3] Appendix G, Sheet 6, Detail 6 shows a typical containment area setup.

LEAF Method 1314 testing, which is specific to liquid/solid partitioning under percolation conditions. The resulting leachate produced via LEAF Method 1314 will be analyzed for PFAS via USEPA Draft Method 1633 and for dissolved organic carbon (DOC) by Method SM5310C.[4] ISS baseline sampling and analysis details are presented in Table 4 and discussed in this section.

The baseline composite soil samples will be collected after the initial homogenization mixing has been completed, but prior to treatment mixing (i.e., no treatment amendments will have been added to the test cell). Initial homogenization mixing will be confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. The timing for collection of baseline composite soil samples during ISS pilot implementation is described in Section 6.1.7.

Each baseline composite soil sample will be placed in a 5-gallon UN-compliant (shipping standard UN1H2/Y30/S) HDPE bucket. Each baseline composite soil sample will be composed of soils acquired from five discrete locations (1 gallon per discrete location). The soils will be acquired from the discrete locations via the excavator bucket. An aliquot of each discrete sample from the upper and lower portions of Test Cell No. 1 and the upper portion of Test Cell No. 2 will be collected for laboratory analysis of select inorganics (aluminum, calcium, magnesium, iron, and sulfur) via Method 6020. These metals were selected for analysis because they will be present at higher concentrations in soils following addition of the solidification amendments (BFS and/or PLC). Analyzing soil samples collected from discrete locations within the solidified cell portions for these metals is intended to provide a data set to further validate mixing homogeneity.

Approximately 1 gallon of soil per discrete location will then be transferred to a 5-gallon bucket using a hand shovel. Soil from all five discrete sample locations will then be mixed by hand within the 5-gallon bucket (using a post hole earth auger or similar tool) until confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. Field logs detailing actual mixing equipment (manufacturer, model, and serial number), start and stop times, and visual observations will be recorded and signed by both S-A JV and USACE oversight personnel.

Discrete location details follow:

- Test Cell No. 1, Lower Portion:
  - Discrete location 1: 10-12 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 12-14 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 14-16 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 16-18 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 18-20 ft bgs; center of excavation

- Test Cell No. 1, Upper Portion:
  - Discrete location 1: 0-2 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 2-4 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 4-6 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 6-8 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 8-10 ft bgs; center of excavation

[4] DOC analysis may not be performed on leachate samples if the TOC concentration in the corresponding baseline composite soil sample is less than 10,000 milligrams per kilogram.

- Test Cell No. 2, Lower Portion:
  - Discrete location 1: 10-12 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 12-14 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 14-16 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 16-18 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 18-20 ft bgs; center of excavation

- Test Cell No. 2, Upper Portion:
  - Discrete location 1: 0-2 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 2-4 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 4-6 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 6-8 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 8-10 ft bgs; center of excavation

6.1.7 ISS Pilot Implementation

ISS pilot implementation details are presented in the Contract Drawings in Appendix G. The two AOC 31 ISS test cells will be surveyed and staked prior to initiating subsurface intrusive activities. Each ISS test cell will be approximately 15 ft wide by 15 ft long by 20 ft deep. A CAT 352 excavator or similar (must be able to excavate and mix the cells to depth) with a bucket will be used to excavate the test cells. Soil homogenization will be done using the same excavator with one or a combination of the following attachments: standard bucket, skeleton bucket, rake, mixer/mulcher. A skid steer with be utilized to support the excavator as needed.

Appropriate soil erosion and sediment controls will be installed, and best management practices will be employed prior to the execution of soil mixing work. To prevent direct contact between surface soils and stockpiled soils, pre-excavated soils will be temporarily staged adjacent to the test cell on 10-mil polyethylene liner prior to re-introduction for mixing. After the soil mixing work has been completed, areas disturbed by heavy equipment operations and the temporary staging area will be regraded and restored to match existing conditions.

A soil berm will be established using native soil around the perimeter of each ISS cell prior to the initiation of mixing to accommodate potential soil bulking that may occur after mixing. The berm shall be constructed with a 2:1 slope on each side and shall not exceed a maximum height of 1.0 ft. The berm shall begin at the edge of excavation and shall span to a maximum offset of 5.0 feet the from the edge of excavation. A split rail fence shall be installed around the outer limits of the berm. A temporary slide-rail shoring system to stabilize and shore the upper 8 to 10 ft of subgrade soils will be utilized to safely implement the soil mixing work. Soils within each treatment cell will be pre-excavated along the perimeter of the footprint to allow for the installation of the slide-rail panels and corner posts.

The ISS pilot implementation order of operations for each test cell follows:

1. Day 1:
   a. Excavate and temporarily stockpile soils from the upper portion (0 to 10 ft bgs) of the test cell.
   b. Initially mix (without treatment) the lower portion (10 to 20 ft bgs) and position a 6-inch diameter Schedule 80 PVC pipe within the center of the test cell for future lysimeter installation.
   c. Collect five discrete soil samples from the lower portion to generate the lower portion baseline composite sample.
   d. Treatment mix the lower portion.

e. Collect five discrete soil samples from the lower portion to generate the lower portion performance monitoring composite samples.

2. Day 2:
   a. Replace (i.e., backfill) and mix (without treatment) the temporarily excavated soils from the upper portion.
   b. Collect five discrete soil samples from the upper portion to generate the upper portion baseline composite sample.
   c. Treatment mix the upper portion.
   d. Collect five discrete soil samples from the upper portion to generate the upper portion performance monitoring composite samples.

Soil in the upper portion of the test cell will be excavated to allow the excavator to reach the base of the soil mixing zone to effectively mix and blend soils within this lower treatment zone. Prior to the introduction of any treatment amendments, an initial process pass will be performed during which the in-situ compacted soils in the lower portion of the test cell will be broken up and mixed using the excavator. This process will break down the structure of the soils, allow for the removal of large debris that could impede treatment, and improve the overall workability of the soils to support the subsequent amendment mixing step. During this process pass, records will be kept of the effectiveness of the excavator and production rates that were achieved. If obstructions such as boulders or other potentially damaging materials are encountered, the operator will stop soil mixing until the nature of the obstruction is known. Obstructions or debris that will affect or impede soil homogenization, proper mixing, or effective PFAS treatment will be removed and staged in the temporary staging area. Once the lower portion of the test cell is fully mixed, the baseline composite soil sample for laboratory analysis will be collected as described in Section 6.1.6 and Day 1 Step (c) above. Treatment mix will then be added at the appropriate dosing percentage to the lower portion of the test cell and blended. Once the treatment mix (with water) has been thoroughly mixed and homogenized, the performance monitoring composite sample for laboratory analysis will be collected from the lower portion of the test cell as described in Day 1 Step (e) above.

On Day 2, the pre-excavated soil from the upper portion of the test cell will be replaced into the test cell and the upper portion of the test cell will be mixed blended. To achieve consistent and uniform mixing of the upper portion of the test cell, the pre-excavated soil will be replaced and blended in small amounts with treatment mix.[5] Thorough mixing and homogenization will be visually confirmed before the excavator bucket of soil and treatment mix are added. Once the upper portion of the test cell is fully mixed, the baseline composite soil sample for laboratory analysis will be collected as described in Section 6.1.6 and Day 2 Step (b) above. Treatment mix will then be added at the appropriate dosing percentage to the upper portion of the test cell and blended. Once the treatment mix (with water) has been thoroughly mixed and homogenized with the upper test cell soil, the performance monitoring composite sample for laboratory analysis will be collected from the upper portion of the test cell as described in Day 2 Step (d) above. After the mixing work and sampling has been completed, the shoring system will be removed.

Each mixing operation (treatment and non-treatment) will be performed by an experienced ISS subcontractor. The subcontractor's operator shall have a minimum of five years of soil mixing experience. Mixing shall be confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. S-A JV oversight personnel shall

[5] Blending of soil with treatment mix will be performed within the test cell. Ex situ mixing of pre-excavated soil with treatment mix prior to replacement in the test cell would require construction of a containerized area for mixing and handling of wet blended soil, resulting in added cost and waste materials.

have at least three years of experience observing soil mixing work and collecting performance monitoring samples. A senior technical subject matter expert will also be on site during the first few days of soil mixing.

Field logs detailing actual mixing equipment (manufacturer, model, and serial number), additive amounts (for treatment mixing only), start and stop times, and visual observations will be recorded and signed by both S-A JV and USACE oversight personnel. Key daily mixing observations will include:

- amendments ratios;
- amendment quantities;
- excavator size and reach length;
- excavator bucket size and type; and
- production rates / soil mixing timeframes.

Key daily mixing requirements will include:

- adequacy of blending, indicated by a consistent color when amendment is effectively mixed into sandy soil (variations in color will require additional mixing/blending); and
- adequacy of consistency, indicated by the absence of large clumps of soil, breakdown of the compacted in-situ soil structure, absence of cohesive clays (i.e., clay liquid limits reached), and creation of a "runny-like" slurry in situ.

Water for the treatment mix will be supplied and collected from the nearest fire hydrant and will likely need to be trucked to the pilot test area. A sample of the source fire hydrant water will be collected and analyzed for PFAS prior to use during the pilot test to confirm that the source water from the fire hydrant is PFAS-free.[6]

Based on the bench-scale testing results summarized in Section 4.3, the following mix design recipe has been assumed for this pilot testing (and will be finalized prior to mobilization):

- FLUORO-SORB 100 at 1% by dry weight;
- PLC at 2.5% by dry weight;
- BFS at 5% by dry weight; and
- Target water to amendment ratio of 2:1.

6.1.7.1 Test Cell No. 1 – ISS and Performance Monitoring Sample Acquisition

At Test Cell No. 1, consistent with the ISS implementation order of operations presented in Section 6.1.7, FLUORO-SORB 100 (1%), PLC (2.5%), BFS (5%), and water will be added and mixed into both the lower portion (10 to 20 ft bgs) and upper portion (0 to 10 ft bgs) of the test cell to stabilize and solidify. Treatment mixing will be confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. The Test Cell No. 1 soil sampling and analysis details are presented in Table 4 and Section 6.1.9.1.

Each composite performance monitoring soil sample will be collected in a 5-gallon UN-compliant (shipping standard UN1H2/Y30/S) HDPE bucket. Each composite performance monitoring soil sample will be composed of

[6] All potable water at the former Fort Devens and Town of Ayer is currently pre-treated for PFAS, so this source water will also have been documented as PFAS-free based on the pre-treatment. PFAS-free as it is used in this Work Plan indicates laboratory analytical results that are non-detect for PFAS compounds listed in Draft-4 Method 1633 (S-A JV samples) and/or Method 533 (public water supply).

soils acquired from five discrete locations. Soils will be acquired from the discrete locations via the excavator bucket. An aliquot of each discrete sample will be collected from the excavator bucket and placed in a mold for subsequent laboratory analysis of UCS by ASTM D1633. A second aliquot of each discrete sample from the upper and lower portions of Test Cell No. 1 will be collected for laboratory analysis of select inorganics (aluminum, calcium, magnesium, iron, and sulfur) by Method 6020. These metals were selected for analysis because they will be present at higher concentrations in soils following addition of the solidification amendments (BFS and/or PLC). Analyzing soil samples collected from discrete locations within the solidified cell portions for these metals is intended to provide a data set to further validate mixing homogeneity.

Two composite samples will then be prepared for each of the upper and lower portions of Test Cell No. 1 using soils collected from the discrete locations portion. Approximately 2 gallons of soil per discrete location will be transferred to two 5-gallon buckets using a hand shovel, 1 gallon to each bucket. Soil from all five discrete sample locations will then be mixed by hand within each 5-gallon bucket (using a post hole earth auger or similar tool) until mixing is confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. Field logs detailing actual mixing equipment (manufacturer, model, and serial number), start and stop times, and visual observations will be recorded and signed by both S-A JV and USACE oversight personnel. One of the two composite samples prepared for each portion of Test Cell No. 1 will be used for the performance monitoring described in Section 6.1.9.1; the second composite sample from each portion (for a total of two samples) will be stored in the Arcadis Treatability Laboratory for potential future testing. The samples stored for potential future testing are not presented in Table 4 because the analytical program for these samples has not yet been finalized.

Discrete location details follow:

- Test Cell No. 1 Lower Portion :
  - Discrete location 1: 10-12 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 12-14 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 14-16 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 16-18 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 18-20 ft bgs; center of excavation

- Test Cell No. 1 Upper Portion:
  - Discrete location 1: 0-2 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 2-4 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 4-6 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 6-8 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 8-10 ft bgs; center of excavation

6.1.7.2 Test Cell No. 2 – ISS and Performance Monitoring Sample Acquisition

At Test Cell No. 2, consistent with the ISS implementation order of operations presented in Section 6.1.7, FLUORO-SORB 100 (1%) and water will be added and mixed into the lower portion (10 to 20 ft bgs) of the test cell to stabilize only. FLUORO-SORB 100 (1%), PLC (2.5%), BFS (5%), and water will be added and mixed into the upper portion (0 to 10 ft bgs) to stabilize and solidify. Treatment mixing will be confirmed complete via visual inspection by both A-A JV and USACE oversight personnel. The Test Cell No. 2 soil sampling and analysis details are presented in Table 4 and Section 6.1.9.2.

Each composite performance monitoring soil sample will be collected in a 5-gallon UN-compliant (shipping standard UN1H2/Y30/S) HDPE bucket. Each composite performance monitoring soil sample will be composed of soils acquired from five discrete locations. Soils will be acquired from the discrete locations via the excavator bucket. An aliquot of each discrete sample from the upper portion of the test cell will be collected from the excavator bucket and placed in a mold for subsequent laboratory analysis of UCS by ASTM D1633. A second aliquot of each discrete sample from the upper portion of Test Cell No. 2 will be collected for laboratory analysis of select inorganics (aluminum, calcium, magnesium, iron, and sulfur) by Method 6020. These metals were selected for analysis because they will be present at higher concentrations in soils following addition of the solidification amendments (BFS and/or PLC). Analyzing soil samples collected from discrete locations within the solidified cell portions for these metals is intended to provide a data set to further validate mixing homogeneity.

Two composite samples will then be prepared using soils collected from the discrete locations in each portion of Test Cell No. 2. Approximately 2 gallons of soil per discrete location will then be transferred to two 5-gallon buckets using a hand shovel, 1 gallon to each bucket.

Soil from all five discrete sample locations will then be mixed by hand within each 5-gallon bucket (using a post hole earth auger or similar tool) until mixing is confirmed complete via visual inspection by both S-A JV and USACE oversight personnel. Field logs detailing actual mixing equipment (manufacturer, model, and serial number), start and stop times, and visual observations will be recorded and signed by both S-A JV and USACE oversight personnel. One of the two composite samples prepared for each portion of Test Cell No. 2 will be used for the performance monitoring described in Section 6.1.9.2; the second composite sample from each portion (for a total of two samples) will be stored in the Arcadis Treatability Laboratory for potential future testing. The samples stored for potential future testing are not presented in Table 4 because the analytical program for these samples has not yet been finalized.

Discrete location details follow:

- Test Cell No. 2, Lower Portion:
  - Discrete location 1: 10-12 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 12-14 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 14-16 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 16-18 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 18-20 ft bgs; center of excavation

- Test Cell No. 2, Upper Portion:
  - Discrete location 1: 0-2 ft bgs; 3-5 ft off eastern excavation limit; centered north-south
  - Discrete location 2: 2-4 ft bgs; 3-5 ft off northern excavation limit; centered east-west
  - Discrete location 3: 4-6 ft bgs; 3-5 ft off western excavation limit; centered north-south
  - Discrete location 4: 6-8 ft bgs; 3-5 ft off southern excavation limit; centered east-west
  - Discrete location 5: 8-10 ft bgs; center of excavation

6.1.8 Lysimeter Installation and Development

During ISS pilot implementation, a 6-inch diameter Schedule 80 PVC pipe will be placed at the center of each test cell for future lysimeter installation to occur without interacting with or impacting the integrity of the solidified monoliths. The PVC pipe placed in Test Cell No. 1 will be at least 22 ft long and installed to extend a minimum of

1 ft beneath the lower portion of the cell (i.e., to at least 21 ft bgs). The PVC pipe placed in Test Cell No. 2 will be at least 12 ft long and installed to extend a minimum of 1 ft beneath the solidified upper portion of the cell (i.e., to at least 11 ft bgs). The top and bottom of each PVC pipe will be capped during installation to prevent soils from entering the interior of the pipe.

One new lysimeters will be installed post ISS pilot implementation below each test cell using a direct push GeoProbe. The two new lysimeters will be labeled 31LS-09 and 31LS-10, and both porewater collection cups will be set at 25 ft bgs. The two lysimeter installation boreholes will be drilled within the interior of the 6-inch diameter Schedule 80 PVC pipes (previously placed during ISS pilot implementation so as not to interact with or impact the integrity of the ISS monoliths). The two lysimeters will be installed and developed in accordance with S-A JV TGI – Procedures for Suction Lysimeter Installation and O&M (Rev: 1), attached as Appendix B. Post installation, the tops of the 6-inch diameter PVC pipes will be sealed to prevent migration of surface precipitation through the pipe interiors to the lysimeter collection cups.

6.1.9 Baseline Comparison and Performance Monitoring

All soil samples (baseline and performance monitoring) will initially be shipped to the Arcadis Treatability Laboratory. Soil samples will then be shipped to Eurofins from the Arcadis Treatability Laboratory as needed. All water samples will be shipped directly to Eurofins. All shipments will be executed under chain-of-custody procedures, consistent with sample shipping methodology, including the use of PFAS-free sampling materials and sample collection vessels. The Area 3 QAPP (S-A JV 2024b) and Area 3 QAPP Addendum (S-A JV 2024a) include the analyses and required quality control samples. Sampling and analysis reference table and section numbers follow:

- Baseline source water sampling and analysis details are presented in Table 5 and Section 6.1.5.
- Baseline soil sampling and analysis details are presented in Table 4 and Section 6.1.6.
- Performance monitoring soil sampling and analysis details are presented in Table 4 and Sections 6.1.9.1 and 6.1.9.2.
- Performance monitoring porewater (lysimeter) and groundwater sampling analysis details are presented in Table 5 and Section 6.1.9.3.

As described in Sections 6.1.7.1 and 6.1.7.2, a second composite sample will be collected from each portion of Test Cells No. 1 and No. 2 (a total of four additional composite samples) and stored in the Arcadis Treatability Laboratory for potential future performance testing. These samples for potential future performance testing are not presented in Table 4 because the analytical program for these samples has not yet been finalized. The samples will be stored in their original containers (cylindrical molds for the solidified mixes and HDPE buckets for the unsolidified mixes). The cured, solidified cylindrical molds will be placed into plastic bags to prevent desiccation. The gasketed HDPE bucket lids will provide a sufficient seal to prevent desiccation of the unsolidified samples. The samples will be placed in secondary containment such as a plastic mortar mixing tray or an oversized, sealable bucket while being stored. The samples will be stored at ambient laboratory temperature, consistent with storage conditions during bench-scale treatability testing.

6.1.9.1 Test Cell No.1 Soils Performance Monitoring

- Lower Portion – Post-Treatment Mixing – Stabilized and Solidified:

- 28 Days Post-Treatment Mixing:
  - LEAF Method 1315 (resulting leachate to be analyzed for PFAS by USEPA Draft Method 1633 and DOC by Method SM5310C)7;
  - UCS by ASTM D1633; and
  - Hydraulic Conductivity by ASTM D5084.

- Upper Portion – Post-Treatment Mixing – Stabilized and Solidified:
  - 28 Days Post-Treatment Mixing:
    - LEAF Method 1315 (resulting leachate to be analyzed for PFAS by USEPA Draft Method 1633 and DOC by Method SM5310C)8;
    - UCS by ASTM D1633; and
    - Hydraulic Conductivity by ASTM D5084.

6.1.9.2 Test Cell No. 2 (Split Portions) Soils Performance Monitoring

- Lower Portion – Post-Treatment Mixing – Stabilized Only:
  - 28 Days Post-Treatment Mixing:
    - LEAF Method 1314 (resulting leachate to be analyzed for PFAS by USEPA Draft Method 1633 and DOC by Method SM5310C)9; and
    - Hydraulic Conductivity by ASTM D5084 (remolded).

- Upper Portion – Post-Treatment Mixing – Stabilized and Solidified:
  - 28 Days Post-Treatment Mixing:
    - LEAF Method 1315 (resulting leachate to be analyzed for PFAS by USEPA Draft Method 1633 and DOC by Method SM5310C)10;
    - UCS by ASTM D1633; and
    - Hydraulic Conductivity by ASTM D5084.

[7] DOC analysis may not be performed if the TOC concentration in the lower portion baseline composite soil sample is less than 10,000 milligrams per kilogram.
[8] DOC analysis may not be performed if the TOC concentration in the upper portion baseline composite soil sample is less than 10,000 milligrams per kilogram.
[9] DOC analysis may not be performed if the TOC concentration in the lower portion baseline composite soil sample is less than 10,000 milligrams per kilogram.
[10] DOC analysis may not be performed if the TOC concentration in the upper portion baseline composite soil sample is less than 10,000 milligrams per kilogram

6.1.9.3 Porewater and Groundwater Performance Monitoring

The primary performance monitoring samples are those soils samples that will be collected from the ISS pilot test cells (Section 6.1.9). Results of testing the in-place mix will provide real data on how effectively PFAS mass has been treated and encapsulated, and how much PFAS in soil may continue to leach from the treated areas.

In addition to the primary performance monitoring samples, vadose zone porewater and saturated zone groundwater samples will be collected and analyzed. The two new lysimeters (one to be installed below each test cell) will be sampled semi-annually for 2 years following ISS pilot implementation, if any porewater accumulates, for a total of four lysimeter sampling events. These porewater samples will be analyzed for PFAS by USEPA Draft Method 1633, and results will be evaluated to assess whether vadose zone porewater percolating through the ISS test cells provides insight into the performance of the pilot test. Data from the two new test cell lysimeters will be compared with results from the two existing lysimeters outside and closest to the test cells (31LS-02 and 31LS-06). Lysimeter data may or may not show a decrease in PFAS concentrations in porewater because percolation of rainfall is anticipated to be stopped and/or greatly reduced by ISS, and the existing porewater concentrations may not be affected without additional percolation through the vadose zone. The performance monitoring porewater sampling and analysis details are presented in Table 5.

Additionally, four to-be-installed groundwater monitoring wells (to be installed either as part of the Area 3 Phase II RI to be conducted separately or as part of the AOC 31 pilot test for groundwater) that will be located downgradient of the ISS pilot test cells may also be sampled semi-annually for 2 years. These groundwater samples would also be analyzed for PFAS by USEPA Draft Method 1633, and results would be evaluated to assess if these data, over a 2-year period, provide insight into performance of the pilot test. A 2-year period also may not provide enough time for the “signal” of shallow (0 to 20 ft bgs) vadose zone soil treatment to reach groundwater approximately 70 ft bgs and travel downgradient to the monitoring wells. The performance monitoring groundwater sampling and analysis details are presented in Table 5.

6.1.10 Decommissioning, Site Restoration, and Waste Management

Prior to demobilization, all heavy equipment and the slide-rail shoring system will be decontaminated and inspected to help prevent damage or cross-contamination due to field activities. The berm material around the perimeter of each test cell will be regraded and mounded. A layer of non-woven geotextile material will be installed over each test cell followed by a 6-inch surface layer of AASHTO No. 3 stone. Double split-rail fence will also be installed around the perimeter of each test cell to provide visual awareness of the pilot test areas. The main construction entrance will remain in place following completion of the pilot installations. Once the areas have been restored, the straw wattle will be removed and disposed of offsite.

General construction debris, personal protective equipment, and miscellaneous refuse will be generated and placed in a roll-off container and disposed of at the local landfill as municipal solid waste. One roll-off container (10 cubic yards) of general waste is anticipated to be generated.

No IDW or other PFAS-impacted waste that would require off-site disposal is expected to be generated during the pilot testing. ISS bulk material will remain within each test cell, and decontamination of equipment will also be performed over the test cells. Lysimeters installed below each test cell will generate minimal cuttings, if any, because they will be installed through the 6-inch PVC pipe pre-installed through the center of each cell. If any unexpected IDW is generated, it will be containerized, characterized, and properly disposed of off-site in

accordance with the Area 3 QAPP (S-A JV 2024b), the Area 3 QAPP Addendum *for* AOC 31 Pilot Tests for PFAS in Soils and Groundwater (S-A JV 2024a), and the IDW Management Plan for PFAS RIs (S-A JV 2024c).

6.1.11 Data Analysis and Reporting

Following the completion of ISS activities, the quantities of materials used will be calculated based on the measured mixing concentrations and an interim pilot test report summarizing completion of field activities will be prepared. The report will include photos, waste manifest(s) (if applicable), safety logs, performance sampling results, daily field summary reports and the means and methods and any field variances required as part of this work. Semi-annual progress reports will be prepared to summarize porewater and groundwater data collected as part of this pilot test effort. A summary pilot test report will be completed at the end of the 2-year monitoring period and will include recommendations regarding full-scale implementation.

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Tables

Table 1
AOC 31 Lysimeter Construction and Development
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Lysimeter ID	Lysimeter Collection Cup Depth Interval (ft bgs)	September 2023 Installation Purge Data				
		1st Purge (mL)	2nd Purge (mL)	2-hour Test (mL)	3rd Purge (mL)	Total Purge Volume (mL)
31LS-01	13-14	300	380	NA	NA	680
31LS-02	19-20	0	125	NA	NA	125
31LS-03	33-34	0	475	NA	NA	475
31LS-04	2-3	290	0	NA	340	630
31LS-05	13-14	325	0	NA	375	700
31LS-06	19-20	340	400	NA	NA	740
31LS-07	50-51	75	390	NA	NA	465
31LS-08	11-12	300	300	125	0	725

Acronyms and Abbreviations:
bgs = below ground surface
ft = foot
ID = identification
mL = milliliter
NA = not applicable

Table 2
AOC 31 PFAS in Soils and SPLP Leachate
Pilot Test Work Plan for Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Location ID:	31SB-23-01	31SB-23-02	31SB-23-03	31SB-23-04	31SB-23-05	31SB-23-06	31SB-23-07	31SB-23-08	31SB-23-08
Field Sample ID:	31SB-23-01-13-14	31SB-23-02-19-20	31SB-23-03-33-34	31SB-23-04-2-3	31SB-23-05-13-14	31SB-23-06-19-20	31SB-23-07-50-51	31SB-DUP-23	31SB-23-08-11-12
Lab Sample ID:	410-142725-6	410-142725-8	410-142725-7	410-142725-4	410-142725-2	410-142725-5	410-142725-3	410-142725-9	410-142725-1
Sample Date:	9/12/2023	9/13/2023	9/13/2023	9/11/2023	9/11/2023	9/12/2023	9/11/2023	9/11/2023	9/11/2023
Sample Type:	N	N	N	N	N	N	N	FD	N
PFAS in Soils (µg/kg)									
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.810 J	1.30	0.630 J	2.10	ND	0.860 J	1.20	ND	ND
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	41.0	39.0	2.20	33.0	55.0	110	11.0	33.0 J	18.0 J
N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.120 J	ND	ND	0.0530 J	ND	0.0780 J	ND	0.130 J	0.160 J
N-Methyl heptadecafluorooctanesulfonamide (NMeFOSA)	ND	ND	ND	0.610	ND	ND	ND	2.10	2.80
N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.510 J	0.120 J	ND	ND	ND	0.650 J	ND	1.30 J	1.10 J
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	0.0600 J	ND	ND
Perfluorodecanesulfonic acid (PFDS)	0.290	ND	ND	0.530	ND	0.180 J	0.0670 J	0.570 J	1.20 J
Perfluorodecanoic acid (PFDA)	0.220	0.110 J	ND	0.590	0.160 J	0.580	ND	0.310	0.510
Perfluorododecanesulfonic acid (PFDoS)	0.0650 J	ND	ND	0.770	ND	ND	ND	0.230	0.510
Perfluorododecanoic acid (PFDoA)	ND	ND	ND	0.110 J	ND	ND	ND	ND	ND
Perfluoroheptanesulfonic acid (PFHpS)	0.850	1.40	0.410	0.110 J	0.130 J	2.50	0.210	0.210	0.150 J
Perfluoroheptanoic acid (PFHpA)	0.110 J	0.260	0.100 J	0.720	0.0940 J	0.180 J	0.0830 J	0.110 J	0.0770 J
Perfluorohexanesulfonic acid (PFHxS)	1.20	2.90	2.10	2.10	1.20	3.30	1.50	1.90	1.60
Perfluorohexanoic acid (PFHxA)	0.100 J	0.240 J	ND	0.620	ND	ND	ND	ND	ND
Perfluorononanesulfonic acid (PFNS)	0.220	ND	ND	0.120 J	ND	0.440	ND	0.190 J	0.290
Perfluorononanoic acid (PFND)	0.420	0.500	0.140 J	0.520	0.150 J	0.850	ND	0.130 J	0.230
Perfluorooctanesulfonamide (PFOSA)	39.0	10.0 J	0.440	38.0	28.0	61.0	18.0	100	140
Perfluorooctanesulfonic acid (PFOS)	190	560 J	88.0	16.0	220	1900	55.0	150 J	67.0 J
Perfluorooctanoic acid (PFOA)	1.10	1.40 J	0.620	1.50	0.820	1.70	0.320	0.810	0.780
Perfluoropentanesulfonic acid (PFPeS)	ND	ND	ND	0.0960 J	ND	ND	0.100 J	ND	ND
Perfluoropentanoic acid (PFPeA)	ND	ND	ND	0.470 J	ND	ND	ND	ND	ND
Perfluoroundecanoic acid (PFUND)	ND	ND	ND	0.240	ND	ND	ND	ND	0.130 J
PFAS in SPLP Induced Leachate (ng/L)									
3-Perfluoroheptyl propanoic acid (7:3FTCA)	ND	ND	ND	20.0 J	ND	ND	ND	ND	ND
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	41.0	55.0	24.0	51.0	9.30	39.0 J	13.0	9.40	9.00 J
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1400	1200	69.0	1200	2000	4500	330	850 J	500 J
N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	5.60	ND	ND	2.60	ND	ND	ND	2.80	3.80
N-Methyl heptadecafluorooctanesulfonamide (NMeFOSA)	ND	ND	ND	17.0	9.30	9.30 J	2.90	ND	5.70 J
N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	38.0 J	8.00 J	ND	8.50 J	11.0 J	49.0 J	6.90 J	60.0 J	48.0 J
Perfluorobutanesulfonic acid (PFBS)	ND	0.720 J	ND	1.50 J	ND	ND	0.510 J	0.440 J	ND
Perfluorobutanoic acid (PFBA)	ND	ND	ND	8.00 J	ND	ND	ND	ND	ND
Perfluorodecanesulfonic acid (PFDS)	10.0	ND	ND	10.0	0.930 J	5.80 J	1.70 J	15.0 J	27.0 J
Perfluorodecanoic acid (PFDA)	12.0	4.30 J	ND	28.0	4.70	23.0	0.870 J	16.0	16.0
Perfluorododecanesulfonic acid (PFDoS)	ND	ND	ND	1.20 J	ND	ND	ND	ND	2.20 J
Perfluorododecanoic acid (PFDoA)	ND	ND	ND	2.30 J	ND	ND	ND	0.860 J	2.30
Perfluoroheptanesulfonic acid (PFHpS)	35.0	65.0	13.0	4.00 J	6.10	78.0	3.10	7.30	4.90
Perfluoroheptanoic acid (PFHpA)	7.50	13.0	6.40	43.0	5.40	9.80 J	3.90	7.00	4.30
Perfluorohexanesulfonic acid (PFHxS)	72.0	160	100	110	62.0	180	38.0	110	75.0
Perfluorohexanoic acid (PFHxA)	8.20	22.0 J	6.00	36.0	3.20	22.0	8.30	7.70	4.90
Perfluorononanesulfonic acid (PFNS)	9.20	4.20 J	ND	5.00	5.50	14.0 J	2.50	7.70	8.10
Perfluorononanoic acid (PFND)	24.0	19.0	4.20	30.0	5.50	36.0	1.40 J	8.40	6.40
PerfluorooctanesulfoNDmide (PFOSA)	1400	420 J	10.0	1500	1400	2600	690	3000	3400
Perfluorooctanesulfonic acid (PFOS)	7400	21000 J	3500	600	8700	61000	1800	5600 J	2200 J
Perfluorooctanoic acid (PFOA)	66.0	58.0 J	39.0	97.0	33.0	110	11.0	48.0	30.0
Perfluoropentanesulfonic acid (PFPeS)	0.870 J	2.50	0.850 J	3.60	ND	ND	1.60 J	0.830 J	0.590 J
Perfluoropentanoic acid (PFPeA)	2.10 J	4.90	ND	26.0	ND	ND	4.50 J	ND	3.00 J
Perfluoroundecanoic acid (PFUND)	ND	ND	ND	8.10	ND	ND	ND	1.80 J	3.30

Note:
1. Only detections are shown above. Compounds that were not detected are shown with an "ND".

Acronyms and Abbreviations:
ID = identification
FD = Field Duplicate sample type
N = Normal sample type
ND = not detected
µg/kg = microgram per kilogram
ng/L = nanogram per liter
PFAS = per- and polyfluoroalkyl substances
SPLP = synthetic precipitation leaching procedure

Laboratory Qualifier:
J = Estimated Value

Table 3
AOC 31 PFAS in Porewater
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Locations:	31LS-01	31LS-01	31LS-01	31LS-01	31LS-02	31LS-02	31LS-02	31LS-02	31LS-03	31LS-03	31LS-03	31LS-03
Field Sample ID:	31LS-01-NOV23	31LS-01-DEC23	31LS-01-FEB24	31LS-01-APR24	31LS-02-NOV23	31LS-02-DEC23	31LS-02-FEB24	31LS-02-APR24	31LS-03-NOV23	31LS-03-DEC23	31LS-03-FEB24	31LS-03-APR24
Lysimeter Collection Cup Depth Interval (ft bgs)	13-14	13-14	13-14	13-14	19-20	19-20	19-20	19-20	33-34	33-34	33-24	33-24
Sample Date:	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024
PFAS (ng/L)												
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	76.0 U	76.0 U	7.50 U	7.20 U	76.0 U	76.0 U	76.0 U	8.00 U	8.20 U	8.00 U	7.20 U	7.20 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	250 U	250 U	**10.0 J**	**20.0 J**	250 U	250 U	250 U	26.0 U	27.0 U	26.0 U	24.0 U	24.0 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	250 U	250 U	25.0 U	24.0 U	250 U	250 U	250 U	26.0 U	27.0 U	26.0 U	24.0 U	24.0 U
3-Perfluoropropyl propanoic acid (3:3FTCA)	50.0 U	50.0 U	**2.70 J**	**7.90 J**	50.0 U	50.0 U	50.0 U	5.30 U	5.40 U	5.30 U	4.70 U	4.80 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	38.0 U	38.0 U	3.70 U	3.60 U	38.0 U	38.0 U	38.0 U	4.00 U	4.10 U	4.00 U	3.60 U	3.60 U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38.0 U	38.0 U	3.70 U	36.0 U	38.0 U	38.0 U	38.0 U	**2.40 J**	4.10 U	4.00 U	3.60 U	3.60 U
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**7,800**	**2,400 J**	**1,800**	**5,600**	**660**	**560**	**770**	**520**	**260**	**280**	**280**	**200**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**240 J**	**580**	**570**	**180 J**	**250**	**270**	**350**	**230**	**28.0**	**32.0**	**36.0**	**40**
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	38.0 U	38.0 U	3.70 U	3.60 U	38.0 U	38.0 U	38.0 U	4.00 U	4.10 U	4.00 U	3.60 U	3.60 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	40.0 U	40.0 U	3.90 U	3.80 U	40.0 U	40.0 U	40.0 U	4.20 U	4.30 U	4.20 U	3.80 U	3.80 U
N-Ethyl perfluorooctanesulfonamide (NEtFOSA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14.0 U	14.0 U	1.40 U	1.30 U	14.0 U	14.0 U	14.0 U	1.50 U	**1.50 J**	1.50 U	1.30 U	1.30 U
N-Ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	100 U	100 U	9.80 U	9.50 U	100 U	100 U	100 U	11.0 U	11.0 U	11.0 U	9.50 U	9.50 U
N-Methyl heptadecafluorooctanesulfonamide (NMeFOSA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24.0 U	24.0 U	**1.80 J**	2.30 U	24.0 U	24.0 U	24.0 U	2.50 U	2.60 U	2.50 U	2.30 U	2.30 U
N-Methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	100 U	100 U	9.80 U	9.50 U	100 U	100 U	100 U	11.0 U	11.0 U	11.0 U	9.50 U	9.50 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20.0 U	20.0 U	2.00 U	1.90 U	20.0 U	20.0 U	20.0 U	2.10 U	2.10 U	2.10 U	1.90 U	1.90 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	18.0 U	18.0 U	1.80 U	1.70 U	18.0 U	18.0 U	18.0 U	1.90 U	1.90 U	1.90 U	1.70 U	1.70 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	20.0 U	20.0 U	2.00 U	1.90 U	20.0 U	20.0 U	20.0 U	2.10 U	2.10 U	2.10 U	1.90 U	1.90 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	20.0 U	20.0 U	2.00 U	1.90 U	20.0 U	20.0 U	20.0 U	2.10 U	2.10 U	2.10 U	1.90 U	1.90 U
Perfluorobutanesulfonic acid (PFBS)	**76.0 J**	**96.0**	**66.0**	**48**	**95.0**	**130**	**130**	**84**	**80.0**	**74.0**	**89.0**	**78**
Perfluorobutanoic acid (PFBA)	**200**	**170**	**160**	**160**	**210**	**210**	**240**	**190**	**140**	**140**	**150**	**120**
Perfluorodecanesulfonic acid (PFDS)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
Perfluorodecanoic acid (PFDA)	10.0 U	10.0 U	**3.30**	**1.20 J**	10.0 U	10.0 U	10.0 U	**1.10 J**	1.10 U	1.10 U	0.950 U	0.950 U
Perfluorododecanesulfonic acid (PFDoS)	19.0 U	19.0 U	1.90 U	1.80 U	19.0 U	19.0 U	19.0 U	2.00 U	2.00 U	2.00 U	1.80 U	1.80 U
Perfluorododecanoic acid (PFDoA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
Perfluoroheptanesulfonic acid (PFHpS)	**610**	**210 J**	**140**	**470 J**	**120**	**180**	**220**	**240**	**57.0**	**71.0**	**58.0**	**50**
Perfluoroheptanoic acid (PFHpA)	**730**	**690**	**600**	**540**	**780**	**750**	**900**	**860**	**400**	**460**	**420**	**410**
Perfluorohexanesulfonic acid (PFHxS)	**9,600**	**5,500**	**4,800**	**7,900**	**3,500**	**4,600**	**5,400**	**4,200**	**2,100**	**2,400**	**2,200**	**2,100**
Perfluorohexanoic acid (PFHxA)	**1,700**	**1,500**	**1,300**	**1,000**	**1,300**	**1,600**	**1,500**	**1,400**	**1,100**	**1,100**	**1,100**	**1,100**
Perfluorononanesulfonic acid (PFNS)	10.0 U	10.0 U	**0.440 J**	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
Perfluorononanoic acid (PFNA)	**28.0**	**36.0**	**29.0**	**50.0 J**	**36.0**	**52.0**	**66.0**	**66**	**8.60**	**11.0**	**8.50**	**9.1**
Perfluorooctanesulfonamide (PFOSA)	**290**	**330**	**340**	**180**	**66.0**	**72.0**	**80.0**	**64**	**17.0**	**17.0**	**12.0**	**15**
Perfluorooctanesulfonic acid (PFOS)	**15,000**	**5,900**	**5,500**	**12,000**	**5,700**	**11,000**	**12,000**	**8,400**	**2,600**	**2,800**	**2,400**	**2,600**
Perfluorooctanoic acid (PFOA)	**8,500**	**2,800**	**2,400**	**5,800**	**930**	**1,200**	**1,300**	**1,400**	**490**	**550**	**450**	**440**
Perfluoropentanesulfonic acid (PFPeS)	**180**	**200**	**150**	**220**	**170**	**250**	**210**	**270**	**130**	**160**	**140**	**170**
Perfluoropentanoic acid (PFPeA)	**840**	**530 J**	**530**	**600**	**590**	**650**	**770**	**600**	**350**	**420**	**430**	**360**
Perfluorotetradecanoic acid (PFTeDA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
Perfluorotridecanoic acid (PFTrDA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U
Perfluoroundecanoic acid (PFUnA)	10.0 U	10.0 U	0.980 U	0.950 U	10.0 U	10.0 U	10.0 U	1.10 U	1.10 U	1.10 U	0.950 U	0.950 U

Note:
Detects are displayed in bold font.

Acronyms and Abbreviations:
bgs = below ground surface
ft = foot
ID = identification

Data Qualifier Definitions:
J = estimated value
U = undetected: The analyte was analyzed for, but not detected; Reporting Limit is presented in non bold font.

Units:
ng/L = nanogram per liter

Table 3
AOC 31 PFAS in Porewater
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Locations:	31LS-04	31LS-04	31LS-04	31LS-04	31LS-05	31LS-05	31LS-05	31LS-05	31LS-06	31LS-06	31LS-06	31LS-06
Field Sample ID:	31LS-04-NOV23	31LS-04-DEC23	31LS-04-FEB24	31LS-04-APR24	31LS-05-NOV23	31LS-05-DEC23	31LS-05-FEB24	31LS-05-APR24	31LS-06-NOV23	31LS-06-DEC23	31LS-06-FEB24	31LS-06-APR24
Lysimeter Collection Cup Depth Interval (ft bgs)	2-3	2-3	2-3	2-3	13-14	13-14	13-14	13-14	19-20	19-20	19-20	19-20
Sample Date:	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024
PFAS (ng/L)												
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	76.0 U	76.0 U	76.0 U	7.50 U	76.0 U	7.60 U	7.50 U	7.80 U	7.40 U	7.70 U	7.70 U	7.50 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	250 U	250 U	250 U	25.0 U	250 U	25.0 U	25.0 U	26.0 U	24.0 U	25.0 U	25.0 U	25.0 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	250 U	250 U	250 U	25.0 U	250 U	25.0 U	25.0 U	26.0 U	24.0 U	25.0 U	25.0 U	25.0 U
3-Perfluoropropyl propanoic acid (3:3FTCA)	50.0 U	50.0 U	50.0 U	4.90 U	50.0 U	5.00 U	4.90 U	5.10 U	4.90 U	5.10 U	5.10 U	4.90 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	38.0 U	38.0 U	38.0 U	3.70 U	38.0 U	3.80 U	3.80 U	3.90 U	3.70 U	3.90 U	3.80 U	3.70 U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	**25.0 J**	38.0 U	38.0 U	**4.20 J**	38.0 U	3.80 U	3.80 U	3.90 U	3.70 U	3.90 U	3.80 U	37.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**390**	**900**	**330**	**380**	**270**	**210**	**190**	**200**	**130**	**93.0**	**130**	**110**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**4,700**	**3,200**	**4,000**	**2,200**	**1,300**	**1,100**	**1,100**	**950**	**89.0**	**50.0**	**47.0**	**40**
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	38.0 U	38.0 U	38.0 U	3.70 U	38.0 U	3.80 U	3.80 U	3.90 U	3.70 U	3.90 U	3.80 U	3.70 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	40.0 U	40.0 U	40.0 U	3.90 U	40.0 U	4.00 U	4.00 U	4.10 U	3.90 U	4.10 U	4.10 U	3.90 U
N-Ethyl perfluorooctanesulfonamide (NEtFOSA)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	1.00 U	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14.0 U	14.0 U	14.0 U	**0.780 J**	14.0 U	**1.10 J**	1.40 U	1.40 U	**0.830 J**	1.40 U	1.40 U	1.40 U
N-Ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	100 U	100 U	100 U	9.80 U	100 U	10.0 U	9.90 U	10.0 U	9.70 U	10.0 U	10.0 U	9.80 U
N-Methyl heptadecafluorooctanesulfonamide (NMeFOSA)	10.0 U	10.0 U	10.0 U	**0.850 J**	10.0 U	**0.820 J**	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24.0 U	24.0 U	24.0 U	**11**	24.0 U	**3.90 J**	**3.90 J**	**3.60 J**	2.30 U	2.40 U	2.40 U	2.40 U
N-Methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	100 U	100 U	100 U	9.80 U	100 U	10.0 U	9.90 U	10.0 U	9.70 U	10.0 U	10.0 U	9.80 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20.0 U	20.0 U	20.0 U	2.00 U	20.0 U	2.00 U	2.00 U	2.10 U	1.90 U	2.00 U	2.00 U	2.00 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	18.0 U	18.0 U	18.0 U	1.80 U	18.0 U	1.80 U	1.80 U	1.90 U	1.80 U	1.80 U	1.80 U	1.80 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	20.0 U	20.0 U	20.0 U	2.00 U	20.0 U	2.00 U	2.00 U	2.10 U	1.90 U	2.00 U	2.00 U	2.00 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	20.0 U	20.0 U	20.0 U	2.00 U	20.0 U	2.00 U	2.00 U	2.10 U	1.90 U	2.00 U	2.00 U	2.00 U
Perfluorobutanesulfonic acid (PFBS)	**67.0**	**49.0**	**18.0 J**	**12**	**51.0**	**49.0**	**30.0**	**18**	**140**	**190**	**72.0**	**51**
Perfluorobutanoic acid (PFBA)	**280**	**310**	**110**	**67**	**110**	**98.0**	**83.0**	**58**	**210**	**210**	**100**	**84**
Perfluorodecanesulfonic acid (PFDS)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	1.00 U	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
Perfluorodecanoic acid (PFDA)	**26.0**	**21.0**	**24.0**	**27**	**5.30 J**	**4.70**	**3.80**	**3.8**	**0.720 J**	1.00 U	1.00 U	0.980 U
Perfluorododecanesulfonic acid (PFDoS)	19.0 U	19.0 U	19.0 U	1.90 U	19.0 U	1.90 U	1.90 U	2.00 U	1.90 U	1.90 U	1.90 U	1.90 U
Perfluorododecanoic acid (PFDoA)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	1.00 U	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
Perfluoroheptanesulfonic acid (PFHpS)	**13.0 J**	**12.0 J**	**8.20 J**	**11**	**40.0**	**56.0**	**47.0**	**54**	**28.0**	**21.0**	**21.0**	**30**
Perfluoroheptanoic acid (PFHpA)	**720**	**1,200**	**500**	**380**	**470**	**430**	**360**	**310**	**460**	**520**	**510**	**460**
Perfluorohexanesulfonic acid (PFHxS)	**980**	**2,300**	**670**	**510**	**2,400**	**3,000**	**2,000**	**1,700**	**3,900**	**4,800**	**4,200**	**3,500**
Perfluorohexanoic acid (PFHxA)	**1,400**	**1,500**	**530**	**350**	**630**	**560**	**470**	**340**	**1,400**	**1,500**	**840**	**650**
Perfluorononanesulfonic acid (PFNS)	10.0 U	10.0 U	10.0 U	**2.4**	10.0 U	**1.30 J**	**1.10 J**	**1.10 J**	0.970 U	1.00 U	1.00 U	0.980 U
Perfluorononanoic acid (PFNA)	**67.0**	**73.0**	**41.0**	**52**	**29.0**	**34.0**	**30.0**	**30**	**13.0**	**9.30**	**16.0**	**16**
Perfluorooctanesulfonamide (PFOSA)	**3,300**	**1,900**	**1,900**	**2,100**	**800**	**640**	**550**	**480**	**53.0**	**30.0**	**22.0**	**24**
Perfluorooctanesulfonic acid (PFOS)	**5,800**	**2,800**	**2,700**	**2,600**	**6,200**	**7,900**	**8,200**	**6,200**	**2,400**	**1,200**	**1,600**	**1,700**
Perfluorooctanoic acid (PFOA)	**670**	**1,800**	**720**	**820**	**860**	**1,000**	**780**	**810**	**500**	**620**	**590**	**610**
Perfluoropentanesulfonic acid (PFPeS)	**91.0**	**120**	**37.0**	**27**	**62.0**	**67.0**	**51.0**	**61**	**220**	**360**	**170**	**170**
Perfluoropentanoic acid (PFPeA)	**970**	**1,000**	**410**	**250**	**340**	**240**	**250**	**170**	**500**	**460**	**280**	**260**
Perfluorotetradecanoic acid (PFTeDA)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	1.00 U	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
Perfluorotridecanoic acid (PFTrDA)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	1.00 U	0.990 U	1.00 U	0.970 U	1.00 U	1.00 U	0.980 U
Perfluoroundecanoic acid (PFUnA)	10.0 U	10.0 U	10.0 U	0.980 U	10.0 U	**0.680 J**	0.990 U	**0.510 J**	0.970 U	1.00 U	1.00 U	0.980 U

Note:
Detects are displayed in bold font.

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ID = identification

Data Qualifier Definitions:
J = estimated value
U = undetected: The analyte was analyzed for, but not detected; Reporting Limit is p

Units:
ng/L = nanogram per liter

Table 3
AOC 31 PFAS in Porewater
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Locations:	31LS-07	31LS-07	31LS-07	31LS-07	31LS-08	31LS-08	31LS-08	31LS-08	31LS-08 (FD)	31LS-08 (FD)	31LS-08 (FD)	31LS-08 (FD)
Field Sample ID:	31LS-07-NOV23	31LS-07-DEC23	31LS-07-FEB24	31LS-07-APR24	31LS-08-NOV23	31LS-08-DEC23	31LS-08-FEB24	31LS-08-APR24	31LS-DUP-01-NOV23	31LS-08-DEC23	31LS-DUP-01-FEB24	31LS-DUP-01-APR24
Lysimeter Collection Cup Depth Interval (ft bgs)	50-51	50-51	50-51	50-51	11-12	11-12	11-12	11-12	11-12	11-12	11-12	11-12
Sample Date:	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024	11/03/2023	12/20/2023	02/08/2024	04/03/2024
PFAS (ng/L)												
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	76.0 U	76.0 U	7.40 U	7.60 U	8.10 U	7.50 U	7.30 U	11.0 U	9.10 U	7.30 U	6.70 U	8.70 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	250 U	250 U	**11.0 J**	**13.0 J**	26.0 U	24.0 U	24.0 U	36.0 U	30.0 U	25.0 U	22.0 U	29.0 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	250 U	250 U	24.0 U	25.0 U	26.0 U	24.0 U	24.0 U	36.0 U	30.0 U	-	22.0 U	29.0 U
3-Perfluoropropyl propanoic acid (3:3FTCA)	50.0 U	50.0 U	**3.80 J**	**5.50 J**	5.30 U	4.80 U	4.80 U	7.20 U	6.00 U	4.90 U	4.40 U	5.80 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	38.0 U	38.0 U	3.70 U	3.80 U	4.00 U	3.70 U	3.60 U	5.50 U	4.50 U	-	3.30 U	4.40 U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38.0 U	38.0 U	3.70 U	3.80 U	4.00 U	3.60 U	3.60 U	5.50 U	4.50 U	3.70 U	3.30 U	4.40 U
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**570**	**510**	**470**	**490**	**130**	**100**	**70.0**	**49**	**140**	**130**	**68.0**	**50**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**41.0 J**	**68.0 J**	**85.0**	**110**	**260**	**310**	**220**	**180**	**240**	-	**260**	**170**
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	38.0 U	38.0 U	3.70 U	3.80 U	4.00 U	-	3.60 U	5.50 U	4.50 U	3.70 U	3.30 U	4.40 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	40.0 U	40.0 U	3.90 U	4.00 U	4.20 U	3.90 U	3.80 U	5.70 U	4.80 U	-	3.50 U	4.60 U
N-Ethyl perfluorooctanesulfonamide (NEtFOSA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.980 U	0.960 U	1.40 U	1.20 U	0.960 U	0.880 U	1.20 U
N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14.0 U	14.0 U	1.40 U	1.40 U	**1.30 J**	1.30 U	1.30 U	2.00 U	1.70 U	1.40 U	1.20 U	1.60 U
N-Ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	100 U	100 U	9.70 U	10.0 U	11.0 U	9.60 U	9.60 U	14.0 U	12.0 U	9.80 U	8.80 U	12.0 U
N-Methyl heptadecafluorooctanesulfonamide (NMeFOSA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.960 U	0.960 U	1.40 U	1.20 U	0.980 U	0.880 U	1.20 U
N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24.0 U	24.0 U	2.30 U	2.40 U	2.50 U	-	**2.30 J**	**2.30 J**	2.90 U	**1.40 J**	**2.80 J**	**2.10 J**
N-Methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	100 U	100 U	9.70 U	10.0 U	11.0 U	9.80 U	9.60 U	14.0 U	12.0 U	9.60 U	8.80 U	12.0 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20.0 U	20.0 U	1.90 U	2.00 U	2.10 U	-	1.90 U	2.90 U	2.40 U	2.00 U	1.80 U	2.30 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	18.0 U	18.0 U	1.70 U	1.80 U	1.90 U	1.80 U	1.70 U	2.60 U	2.10 U	1.70 U	1.60 U	2.10 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	20.0 U	20.0 U	1.90 U	2.00 U	2.10 U	2.00 U	1.90 U	2.90 U	2.40 U	1.90 U	1.80 U	2.30 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	20.0 U	20.0 U	1.90 U	2.00 U	2.10 U	2.00 U	1.90 U	2.90 U	2.40 U	1.90 U	1.80 U	2.30 U
Perfluorobutanesulfonic acid (PFBS)	**69.0**	**72.0**	**69.0**	**79**	**32.0**	**24.0**	**11.0**	**7.4**	**31.0**	**29.0**	**10.0**	**6.8**
Perfluorobutanoic acid (PFBA)	**220**	**210**	**240**	**260**	**46.0**	**25.0**	**30.0**	**33**	**42.0**	**29.0**	**29.0**	**35**
Perfluorodecanesulfonic acid (PFDS)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.960 U	0.960 U	1.40 U	1.20 U	0.980 U	0.880 U	1.20 U
Perfluorodecanoic acid (PFDA)	10.0 U	10.0 U	0.970 U	1.00 U	**3.50**	**3.40**	**3.60**	**3.4**	**2.20 J**	-	**3.30**	**3.7**
Perfluorododecanesulfonic acid (PFDoS)	19.0 U	19.0 U	1.80 U	1.90 U	2.00 U	-	1.80 U	2.70 U	2.30 U	1.90 U	1.70 U	2.20 U
Perfluorododecanoic acid (PFDoA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.980 U	0.960 U	1.40 U	1.20 U	0.960 U	0.880 U	1.20 U
Perfluoroheptanesulfonic acid (PFHpS)	**16.0 J**	**27.0**	**39.0**	**52**	**10.0**	-	**14.0**	**17**	**13.0**	**21.0**	**14.0**	**16**
Perfluoroheptanoic acid (PFHpA)	**640**	**680**	**670**	**830**	**240**	-	**170**	**130**	**250**	**190**	**170**	**130**
Perfluorohexanesulfonic acid (PFHxS)	**2,600**	**4,000**	**3,400**	**3,400**	**2,200**	-	**1,100**	**760**	**2,200**	**1,400**	**1,200**	**970**
Perfluorohexanoic acid (PFHxA)	**3,800**	**3,200**	**2,800**	**3,000**	**290**	-	**170**	**140**	**260**	**190**	**180**	**140**
Perfluorononanesulfonic acid (PFNS)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.960 U	0.960 U	1.40 U	1.20 U	0.980 U	0.880 U	1.20 U
Perfluorononanoic acid (PFNA)	**5.00 J**	**7.50 J**	**7.20**	**9.7**	**9.80**	-	**17.0**	**17**	**8.60**	**12.0**	**15.0**	**17**
Perfluorooctanesulfonamide (PFOSA)	**61.0**	**65.0**	**75.0**	**86**	**490**	**560**	**480**	**520**	**510**	**420**	**570**	**550**
Perfluorooctanesulfonic acid (PFOS)	**400**	**820**	**1,100**	**1,200**	**1,200**	-	**810**	**820**	**880**	**980**	**770**	**770**
Perfluorooctanoic acid (PFOA)	**830**	**820**	**840**	**980**	**770**	**680**	**470**	**370**	**810**	-	**430**	**360**
Perfluoropentanesulfonic acid (PFPeS)	**190**	**220**	**250**	**350**	**66.0**	**45.0**	**29.0**	**20**	**61.0**	-	**30.0**	**19**
Perfluoropentanoic acid (PFPeA)	**750**	**600**	**670**	**850**	**130**	**65.0**	**92.0**	**79**	**120**	-	**90.0**	**79**
Perfluorotetradecanoic acid (PFTeDA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.980 U	0.960 U	1.40 U	1.20 U	0.960 U	0.880 U	1.20 U
Perfluorotridecanoic acid (PFTrDA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.960 U	0.960 U	1.40 U	1.20 U	0.980 U	0.880 U	1.20 U
Perfluoroundecanoic acid (PFUnA)	10.0 U	10.0 U	0.970 U	1.00 U	1.10 U	0.960 U	0.960 U	1.40 U	1.20 U	-	0.880 U	1.20 U

Note:
Detects are displayed in bold font.

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bgs = below ground surface
ft = foot
ID = identification

Data Qualifier Definitions:
J = estimated value
U = undetected: The analyte was analyzed for, but not detected; Reporting Limit is p

Units:
ng/L = nanogram per liter

Table 4
AOC 31 ISS Pilot Test – Performance Monitoring: Soil Sampling & Analysis Details
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Sample Event	Location	Soil Analysis[a]																								Leachate[b,c] Analysis					
		Soil PFAS (Method 1633)			Soil TOC (Method Lloyd Kahn)			Soil Inorganics[d] (Method 6020)			Soil LEAF (Method 1314)			Soil LEAF (Method 1315)			Soil Unconfined Strength (Method D1633)			Soil Hydraulic Conductivity (Method D5084)			Soil REMOLDED Hydraulic Conductivity (Method D5084)			Leachate PFAS (Method 1633)			Leachate DOC (Method SM5310C)		
		Primary	EB[e]	FB[e]	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary	EB	FB	Primary[f]	EB	FB
Baseline (After Initial Homogenization, but Prior to Treatment Mixing)	Treatment Cell 1, Upper Portion (0-10 ft bgs)	1	0	0	1	0	0	5	N/A	N/A	1	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 1, Lower Portion (10-20 ft bgs)	1	0	0	1	0	0	5	N/A	N/A	1	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 2, Upper Portion (0-10 ft bgs)	1	0	0	1	0	0	5	N/A	N/A	1	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 2, Lower Portion (10-20 ft bgs)	1	1	1	1	0	0	0	N/A	N/A	1	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	9	N/A	N/A	9	N/A	N/A
Post Treatment Mixing	Treatment Cell 1, Upper Portion (0-10 ft bgs)	--	--	--	--	--	--	5	N/A	N/A	--	--	--	1	N/A	N/A	6	N/A	N/A	1	N/A	N/A	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 1, Lower Portion (10-20 ft bgs)	--	--	--	--	--	--	5	N/A	N/A	--	--	--	1	N/A	N/A	6	N/A	N/A	1	N/A	N/A	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 2, Upper Portion (0-10 ft bgs)	--	--	--	--	--	--	5	N/A	N/A	--	--	--	1	N/A	N/A	6	N/A	N/A	1	N/A	N/A	--	--	--	9	N/A	N/A	9	N/A	N/A
	Treatment Cell 2, Lower Portion (10-20 ft bgs)	--	--	--	--	--	--	0	--	--	1	N/A	N/A	--	--	--	--	--	--	--	--	--	1	N/A	N/A	9	N/A	N/A	9	N/A	N/A
	Sum Per Column:	4	1	1	4	0	0	30	0	0	5	0	0	3	0	0	18	0	0	3	0	0	1	0	0	72	0	0	72	0	0
		Total Samples:		**6**	**Total Samples:**		**4**	**Total Samples:**		**30**	**Total Samples:**		**5**	**Total Samples:**		**3**	**Total Samples:**		**18**	**Total Samples:**		**3**	**Total Samples:**		**1**	**Total Samples:**		**72**	**Total Samples:**		**72**

Notes:
a. Soil samples will be composited in the field; thus, duplicates and MS/MSDs are not applicable.
b. Leachate is derived from either LEAF 1314 or 1315 in laboratory
c. Nine leachate samples are generated from each LEAF 1314 or 1315 parent sample in laboratory
d. Inorganic analytes are aluminum (Al), calcium (Ca), magnesium (Mg), iron (Fe), and sulfur (S).
e. Soil PFAS equipment and field blanks to be collected at a minimum frequency of one per sampling event
f. DOC analysis may not be performed if the TOC concentration in the corresponding baseline composite soil sample is less than 10,000 milligrams per kilogram.
"--" indicates analytical method is not required for sampling event at location
Samples collected to be stored in the Arcadis Treatability Laboratory for potential future performance testing are not presented in this Table because the analytical program for these samples has not yet been finalized.

Acronyms and Abbreviations:
bgs = below ground surface
DOC = dissolved organic carbon
EB = equipment blank
FB = field blank
ft = foot
ISS = in situ soil stabilization/solidification
MS = matrix spike
MSD = matrix spike duplicate
N/A = not applicable
PFAS = per- and polyfluoroalkyl substances
TOC = total organic carbon

Table 5
AOC 31 ISS Pilot Test – Performance Monitoring: Water Sampling & Analysis Details
Pilot Test Work Plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils
Area of Concern 31 – Former Fort Devens Army Installation
Devens, Massachusetts

Sampling Event	PFAS (Method 1633)					
	ISS Source Water Analysis					
	Primary[a,b]	Duplicate[c]	MS[d]	MSD[d]	EB[e]	FB[f]
Pre ISS Implementation	3	1	N/A	N/A	N/A	1
Total ISS Source Water PFAS (Method 1633) Samples:					5	
	Porewater & Groundwater Analysis					
Year 1, Half 1	8	2	1	1	2	1
Year 1, Half 2	8	2	1	1	2	1
Year 2, Half 1	8	2	1	1	2	1
Year 2, Half 2	8	2	1	1	2	1
Sum Per Porewater and Groundwater Column	32	8	4	4	8	4
Total Porewater and Groundwater PFAS (Method 1633) Samples:					**60**	
Total Water PFAS (Method 1633) Samples:					**65**	

Notes:

a. PFAS primary porewater and groundwater samples include four lysimeter porewater samples and four well groundwater samples per sampling event

b. Number of PFAS primary parent samples is set and thus is not subject to change

c. PFAS duplicates to be collected at a minimum frequency of one per sampling event per water type (porewater vs groundwater)

d. PFAS MS/MSDs to be collected at a minimum frequency of one per sampling event

e. PFAS equipment blanks to be collected at a minimum frequency of one per sampling event per water type (porewater vs groundwater); not applicable for source water sampling

f. PFAS field blanks to be collected at a minimum frequency of one per sampling event

Acronyms and Abbreviations:

EB = equipment blank

FB = field blank

ISS = in situ soil stabilization/solidification

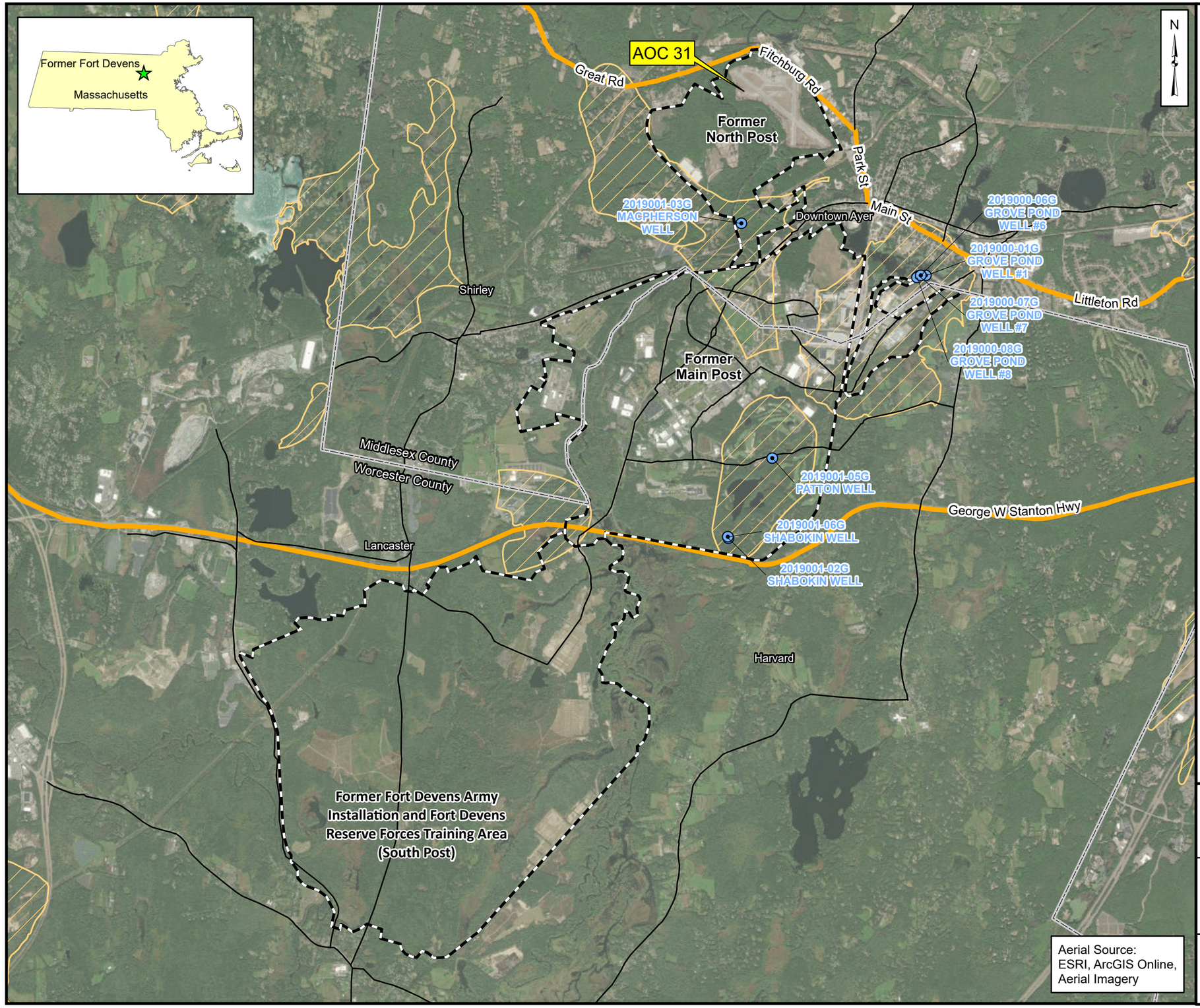
MS = matrix spike

MSD = matrix spike duplicate

N/A = not applicable

PFAS = per- and polyfluoroalkyl substances

Figures



LEGEND

- FORMER FORT DEVENS BOUNDARY
- WATER SUPPLY WELL
- COUNTY LINE
- HIGHWAY
- MAJOR ROAD
- MASSDEP ZONE II WELLHEAD PROTECTION AREA

ACRONYMS:
AOC = AREA OF CONTAMINATION
MASSDEP = MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

0 1 2
Miles

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS army INSTALLATION
DEVENS, MASSACHUSETTS

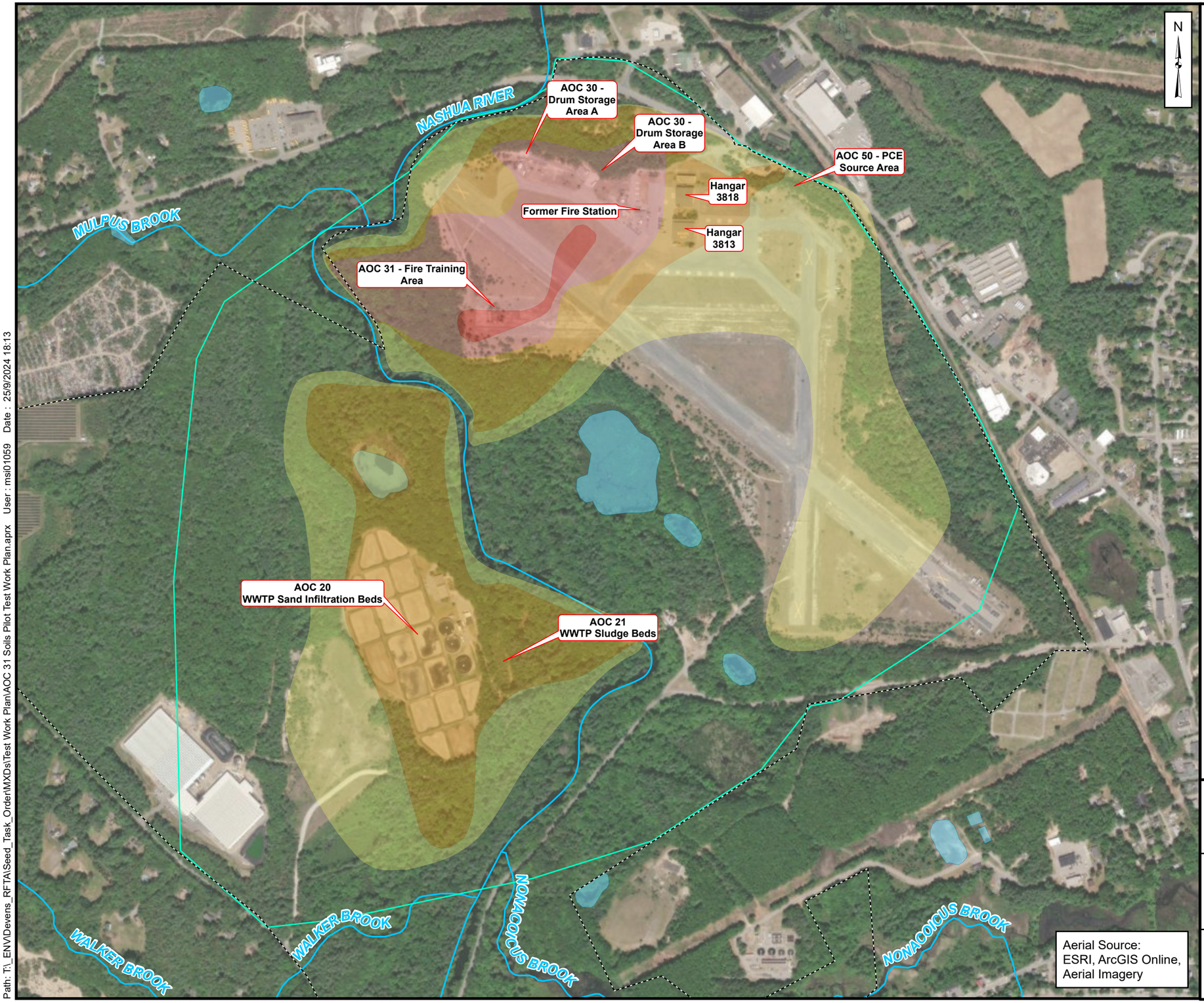
SITE LOCATION

SERES Engineering & Services, LLC
ARCADIS a joint venture

Figure 1

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File: Figure 1 Site Location



N

LEGEND

- FORMER FORT DEVENS BOUNDARY
- PFAS AREA 3
- APPROXIMATE EXTENT OF THE AREA WHERE THE SUM OF PFAS6 CONCENTRATIONS EXCEEDS THE SSSL IN GROUNDWATER
- APPROXIMATE EXTENT OF THE AREA >10X PFAS6 SSSL
- APPROXIMATE EXTENT OF THE AREA >100X PFAS6 SSSL
- APPROXIMATE EXTENT OF THE AREA >1000X PFAS6 SSSL
- STREAM
- WATERBODY

NOTES:
SSSL = SITE-SPECIFIC SCREENING LEVEL
WWTP = WASTEWATER TREATMENT PLANT
AOC = AREA OF CONTAMINATION
PCE = TETRACHLOROETHYLENE
PFAS = PER- AND POLYFLUOROALKYL SUBSTANCES
PFAS6 = PFOS, PFOA, PFHxS, PFNA, PFHpA, AND PFDA
PFOS = PERFLUOROOCTANE SULFONIC ACID
PFOA = PERFLUOROOCTANOIC ACID
PFHxS = PERFLUOROHEXANESULFONIC ACID
PFNA = PERFLUORONONAOIC ACID
PFHpA = PERFLUOROHEPTANOIC ACID
PFDA = PERFLUORODECANOIC ACID
X = TIMES

0 500 1,000
Feet

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

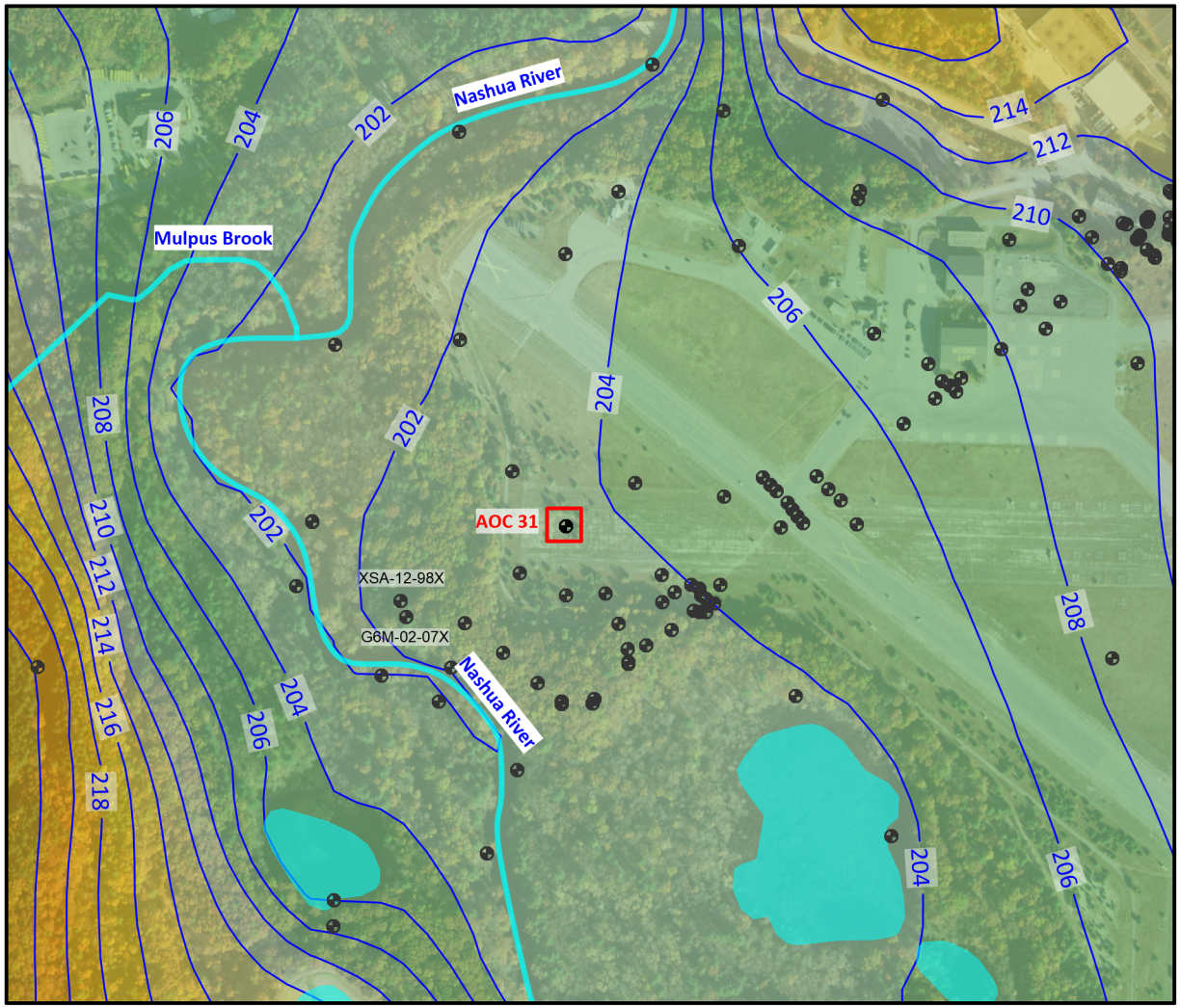
AREA 3 PFAS IN GROUNDWATER: ORDER OF MAGNITUDE CONTOURS

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ARCADIS a joint venture

Figure 2

Path: T:_ENV\Devens_RFTA\Seed_Task_Order\MXDs\Test Work Plan\AOC 31 Soils Pilot Test Work Plan.aprx User : msi01059 Date : 25/9/2024 18:13

File: Figure 2 AREA 3 PFAS IN GROUNDWATER ORDER OF MAGNITUDE CONTOURS



N

Water Level Elevation
(ft AMSL)

258
254
250
246
242
238
234
230
226
222
218
214
210
206
202
198

SCALE:FEET

0 650 1300

LEGEND:

SIMULATED GROUNDWATER ELEVATION CONTOUR (feet above mean sea level [ft AMSL])

AREA OF CONCERN (AOC)

AREA 3 MONITORING WELL

NOTES:

1. Two wells which are potentially downgradient of AOC 31, XSA-12-98X and G6M-02-07X, had PFAS6 detections ranging from 110-224 ng/L. XSA-12-98X was sampled four times and G6M-02-07X was sampled twice. Due to the detected low concentrations with respect to the AOC 31 concentrations, these two potentially downgradient wells are assumed to not be intersecting a significant amount of PFAS mass emanating from AOC 31. No other wells potentially downgradient of AOC 31have been sampled for PFAS.
2. PFAS = Per- and Polyfluoroalkyl Substances
3. PFAS6 = PFDA, PFHpA, PFHxS, PFNA, PFOA, PFOS
   PFOS = PERFLUOROOCTANE SULFONIC ACID
   PFOA = PERFLUOROOCTANOIC ACID
   PFHxS = PERFLUOROHEXANESULFONIC ACID
   PFNA = PERFLUORONONAOIC ACID
   PFHpA = PERFLUOROHEPTANOIC ACID
   PFDA = PERFLUORODECANOIC ACID

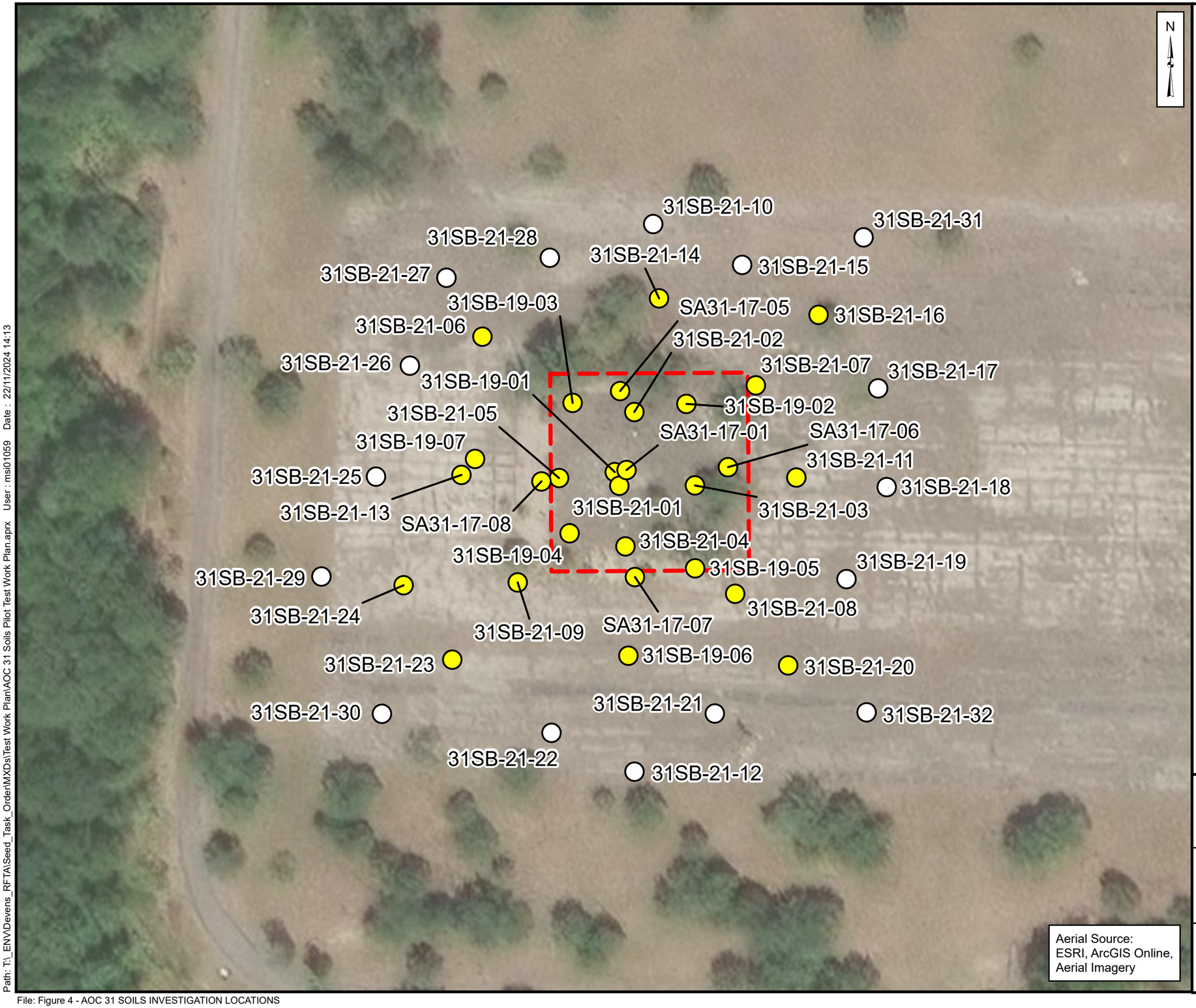
PROJECT NAME:

AOC 31 Soils Pilot Test Work Plan
Former Fort Devens Army Installation
Devens, Massachusetts

Simulated Overburden Water Level Elevation Contours

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a joint venture

FIGURE
3



LEGEND

AOC 31 FORMER FIRE TRAINING AREA

COMPLETED SOIL BORING BELOW 2022 PFOS SSSL* (13 µg/kg)

COMPLETED SOIL BORING ABOVE 2022 PFOS SSSL* (13 µg/kg)

*PFAS CONCENTRATIONS WILL BE COMPARED TO DoD ACCEPTED RISK SCREENING LEVELS AT THE TIME OF THE RISK EVALUATION

NOTE:
1. BORINGS WERE CONDUCTED DURING THE FOLLOWING EVENTS:
 2017 SITE INVESTIGATION (EXAMPLE: SA31-17-05)
 2019 PHASE I REMEDIAL INVESTIGATION (EXAMPLE: 31SB-19-02)
 2022 SUPPLEMENTAL SAMPLING (EXAMPLE: 31SB-21-11; NOTE: SOIL BORINGS WERE IDENTIFIED WITH 21 DESPITE BEING CONDUCTED IN 2022)

ACRONYMS:
1. AOC = AREA OF CONTAMINATION
2. DoD = UNITED STATES DEPARTMENT OF DEFENSE
3. PFAS = PER- AND POLYFLUOROALKYL SUBSTANCES
4. PFOS = PERFLUOROOCTANE SULFONIC ACID
5. SSSL = SITE-SPECIFIC SCREENING LEVEL (CHILD RESIDENT DERMAL PLUS INGESTION SOIL EXPOSURE VALUE)

0 50 100
Feet

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

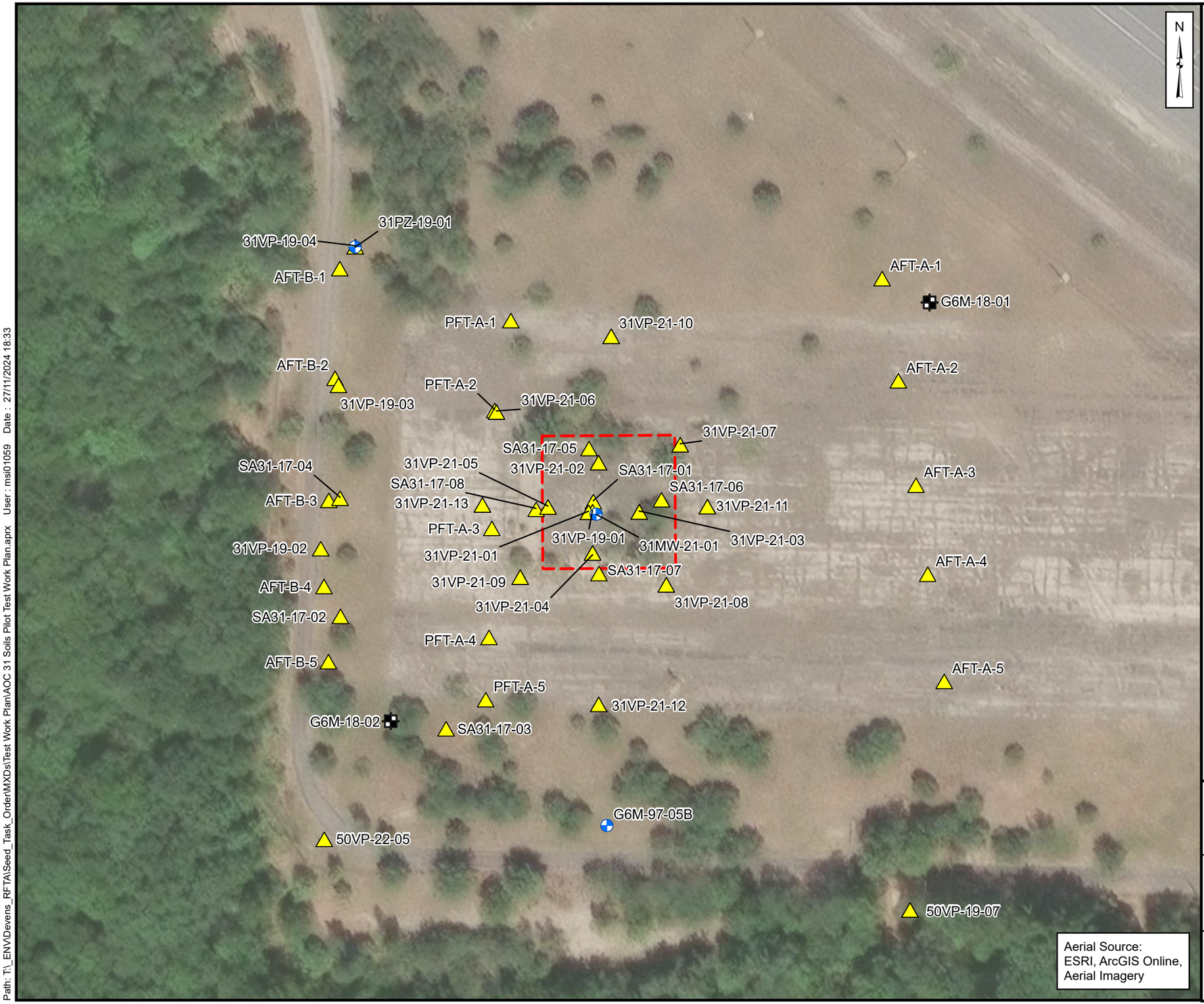
AOC 31 SOILS INVESTIGATION LOCATIONS

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Figure 4

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File: Figure 4 - AOC 31 SOILS INVESTIGATION LOCATIONS



LEGEND

- AOC 31 FORMER FIRE TRAINING AREA
- MONITORING WELL
- VERTICAL AQUIFER PROFILE/GRAB GROUNDWATER SAMPLE
- VERTICAL AQUIFER PROFILE/GRAB GROUNDWATER SAMPLE AND MONITORING WELL

NOTE:
1. BORINGS WERE CONDUCTED DURING THE FOLLOWING EVENTS:
2017 SITE INVESTIGATION (EXAMPLE: SA31-17-05)
2019 PHASE I REMEDIAL INVESTIGATION (EXAMPLE: 31SB-19-02)
2022 SUPPLEMENTAL SAMPLING (EXAMPLES: 31SB-21-11, AFTs, AND PFTs; NOTE: SOIL BORINGS WERE IDENTIFIED WITH 21 DESPITE BEING CONDUCTED IN 2022)

ACRONYM:
1. AOC = AREA OF CONTAMINATION

0 75 150
Feet

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

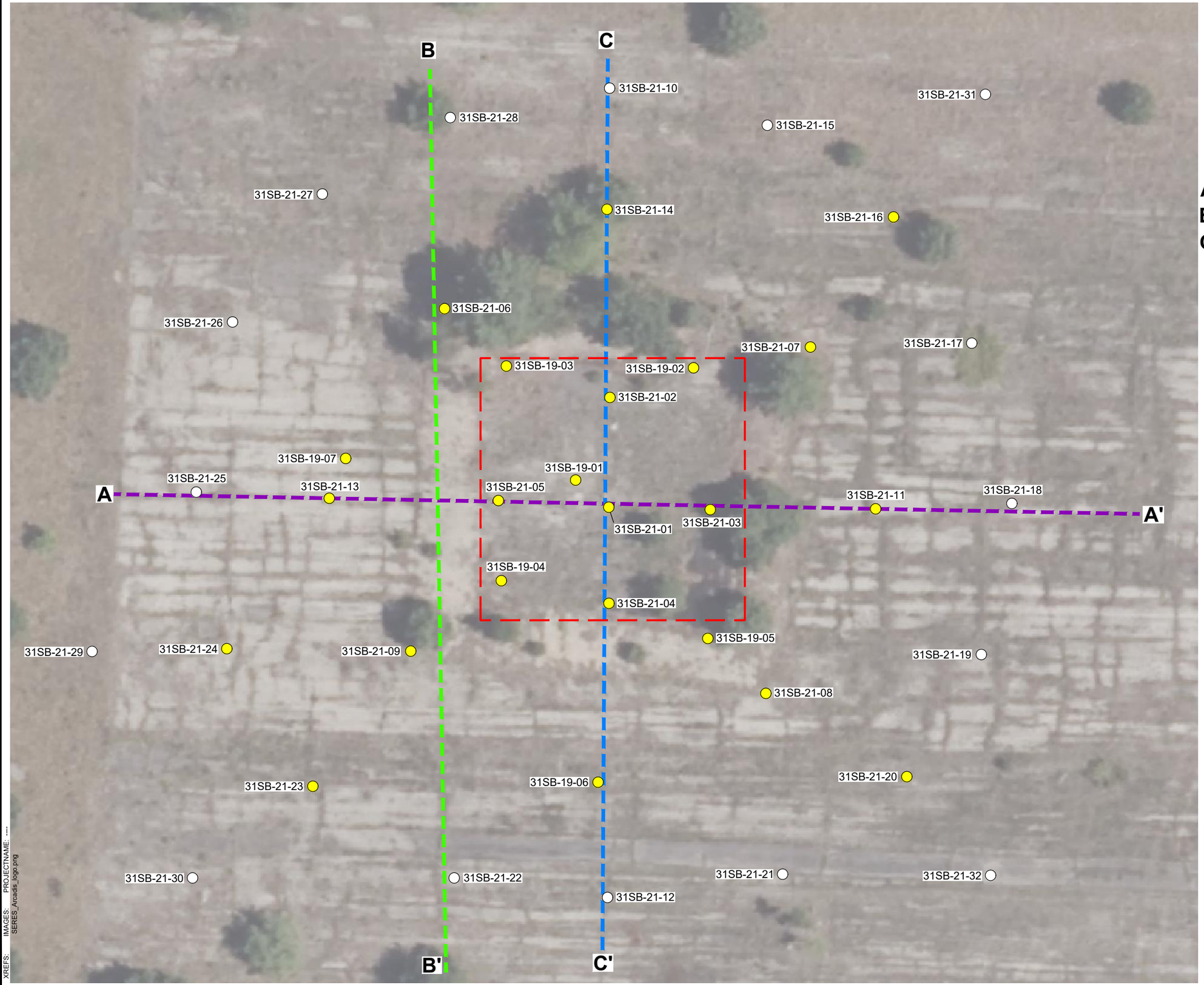
AOC 31 GROUNDWATER INVESTIGATION LOCATIONS

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Figure 5

Path: T:_ENV\Devens_RFTA\Seed_Task_Order\MXDs\Test Work Plan\AOC 31 Soils Pilot Test Work Plan.aprx User : msi01059 Date : 27/11/2024 18:33

File: Figure 5 - AOC 31 GROUNDWATER INVESTIGATION LOCATIONS



LEGEND

- COMPLETED SOIL BORING WITH NO PFOS DETECTION EQUAL TO OR GREATER THAN 13µg/kg
- COMPLETED SOIL BORING WITH AT LEAST ONE PFOS DETECTION EQUAL TO OR GREATER THAN 13µg/kg.

A – – – A' TRANSECT LINE

B – – – B' TRANSECT LINE

C – – – C' TRANSECT LINE

FORMER FIRE TRAINING AREA

NOTES:

1. 13µg/kg IS THE RESIDENTIAL SCENARIO SCREENING LEVEL FOR PFOS IN SOILS WITH A TARGET HAZARD QUOTIENT OF 0.1 (BASED ON THE EPA RSL TABLES DATED MAY 2023)
2. EPA = ENVIRONMENTAL PROTECTION AGENCY
3. PFOS = PERFLUOROOCTANE SULFONATE
4. RSL = RISK SCREENING LEVELS
5. µg/kg = MICROGRAMS PER KILOGRAM

0 30' 60'

Approximate Scale: 1 in. = 30 ft.

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

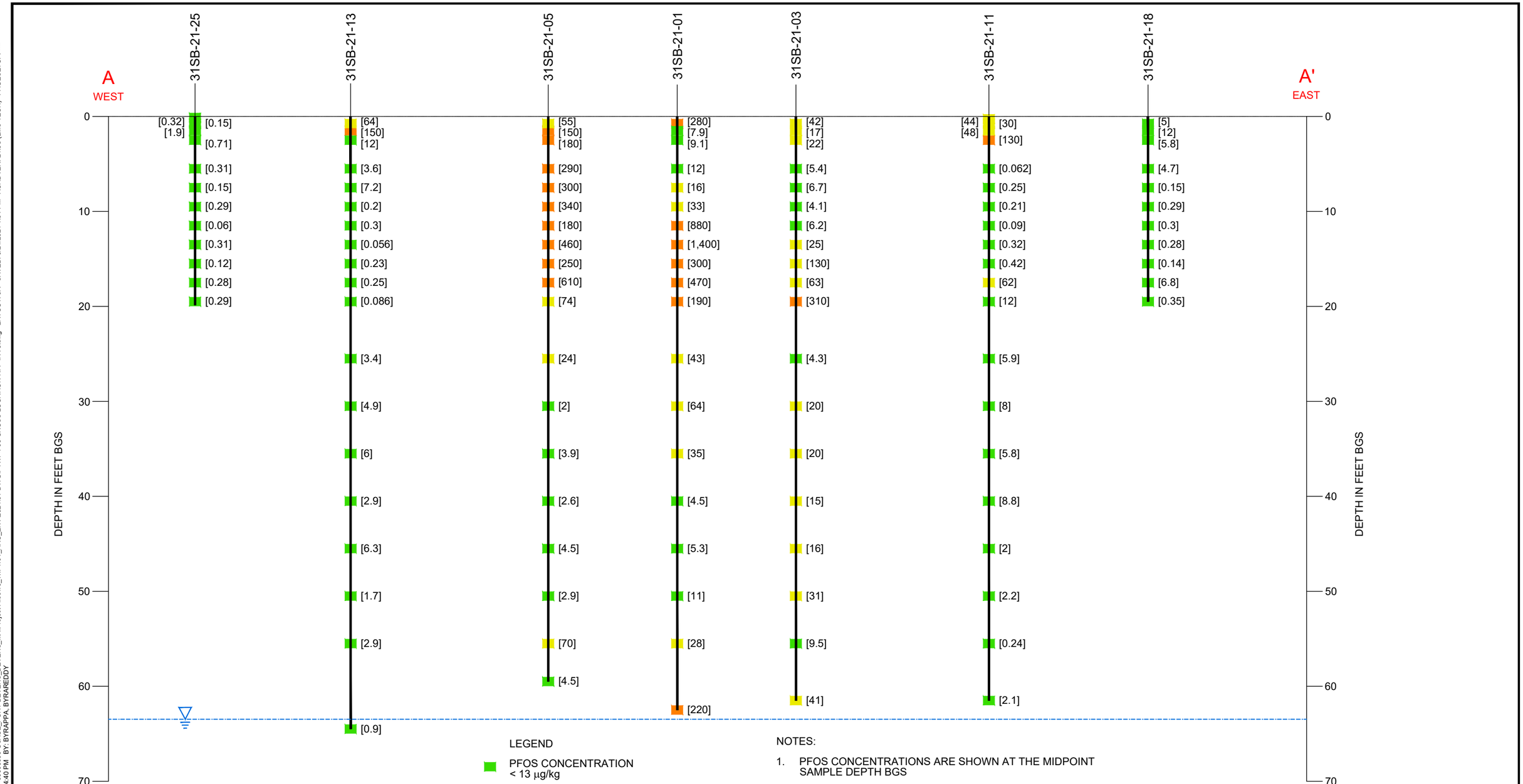
AOC 31 CROSS SECTIONS MAP: PFOS IN SOILS

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FIGURE
6

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KEY PLAN
SHOWING CROSS SECTION A-A'

LEGEND

- PFOS CONCENTRATION < 13 µg/kg
- PFOS CONCENTRATION 13 - 130 µg/kg
- PFOS CONCENTRATION > 130 µg/kg
- WATER TABLE
- [0.32] PFOS CONCENTRATION AT SAMPLE DEPTH IN µg/kg

NOTES:

1. PFOS CONCENTRATIONS ARE SHOWN AT THE MIDPOINT SAMPLE DEPTH BGS
2. WATER TABLE ONSITE IS APPROXIMATELY 64 FEET BGS BASED ON SPRING 2022 WATER LEVELS
3. µg/kg = MICROGRAMS PER KILOGRAM
4. BGS = BELOW GROUND SURFACE
5. PFOS = PERFLUOROOCTANE SULFONATE
6. > = GREATER THAN
7. < = LESSER THAN

0 25' 50'
HORIZONTAL GRAPHIC SCALE

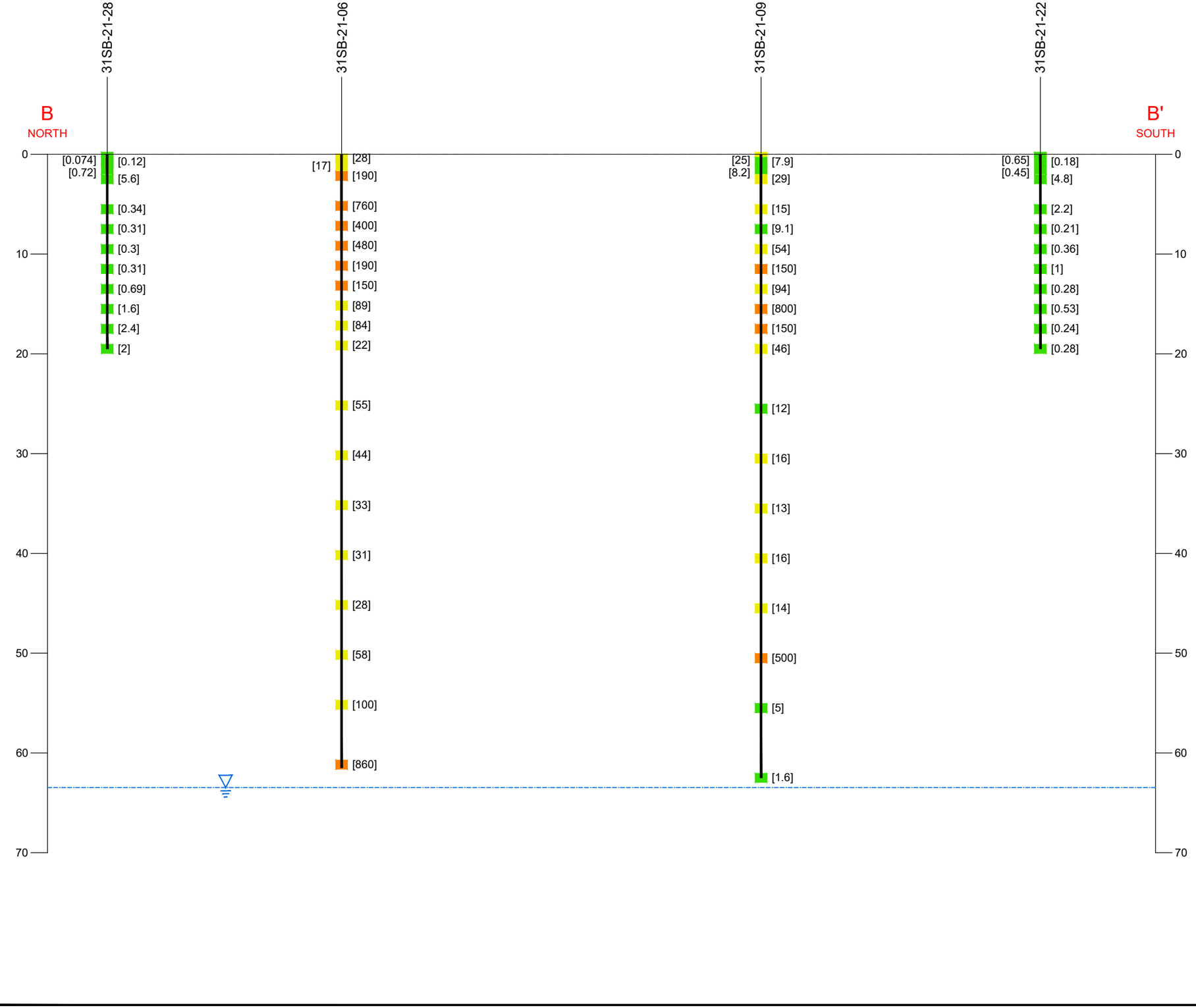
0 10' 20'
VERTICAL GRAPHIC SCALE

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 CROSS SECTION A-A': PFOS IN SOILS

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FIGURE
6a





KEY PLAN
SHOWING CROSS SECTION B-B'

LEGEND

- PFOS CONCENTRATION < 13 µg/kg
- PFOS CONCENTRATION 13 - 130 µg/kg
- PFOS CONCENTRATION > 130 µg/kg
- WATER TABLE
- [0.32] PFOS CONCENTRATION AT SAMPLE DEPTH IN µg/kg

NOTES:

1. PFOS CONCENTRATIONS ARE SHOWN AT THE MIDPOINT SAMPLE DEPTH BGS
2. WATER TABLE ONSITE IS APPROXIMATELY 64 FEET BGS BASED ON SPRING 2022 WATER LEVELS
3. µg/kg = MICROGRAMS PER KILOGRAM
4. BGS = BELOW GROUND SURFACE
5. PFOS = PERFLUOROOCTANE SULFONATE
6. > = GREATER THAN
7. < = LESSER THAN

0 25' 50'
HORIZONTAL GRAPHIC SCALE

0 10' 20'
VERTICAL GRAPHIC SCALE

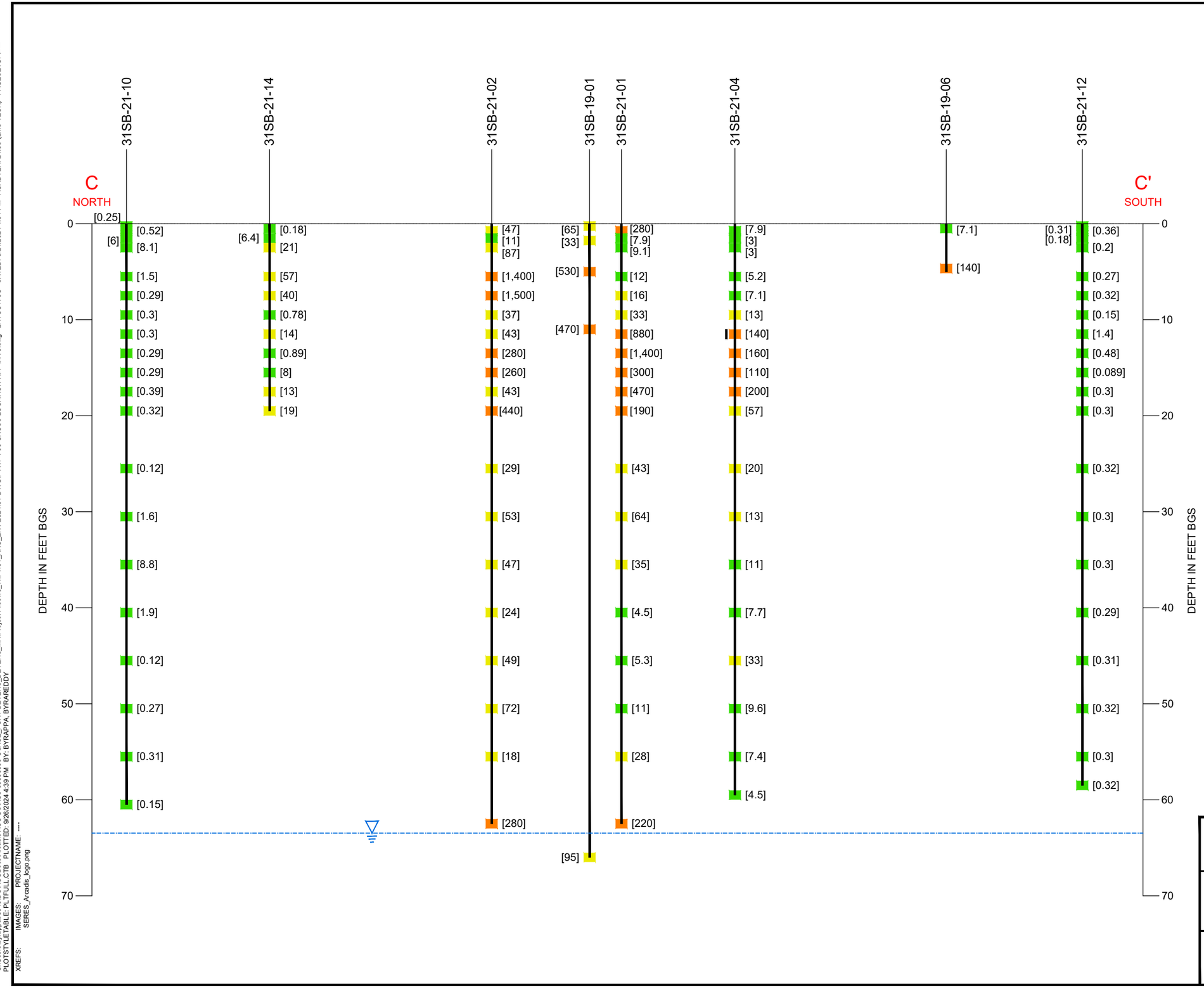
AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

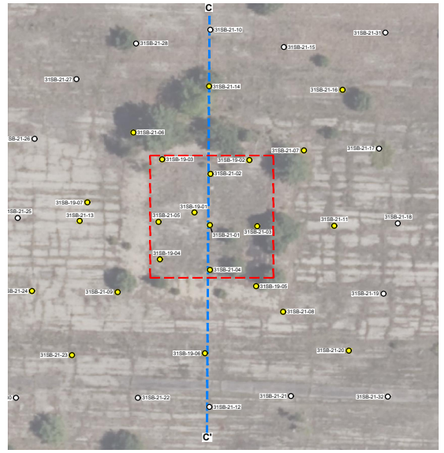
AOC 31 CROSS SECTION B-B': PFOS IN SOILS

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ARCADIS a joint venture

FIGURE
6b

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KEY PLAN
SHOWING CROSS SECTION C-C'

LEGEND

- PFOS CONCENTRATION < 13 µg/kg
- PFOS CONCENTRATION 13 - 130 µg/kg
- PFOS CONCENTRATION > 130 µg/kg
- WATER TABLE
- [0.32] PFOS CONCENTRATION AT SAMPLE DEPTH IN µg/kg

NOTES:

1. PFOS CONCENTRATIONS ARE SHOWN AT THE MIDPOINT SAMPLE DEPTH BGS
2. WATER TABLE ONSITE IS APPROXIMATELY 64 FEET BGS BASED ON SPRING 2022 WATER LEVELS
3. µg/kg = MICROGRAMS PER KILOGRAMS
4. BGS = BELOW GROUND SURFACE
5. PFOS = PERFLUOROOCTANE SULFONATE
6. > = GREATER THAN
7. < = LESSER THAN

0 25' 50'
HORIZONTAL GRAPHIC SCALE

0 10' 20'
VERTICAL GRAPHIC SCALE

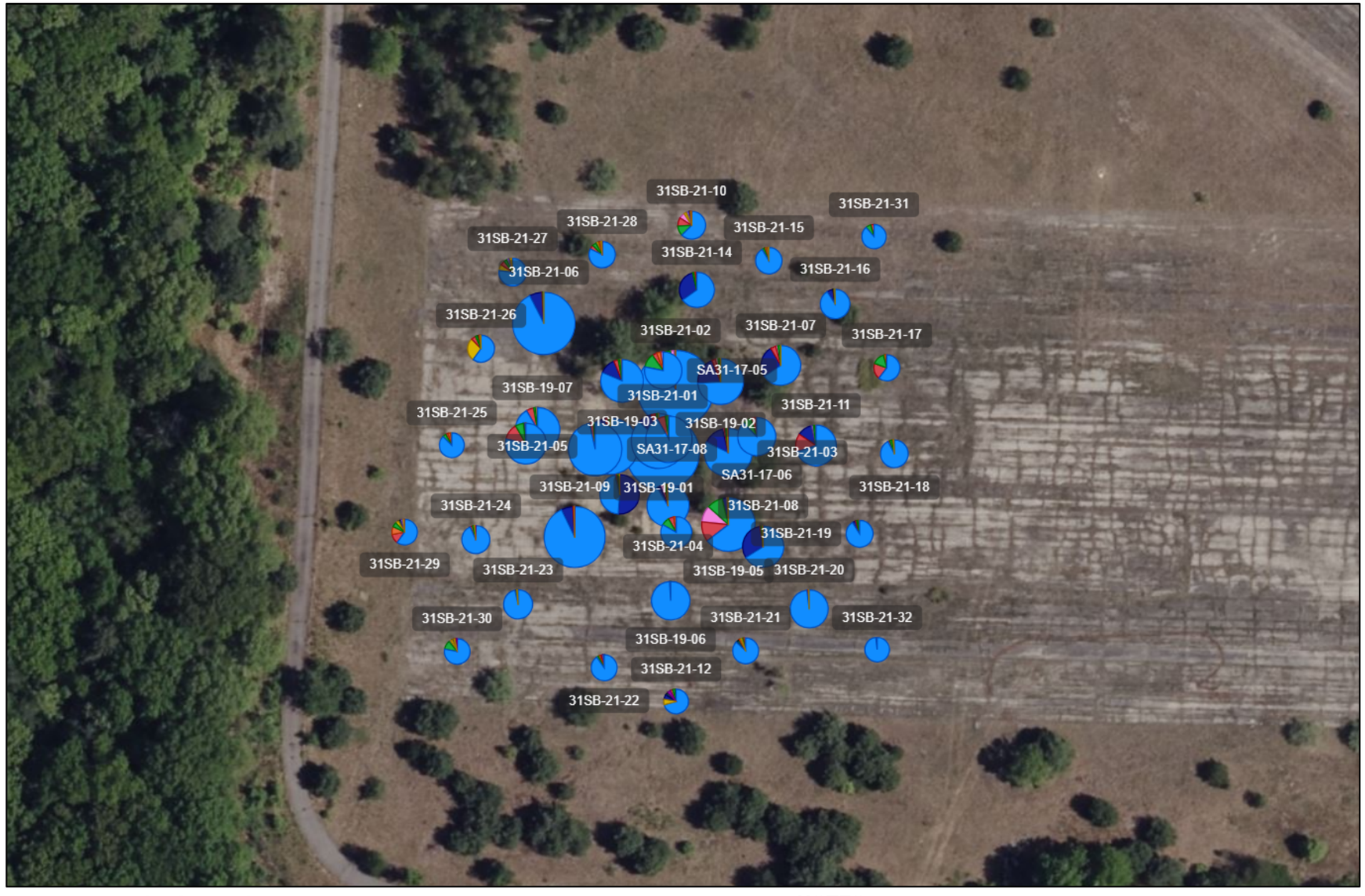
AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 CROSS SECTION C-C': PFOS IN SOILS

SERES Engineering & Sciences, LLC
ARCADIS a joint venture

FIGURE
6c

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PFAS

- 6:2 FtS
- 8:2 FtS
- EtFOSAA
- MeFOSAA
- PFBS
- PFDA
- PFDoA
- PFHpA
- PFHxA
- PFHxS
- PFNA
- PFOA
- PFOS
- PFTeDA
- PFTrDA
- PFUnA

Approx.
30 feet

N

ANALYTE ACRONYMS

1. 6:2 FtS = 6:2 fluorotelomer sulfonate
2. 8:2 FtS = 8:2 fluorotelomer sulfonic acid
3. EtFOSAA = N-ethyl perfluorooctane sulfonamidoacetic acid
4. MeFOSAA = N-methylperfluorooctane sulfonamidoacetic acid
5. PFBS = perfluorobutanesulfonic acid
6. PFDA = perfluorodecanoic acid
7. PFDoA = perfluorododecanoic acid
8. PFHpA = perfluoroheptanoic acid
9. PFHxA = perfluorohexanoic acid
10. PFHxS = perfluorohexanesulfonic acid
11. PFNA = perfluorononanoic acid
12. PFOA = perfluorooctanoic acid
13. PFOS = perfluorooctanesulfonic acid
14. PFTeDA = perfluorotetradecanoic acid
15. PFTrDA = perfluorotridecanoic acid
16. PFUnA = perfluoroundecanoic acid

NOTES

1. A PIE CHART SHOWING THE MAXIMUM PFAS MIXTURE AT EACH SAMPLED LOCATION IS SHOWN REGARDLESS OF CONCENTRATION DETECTED.
2. THE SIZE OF THE PIE CHART IS PROPORTIONAL TO THE SUM OF THE PFAS CONCENTRATIONS. LARGER PIE CHARTS INDICATE HIGHER TOTAL PFAS CONCENTRATIONS WHEN COMPARED TO SMALLER PIE CHARTS.
3. PFAS = PER- AND POLYFLUOROALKYL SUBSTANCES
4. AOC = AREA OF CONTAMINATION

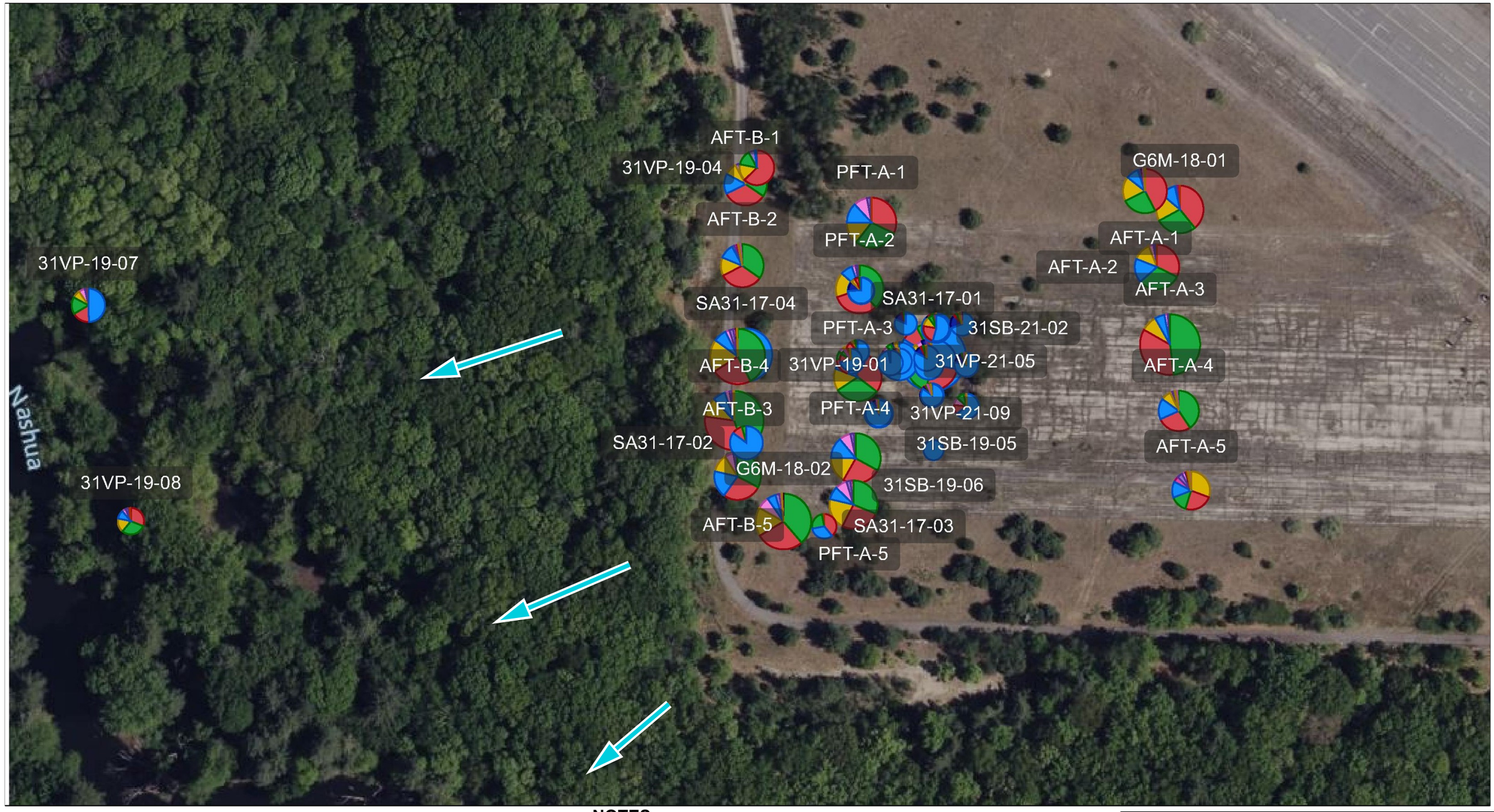
AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 PFAS MIXTURES IN SOIL

SERES Engineering & Services, LLC
ARCADIS
a joint venture

FIGURE
7

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ANALYTE ACRONYMS

1. 6:2 FtS = 6:2 fluorotelomer sulfonate
2. 8:2 FtS = 8:2 fluorotelomer sulfonic acid
3. EtFOSAA = N-ethyl perfluorooctane sulfonamidoacetic acid
4. MeFOSAA = N-methylperfluorooctane sulfonamidoacetic acid
5. PFBS = perfluorobutanesulfonic acid
6. PFDA = perfluorodecanoic acid
7. PFDoA = perfluorododecanoic acid
8. PFHpA = perfluoroheptanoic acid
9. PFHxA = perfluorohexanoic acid
10. PFHxS = perfluorohexanesulfonic acid
11. PFNA = perfluorononanoic acid
12. PFOA = perfluorooctanoic acid
13. PFOS = perfluorooctanesulfonic acid
14. PFTeDA = perfluorotetradecanoic acid
15. PFTrDA = perfluorotridecanoic acid
16. PFUnA = perfluoroundecanoic acid

NOTES

1. A PIE CHART SHOWING THE MAXIMUM PFAS MIXTURE AT EACH SAMPLED LOCATION IS SHOWN REGARDLESS OF CONCENTRATION DETECTED.
2. THE SIZE OF THE PIE CHART IS PROPORTIONAL TO THE SUM OF THE PFAS CONCENTRATIONS. LARGER PIE CHARTS INDICATE HIGHER TOTAL PFAS CONCENTRATIONS WHEN COMPARED TO SMALLER PIE CHARTS.
3. PFAS = PER- AND POLYFLUOROALKYL SUBSTANCES

INTERPRETED GROUNDWATER FLOW DIRECTION

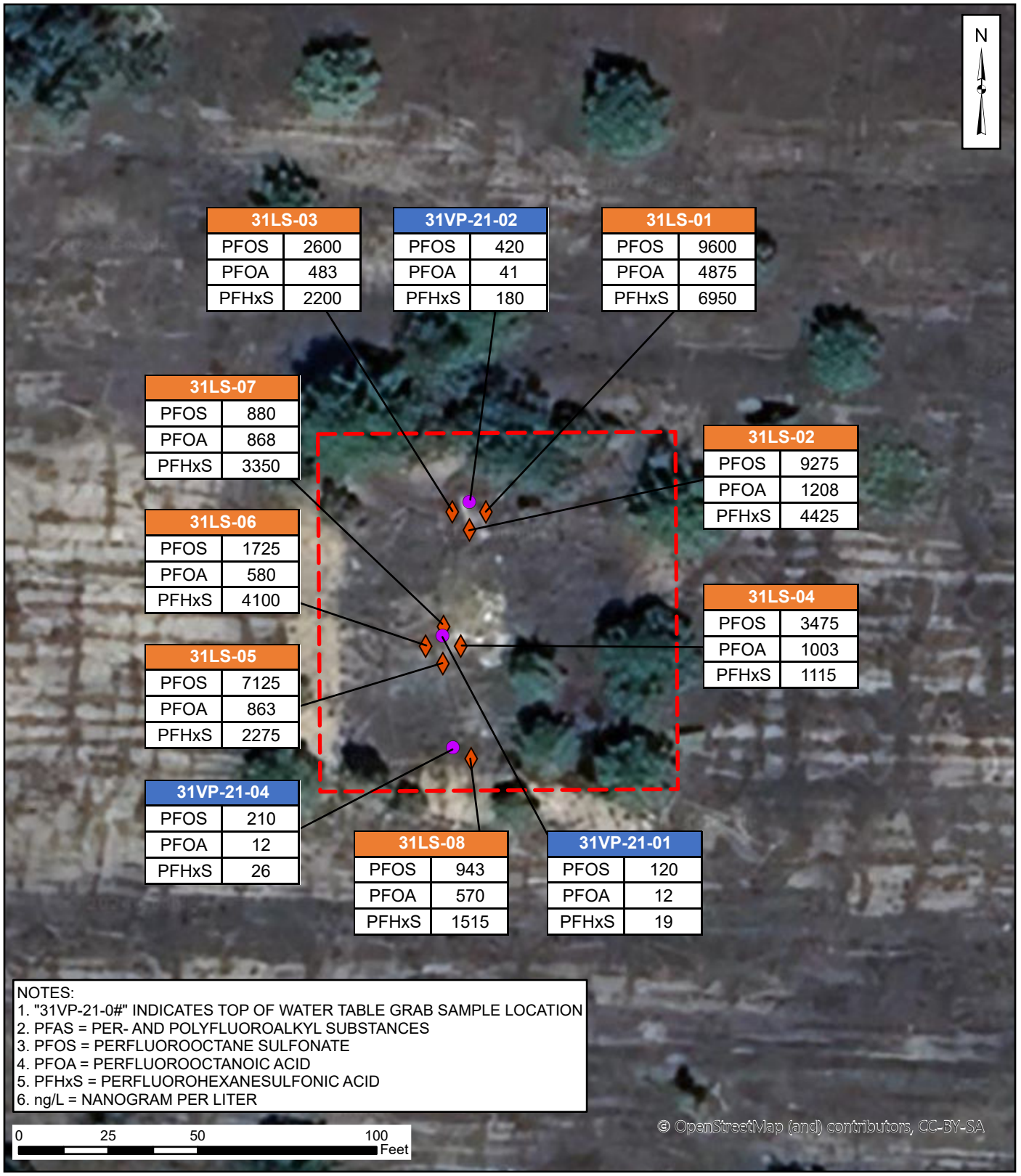
AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 PFAS MIXTURES IN GROUNDWATER

SERES Engineering & Services, LLC
ARCADIS a joint venture

FIGURE 8

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LEGEND

- SOIL BORING
- SOIL BORING/LYSIMETER LOCATION
- FORMER FIRE TRAINING AREA

LYSIMETER ID	
PFAS	MEAN POREWATER CONCENTRATION (ng/L) DETECTED FROM THE FOUR LYSIMETER SAMPLING EVENTS (NOVEMBER 2023, DECEMBER 2023, FEBRUARY 2024, AND APRIL 2024)

SHALLOW GROUNDWATER GRAB SAMPLE ID	
PFAS	GROUNDWATER CONCENTRATION (ng/L) DETECTED FROM SINGLE SAMPLE PER LOCATION. SAMPLES FROM 31VP-21-01 AND 31VP-21-02 WERE COLLECTED ON 7/6/2022, AND SAMPLE FROM 31VP-21-04 WAS COLLECTED ON 6/30/2022

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 LYSIMETER POREWATER AND SHALLOW GROUNDWATER CONCENTRATIONS

SERES Engineering & Services, LLC
ARCADIS
a joint venture

FIGURE 9

City: Clifton Park Div/Group: ENV Created By: Last Saved By: msi01059
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0 12.5' 25'
GRAPHIC SCALE

LEGEND:

- PROPOSED TEST CELL LOCATION
- SOIL BORING / LYSIMETER LOCATION
- SOIL BORING LOCATION
- MONITORING WELL LOCATION

AOC 31 SOILS PILOT TEST WORK PLAN
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

AOC 31 PROPOSED IN SITU STABILIZATION/SOLIDIFICATION TEST CELL LOCATIONS

ARCADIS

FIGURE
10

C:\Users\GSTEINBERGER\DCVACCDocs\Arcadis ACC US\AUS-99999999-USACE_FORT DEVENS_DEVENS_MA\Project Files\10_WIP\10T_ARC_ENV\2024\01-DWG\AOC31-EXCAV-FIG10-ISS TEST CELLS.dwg LAYOUT: 10 SAVED: 11/4/2024 3:35 PM ACADVER: 24.3S (LMS TECH) PAGESETUP: PDF-AP
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Appendix A

AOC 31 Supplemental Sampling Results

ARCADIS

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-01	31SB-21-01-0.5-1	0.5	1	07/06/2022	**17.0**	**14.0**	**0.0820 J**	0.0500 U	**1.10**	**0.610**	**0.330**	**0.820**	**17.0**	**2.90**	**0.490**	**280**	**2.70**	**0.120 J**	**0.120 J**	**0.520**
31SB-21-01	31SB-21-01-11-12	11	12	07/06/2022	**2.30**	**39.0**	0.0920 U	0.0460 U	0.0920 U	**0.180**	0.0920 U	**0.350**	**4.80**	**0.330**	**0.760**	**880**	**2.50**	0.0920 U	0.0460 U	0.0920 U
31SB-21-01	31SB-21-01-1-2	1	2	07/06/2022	**1.30**	**2.30**	**0.0530 J**	**0.0370 J**	0.0970 U	**0.350**	**0.280**	**0.260**	**0.810**	**0.260**	**0.200**	**7.90**	**0.340**	0.0970 U	**0.0650 J**	**0.440**
31SB-21-01	31SB-21-01-13-14	13	14	07/06/2022	**2.90**	**73.0**	0.0960 U	0.0480 U	0.0960 U	**0.290**	0.0960 U	**0.380**	**4.60**	**0.280**	**1.10**	**1,400**	**3.10**	0.0960 U	0.0480 U	0.0960 U
31SB-21-01	31SB-21-01-15-16	15	16	07/06/2022	**0.300 J**	**60.0**	**0.0570 J**	0.0560 U	0.110 U	**0.160 J**	0.110 U	**0.0460 J**	**0.460**	**0.0610 J**	**0.190 J**	**300**	**0.460**	0.110 U	0.0560 U	0.110 U
31SB-21-01	31SB-21-01-17-18	17	18	07/06/2022	**0.420**	**73.0**	**0.0490 J**	0.0470 U	0.0950 U	**0.180 J**	0.0950 U	**0.120 J**	**1.20**	**0.130 J**	**0.200**	**470**	**0.900**	0.0950 U	0.0470 U	0.0950 U
31SB-21-01	31SB-21-01-19-20	19	20	07/06/2022	**15.0**	**13.0**	0.100 U	0.0500 U	**0.460**	0.100 U	0.100 U	**0.660**	**21.0**	**2.60**	**0.0510 J**	**190**	**7.80**	0.100 U	0.0500 U	0.100 U
31SB-21-01	31SB-21-01-2-3	2	3	07/06/2022	**1.10**	**2.30**	0.120 U	0.0600 U	0.120 U	**0.240**	**0.140 J**	**0.260**	**0.620**	**0.260**	**0.0840 J**	**9.10**	**0.370**	0.120 U	0.0600 U	**0.260**
31SB-21-01	31SB-21-01-25-26	25	26	07/06/2022	**0.220 J**	**1.90**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.0440 J**	**0.760**	**0.110 J**	**0.0220 J**	**43.0**	**0.180 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-01	31SB-21-01-30-31	30	31	07/06/2022	**0.200 J**	**7.50**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.0610 J**	**0.850**	**0.130 J**	**0.0300 J**	**64.0**	**0.240 J**	0.120 U	0.0600 U	0.120 U
31SB-21-01	31SB-21-01-35-36	35	36	07/06/2022	**0.130 J**	**6.10**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	**0.0380 J**	**0.430**	**0.0990 J**	**0.0250 J**	**44.0**	**0.170 J**	0.0950 U	0.0480 U	0.0950 U
31SB-21-01	31SB-21-01-40-41	40	41	07/06/2022	**0.0710 J**	**0.640**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.290**	**0.110 J**	0.0580 U	**4.50**	**0.0920 J**	0.120 U	0.0580 U	0.120 U
31SB-21-01	31SB-21-01-45-46	45	46	07/06/2022	**0.0860 J**	**0.790**	0.110 U	0.0550 U	0.110 U	0.110 U	0.110 U	**0.0590 J**	**0.510**	**0.110 J**	0.0550 U	**5.30**	**0.130 J**	0.110 U	0.0550 U	0.110 U
31SB-21-01	31SB-21-01-50-51	50	51	07/06/2022	**0.0980 J**	**1.50**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.360**	**0.100 J**	0.0510 U	**11.0**	**0.120 J**	0.100 U	0.0510 U	0.100 U
31SB-21-01	31SB-21-01-55-56	55	56	07/06/2022	**0.270 J**	**5.00**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.500**	**0.120 J**	**0.0240 J**	**42.0**	**0.180 J**	0.100 U	0.0520 U	0.100 U
31SB-21-01	31SB-21-01-5-6	5	6	07/06/2022	**0.780**	**7.80**	0.120 U	0.0620 U	0.120 U	**0.390**	0.120 U	**0.200 J**	**0.850**	**0.0740 J**	**0.280**	**12.0**	**0.490**	0.120 U	0.0620 U	0.120 U
31SB-21-01	31SB-21-01-62-63	62	63	07/06/2022	**1.60**	**15.0**	0.100 U	0.0510 U	0.100 U	**0.0570 J**	0.100 U	**0.0500 J**	**1.60**	**0.210**	**0.210**	**220**	**1.30**	0.100 U	0.0510 U	0.100 U
31SB-21-01	31SB-21-01-7-8	7	8	07/06/2022	**1.00**	**13.0**	**0.0880 J**	0.0460 U	0.0930 U	**0.420**	0.0930 U	**0.290**	**1.80**	**0.0840 J**	**0.310**	**16.0**	**0.850**	0.0930 U	0.0460 U	**0.0820 J**
31SB-21-01	31SB-21-01-9-10	9	10	07/06/2022	**0.730**	**29.0**	0.130 U	0.0640 U	0.130 U	**0.350**	0.130 U	**0.340**	**1.80**	**0.110 J**	**0.250 J**	**33.0**	**0.850**	0.130 U	0.0640 U	0.130 U
31SB-21-01 (FD)	AOC31SB-21-01-35-36 DUP43	35	36	07/06/2022	**0.110 J**	**5.00**	0.0930 U	0.0470 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	**0.400**	**0.0880 J**	**0.0240 J**	**35.0**	**0.130 J**	0.0930 U	0.0470 U	0.0930 U
31SB-21-01 (FD)	AOC31SB-21-01-55-56 DUP44	55	56	07/06/2022	**0.210 J**	**3.10**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.430**	**0.130 J**	**0.0280 J**	**28.0**	**0.170 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-02	31SB-21-02-0.5-1	0.5	1	07/06/2022	**0.730**	**1.80**	0.100 U	0.0510 U	**0.160 J**	**0.110 J**	0.100 U	**0.200**	**4.80**	**0.460**	0.200 U	**47.0**	**0.660**	0.100 U	0.0510 U	**0.0730 J**
31SB-21-02	31SB-21-02-11-12	11	12	07/06/2022	**30.0**	**0.0970 J**	0.100 U	0.210 U	0.100 U	0.100 U	0.100 U	**0.280**	**16.0**	**0.270**	0.0510 U	**43.0**	**41.0**	0.100 U	0.0510 U	0.100 U
31SB-21-02	31SB-21-02-1-2	1	2	07/06/2022	**0.0680 J**	**0.540**	0.0930 U	0.0470 U	0.0930 U	**0.110 J**	0.0930 U	**0.160 J**	**0.470**	**0.120 J**	0.190 U	**11.0**	**0.140 J**	0.0930 U	0.0470 U	0.0930 U
31SB-21-02	31SB-21-02-13-14	13	14	07/06/2022	**12.0**	**4.00**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.210 J**	**7.60**	**0.320**	0.0580 U	**280**	**14.0**	0.120 U	0.230 U	0.120 U
31SB-21-02	31SB-21-02-15-16	15	16	07/06/2022	**6.40**	**7.00**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.210 J**	**4.90**	**1.00**	0.240 U	**260**	**7.60**	0.120 U	0.0600 U	0.120 U
31SB-21-02	31SB-21-02-17-18	17	18	07/06/2022	**22.0**	**0.870**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	**0.310**	**13.0**	**0.440**	0.0480 U	**43.0**	**33.0**	0.0950 U	0.0480 U	0.0950 U
31SB-21-02	31SB-21-02-19-20	19	20	07/06/2022	**1.60**	**57.0**	0.100 U	0.0500 U	**0.160 J**	**0.400**	0.100 U	**0.250**	**4.90**	**0.400**	**0.400**	**440**	**2.70**	0.100 U	0.0500 U	0.100 U
31SB-21-02	31SB-21-02-2-3	2	3	07/06/2022	**0.0660 J**	**83.0**	**0.140 J**	0.0470 U	0.0930 U	**0.900**	0.0930 U	**0.0810 J**	**0.890**	**0.0780 J**	**0.270**	**87.0**	**0.460**	0.0930 U	0.0470 U	0.0930 U
31SB-21-02	31SB-21-02-25-26	25	26	07/06/2022	**0.330**	**0.550**	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.0930 J**	**1.10**	**0.0850 J**	**0.0330 J**	**29.0**	**0.380**	0.0990 U	0.0490 U	0.0990 U
31SB-21-02	31SB-21-02-30-31	30	31	07/06/2022	**0.430**	**1.00**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.0860 J**	**1.50**	**0.110 J**	**0.0740 J**	**53.0**	**0.500**	0.0940 U	0.0470 U	0.0940 U
31SB-21-02	31SB-21-02-35-36	35	36	07/06/2022	**0.370**	**0.530**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.0730 J**	**0.900**	**0.0770 J**	**0.0630 J**	**47.0**	**0.320**	0.0990 U	0.0500 U	0.0990 U
31SB-21-02	31SB-21-02-40-41	40	41	07/06/2022	**0.350**	**0.550**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0540 J**	**0.500**	**0.0980 J**	**0.0440 J**	**23.0**	**0.160 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-02	31SB-21-02-45-46	45	46	07/06/2022	**0.350**	**3.10**	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.0720 J**	**0.850**	**0.120 J**	**0.0430 J**	**49.0**	**0.290 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-02	31SB-21-02-50-51	50	51	07/06/2022	**0.130 J**	**4.90**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0610 J**	**0.520**	**0.0950 J**	**0.0370 J**	**72.0**	**0.110 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-02	31SB-21-02-55-56	55	56	07/06/2022	**0.0730 J**	**1.10**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.150 J**	**0.0570 J**	0.0480 U	**18.0**	0.140 U	0.0950 U	0.0480 U	0.0950 U
31SB-21-02	31SB-21-02-5-6	5	6	07/06/2022	**2.50**	**3.50**	0.100 U	0.0510 U	**0.580**	0.100 U	0.100 U	**0.370**	**14.0**	**0.620**	**0.780**	**1,400**	**4.40**	0.100 U	0.0510 U	0.100 U
31SB-21-02	31SB-21-02-62-63	62	63	07/06/2022	**2.20**	**23.0**	**0.170 J**	0.0510 U	**0.0450 J**	**0.120 J**	**0.0550 J**	**0.110 J**	**2.40**	**0.270**	**0.150 J**	**280**	**1.50**	0.100 U	**0.0400 J**	**0.0480 J**
31SB-21-02	31SB-21-02-7-8	7	8	07/06/2022	**6.30**	**1.10**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.240**	**7.20**	**0.280**	**1.10**	**1,500**	**11.0**	0.0980 U	0.0490 U	0.0980 U
31SB-21-02	31SB-21-02-9-10	9	10	07/06/2022	**19.0**	**0.620**	0.100 U	0.0500 U	**0.0640 J**	0.100 U	0.100 U	**3.30**	**56.0**	**1.10**	**0.330**	**37.0**	**28.0**	0.100 U	0.0500 U	0.100 U
31SB-21-02 (FD)	AOC 31SB-21-02-30-31-DUP41	30	31	07/06/2022	**0.390**	**1.10**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.0860 J**	**1.60**	**0.110 J**	**0.0770 J**	**53.0**	**0.510**	0.100 U	0.0510 U	0.100 U
31SB-21-02 (FD)	AOC 31SB-21-02-40-41-DUP42	40	41	07/06/2022	**0.340**	**0.530**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0460 J**	**0.490**	**0.0920 J**	**0.0370 J**	**24.0**	**0.150 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-03	31SB-21-03-0.5-1	0.5	1	07/05/2022	**4.00**	**3.10**	0.100 U	0.0510 U	**0.170 J**	**0.640**	**0.190 J**	**0.320**	**3.50**	**0.870**	**0.240**	**42.0**	**1.10**	**0.0870 J**	**0.0640 J**	**0.480**

PFAS Remedial Investigation
Supplemental Data (Soil)
AOC 31
Former Fort Devens, Massachusetts

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-03	31SB-21-03-11-12	11	12	07/05/2022	**0.320**	**1.80**	0.0970 U	0.0480 U	0.0970 U	**0.150 J**	0.0970 U	**0.400**	**3.60**	**0.250**	**0.140 J**	**6.20**	**1.10**	0.0970 U	0.0480 U	0.0970 U
31SB-21-03	31SB-21-03-1-2	1	2	07/05/2022	**0.460**	**0.380**	**0.0740 J**	0.0600 U	0.120 U	**0.620**	0.120 U	**0.140 J**	**1.20**	**0.210 J**	**0.150 J**	**17.0**	**0.530**	0.120 U	0.0600 U	0.120 U
31SB-21-03	31SB-21-03-13-14	13	14	07/05/2022	**0.300 J**	**8.20**	0.110 U	0.0570 U	0.110 U	**0.150 J**	0.110 U	**0.360**	**3.30**	**0.210 J**	**0.130 J**	**25.0**	**1.40**	0.110 U	0.0570 U	0.110 U
31SB-21-03	31SB-21-03-15-16	15	16	07/05/2022	**0.300 J**	**33.0**	**0.320**	0.0530 U	0.110 U	**0.150 J**	0.110 U	**0.210**	**1.70**	**0.250**	**0.120 J**	**130**	**1.10**	0.110 U	0.0530 U	0.110 U
31SB-21-03	31SB-21-03-17-18	17	18	07/05/2022	**0.270 J**	**8.50**	**0.0570 J**	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.130 J**	**1.40**	**0.170 J**	**0.0400 J**	**63.0**	**0.810**	0.0960 U	0.0480 U	0.0960 U
31SB-21-03	31SB-21-03-19-20	19	20	07/05/2022	**0.510**	**53.0**	**0.440**	0.0520 U	0.100 U	**0.190 J**	**0.0960 J**	**0.230**	**2.70**	**0.460**	**0.0880 J**	**310**	**1.50**	0.100 U	0.0520 U	**0.0580 J**
31SB-21-03	31SB-21-03-2-3	2	3	07/05/2022	**0.330 J**	**0.460**	0.110 U	0.0570 U	0.110 U	**0.780**	**0.0760 J**	**0.300**	**3.90**	**0.360**	**0.250**	**22.0**	**0.970**	0.110 U	0.0570 U	**0.0820 J**
31SB-21-03	31SB-21-03-25-26	25	26	07/05/2022	**0.150 J**	**2.60**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.170 J**	**1.30**	**0.200**	**0.0210 J**	**5.30**	**0.390**	0.0940 U	0.0470 U	0.0940 U
31SB-21-03	31SB-21-03-30-31	30	31	07/05/2022	**0.510**	**2.80**	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.200 J**	**3.10**	**0.300**	**0.0320 J**	**20.0**	**1.20**	0.110 U	0.0530 U	0.110 U
31SB-21-03	31SB-21-03-35-36	35	36	07/05/2022	**0.760**	**0.740 J**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.0930 J**	**2.50**	**0.230**	0.0580 U	**10.0 J**	**1.20 J**	0.120 U	0.0580 U	0.120 U
31SB-21-03	31SB-21-03-40-41	40	41	07/05/2022	**1.10**	**1.30**	0.0950 U	0.0470 U	0.0950 U	0.0950 U	0.0950 U	**0.100 J**	**3.40**	**0.210**	**0.0290 J**	**15.0**	**2.00**	0.0950 U	0.0470 U	0.0950 U
31SB-21-03	31SB-21-03-45-46	45	46	07/05/2022	**1.00**	**0.550**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.0380 J**	**1.80**	**0.0540 J**	0.0500 U	**16.0**	**1.70**	0.0990 U	0.0500 U	0.0990 U
31SB-21-03	31SB-21-03-50-51	50	51	07/05/2022	**2.40**	**0.920**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0430 J**	**2.30**	**0.0400 J**	**0.0250 J**	**31.0**	**2.60**	0.0980 U	0.0490 U	0.0980 U
31SB-21-03	31SB-21-03-55-56	55	56	07/05/2022	**1.00**	**0.220 J**	0.110 U	0.0570 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.660**	0.110 U	0.0570 U	**8.90**	**0.890**	0.110 U	0.0570 U	0.110 U
31SB-21-03 (FD)	31SB-21-03-55-56-DUP40	55	56	07/05/2022	**1.30**	**0.200 J**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.0480 J**	**0.970**	**0.0430 J**	0.0580 U	**9.50**	**1.20**	0.120 U	0.0580 U	0.120 U
31SB-21-03	31SB-21-03-5-6	5	6	07/05/2022	**0.180 J**	**0.510**	0.100 U	0.0500 U	0.100 U	**0.0640 J**	0.100 U	**0.220**	**1.90**	**0.150 J**	**0.110 J**	**5.40**	**0.510**	0.100 U	0.0500 U	0.100 U
31SB-21-03	31SB-21-03-61-62	61	62	07/05/2022	**0.680**	**0.870**	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.280**	**0.0490 J**	0.190 U	**41.0**	**0.480**	0.0970 U	0.0480 U	0.0970 U
31SB-21-03	31SB-21-03-7-8	7	8	07/05/2022	**0.210 J**	**0.530**	0.100 U	0.0520 U	0.100 U	**0.0860 J**	0.100 U	**0.300**	**3.50**	**0.220**	**0.0960 J**	**6.70**	**0.990**	0.100 U	0.0520 U	0.100 U
31SB-21-03	31SB-21-03-9-10	9	10	07/05/2022	**0.150 J**	**0.340**	0.100 U	0.0500 U	0.100 U	**0.0550 J**	0.100 U	**0.230**	**3.10**	**0.270**	**0.0590 J**	**4.10**	**0.910**	0.100 U	0.0500 U	0.100 U
31SB-21-03 (FD)	AOC31SB-21-03-25-26-DUP38	25	26	07/05/2022	**0.150 J**	**1.80**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.160 J**	**1.20**	**0.200**	0.0490 U	**4.30**	**0.350**	0.0980 U	0.0490 U	0.0980 U
31SB-21-03 (FD)	AOC31SB-21-03-35-36-DUP39	35	36	07/05/2022	**1.20**	**2.00 J**	0.0920 U	0.0460 U	0.0920 U	0.0920 U	0.0920 U	**0.140 J**	**3.90**	**0.310**	**0.0360 J**	**20.0 J**	**2.00 J**	0.0920 U	0.0460 U	0.0920 U
31SB-21-04	31SB-21-04-0.5-1	0.5	1	06/30/2022	**1.50**	**1.30**	0.100 U	0.0500 U	**0.0610 J**	**0.0670 J**	**0.190 J**	**0.130 J**	**0.970**	**0.250**	**0.0650 J**	**7.90**	**0.330**	**0.230**	**0.270**	**0.140 J**
31SB-21-04	31SB-21-04-11-12	11	12	06/30/2022	**0.750**	**5.40**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	**0.100 J**	**1.50**	**0.110 J**	**0.170 J**	**140**	**0.610**	0.0950 U	0.0480 U	0.0950 U
31SB-21-04	31SB-21-04-1-2	1	2	06/30/2022	**0.230 J**	**0.440**	0.100 U	**0.0320 J**	0.100 U	**0.0850 J**	**0.230**	**0.0760 J**	**0.330**	**0.120 J**	**0.0470 J**	**3.00**	**0.210 J**	**0.0370 J**	**0.0690 J**	**0.240**
31SB-21-04	31SB-21-04-13-14	13	14	06/30/2022	**2.10**	**5.80**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.130 J**	**2.10**	**0.130 J**	**0.110 J**	**160**	**1.60**	0.100 U	0.0510 U	0.100 U
31SB-21-04	31SB-21-04-15-16	15	16	06/30/2022	**3.90**	**2.90**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.160 J**	**2.90**	**0.190 J**	**0.0860 J**	**110**	**2.00**	0.100 U	0.0510 U	0.100 U
31SB-21-04	31SB-21-04-17-18	17	18	06/30/2022	**5.70**	**3.50**	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	**0.180 J**	**3.20**	**0.200**	**0.150 J**	**200**	**2.60**	0.0970 U	0.0480 U	0.0970 U
31SB-21-04	31SB-21-04-19-20	19	20	06/30/2022	**1.00**	**1.00**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.0960 J**	**1.20**	**0.170 J**	**0.0600 J**	**57.0**	**1.00**	0.0940 U	0.0470 U	0.0940 U
31SB-21-04	31SB-21-04-2-3	2	3	06/30/2022	**0.230 J**	**0.760**	**0.0890 J**	0.0500 U	0.100 U	**0.100 J**	**0.210**	**0.100 J**	**0.290**	**0.190 J**	**0.0270 J**	**3.00**	**0.260 J**	0.100 U	**0.0510 J**	**0.310**
31SB-21-04	31SB-21-04-25-26	25	26	06/30/2022	**0.0530 J**	**0.460**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0480 J**	**0.330**	**0.0350 J**	**0.0310 J**	**20.0**	**0.410**	0.100 U	0.0500 U	0.100 U
31SB-21-04	31SB-21-04-30-31	30	31	06/30/2022	0.0990 U	**0.370**	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.300**	0.0990 U	**0.0250 J**	**13.0**	**0.160 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-04	31SB-21-04-35-36	35	36	06/30/2022	0.0980 U	**0.400**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.450**	0.0980 U	0.0490 U	**11.0**	**0.200 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-04	31SB-21-04-40-41	40	41	06/30/2022	0.0960 U	**0.160 J**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.160 J**	0.0960 U	0.0480 U	**4.60 J**	**0.100 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-04	31SB-21-04-45-46	45	46	06/30/2022	**0.0820 J**	**1.40**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0470 J**	**0.830**	0.0960 U	**0.0410 J**	**33.0**	**0.360**	0.0960 U	0.0480 U	0.0960 U
31SB-21-04	31SB-21-04-50-51	50	51	06/30/2022	**0.0350 J**	**0.500**	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.160 J**	0.0970 U	0.0490 U	**9.60**	**0.0760 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-04	31SB-21-04-55-56	55	56	06/30/2022	**0.350**	**0.290**	0.0950 U	0.0470 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.360**	0.0950 U	0.0470 U	**7.60**	**0.0830 J**	0.0950 U	0.0470 U	0.0950 U
31SB-21-04	31SB-21-04-5-6	5	6	06/30/2022	**0.120 J**	**0.870**	**0.0580 J**	0.0500 U	0.100 U	**0.0850 J**	0.100 U	**0.0520 J**	**0.380**	**0.0700 J**	**0.0640 J**	**5.20**	**0.250 J**	0.100 U	0.0500 U	0.100 U
31SB-21-04	31SB-21-04-59-60	59	60	06/30/2022	0.0970 U	**0.110 J**	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.110 J**	0.0970 U	0.0480 U	**4.50 J**	0.140 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-04	31SB-21-04-7-8	7	8	06/30/2022	**0.0760 J**	**2.20**	**0.0940 J**	0.490 U	0.0960 U	**0.120 J**	0.0960 U	0.0960 U	**0.240**	**0.0620 J**	**0.0560 J**	**7.10**	**0.190 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-04	31SB-21-04-9-10	9	10	06/30/2022	**0.0600 J**	**4.10**	**0.0920 J**	0.410 U	0.100 U	**0.100 J**	0.100 U	0.100 U	**0.280**	**0.0460 J**	**0.0600 J**	**13.0**	**0.200 J**	0.100 U	0.0510 U	0.100 U
31SB-21-04 (FD)	AOC 31SB-21-04-30-31-DUP33	30	31	06/30/2022	**0.0260 J**	**0.460**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.320**	0.0940 U	**0.0270 J**	**13.0**	**0.190 J**	0.0940 U	0.0470 U	0.0940 U
31SB-21-04 (FD)	AOC-31SB-21-04-40-41 DUP34	40	41	06/30/2022	**0.0290 J**	**0.300**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.250**	0.100 U	0.0500 U	**7.70 J**	**0.150 J**	0.100 U	0.0500 U	0.100 U
31SB-21-04 (FD)	AOC31SB-21-04-55-56 DUP35	55	56	06/30/2022	0.0950 U	**0.290**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.340**	0.0950 U	0.0480 U	**7.40**	**0.0580 J**	0.0950 U	0.0480 U	0.0950 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-05	31SB-21-05-0.5-1	0.5	1	07/01/2022	**3.80**	**2.60**	0.0960 U	0.0480 U	**0.880**	**0.100 J**	0.0960 U	**0.350**	**8.00**	**1.90**	**0.0740 J**	**55.0**	**2.50**	0.0960 U	0.0480 U	**0.0590 J**
31SB-21-05	31SB-21-05-11-12	11	12	07/01/2022	**0.0510 J**	**12.0**	**0.0810 J**	0.0470 U	0.0930 U	**0.0680 J**	0.0930 U	**0.0810 J**	**1.50**	**0.100 J**	**0.0980 J**	**180**	**0.860**	0.0930 U	0.0470 U	0.0930 U
31SB-21-05	31SB-21-05-1-2	1	2	07/01/2022	**0.230 J**	**30.0**	**0.380**	0.0500 U	**0.0410 J**	**0.550**	**0.0510 J**	**0.0810 J**	**1.80**	**0.190 J**	**0.160 J**	**150**	**0.690**	0.0990 U	0.0500 U	**0.0880 J**
31SB-21-05	31SB-21-05-13-14	13	14	07/01/2022	**0.0450 J**	**18.0**	**0.170 J**	0.0500 U	0.100 U	**0.140 J**	0.100 U	**0.0570 J**	**1.20**	**0.0930 J**	**0.100 J**	**460**	**0.670**	0.100 U	0.0500 U	0.100 U
31SB-21-05	31SB-21-05-15-16	15	16	07/01/2022	**0.220 J**	**3.00**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**1.70**	**0.160 J**	**0.0940 J**	**250**	**1.50**	0.100 U	0.0510 U	0.100 U
31SB-21-05	31SB-21-05-17-18	17	18	07/01/2022	**0.360**	**6.10**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0570 J**	**2.40**	**0.160 J**	**0.240**	**610**	**2.40**	0.0960 U	0.0480 U	0.0960 U
31SB-21-05	31SB-21-05-19-20	19	20	07/01/2022	**0.0320 J**	**0.890**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0490 J**	**0.740**	**0.270**	**0.0230 J**	**74.0**	**0.490**	0.100 U	0.0520 U	0.100 U
31SB-21-05	31SB-21-05-2-3	2	3	07/01/2022	**0.120 J**	**24.0**	**0.170 J**	0.0500 U	0.100 U	**0.190 J**	0.100 U	**0.110 J**	**1.50**	**0.180 J**	**0.120 J**	**180**	**0.670**	0.100 U	0.0500 U	0.100 U
31SB-21-05	31SB-21-05-25-26	25	26	07/01/2022	**0.0290 J**	**0.310**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.530**	**0.0750 J**	0.0490 U	**31.0**	**0.260 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-05	31SB-21-05-30-31	30	31	07/01/2022	0.110 U	0.110 U	0.110 U	0.0570 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.340**	**0.0820 J**	0.0570 U	**2.00**	**0.130 J**	0.110 U	0.0570 U	0.110 U
31SB-21-05	31SB-21-05-35-36	35	36	07/01/2022	**0.110 J**	0.0920 U	0.0920 U	0.0460 U	0.0920 U	0.0920 U	0.0920 U	**0.0660 J**	**0.520**	**0.0760 J**	0.0460 U	**3.90**	**0.280**	0.0920 U	0.0460 U	0.0920 U
31SB-21-05	31SB-21-05-40-41	40	41	07/01/2022	**0.0870 J**	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.370**	**0.0790 J**	0.0510 U	**2.50**	**0.220 J**	0.100 U	0.0510 U	0.100 U
31SB-21-05	31SB-21-05-45-46	45	46	07/01/2022	**0.210 J**	0.0930 U	0.0930 U	0.0460 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	**0.600**	**0.0830 J**	0.0460 U	**4.50**	**0.370**	0.0930 U	0.0460 U	0.0930 U
31SB-21-05	31SB-21-05-50-51	50	51	07/01/2022	**0.110 J**	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.380**	0.100 U	0.0510 U	**2.90**	**0.240 J**	0.100 U	0.0510 U	0.100 U
31SB-21-05	31SB-21-05-55-56	55	56	07/01/2022	**1.20**	**0.700**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.100 J**	**3.00**	**0.0710 J**	**0.120 J**	**70.0**	**2.70**	0.100 U	0.0510 U	0.100 U
31SB-21-05	31SB-21-05-5-6	5	6	07/01/2022	**0.130 J**	**18.0**	**0.0520 J**	0.0470 U	0.0950 U	**0.170 J**	0.0950 U	**0.110 J**	**2.30**	**0.0990 J**	**0.370**	**290**	**1.50**	0.0950 U	0.0470 U	0.0950 U
31SB-21-05	31SB-21-05-59-60	59	60	07/01/2022	**0.110 J**	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.410**	0.0990 U	0.0490 U	**4.50**	**0.330**	0.0990 U	0.0490 U	0.0990 U
31SB-21-05	31SB-21-05-7-8	7	8	07/01/2022	**0.0990 J**	**7.50**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0570 J**	**1.70**	**0.0770 J**	**0.170 J**	**300**	**0.610**	0.0960 U	0.0480 U	0.0960 U
31SB-21-05	31SB-21-05-9-10	9	10	07/01/2022	**0.140 J**	**14.0**	0.110 U	0.0530 U	0.110 U	**0.0530 J**	0.110 U	**0.0400 J**	**1.20**	**0.0560 J**	**0.190 J**	**340**	**0.650**	0.110 U	0.0530 U	0.110 U
31SB-21-05 (FD)	AOC 31SB-21-05-40-41-DUP37	40	41	07/01/2022	**0.0770 J**	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	**0.0400 J**	**0.390**	**0.0920 J**	0.0480 U	**2.60**	**0.230 J**	0.0970 U	0.0480 U	0.0970 U
31SB-21-05 (FD)	AOC 31SB-21-05-DUP36	25	26	07/01/2022	0.0980 U	**0.230**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.490**	**0.0760 J**	0.0490 U	**24.0**	**0.270 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-06	31SB-21-06-0.5-1	0.5	1	06/30/2022	**0.490**	**3.20**	0.110 U	0.0530 U	0.110 U	**0.170 J**	**0.0600 J**	**0.0920 J**	**2.10**	**0.130 J**	**0.0940 J**	**28.0**	**0.260 J**	0.110 U	0.0530 U	**0.0640 J**
31SB-21-06	31SB-21-06-11-12	11	12	06/30/2022	**0.110 J**	**10.0**	0.110 U	0.0560 U	0.110 U	**0.0650 J**	0.110 U	**0.0590 J**	**1.20**	**0.180 J**	**0.0790 J**	**190**	**0.250 J**	0.110 U	0.0560 U	0.110 U
31SB-21-06	31SB-21-06-1-2	1	2	06/30/2022	**0.200 J**	**2.60**	0.0980 U	**0.0390 J**	0.0980 U	**0.240**	0.0980 U	**0.0780 J**	**1.10**	**0.0380 J**	**0.0760 J**	**17.0**	**0.150 J**	0.0980 U	0.0490 U	**0.0560 J**
31SB-21-06	31SB-21-06-13-14	13	14	06/30/2022	**0.0700 J**	**3.00**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.0420 J**	**1.20**	**0.180 J**	**0.0470 J**	**66.0**	**0.230 J**	0.0940 UJ	0.0470 U	0.0940 U
31SB-21-06	31SB-21-06-15-16	15	16	06/30/2022	**0.450**	**1.90**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0680 J**	**3.90**	**0.170 J**	**0.0490 J**	**170**	**1.60**	0.100 UJ	0.0520 U	0.100 U
31SB-21-06	31SB-21-06-17-18	17	18	06/30/2022	**0.530**	**1.30**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0610 J**	**4.20**	**0.120 J**	**0.0570 J**	**190**	**2.00**	0.0980 U	0.0490 U	0.0980 U
31SB-21-06	31SB-21-06-19-20	19	20	06/30/2022	**0.210 J**	**0.450**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**3.80**	**0.160 J**	**0.0370 J**	**150**	**1.40**	0.100 U	0.0520 U	0.100 U
31SB-21-06	31SB-21-06-2-3	2	3	06/30/2022	**0.240 J**	**10.0**	**0.200**	**0.450**	0.100 U	**0.130 J**	**0.0530 J**	**0.0540 J**	**1.10**	**0.110 J**	**0.130 J**	**190**	**0.250 J**	0.100 U	0.0500 U	**0.0620 J**
31SB-21-06	31SB-21-06-25-26	25	26	06/30/2022	**0.150 J**	**0.100 J**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**3.30**	**0.170 J**	0.0500 U	**84.0**	**0.770**	0.0990 U	0.0500 U	0.0990 U
31SB-21-06	31SB-21-06-30-31	30	31	06/30/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.860**	**0.130 J**	0.0520 U	**22.0**	**0.130 J**	0.100 U	0.0520 U	0.100 U
31SB-21-06	31SB-21-06-35-36	35	36	06/30/2022	**0.0530 J**	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.0420 J**	**1.20**	**0.160 J**	0.0490 U	**44.0**	**0.190 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-06	31SB-21-06-40-41	40	41	06/30/2022	0.0960 U	**0.0650 J**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.960**	**0.110 J**	0.0480 U	**33.0**	**0.180 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-06	31SB-21-06-45-46	45	46	06/30/2022	0.0990 U	**0.0730 J**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.830**	**0.100 J**	0.0500 U	**28.0**	**0.170 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-06	31SB-21-06-50-51	50	51	06/30/2022	**0.0710 J**	**0.180 J**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0610 J**	**1.60**	**0.110 J**	0.0490 U	**58.0**	**0.260 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-06	31SB-21-06-55-56	55	56	06/30/2022	**0.100 J**	**0.290**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0650 J**	**2.10**	**0.110 J**	**0.0240 J**	**100**	**0.330**	0.0960 U	0.0480 U	0.0960 U
31SB-21-06	31SB-21-06-5-6	5	6	06/30/2022	**1.00**	**61.0**	0.100 U	0.0510 U	0.100 U	**0.110 J**	0.100 U	**0.140 J**	**3.00**	**0.220**	**0.450**	**760**	**1.30**	0.100 U	0.0510 U	0.100 U
31SB-21-06	31SB-21-06-61-62	61	62	06/30/2022	**0.110 J**	**3.70**	0.110 U	**0.0880 J**	0.110 U	**0.0930 J**	0.110 U	0.110 U	**1.20**	**0.170 J**	**0.0870 J**	**860**	**0.300 J**	0.110 U	0.0540 U	0.110 U
31SB-21-06	31SB-21-06-7-8	7	8	06/30/2022	**0.390**	**24.0**	**0.0590 J**	0.0480 U	0.0950 U	**0.260**	0.0950 U	**0.220**	**1.60**	**0.130 J**	**0.170 J**	**400**	**0.450**	0.0950 U	0.0480 U	0.0950 U
31SB-21-06	31SB-21-06-9-10	9	10	06/30/2022	**0.270 J**	**17.0**	**0.110 J**	0.0510 U	0.100 U	**0.240**	0.100 U	**0.140 J**	**2.10**	**0.130 J**	**0.110 J**	**480**	**0.400**	0.100 UJ	0.0510 U	0.100 U
31SB-21-06 (FD)	AOC31SB-21-06-25-26 DUP30	25	26	06/30/2022	**0.140 J**	**0.110 J**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**3.30**	**0.140 J**	0.0490 U	**89.0**	**0.730**	0.0980 U	0.0490 U	0.0980 U
31SB-21-06 (FD)	AOC31SB-21-06-35-36 DUP31	35	36	06/30/2022	**0.0400 J**	**0.0360 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0430 J**	**1.40**	**0.150 J**	0.0500 U	**55.0**	**0.230 J**	0.100 U	0.0500 U	0.100 U
31SB-21-06 (FD)	AOC31SB-21-06-45-46 DUP32	45	46	06/30/2022	**0.0330 J**	**0.0920 J**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.890**	**0.100 J**	0.0480 U	**31.0**	**0.180 J**	0.0960 U	0.0480 U	0.0960 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-07	31SB-21-07-0.5-1	0.5	1	06/24/2022	**0.0540 J**	**0.140 J**	0.110 U	0.0560 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.240**	**0.0400 J**	**0.0250 J**	**2.40**	**0.0760 J**	0.110 U	0.0560 U	0.110 U
31SB-21-07	31SB-21-07-11-12	11	12	06/24/2022	**0.510**	**2.80**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.110 J**	**1.50**	**0.0590 J**	**0.300**	**90.0**	**1.60**	0.120 U	0.0580 U	0.120 U
31SB-21-07	31SB-21-07-1-2	1	2	06/24/2022	0.130 U	0.130 U	0.130 U	0.0630 U	0.130 U	0.130 U	0.130 U	0.130 U	**0.0980 J**	0.130 U	0.0630 U	**1.00**	0.190 U	0.130 U	0.0630 U	0.130 U
31SB-21-07	31SB-21-07-13-14	13	14	06/24/2022	**0.690**	**1.40**	0.120 U	0.0590 U	0.120 U	0.120 U	0.120 U	**0.130 J**	**2.60**	**0.0980 J**	**0.190 J**	**90.0**	**1.60**	0.120 U	0.0590 U	0.120 U
31SB-21-07	31SB-21-07-15-16	15	16	06/24/2022	**2.70**	**0.240 J**	0.130 U	0.0630 U	0.130 U	0.130 U	0.130 U	**0.250**	**7.20**	**0.190 J**	**0.0640 J**	**57.0**	**2.00**	0.130 U	0.0630 U	0.130 U
31SB-21-07	31SB-21-07-17-18	17	18	06/24/2022	**3.00**	**0.250**	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	**0.290**	**4.50**	**0.310**	**0.0920 J**	**63.0**	**2.70**	0.0970 U	0.0490 U	0.0970 U
31SB-21-07	31SB-21-07-19-20	19	20	06/24/2022	**1.90**	**0.0820 J**	0.110 U	0.0550 U	0.110 U	0.110 U	0.110 U	**0.190 J**	**3.50**	**0.210 J**	**0.0330 J**	**22.0**	**2.30**	0.110 U	0.0550 U	0.110 U
31SB-21-07	31SB-21-07-2-3	2	3	06/24/2022	**0.0390 J**	**6.00**	**0.0840 J**	**0.260 J**	0.100 U	**0.280**	0.100 U	**0.0710 J**	**0.160 J**	0.100 U	**0.0790 J**	**11.0**	**0.110 J**	0.100 U	0.0510 U	**0.100 J**
31SB-21-07	31SB-21-07-25-26	25	26	06/24/2022	**0.690**	**0.0610 J**	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.0950 J**	**1.80**	**0.0830 J**	0.0540 U	**13.0**	**1.10**	0.110 U	0.0540 U	0.110 U
31SB-21-07	31SB-21-07-30-31	30	31	06/24/2022	**0.190 J**	**0.0590 J**	0.120 U	0.0590 U	0.120 U	0.120 U	0.120 U	**0.110 J**	**0.880**	**0.150 J**	**0.0290 J**	**12.0**	**0.550**	0.120 U	0.0590 U	0.120 U
31SB-21-07	31SB-21-07-35-36	35	36	06/24/2022	**0.130 J**	**0.120 J**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.0790 J**	**0.790**	**0.120 J**	0.0510 U	**15.0**	**0.400**	0.100 U	0.0510 U	0.100 U
31SB-21-07	31SB-21-07-40-41	40	41	06/24/2022	**0.110 J**	**0.140 J**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.100 J**	**0.920**	**0.0770 J**	0.0600 U	**13.0**	**0.380**	0.120 U	0.0600 U	0.120 U
31SB-21-07	31SB-21-07-45-46	45	46	06/24/2022	**0.300**	**0.400**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.0570 J**	**1.00**	**0.0380 J**	**0.0360 J**	**24.0 J**	**0.830**	0.0940 U	0.0470 U	0.0940 U
31SB-21-07 (FD)	31SB-21-07-45-46 DUP18	45	46	06/24/2022	**0.260 J**	**0.400**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.0700 J**	**0.840**	**0.0490 J**	**0.0320 J**	**21.0**	**0.680**	0.120 U	0.0600 U	0.120 U
31SB-21-07	31SB-21-07-50-51	50	51	06/24/2022	**0.260 J**	**0.550**	0.120 U	0.0590 U	0.120 U	0.120 U	0.120 U	**0.0920 J**	**0.410**	**0.0480 J**	0.0590 U	**11.0**	**0.280 J**	0.120 U	0.0590 U	0.120 U
31SB-21-07	31SB-21-07-55-56	55	56	06/24/2022	**0.160 J**	**0.460**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0590 J**	**0.260**	0.0960 U	0.0480 U	**7.40**	**0.140 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-07 (FD)	31SB-21-07-55-56 DUP19	55	56	06/24/2022	**0.200 J**	**0.470**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.0770 J**	**0.320**	0.120 U	0.0580 U	**8.50**	**0.190 J**	0.120 U	0.0580 U	0.120 U
31SB-21-07	31SB-21-07-5-6	5	6	06/24/2022	0.120 U	**43.0**	0.120 U	0.0590 U	0.120 U	**0.0630 J**	0.120 U	**0.0890 J**	**0.180 J**	**0.0460 J**	**0.0980 J**	**26.0**	**0.140 J**	0.120 U	0.0590 U	0.120 U
31SB-21-07	31SB-21-07-61-62	61	62	06/24/2022	**0.0990 J**	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.0400 J**	**0.290**	0.110 U	0.0530 U	**0.360**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-07	31SB-21-07-7-8	7	8	06/24/2022	0.120 U	**13.0**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.140 J**	**0.340**	**0.0460 J**	**0.180 J**	**110**	**0.350 J**	0.120 U	0.0600 U	0.120 U
31SB-21-07	31SB-21-07-9-11	9	11	06/24/2022	**0.0370 J**	**14.0**	0.120 U	0.0620 U	0.120 U	0.120 U	0.120 U	**0.110 J**	**0.550**	**0.0500 J**	**0.120 J**	**97.0**	**0.470**	0.120 U	0.0620 U	0.120 U
31SB-21-08	31SB-21-08-0.5-1	0.5	1	06/27/2022	0.110 U	**0.770**	0.110 U	0.0530 U	0.110 U	**0.170 J**	0.110 U	**0.0980 J**	**0.240**	**0.0860 J**	**0.0910 J**	**5.80**	**0.130 J**	0.110 U	0.0530 U	**0.0500 J**
31SB-21-08	31SB-21-08-0-0.5	0	0.5	06/27/2022	**0.420**	**0.530**	0.100 U	0.0500 U	**0.0480 J**	**0.410**	**0.0890 J**	**0.130 J**	**0.930**	**0.210**	**0.150 J**	**15.0**	**0.350**	**0.0370 J**	**0.0450 J**	**0.300**
31SB-21-08	31SB-21-08-11-12	11	12	06/27/2022	**0.0270 J**	**2.70**	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	**0.0810 J**	**0.820**	**0.0320 J**	**0.0460 J**	**70.0**	**0.320**	0.0970 U	0.0490 U	0.0970 U
31SB-21-08	31SB-21-08-1-2	1	2	06/27/2022	0.100 U	**13.0**	**0.0660 J**	0.0510 U	0.100 U	**0.180 J**	0.100 U	**0.0710 J**	**0.240**	**0.0560 J**	**0.0550 J**	**7.50**	**0.130 J**	0.100 U	0.0510 U	0.100 U
31SB-21-08	31SB-21-08-13-14	13	14	06/27/2022	**0.0330 J**	**4.50**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0840 J**	**0.790**	**0.0570 J**	**0.0720 J**	**130**	**0.490**	0.100 U	0.0520 U	0.100 U
31SB-21-08	31SB-21-08-15-16	15	16	06/27/2022	**0.690**	**9.30**	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.0700 J**	**1.40**	**0.0670 J**	**0.0390 J**	**110**	**1.20**	0.110 U	0.0540 U	0.110 U
31SB-21-08	31SB-21-08-17-18	17	18	06/27/2022	**0.540**	**2.80**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.450**	0.0980 U	0.0490 U	**26.0**	**0.350**	0.0980 U	0.0490 U	0.0980 U
31SB-21-08	31SB-21-08-19-20	19	20	06/27/2022	**0.400**	**0.790**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.370**	**0.0310 J**	0.0500 U	**11.0**	**0.290 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-08	31SB-21-08-2-3	2	3	06/27/2022	**0.0400 J**	**62.0**	0.0990 U	0.0500 U	0.0990 U	**0.270**	0.0990 U	**0.0910 J**	**0.440**	**0.120 J**	**0.140 J**	**35.0**	**0.650**	0.0990 U	0.0500 U	0.0990 U
31SB-21-08	31SB-21-08-25-26	25	26	06/27/2022	0.100 U	**0.520**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0930 J**	0.100 U	0.0500 U	**4.10**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-08	31SB-21-08-30-31	30	31	06/27/2022	0.120 U	**0.360**	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.250**	0.120 U	0.0580 U	**4.00**	0.170 U	0.120 U	0.0580 U	0.120 U
31SB-21-08	31SB-21-08-35-36	35	36	06/27/2022	0.0990 U	**0.0440 J**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.280**	0.0990 U	0.0500 U	**1.50**	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-08	31SB-21-08-40-41	40	41	06/27/2022	0.0940 U	**0.0520 J**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.240**	0.0940 U	0.0470 U	**1.60**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-08	31SB-21-08-45-46	45	46	06/27/2022	0.100 U	**0.170 J**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.570**	0.100 U	0.0510 U	**4.70 J**	**0.0610 J**	0.100 U	0.0510 U	0.100 U
31SB-21-08	31SB-21-08-50-51	50	51	06/27/2022	0.0990 U	**0.0810 J**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.360**	0.0990 U	0.0500 U	**2.30**	**0.0640 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-08	31SB-21-08-55-56	55	56	06/27/2022	**0.0390 J**	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.170 J**	0.100 U	0.0520 U	**2.50**	**0.0860 J**	0.100 U	0.0520 U	0.100 U
31SB-21-08	31SB-21-08-5-6	5	6	06/27/2022	**0.0550 J**	**1.60**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.120 J**	**0.970**	**0.0380 J**	**0.0680 J**	**41.0**	**0.880**	0.0960 U	0.0480 U	0.0960 U
31SB-21-08	31SB-21-08-62-63	62	63	06/27/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0440 J**	0.100 U	0.0500 U	**8.80**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-08	31SB-21-08-7-8	7	8	06/27/2022	**0.0350 J**	**5.00**	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	**0.0930 J**	**0.840**	**0.0400 J**	**0.0650 J**	**58.0**	**0.590**	0.120 U	0.0600 U	0.120 U
31SB-21-08	31SB-21-08-9-10	9	10	06/27/2022	**0.0360 J**	**8.20**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0960 J**	**0.640**	**0.0450 J**	**0.0550 J**	**47.0**	**0.350**	0.0960 U	0.0480 U	0.0960 U
31SB-21-08 (FD)	AOC31SB-21-08-35-36 DUP22	35	36	06/27/2022	0.100 U	**0.0440 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.220**	0.100 U	0.0500 U	**1.30**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-08 (FD)	AOC31SB-21-08-55-56 DUP23	55	56	06/27/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.160 J**	0.0980 U	0.0490 U	**2.10**	**0.0660 J**	0.0980 U	0.0490 U	0.0980 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-09	31SB-21-09-0.5-1	0.5	1	06/28/2022	**0.0770 J**	**2.50**	**0.0540 J**	0.0520 U	0.100 U	**0.800**	**0.240**	**0.190 J**	**0.490**	**0.110 J**	**0.160 J**	**7.90**	**0.210 J**	0.100 U	**0.0370 J**	**0.710**
31SB-21-09	31SB-21-09-0-0.5	0	0.5	06/28/2022	**0.120 J**	**2.00**	0.100 U	0.0510 U	0.100 U	**0.630**	**0.120 J**	**0.240**	**0.970**	**0.110 J**	**0.170 J**	**25.0**	**0.320**	0.100 U	**0.0340 J**	**0.720**
31SB-21-09	31SB-21-09-11-12	11	12	06/28/2022	**0.190 J**	**14.0**	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.180 J**	**0.510**	**0.0400 J**	**0.0980 J**	**150**	**0.450**	0.0990 U	0.0490 U	0.0990 U
31SB-21-09	31SB-21-09-1-2	1	2	06/28/2022	**0.0370 J**	**6.10**	**0.190 J**	**0.130 J**	0.0980 U	**1.10**	0.0980 U	**0.200**	**0.420**	**0.0920 J**	**0.110 J**	**8.20**	**0.320**	0.0980 U	0.0490 U	**0.360**
31SB-21-09	31SB-21-09-13-14	13	14	06/28/2022	**0.330**	**12.0**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.120 J**	**0.570**	**0.0510 J**	**0.0510 J**	**94.0**	**0.260 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-09	31SB-21-09-15-16	15	16	06/28/2022	**1.50**	**54.0**	0.110 U	0.0530 U	0.110 U	**0.170 J**	0.110 U	**0.170 J**	**2.40**	**0.430**	**0.140 J**	**800**	**0.430**	0.110 U	0.0530 U	0.110 U
31SB-21-09	31SB-21-09-17-18	17	18	06/28/2022	**0.490**	**9.70**	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.0730 J**	**1.00**	**0.120 J**	**0.0330 J**	**150**	**0.140 J**	0.110 U	0.0540 U	0.110 U
31SB-21-09	31SB-21-09-19-20	19	20	06/28/2022	**0.290 J**	**2.20**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.0390 J**	**0.590**	**0.0570 J**	0.0510 U	**46.0**	**0.0800 J**	0.100 U	0.0510 U	0.100 U
31SB-21-09	31SB-21-09-2-3	2	3	06/28/2022	0.100 U	**39.0**	0.100 U	0.0520 U	0.100 U	**1.30**	0.100 U	**0.240**	**0.410**	**0.110 J**	**0.290**	**29.0**	**0.600**	0.100 U	0.0520 U	0.100 U
31SB-21-09	31SB-21-09-25-26	25	26	06/28/2022	**0.0700 J**	**0.570**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.750**	**0.0600 J**	0.0490 U	**19.0**	**0.0790 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-09	31SB-21-09-30-31	30	31	06/28/2022	**0.0810 J**	**0.460**	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.730**	**0.0510 J**	0.0480 U	**16.0**	**0.0830 J**	0.0970 U	0.0480 U	0.0970 U
31SB-21-09	31SB-21-09-35-36	35	36	06/28/2022	**0.0380 J**	**0.350**	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.480**	0.0970 U	0.0490 U	**13.0**	**0.0580 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-09	31SB-21-09-40-41	40	41	06/28/2022	**0.0280 J**	**0.430**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.360**	0.0990 U	0.0500 U	**16.0**	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-09	31SB-21-09-45-46	45	46	06/28/2022	0.0970 U	**0.420**	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.330**	0.0970 U	0.0480 U	**16.0**	0.140 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-09	31SB-21-09-50-51	50	51	06/28/2022	**0.170 J**	**13.0**	0.100 U	0.0520 U	0.100 U	**0.0690 J**	0.100 U	0.100 U	**2.60**	**0.0980 J**	**0.120 J**	**500**	**0.230 J**	0.100 U	0.0520 U	0.100 U
31SB-21-09	31SB-21-09-55-56	55	56	06/28/2022	0.100 U	**0.0370 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0340 J**	0.100 U	0.0500 U	**5.00**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-09	31SB-21-09-5-6	5	6	06/28/2022	**0.0490 J**	**53.0**	0.100 U	0.0500 U	0.100 U	**0.190 J**	0.100 U	**0.240**	**0.950**	**0.0440 J**	**0.330**	**15.0**	**0.470**	0.100 U	0.0500 U	0.100 U
31SB-21-09	31SB-21-09-62-63	62	63	06/28/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0650 J**	0.100 U	0.0500 U	**1.60**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-09	31SB-21-09-7-8	7	8	06/28/2022	0.0980 U	**26.0**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.140 J**	**0.560**	0.0980 U	**0.130 J**	**9.10**	**0.240 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-09	31SB-21-09-9-10	9	10	06/28/2022	**0.0550 J**	**26.0**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.120 J**	**0.460**	0.100 U	**0.100 J**	**54.0**	**0.280 J**	0.100 U	0.0510 U	0.100 U
31SB-21-09 (FD)	AOC31SB-21-09-25-26 DUP26	25	26	06/28/2022	**0.0430 J**	**0.390**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.490**	**0.0550 J**	0.0480 U	**12.0**	**0.0540 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-09 (FD)	AOC31SB-21-09-45-46 DUP27	45	46	06/28/2022	0.0960 U	**0.340**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.310**	0.0960 U	0.0480 U	**14.0**	0.140 U	0.0960 U	0.0480 U	0.0960 U
31SB-21-10	31SB-21-10-0.5-1	0.5	1	06/23/2022	**0.0280 J**	0.0990 U	0.0990 U	**0.0270 J**	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0360 J**	**0.0410 J**	**0.0580 J**	**0.520**	0.150 U	0.0990 U	**0.0260 J**	0.0990 U
31SB-21-10	31SB-21-10-0-0.5	0	0.5	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.160 J**	**0.0340 J**	0.100 U	**0.0380 J**	**0.0400 J**	**0.0620 J**	**0.250 J**	0.150 U	0.100 U	**0.0300 J**	**0.0510 J**
31SB-21-10	31SB-21-10-11-12	11	12	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0560 J**	**0.120 J**	**0.0760 J**	0.0500 U	0.100 U	**0.150 J**	0.100 U	0.0500 U	0.100 U
31SB-21-10	31SB-21-10-1-2	1	2	06/23/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0430 J**	**0.0570 J**	**0.0740 J**	**0.140 J**	**6.00**	**0.130 J**	0.100 U	0.0520 U	0.100 U
31SB-21-10	31SB-21-10-13-14	13	14	06/23/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0860 J**	**0.0560 J**	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-10	31SB-21-10-15-16	15	16	06/23/2022	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.310**	**0.0850 J**	0.0480 U	0.0950 U	0.140 U	0.0950 U	0.0480 U	0.0950 U
31SB-21-10	31SB-21-10-17-18	17	18	06/23/2022	0.130 U	0.130 U	0.130 U	0.0640 U	0.130 U	0.130 U	0.130 U	0.130 U	**0.340**	**0.0710 J**	0.0640 U	0.130 U	0.190 U	0.130 U	0.0640 U	0.130 U
31SB-21-10	31SB-21-10-19-20	19	20	06/23/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.130 J**	0.110 U	0.0530 U	0.110 U	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-10	31SB-21-10-2-3	2	3	06/23/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0590 J**	**0.0580 J**	**0.0650 J**	**8.10**	**0.160 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-10	31SB-21-10-25-26	25	26	06/23/2022	0.0950 U	0.0950 U	0.0950 U	0.0470 U	0.0950 U	0.0950 U	0.0950 U	**0.0600 J**	**0.140 J**	0.0950 U	0.0470 U	**0.120 J**	**0.230 J**	0.0950 U	0.0470 U	0.0950 U
31SB-21-10 (FD)	31SB-21-10-25-26 DUP16	25	26	06/23/2022	0.100 UJ	0.100 UJ	0.100 UJ	0.0520 UJ	0.100 UJ	0.100 UJ	0.100 UJ	**0.0630 J**	**0.170 J**	0.100 UJ	0.0520 UJ	**0.140 J**	**0.210 J**	0.100 UJ	0.0520 UJ	0.100 UJ
31SB-21-10	31SB-21-10-30-31	30	31	06/23/2022	**0.960**	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	**0.360**	**1.40**	**0.0460 J**	0.0480 U	**1.60 J**	**1.60**	0.0950 U	0.0480 U	0.0950 U
31SB-21-10	31SB-21-10-35-36	35	36	06/23/2022	**0.0440 J**	**0.140 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.200**	**1.40**	**0.0370 J**	**0.0270 J**	**8.80**	**0.640**	0.100 U	0.0500 U	0.100 U
31SB-21-10	31SB-21-10-40-41	40	41	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.0520 J**	**0.310**	0.100 U	0.0510 U	**1.90**	**0.110 J**	0.100 U	0.0510 U	0.100 U
31SB-21-10	31SB-21-10-45-46	45	46	06/23/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	**0.0990 J**	**0.460**	**0.0710 J**	0.0490 U	**0.120 J**	**0.0780 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-10 (FD)	31SB-21-10-45-46 DUP17	45	46	06/23/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.0860 J**	**0.380**	**0.0740 J**	0.0490 U	0.0990 U	**0.0770 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-10	31SB-21-10-50-51	50	51	06/23/2022	**0.0250 J**	0.0900 U	0.0900 U	0.0450 U	0.0900 U	0.0900 U	0.0900 U	**0.140 J**	**0.900**	**0.0880 J**	0.0450 U	0.0900 U	**0.160 J**	0.0900 U	0.0450 U	0.0900 U
31SB-21-10	31SB-21-10-55-56	55	56	06/23/2022	**0.0890 J**	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0520 J**	**0.540**	**0.170 J**	0.0520 U	0.100 U	**0.140 J**	0.100 U	0.0520 U	0.100 U
31SB-21-10	31SB-21-10-5-6	5	6	06/23/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.150 J**	**0.150 J**	**0.290**	0.0540 U	**1.50 J**	**0.560**	0.110 U	0.0540 U	0.110 U
31SB-21-10	31SB-21-10-60-61	60	61	06/23/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0610 J**	**0.320**	**0.110 J**	0.0480 U	**0.150 J**	**0.0980 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-10	31SB-21-10-7-8	7	8	06/23/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.160 J**	**0.150 J**	**0.390**	0.0490 U	0.0980 U	**0.670**	0.0980 U	0.0490 U	0.0980 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-10	31SB-21-10-9-10	9	10	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0560 J**	**0.130 J**	**0.130 J**	0.0500 U	0.100 U	**0.180 J**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-0.5-1	0.5	1	06/27/2022	0.100 U	**2.50**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.350**	**0.270**	**0.0500 J**	**0.220**	**30.0**	**0.430**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-0-0.5	0	0.5	06/27/2022	**0.120 J**	**14.0**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.130 J**	**0.170 J**	**0.0390 J**	**0.240**	**44.0**	**0.280 J**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-11-12	11	12	06/27/2022	**0.120 J**	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.330**	**1.60**	**0.0360 J**	0.0480 U	**0.0900 J**	**0.730**	0.0960 U	0.0480 U	0.0960 U
31SB-21-11	31SB-21-11-1-2	1	2	06/27/2022	**0.0540 J**	**19.0**	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.320**	**0.550**	**0.0450 J**	**0.100 J**	**48.0**	**0.870**	0.0990 U	0.0500 U	0.0990 U
31SB-21-11	31SB-21-11-13-14	13	14	06/27/2022	**0.290**	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	**0.300**	**0.890**	0.0970 U	0.0490 U	**0.320**	**0.650**	0.0970 U	0.0490 U	0.0970 U
31SB-21-11	31SB-21-11-15-16	15	16	06/27/2022	**0.300**	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.140 J**	**0.660**	**0.0400 J**	0.0480 U	**0.420**	**0.460**	0.0960 U	0.0480 U	0.0960 U
31SB-21-11	31SB-21-11-17-18	17	18	06/27/2022	**1.10**	**2.60**	0.120 U	0.0590 U	0.120 U	0.120 U	0.120 U	**0.150 J**	**1.10**	**0.100 J**	**0.0500 J**	**62.0**	**0.660**	0.120 U	0.0590 U	0.120 U
31SB-21-11	31SB-21-11-19-20	19	20	06/27/2022	**0.410**	**0.300**	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.0470 J**	**0.480**	0.110 U	0.0540 U	**12.0**	**0.250 J**	0.110 U	0.0540 U	0.110 U
31SB-21-11	31SB-21-11-2-3	2	3	06/27/2022	**0.330**	**22.0**	0.110 U	0.0560 U	0.110 U	0.110 U	0.110 U	**0.680**	**1.60**	**0.260**	**0.460**	**130**	**1.70**	0.110 U	0.0560 U	0.110 U
31SB-21-11	31SB-21-11-25-26	25	26	06/27/2022	**0.220 J**	**0.200**	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	**0.0640 J**	**0.900**	**0.0850 J**	0.0470 U	**5.90**	**0.410**	0.0940 U	0.0470 U	0.0940 U
31SB-21-11	31SB-21-11-30-31	30	31	06/27/2022	**0.0940 J**	**0.120 J**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	**0.0530 J**	**0.830**	**0.0690 J**	0.0480 U	**8.00**	**0.420**	0.0950 U	0.0480 U	0.0950 U
31SB-21-11	31SB-21-11-35-36	35	36	06/27/2022	**0.230 J**	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.110 J**	**1.60**	**0.0510 J**	0.0500 U	**5.80**	**0.760**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-40-41	40	41	06/27/2022	**0.130 J**	0.110 U	0.110 U	0.0550 U	0.110 U	0.110 U	0.110 U	**0.0690 J**	**0.810**	0.110 U	0.0550 U	**8.80**	**0.310 J**	0.110 U	0.0550 U	0.110 U
31SB-21-11	31SB-21-11-45-46	45	46	06/27/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.200**	0.100 U	0.0500 U	**2.00**	**0.0590 J**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-50-51	50	51	06/27/2022	**0.0520 J**	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.290**	0.100 U	0.0510 U	**2.20**	**0.110 J**	0.100 U	0.0510 U	0.100 U
31SB-21-11	31SB-21-11-55-56	55	56	06/27/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.120 J**	0.120 U	0.0580 U	**0.240 J**	0.170 U	0.120 U	0.0580 U	0.120 U
31SB-21-11	31SB-21-11-5-6	5	6	06/27/2022	**0.0550 J**	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**3.20**	**27.0**	**0.540**	0.0500 U	**0.0620 J**	**0.370**	0.100 U	0.0500 U	0.100 U
31SB-21-11	31SB-21-11-61-62	61	62	06/27/2022	**0.110 J**	**0.0600 J**	0.110 U	0.0550 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.130 J**	0.110 U	0.0550 U	**2.10**	**0.0900 J**	0.110 U	0.0550 U	0.110 U
31SB-21-11	31SB-21-11-7-8	7	8	06/27/2022	**0.950**	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**2.50**	**16.0**	**0.440**	0.0500 U	**0.250 J**	**1.10**	0.0990 U	0.0500 U	0.0990 U
31SB-21-11	31SB-21-11-9-10	9	10	06/27/2022	**0.950**	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**1.70**	**8.40**	**0.290**	0.0480 U	**0.210 J**	**0.910**	0.0960 U	0.0480 U	0.0960 U
31SB-21-11 (FD)	AOC31-SB-21-11-30-31 DUP20	30	31	06/27/2022	**0.0970 J**	**0.0920 J**	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.780**	**0.0560 J**	0.0490 U	**7.10**	**0.390**	0.0970 U	0.0490 U	0.0970 U
31SB-21-11 (FD)	AOC31-SB-21-11-45-46 DUP21	45	46	06/27/2022	0.120 U	0.120 U	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.190 J**	0.120 U	0.0600 U	**1.40**	0.180 U	0.120 U	0.0600 U	0.120 U
31SB-21-12	31SB-21-12-0.5-1	0.5	1	06/28/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0340 J**	**0.360**	**0.0550 J**	0.100 U	0.0500 U	0.100 U
31SB-21-12	31SB-21-12-0-0.5	0	0.5	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.0800 J**	**0.120 J**	0.100 U	**0.0310 J**	0.100 U	**0.0260 J**	**0.310**	0.150 U	**0.0550 J**	**0.0770 J**	**0.140 J**
31SB-21-12	31SB-21-12-11-12	11	12	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**1.40**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-12	31SB-21-12-1-2	1	2	06/28/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.180 J**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-12	31SB-21-12-13-14	13	14	06/28/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0470 U	**0.480**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-12	31SB-21-12-15-16	15	16	06/28/2022	0.0930 U	0.0930 U	0.0930 U	0.0460 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0460 U	**0.0890 J**	0.140 U	0.0930 U	0.0460 U	0.0930 U
31SB-21-12	31SB-21-12-17-18	17	18	06/28/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.150 U	0.0990 UJ	0.0490 U	0.0990 U
31SB-21-12	31SB-21-12-19-20	19	20	06/28/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.150 U	0.0990 U	0.0490 U	0.0990 U
31SB-21-12	31SB-21-12-2-3	2	3	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.200 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-12	31SB-21-12-25-26	25	26	06/28/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-12	31SB-21-12-30-31	30	31	06/28/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-12	31SB-21-12-35-36	35	36	06/28/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.150 U	0.0990 UJ	0.0500 U	0.0990 U
31SB-21-12	31SB-21-12-40-41	40	41	06/28/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-12	31SB-21-12-45-46	45	46	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0460 J**	0.100 U	0.0510 U	0.100 U	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-12	31SB-21-12-50-51	50	51	06/28/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0700 J**	0.100 U	0.0520 U	0.100 U	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-12	31SB-21-12-55-56	55	56	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-12	31SB-21-12-5-6	5	6	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.270 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-12	31SB-21-12-58-59	58	59	06/28/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-12	31SB-21-12-7-8	7	8	06/28/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0490 U	**0.320**	0.150 U	0.0990 U	0.0490 U	0.0990 U
31SB-21-12	31SB-21-12-9-10	9	10	06/28/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.150 J**	0.150 U	0.100 U	0.0510 U	0.100 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-12 (FD)	AOC31SB-21-12-30-31 DUP24	30	31	06/28/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-12 (FD)	AOC31SB-21-12-50-51 DUP25	50	51	06/28/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0580 J**	0.110 U	0.0540 U	0.110 U	0.160 U	0.110 U	0.0540 U	0.110 U
31SB-21-13	31SB-21-13-0.5-1	0.5	1	06/29/2022	0.0950 U	**1.50**	0.0950 UJ	0.0470 UJ	0.0950 U	0.0950 U	0.0950 UJ	0.0950 U	**0.580**	0.0950 U	**0.0340 J**	**64.0**	**0.210 J**	0.0950 UJ	0.0470 U	0.0950 U
31SB-21-13	31SB-21-13-11-12	11	12	06/29/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.190 J**	**2.80**	**0.110 J**	**0.0630 J**	**0.300**	**0.220 J**	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-1-2	1	2	06/29/2022	**0.0360 J**	**2.80**	0.100 UJ	0.0500 UJ	0.100 U	0.100 U	0.100 U	**0.0680 J**	**0.670**	**0.0360 J**	**0.120 J**	**150**	**0.330**	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-13-14	13	14	06/29/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.570**	0.0970 U	0.0490 U	**0.0560 J**	**0.0640 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-13	31SB-21-13-15-16	15	16	06/29/2022	0.100 U	0.100 U	0.100 UJ	0.0520 UJ	0.100 U	0.100 U	0.100 UJ	0.100 U	**0.760**	0.100 U	0.0520 U	**0.230 J**	**0.210 J**	0.100 U	0.0520 U	0.100 UJ
31SB-21-13	31SB-21-13-17-18	17	18	06/29/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.490**	0.0990 U	0.0490 U	**0.250 J**	**0.170 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-13	31SB-21-13-19-20	19	20	06/29/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.190**	0.0960 U	0.0480 U	**0.0860 J**	**0.0630 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-13	31SB-21-13-2-3	2	3	06/29/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.490**	0.0980 U	**0.0490 J**	**12.0 J**	**0.190 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-13	31SB-21-13-25-26	25	26	06/29/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.330**	0.100 U	0.0500 U	**3.40**	**0.0840 J**	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-30-31	30	31	06/29/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.360**	0.100 U	0.0510 U	**4.90**	**0.110 J**	0.100 U	0.0510 U	0.100 U
31SB-21-13	31SB-21-13-35-36	35	36	06/29/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.570**	0.0940 U	0.0470 U	**2.80 J**	**0.120 J**	0.0940 U	0.0470 U	0.0940 U
31SB-21-13	31SB-21-13-40-41	40	41	06/29/2022	0.0910 U	0.0910 U	0.0910 U	0.0460 U	0.0910 U	0.0910 U	0.0910 U	0.0910 U	**0.610**	0.0910 U	0.0460 U	**2.90**	**0.140 J**	0.0910 U	0.0460 U	0.0910 U
31SB-21-13	31SB-21-13-45-46	45	46	06/29/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.960**	0.0960 U	0.0480 U	**6.30**	**0.180 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-13	31SB-21-13-50-51	50	51	06/29/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.220**	0.100 U	0.0500 U	**1.50**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-55-56	55	56	06/29/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0400 J**	**0.780**	**0.0490 J**	0.0500 U	**2.90**	**0.150 J**	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-5-6	5	6	06/29/2022	**0.0910 J**	**0.0800 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.310**	**25.0**	**0.150 J**	0.0500 U	**3.60**	**12.0**	0.100 U	0.0500 U	0.100 U
31SB-21-13	31SB-21-13-64-65	64	65	06/29/2022	**0.0420 J**	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.190 J**	0.0980 U	0.0490 U	**0.900 J**	**0.0660 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-13	31SB-21-13-7-8	7	8	06/29/2022	0.110 U	0.110 UJ	0.110 UJ	0.0560 UJ	0.110 U	0.110 UJ	0.110 UJ	**0.540**	**11.0**	**0.200 J**	0.0560 U	**7.20 J**	**0.550**	0.110 U	0.0560 U	0.110 UJ
31SB-21-13	31SB-21-13-9-10	9	10	06/29/2022	0.120 U	0.120 U	0.120 UJ	0.0590 UJ	0.120 U	0.120 U	0.120 U	**0.340**	**3.70**	**0.220 J**	0.0590 U	**0.200 J**	**0.430**	0.120 U	0.0590 U	0.120 U
31SB-21-13 (FD)	AOC31-SB-21-13-35-36 DUP28	35	36	06/29/2022	0.0920 U	0.0920 U	0.0920 U	0.0460 U	0.0920 U	0.0920 U	0.0920 U	0.0920 U	**0.890**	0.0920 U	0.0460 U	**6.00 J**	**0.170 J**	0.0920 U	0.0460 U	0.0920 U
31SB-21-13 (FD)	AOC31-SB-21-13-50-51 DUP29	50	51	06/29/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.210**	0.100 U	0.0510 U	**1.70**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-14	31SB-21-14-0.5-1	0	1	06/21/2022	0.100 U	**0.140 J**	0.100 U	0.0510 U	0.100 U	**0.140 J**	0.100 U	**0.0590 J**	**0.0300 J**	0.100 U	**0.0460 J**	**0.180 J**	**0.0950 J**	0.100 U	0.0510 U	0.100 U
31SB-21-14	31SB-21-14-11-12	11	12	06/21/2022	**0.0600 J**	**0.690**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.170 J**	**0.340**	**0.0390 J**	**0.200**	**14.0**	**0.580**	0.100 U	0.0510 U	0.100 U
31SB-21-14	31SB-21-14-1-2	1	2	06/21/2022	**0.0550 J**	**5.80**	0.100 U	0.0520 U	0.100 U	**0.520**	0.100 U	**0.430**	**0.160 J**	**0.0800 J**	**0.410**	**6.40**	**0.420**	0.100 U	0.0520 U	0.100 U
31SB-21-14	31SB-21-14-13-14	13	14	06/21/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	**0.0550 J**	**0.320**	0.0990 U	**0.0660 J**	**0.890**	**0.130 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-14	31SB-21-14-15-16	15	16	06/21/2022	0.100 U	**0.590**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0720 J**	**0.220**	**0.0410 J**	**0.110 J**	**8.00**	**0.150 J**	0.100 U	0.0500 U	0.100 U
31SB-21-14	31SB-21-14-17-18	17	18	06/21/2022	0.110 U	**0.420**	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.0600 J**	**0.350**	0.110 U	**0.0400 J**	**13.0**	**0.180 J**	0.110 U	0.0530 U	0.110 U
31SB-21-14	31SB-21-14-19-20	19	20	06/21/2022	**0.0620 J**	**0.710**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0910 J**	**0.620**	**0.0450 J**	**0.0590 J**	**19.0**	**0.360**	0.100 U	0.0520 U	0.100 U
31SB-21-14	31SB-21-14-2-3	2	3	06/21/2022	**0.0720 J**	**27.0**	0.110 U	0.0530 U	0.110 U	**0.410**	0.110 U	**0.480**	**0.270**	**0.0650 J**	**0.730**	**21.0**	**0.750**	0.110 U	0.0530 U	0.110 U
31SB-21-14	31SB-21-14-5-6	5	6	06/21/2022	0.100 U	**1.90**	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	**0.400**	**0.390**	**0.0990 J**	**0.390**	**57.0**	**0.640**	0.100 U	0.0510 U	0.100 U
31SB-21-14	31SB-21-14-7-8	7	8	06/21/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.170 J**	**0.370**	**0.0380 J**	**0.530**	**40.0**	**0.730**	0.110 U	0.0530 U	0.110 U
31SB-21-14	31SB-21-14-9-10	9	10	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	**0.260**	**0.630**	**0.0340 J**	0.0480 U	**0.780 J**	**0.950**	0.0970 U	0.0480 U	0.0970 U
31SB-21-15	31SB-21-15-0.5-1	0.5	1	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	**0.0830 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0560 J**	**0.420**	0.150 U	0.100 U	0.0500 U	**0.0460 J**
31SB-21-15	31SB-21-15-11-12	11	12	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0300 J**	0.100 U	0.0500 U	**0.380**	**0.0560 J**	0.100 U	0.0500 U	0.100 U
31SB-21-15	31SB-21-15-1-2	1	2	06/21/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.0580 J**	0.110 U	0.110 U	**0.110 J**	**6.50 J**	**0.170 J**	0.110 U	0.0530 U	0.110 U
31SB-21-15	31SB-21-15-13-14	13	14	06/21/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-15	31SB-21-15-15-16	15	16	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0450 J**	**0.0370 J**	0.0510 U	0.100 U	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-15	31SB-21-15-17-18	17	18	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.150 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-15	31SB-21-15-19-20	19	20	06/21/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.150 U	0.100 U	0.0520 U	0.100 U
31SB-21-15	31SB-21-15-2-3	2	3	06/21/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0320 J**	0.110 U	**0.0940 J**	**5.00 J**	**0.150 J**	0.110 U	0.0530 U	0.110 U
31SB-21-15	31SB-21-15-5-6	5	6	06/21/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0560 J**	**0.0730 J**	0.0520 U	**0.840**	**0.180 J**	0.100 U	0.0520 U	0.100 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-15	31SB-21-15-7-8	7	8	06/21/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0300 J**	0.0990 U	0.0500 U	0.0990 U	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-15	31SB-21-15-9-10	9	10	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0350 J**	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-15 (FD)	AOC31SB-21-15-1-2-DUP01	1	2	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	**0.0530 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.110 J**	**1.20 J**	**0.120 J**	0.100 U	0.0500 U	0.100 U
31SB-21-15 (FD)	AOC31SB-21-15-2-3-DUP02	2	3	06/21/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0480 J**	**0.0380 J**	**0.0670 J**	**0.0360 J**	**2.70 J**	**0.220 J**	0.100 U	0.0520 U	0.100 U
31SB-21-16	31SB-21-16-0.5-1	0.5	1	06/21/2022	0.0950 U	0.0950 U	0.0950 U	0.0470 U	0.0950 U	**0.160 J**	0.0950 U	**0.0360 J**	**0.0790 J**	**0.0590 J**	**0.0570 J**	**0.760**	**0.0530 J**	0.0950 U	0.0470 U	**0.0450 J**
31SB-21-16	31SB-21-16-11-12	11	12	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0780 J**	0.100 U	0.0510 U	**0.620**	**0.0630 J**	0.100 U	0.0510 U	0.100 U
31SB-21-16	31SB-21-16-1-2	1	2	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0610 J**	**0.0360 J**	**0.0430 J**	**0.680**	**0.0610 J**	0.100 U	0.0510 U	0.100 U
31SB-21-16	31SB-21-16-13-14	13	14	06/21/2022	0.0990 U	**1.70**	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.120 J**	0.0990 U	0.0490 U	**23.0**	**0.0690 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-16	31SB-21-16-15-16	15	16	06/21/2022	0.0960 U	**0.120 J**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.0700 J**	0.0960 U	0.0480 U	**5.00**	0.140 U	0.0960 U	0.0480 U	0.0960 U
31SB-21-16	31SB-21-16-17-18	17	18	06/21/2022	0.110 U	**0.820**	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0710 J**	0.110 U	0.0530 U	**10.0**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-16	31SB-21-16-19-20	19	20	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0480 J**	0.100 U	0.0500 U	**1.20**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-16	31SB-21-16-2-3	2	3	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.0540 J**	0.0970 U	**0.0430 J**	**2.10 J**	0.150 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-16	31SB-21-16-5-6	5	6	06/21/2022	**0.0340 J**	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.130 J**	**0.0440 J**	**0.0570 J**	**3.20**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-16	31SB-21-16-7-8	7	8	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.0610 J**	0.0970 U	**0.0270 J**	**1.80**	0.140 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-16	31SB-21-16-9-10	9	10	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.110 J**	0.100 U	0.0510 U	**1.00 J**	**0.0770 J**	0.100 U	0.0510 U	0.100 U
31SB-21-16 (FD)	AOC31SB-21-16-2-3-DUP03	2	3	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.0410 J**	0.0970 U	**0.0350 J**	**0.700 J**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-17	31SB-21-17-0.5-1	0.5	1	06/21/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	**0.0710 J**	0.100 U	**0.0440 J**	**0.0470 J**	**0.0700 J**	**0.0570 J**	**2.40 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-17	31SB-21-17-11-12	11	12	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.150 J**	0.100 U	0.0510 U	0.100 U	**0.110 J**	0.100 U	0.0510 U	0.100 U
31SB-21-17	31SB-21-17-1-2	1	2	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0400 J**	0.100 U	**0.0370 J**	**3.30**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-17	31SB-21-17-13-14	13	14	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.180 J**	0.100 U	0.0510 U	**0.770**	**0.130 J**	0.100 U	0.0510 U	0.100 U
31SB-21-17	31SB-21-17-15-16	15	16	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.420**	0.100 U	0.0500 U	**0.970**	**0.100 J**	0.100 U	0.0500 U	0.100 U
31SB-21-17	31SB-21-17-17-18	17	18	06/21/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.350**	0.0960 U	0.0480 U	0.0960 U	0.140 U	0.0960 U	0.0480 U	0.0960 U
31SB-21-17	31SB-21-17-19-20	19	20	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.260**	0.0970 U	0.0490 U	**1.10**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-17	31SB-21-17-2-3	2	3	06/21/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0330 J**	0.0940 U	0.0470 U	**0.750**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-17	31SB-21-17-5-6	5	6	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.130 J**	0.100 U	0.0510 U	**0.670**	**0.0780 J**	0.100 U	0.0510 U	0.100 U
31SB-21-17	31SB-21-17-7-8	7	8	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.990**	0.0980 U	0.0490 U	0.0980 U	**0.820**	0.0980 U	0.0490 U	0.0980 U
31SB-21-17	31SB-21-17-9-10	9	10	06/21/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0420 J**	**1.10**	0.0960 U	0.0480 U	0.0960 U	**0.360**	0.0960 U	0.0480 U	0.0960 U
31SB-21-17 (FD)	AOC31-SB-21-17-2-3-DUP04	2	3	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0310 J**	0.0980 U	**0.0350 J**	**3.60**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-18	31SB-21-18-0.5-1	0.5	1	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	**0.0550 J**	0.0980 U	0.0980 U	0.0980 U	**0.0460 J**	**0.110 J**	**5.00**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-18	31SB-21-18-11-12	11	12	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0470 J**	0.0980 U	0.0490 U	0.0980 U	**0.0560 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-18	31SB-21-18-1-2	1	2	06/21/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0430 J**	**0.0340 J**	0.0960 U	**0.180 J**	**12.0**	**0.0750 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-18	31SB-21-18-13-14	13	14	06/21/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0550 J**	0.0940 U	0.0470 U	0.0940 U	**0.0680 J**	0.0940 U	0.0470 U	0.0940 U
31SB-21-18	31SB-21-18-15-16	15	16	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0470 J**	0.100 U	0.0500 U	**0.140 J**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-18	31SB-21-18-17-18	17	18	06/21/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0900 J**	0.100 U	**0.0650 J**	**6.80**	**0.0600 J**	0.100 U	0.0510 U	0.100 U
31SB-21-18	31SB-21-18-19-20	19	20	06/21/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0580 J**	0.0940 U	0.0470 U	**0.350**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-18	31SB-21-18-2-3	2	3	06/21/2022	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.0730 J**	0.0950 U	**0.0650 J**	**5.80 J**	**0.0720 J**	0.0950 U	0.0480 U	0.0950 U
31SB-21-18	31SB-21-18-5-6	5	6	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0430 J**	**0.230**	**0.0360 J**	**0.0580 J**	**4.70**	**0.310**	0.100 U	0.0500 U	**0.0480 J**
31SB-21-18	31SB-21-18-7-8	7	8	06/21/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.320**	0.0990 U	0.0490 U	**0.150 J**	**0.110 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-18	31SB-21-18-9-10	9	10	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0450 J**	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-18 (FD)	AOC-31-SB-21-18-2-3-DUP05	2	3	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	**0.0970 J**	0.0970 U	**0.0510 J**	**0.0290 J**	**0.0340 J**	**0.0470 J**	**2.70 J**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-19	31SB-21-19-0.5-1	0.5	1	06/21/2022	0.120 U	0.120 U	0.120 U	0.0590 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.0580 J**	**8.40**	0.180 U	0.120 U	0.0590 U	0.120 U
31SB-21-19	31SB-21-19-11-12	11	12	06/21/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0760 J**	0.0990 U	**0.0270 J**	**4.90**	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-19	31SB-21-19-1-2	1	2	06/21/2022	0.0950 U	0.0950 U	0.0950 U	0.0470 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.0300 J**	0.0950 U	0.0470 U	**0.720**	0.140 U	0.0950 U	0.0470 U	0.0950 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-19	31SB-21-19-13-14	13	14	06/21/2022	**0.0370 J**	**0.370**	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0500 J**	**0.0810 J**	0.100 U	**0.0550 J**	**5.90**	**0.0570 J**	0.100 U	0.0520 U	0.100 U
31SB-21-19	31SB-21-19-15-16	15	16	06/21/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.120 J**	0.0970 U	0.0490 U	**1.70**	**0.100 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-19	31SB-21-19-17-18	17	18	06/21/2022	0.0950 U	**0.310**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.0620 J**	0.0950 U	0.0480 U	**2.50 J**	0.140 U	0.0950 U	0.0480 U	0.0950 U
31SB-21-19	31SB-21-19-19-20	19	20	06/21/2022	0.0980 U	**0.200**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0450 J**	**0.0680 J**	0.0980 U	0.0490 U	**3.60**	**0.0640 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-19	31SB-21-19-2-3	2	3	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.110 J**	**0.0490 J**	**0.0810 J**	**6.40**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-19	31SB-21-19-5-6	5	6	06/21/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.100 J**	0.0980 U	0.0490 U	**1.30**	**0.0890 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-19	31SB-21-19-7-8	7	8	06/21/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.0850 J**	0.0960 U	0.0480 U	0.0960 U	**0.0980 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-19	31SB-21-19-9-10	9	10	06/21/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.140 J**	0.100 U	**0.0340 J**	**7.50**	**0.0900 J**	0.100 U	0.0500 U	0.100 U
31SB-21-19 (FD)	AOC31-SB-21-19-2-3-DUP06	2	3	06/21/2022	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.0650 J**	**0.0300 J**	**0.0370 J**	**6.30**	0.140 U	0.0950 U	0.0480 U	0.0950 U
31SB-21-20	31SB-21-20-0.5-1	0.5	1	06/22/2022	0.0980 U	**0.0530 J**	0.0980 U	0.0490 U	0.0980 U	**0.170 J**	**0.0620 J**	**0.0440 J**	**0.140 J**	**0.0320 J**	**0.0430 J**	**1.00**	0.150 U	0.0980 U	0.0490 U	**0.300**
31SB-21-20	31SB-21-20-11-12	11	12	06/22/2022	0.290 U	**0.260**	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.950**	0.0950 U	**0.0500 J**	**73.0**	**0.100 J**	0.0950 U	0.0480 U	0.0950 U
31SB-21-20	31SB-21-20-1-2	1	2	06/22/2022	0.120 U	**0.0610 J**	0.120 U	0.0620 U	0.120 U	**0.400**	0.120 U	**0.0840 J**	**0.200 J**	**0.0500 J**	**0.140 J**	**4.60**	**0.0920 J**	0.120 U	0.0620 U	**0.220 J**
31SB-21-20	31SB-21-20-13-14	13	14	06/22/2022	0.300 U	**0.140 J**	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.670**	0.100 U	0.0500 U	**38.0**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-20	31SB-21-20-15-16	15	16	06/22/2022	0.300 U	**0.0960 J**	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.340**	**0.0450 J**	**0.0250 J**	**18.0**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-20	31SB-21-20-17-18	17	18	06/22/2022	0.110 U	**0.0790 J**	0.110 U	0.0560 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.210 J**	0.110 U	**0.0440 J**	**50.0**	0.170 U	0.110 U	0.0560 U	0.110 U
31SB-21-20	31SB-21-20-19-20	19	20	06/22/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.0510 J**	0.0970 U	0.0490 U	**5.60 J**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-20	31SB-21-20-2-3	2	3	06/22/2022	0.0930 U	0.0930 U	0.0930 U	0.0460 U	0.0930 U	0.0930 U	0.0930 U	**0.0450 J**	**0.180 J**	0.0930 U	**0.0890 J**	**4.60**	**0.0560 J**	0.0930 U	0.0460 U	0.0930 U
31SB-21-20	31SB-21-20-5-6	5	6	06/22/2022	0.0990 U	**0.0450 J**	0.0990 U	0.0500 U	0.0990 U	**0.110 J**	0.0990 U	**0.0490 J**	**0.240**	**0.0390 J**	**0.100 J**	**5.50**	**0.0760 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-20	31SB-21-20-7-8	7	8	06/22/2022	0.290 U	**0.550**	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0370 J**	**0.370**	**0.0330 J**	**0.0960 J**	**130**	**0.0830 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-20	31SB-21-20-9-10	9	10	06/22/2022	0.280 U	0.0920 U	0.0920 U	0.0460 U	0.0920 U	0.0920 U	0.0920 U	0.0920 U	**0.310**	0.0920 U	0.0460 U	**12.0**	0.140 U	0.0920 U	0.0460 U	0.0920 U
31SB-21-20 (FD)	AOC31-SB-21-20-2-3-DUP07	2	3	06/22/2022	0.300 U	**0.0810 J**	0.100 U	0.0500 U	0.100 U	**0.320**	0.100 U	**0.0980 J**	**0.260**	**0.0450 J**	**0.220**	**13.0**	**0.120 J**	0.100 U	0.0500 U	**0.0900 J**
31SB-21-21	31SB-21-21-0.5-1	0.5	1	06/22/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	**0.250**	0.0970 U	**0.0400 J**	**0.0660 J**	**0.0560 J**	**0.0940 J**	**2.00**	**0.0680 J**	0.0970 U	0.0490 U	**0.0720 J**
31SB-21-21	31SB-21-21-11-12	11	12	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0360 J**	0.0980 U	**0.0260 J**	**2.10**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-21	31SB-21-21-1-2	1	2	06/22/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0310 J**	**0.0890 J**	**4.50**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-21	31SB-21-21-13-14	13	14	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**1.20**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-21	31SB-21-21-15-16	15	16	06/22/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0480 U	**0.630**	0.140 U	0.0960 U	0.0480 U	0.0960 U
31SB-21-21	31SB-21-21-17-18	17	18	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.270 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-21	31SB-21-21-19-20	19	20	06/22/2022	**0.0310 J**	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0500 U	**0.140 J**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-21	31SB-21-21-2-3	2	3	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0430 J**	0.100 U	**0.0340 J**	**1.00**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-21	31SB-21-21-5-6	5	6	06/22/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0540 J**	0.0940 U	**0.0440 J**	**2.30**	0.140 U	0.0940 U	0.0470 U	**0.0420 J**
31SB-21-21	31SB-21-21-7-8	7	8	06/22/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0470 U	**0.540**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-21	31SB-21-21-9-10	9	10	06/22/2022	0.0920 U	0.0920 U	0.0920 U	0.0460 U	0.0920 U	0.0920 U	0.0920 U	0.0920 U	0.0920 U	0.0920 U	0.0460 U	**0.440**	0.140 U	0.0920 U	0.0460 U	0.0920 U
31SB-21-21 (FD)	AOC31-SB-21-21-2-3-DUP08	2	3	06/22/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	**0.0310 J**	0.0940 U	**0.0330 J**	**0.610**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-22	31SB-21-22-0.5-1	0.5	1	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	**0.0610 J**	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.180 J**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-22	31SB-21-22-0-0.5	0	0.5	06/22/2022	**0.0380 J**	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0720 J**	0.100 U	0.0510 U	**0.650**	**0.0580 J**	0.100 U	0.0510 U	0.100 U
31SB-21-22	31SB-21-22-11-12	11	12	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0400 J**	0.100 U	0.0510 U	**1.00**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-22	31SB-21-22-1-2	1	2	06/22/2022	0.100 U	**0.0390 J**	0.100 U	0.0510 U	0.100 U	**0.0690 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0480 J**	**0.450**	**0.0550 J**	0.100 U	0.0510 U	0.100 U
31SB-21-22	31SB-21-22-13-14	13	14	06/22/2022	0.0930 U	0.0930 U	0.0930 U	0.0470 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0470 U	0.0930 U	0.140 U	0.0930 U	0.0470 U	0.0930 U
31SB-21-22	31SB-21-22-15-16	15	16	06/22/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	**0.530**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-22	31SB-21-22-17-18	17	18	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.240 J**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-22	31SB-21-22-19-20	19	20	06/22/2022	0.0930 U	0.0930 U	0.0930 U	0.0460 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0930 U	0.0460 U	0.0930 U	0.140 U	0.0930 U	0.0460 U	0.0930 U
31SB-21-22	31SB-21-22-2-3	2	3	06/22/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	**0.0730 J**	0.110 U	**0.0480 J**	**0.0320 J**	0.110 U	**0.110 J**	**4.80 J**	**0.120 J**	0.110 U	0.0530 U	0.110 U
31SB-21-22	31SB-21-22-5-6	5	6	06/22/2022	**0.0430 J**	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0820 J**	0.100 U	**0.0370 J**	**2.20**	**0.0740 J**	0.100 U	0.0510 U	0.100 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-22	31SB-21-22-7-8	7	8	06/22/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0490 U	**0.210 J**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-22	31SB-21-22-9-10	9	10	06/22/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0490 U	**0.360**	0.150 U	0.0990 U	0.0490 U	0.0990 U
31SB-21-22 (FD)	AOC31-SB-21-22-2-3-DUP09	2	3	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	**0.150 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0410 J**	**0.860 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-23	31SB-21-23-0.5-1	0.5	1	06/22/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	**0.0720 J**	**0.0380 J**	0.0990 U	**0.0360 J**	0.0990 U	0.0490 U	**0.260 J**	0.150 U	0.0990 U	0.0490 U	**0.0930 J**
31SB-21-23	31SB-21-23-0-0.5	0	0.5	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0520 U	**0.0550 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-23	31SB-21-23-11-12	11	12	06/22/2022	**0.0320 J**	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	**0.0340 J**	0.0960 U	**0.0850 J**	0.0960 U	0.0480 U	**0.960**	**0.0590 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-23	31SB-21-23-1-2	1	2	06/22/2022	**0.0310 J**	0.110 U	0.110 U	0.0530 U	0.110 U	**0.170 J**	0.110 U	0.110 U	**0.120 J**	0.110 U	**0.0320 J**	**1.30**	**0.0610 J**	0.110 U	0.0530 U	0.110 U
31SB-21-23	31SB-21-23-13-14	13	14	06/22/2022	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	**0.180 J**	0.0950 U	0.0480 U	**0.440 J**	**0.0510 J**	0.0950 U	0.0480 U	0.0950 U
31SB-21-23	31SB-21-23-15-16	15	16	06/22/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.170 J**	0.100 U	0.0500 U	**0.640**	**0.0540 J**	0.100 U	0.0500 U	0.100 U
31SB-21-23	31SB-21-23-17-18	17	18	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.100 J**	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-23	31SB-21-23-19-20	19	20	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-23	31SB-21-23-2-3	2	3	06/22/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	**0.0510 J**	0.110 U	0.110 U	0.110 U	**0.0530 J**	**0.0810 J**	**7.40 J**	**0.140 J**	0.110 U	0.0530 U	0.110 U
31SB-21-23	31SB-21-23-5-6	5	6	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.0790 J**	0.100 U	0.100 U	**0.0740 J**	0.100 U	**0.0430 J**	**1.90**	0.150 U	0.100 U	0.0510 U	**0.0490 J**
31SB-21-23	31SB-21-23-7-8	7	8	06/22/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.160 J**	0.0970 U	**0.0530 J**	**21.0**	**0.0830 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-23	31SB-21-23-9-10	9	10	06/22/2022	**0.0280 J**	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0790 J**	0.0980 U	0.0490 U	**6.40**	**0.0520 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-23 (FD)	AOC31-SB-21-23-2-3-DUP10	2	3	06/22/2022	**0.0250 J**	0.0940 U	0.0940 U	0.0470 U	0.0940 U	**0.170 J**	0.0940 U	0.0940 U	**0.0750 J**	0.0940 U	**0.0290 J**	**0.830 J**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-24	31SB-21-24-0.5-1	0.5	1	06/22/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.0370 J**	**0.0360 J**	**0.0430 J**	**2.70**	0.170 U	0.120 U	0.0580 U	0.120 U
31SB-21-24	31SB-21-24-0-0.5	0	0.5	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	**0.0710 J**	**0.0510 J**	0.100 U	**0.0470 J**	0.100 U	**0.0720 J**	**7.20 J**	0.160 U	0.100 U	**0.0320 J**	**0.0590 J**
31SB-21-24	31SB-21-24-11-12	11	12	06/22/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.230**	0.0990 U	0.0500 U	**0.0930 J**	**0.0630 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-24	31SB-21-24-1-2	1	2	06/22/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0340 J**	0.110 U	**0.0360 J**	**3.00**	0.160 U	0.110 U	0.0540 U	0.110 U
31SB-21-24	31SB-21-24-13-14	13	14	06/22/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0600 J**	0.100 U	0.0500 U	0.100 U	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-24	31SB-21-24-15-16	15	16	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0880 J**	0.100 U	0.0510 U	**0.240 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-24	31SB-21-24-17-18	17	18	06/22/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0660 J**	0.0990 U	0.0500 U	**1.00**	**0.0760 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-24	31SB-21-24-19-20	19	20	06/22/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0940 U	0.0470 U	**0.0430 J**	0.140 U	0.0940 U	0.0470 U	0.0940 U
31SB-21-24	31SB-21-24-2-3	2	3	06/22/2022	0.120 U	0.120 U	0.120 U	0.0610 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.0600 J**	0.120 U	**0.0650 J**	**14.0 J**	0.180 U	0.120 U	0.0610 U	0.120 U
31SB-21-24 (FD)	31SB-21-24-2-3 DUP11	2	3	06/22/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.0520 J**	0.120 U	**0.0550 J**	**5.20 J**	0.170 U	0.120 U	0.0580 U	0.120 U
31SB-21-24	31SB-21-24-5-6	5	6	06/22/2022	0.110 U	0.110 U	0.110 U	0.0560 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0830 J**	**0.0520 J**	**0.0320 J**	**5.30**	**0.120 J**	0.110 U	0.0560 U	0.110 U
31SB-21-24	31SB-21-24-7-8	7	8	06/22/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.180 J**	0.0960 U	0.0480 U	0.0960 U	**0.210 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-24	31SB-21-24-9-10	9	10	06/22/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0410 J**	**0.440**	0.0960 U	0.0480 U	0.0960 U	**0.140 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-25	31SB-21-25-0.5-1	0.5	1	06/22/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0540 U	**0.150 J**	0.160 U	0.110 U	0.0540 U	0.110 U
31SB-21-25	31SB-21-25-0-0.5	0	0.5	06/22/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-25	31SB-21-25-11-12	11	12	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0660 J**	0.100 U	0.0520 U	**0.0600 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-25	31SB-21-25-1-2	1	2	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0720 J**	**0.0410 J**	**0.0660 J**	**1.90**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-25	31SB-21-25-13-14	13	14	06/22/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0400 J**	0.100 U	0.0510 U	0.100 U	0.150 U	0.100 UJ	0.0510 U	0.100 U
31SB-21-25	31SB-21-25-15-16	15	16	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0350 J**	0.100 U	0.0520 U	**0.120 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-25	31SB-21-25-17-18	17	18	06/22/2022	0.0940 U	0.0940 UJ	0.0940 U	0.0470 U	0.0940 U	0.0940 UJ	0.0940 U	0.0940 U	**0.0320 J**	0.0940 U	0.0470 U	0.0940 UJ	0.140 U	0.0940 UJ	0.0470 U	0.0940 U
31SB-21-25	31SB-21-25-19-20	19	20	06/22/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	0.150 U	0.0970 U	0.0480 U	0.0970 U
31SB-21-25	31SB-21-25-2-3	2	3	06/22/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0330 J**	**0.0380 J**	**0.710**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-25 (FD)	31SB-21-25-2-3 DUP12	2	3	06/22/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0360 J**	**0.0320 J**	0.0490 U	**0.340**	**0.120 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-25	31SB-21-25-5-6	5	6	06/22/2022	0.110 U	0.110 U	0.110 U	0.0570 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0570 U	**0.310 J**	0.170 U	0.110 U	0.0570 U	0.110 U
31SB-21-25	31SB-21-25-7-8	7	8	06/22/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0520 U	**0.150 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-25	31SB-21-25-9-10	9	10	06/22/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.0700 J**	0.0960 U	0.0480 U	0.0960 U	**0.0950 J**	0.0960 U	0.0480 U	0.0960 U
31SB-21-26	31SB-21-26-0.5-1	0.5	1	06/23/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	**0.0580 J**	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0460 J**	**0.640**	0.150 U	0.0990 U	0.0500 U	0.0990 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-26	31SB-21-26-0-0.5	0	0.5	06/23/2022	0.0940 U	0.0940 U	0.0940 U	0.0470 U	0.0940 U	**0.0570 J**	**0.0280 J**	0.0940 U	0.0940 U	0.0940 U	0.0470 U	**0.300**	0.140 U	0.0940 U	0.0470 U	**0.0490 J**
31SB-21-26	31SB-21-26-11-12	11	12	06/23/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0370 J**	**0.180 J**	0.0980 U	0.0490 U	**0.140 J**	**0.130 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-26	31SB-21-26-1-2	1	2	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.180 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0430 J**	**1.30**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-26	31SB-21-26-13-14	13	14	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0650 J**	**0.0430 J**	0.0500 U	**0.160 J**	**0.0750 J**	0.100 U	0.0500 U	0.100 U
31SB-21-26	31SB-21-26-15-16	15	16	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0640 J**	**0.0320 J**	**0.0400 J**	**2.00**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-26	31SB-21-26-17-18	17	18	06/23/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	**0.0370 J**	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-26	31SB-21-26-19-20	19	20	06/23/2022	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0480 U	0.0950 U	0.140 U	0.0950 U	0.0480 U	0.0950 U
31SB-21-26	31SB-21-26-2-3	2	3	06/23/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	**0.0670 J**	**3.70 J**	0.140 U	0.0960 UJ	0.0480 U	0.0960 U
31SB-21-26 (FD)	31SB-21-26-2-3 DUP13	2	3	06/23/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	**0.0990 J**	0.110 U	0.110 U	0.110 U	0.110 U	**0.0750 J**	**1.50 J**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-26	31SB-21-26-5-6	5	6	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	**0.0490 J**	**0.0460 J**	**0.0610 J**	**0.0960 J**	**4.00**	**0.110 J**	0.100 U	0.0500 U	0.100 U
31SB-21-26	31SB-21-26-7-8	7	8	06/23/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.500**	**0.240**	0.0530 U	0.110 U	0.160 U	0.110 UJ	0.0530 U	0.110 U
31SB-21-26	31SB-21-26-9-10	9	10	06/23/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	**0.0820 J**	**0.130 J**	**2.60 J**	0.0480 U	**5.60**	**0.200 J**	0.0960 UJ	0.0480 U	0.0960 U
31SB-21-27	31SB-21-27-0.5-1	0.5	1	06/23/2022	0.0970 U	0.0970 U	0.0970 U	0.0480 U	0.0970 U	**0.130 J**	0.0970 U	**0.0400 J**	**0.0360 J**	0.0970 U	**0.0520 J**	**1.10**	0.140 U	0.0970 U	0.0480 U	**0.0450 J**
31SB-21-27	31SB-21-27-0-0.5	0	0.5	06/23/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	**0.150 J**	**0.0610 J**	**0.0920 J**	**0.140 J**	**0.0630 J**	**0.0770 J**	**1.30**	**0.0860 J**	0.110 U	0.0540 U	**0.160 J**
31SB-21-27	31SB-21-27-11-12	11	12	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.180 J**	0.100 U	0.0510 U	0.100 U	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-27	31SB-21-27-1-2	1	2	06/23/2022	0.0980 UJ	0.0980 UJ	0.0980 UJ	0.0490 UJ	0.0980 UJ	**0.190 J**	0.0980 UJ	**0.0560 J**	**0.0370 J**	0.0980 UJ	**0.100 J**	**3.00 J**	0.150 UJ	0.0980 UJ	0.0490 UJ	0.0980 UJ
31SB-21-27	31SB-21-27-13-14	13	14	06/23/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	**0.550**	0.0970 U	0.0490 U	**7.80 J**	**0.0580 J**	0.0970 U	0.0490 U	0.0970 U
31SB-21-27	31SB-21-27-15-16	15	16	06/23/2022	0.120 U	0.120 U	0.120 U	0.0600 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.280**	**0.0480 J**	**0.0280 J**	**1.80**	0.180 U	0.120 U	0.0600 U	0.120 U
31SB-21-27	31SB-21-27-17-18	17	18	06/23/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	0.120 U	**0.640**	0.120 U	0.0580 U	**1.00 J**	0.170 U	0.120 U	0.0580 U	0.120 U
31SB-21-27	31SB-21-27-19-20	19	20	06/23/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0810 J**	0.100 U	0.0520 U	**0.0970 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-27	31SB-21-27-2-3	2	3	06/23/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	**0.0390 J**	**0.0760 J**	0.0980 U	**0.0840 J**	**9.20 J**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-27 (FD)	31SB-21-27-2-3 DUP14	2	3	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.180 J**	0.100 U	**0.120 J**	**0.0690 J**	**0.0410 J**	**0.110 J**	**3.30 J**	**0.0740 J**	0.100 U	0.0510 U	0.100 U
31SB-21-27	31SB-21-27-5-6	5	6	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	**0.110 J**	0.100 U	**0.0530 J**	**0.120 J**	**0.0400 J**	**0.0860 J**	**4.20**	**0.0660 J**	0.100 U	0.0500 U	**0.0610 J**
31SB-21-27	31SB-21-27-7-8	7	8	06/23/2022	0.120 UJ	0.120 UJ	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.360**	**0.620**	**0.870**	0.0580 U	**1.10 J**	**0.380**	0.120 U	0.0580 U	0.120 U
31SB-21-27	31SB-21-27-9-10	9	10	06/23/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.640**	**0.0490 J**	0.0490 U	0.0990 U	0.150 U	0.0990 U	0.0490 U	0.0990 U
31SB-21-28	31SB-21-28-0.5-1	0.5	1	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	**0.0870 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0360 J**	**0.120 J**	0.150 U	0.100 U	0.0510 U	**0.0450 J**
31SB-21-28	31SB-21-28-0-0.5	0	0.5	06/23/2022	0.130 U	0.130 U	0.130 U	0.0670 U	0.130 U	0.130 U	**0.0730 J**	0.130 U	0.130 U	0.130 U	0.0670 U	**0.0740 J**	0.200 U	0.130 U	**0.0370 J**	**0.0610 J**
31SB-21-28	31SB-21-28-11-12	11	12	06/23/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.210**	0.100 U	0.0520 U	0.100 U	**0.110 J**	0.100 U	0.0520 U	0.100 U
31SB-21-28	31SB-21-28-1-2	1	2	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	**0.0690 J**	0.100 U	0.100 U	0.100 U	0.100 U	**0.0840 J**	**0.720**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-28	31SB-21-28-13-14	13	14	06/23/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.150 J**	0.110 U	0.0530 U	**0.690**	**0.120 J**	0.110 U	0.0530 U	0.110 U
31SB-21-28	31SB-21-28-15-16	15	16	06/23/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.110 J**	**0.270**	**0.0500 J**	**0.0260 J**	**1.60**	**0.210 J**	0.120 U	0.0580 U	0.120 U
31SB-21-28	31SB-21-28-17-18	17	18	06/23/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	**0.0940 J**	**0.350**	0.110 U	**0.0230 J**	**2.40**	**0.310 J**	0.110 U	0.0530 U	0.110 U
31SB-21-28	31SB-21-28-19-20	19	20	06/23/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.150 J**	0.100 U	**0.0250 J**	**2.00**	**0.150 J**	0.100 U	0.0520 U	0.100 U
31SB-21-28	31SB-21-28-2-3	2	3	06/23/2022	0.120 U	0.120 U	0.120 U	0.0580 U	0.120 U	0.120 U	0.120 U	**0.0940 J**	**0.0930 J**	**0.100 J**	**0.0490 J**	**5.60 J**	**0.150 J**	0.120 U	0.0580 U	0.120 U
31SB-21-28 (FD)	31SB-21-28-2-3 DUP15	2	3	06/23/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0240 J**	**0.400 J**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-28	31SB-21-28-5-6	5	6	06/23/2022	0.110 U	0.110 U	0.110 U	0.0560 U	0.110 U	0.110 U	0.110 U	0.110 U	**0.0690 J**	**0.0570 J**	0.0560 U	0.110 U	**0.110 J**	0.110 U	0.0560 U	0.110 U
31SB-21-28	31SB-21-28-7-8	7	8	06/23/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0770 J**	0.100 U	0.0510 U	0.100 U	**0.0830 J**	0.100 U	0.0510 U	0.100 U
31SB-21-28	31SB-21-28-9-10	9	10	06/23/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0890 J**	0.100 U	0.0500 U	0.100 U	**0.0710 J**	0.100 U	0.0500 U	0.100 U
31SB-21-29	31SB-21-29-0-2	0	2	11/16/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	**0.150 J**	0.100 U	**0.0590 J**	**0.0330 J**	**0.0530 J**	**0.100 J**	**2.30**	**0.0750 J**	0.100 U	**0.0250 J**	**0.0530 J**
31SB-21-29	31SB-21-29-2-4	2	4	11/16/2022	0.110 U	0.110 U	0.110 U	0.0540 U	0.110 U	0.110 U	0.110 U	**0.110 J**	0.110 U	**0.170 J**	**0.420**	**2.50**	**0.240 J**	0.110 U	0.0540 U	0.110 U
31SB-21-29	31SB-21-29-4-6	4	6	11/16/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	**0.0640 J**	**0.140 J**	**0.150 J**	**0.0590 J**	**0.910**	**0.170 J**	0.0990 U	0.0500 U	0.0990 U
31SB-21-29	31SB-21-29-6-8	6	8	11/16/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.510**	0.0990 U	0.0500 U	0.0990 U	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-29	31SB-21-29-8-10	8	10	11/16/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.260**	0.100 U	0.0510 U	0.100 U	0.150 U	0.100 U	0.0510 U	0.100 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (µg/kg)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31SB-21-30	31SB-21-30-0-2	0	2	11/16/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	**0.0960 J**	0.110 U	0.110 U	0.110 U	0.110 U	**0.0480 J**	**0.260 J**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-30	31SB-21-30-2-4	2	4	11/16/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	**0.0980 J**	**0.0330 J**	**0.0980 J**	**0.0330 J**	**3.50**	**0.500**	0.100 U	0.0520 U	0.100 U
31SB-21-30	31SB-21-30-4-6	4	6	11/16/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	**0.0410 J**	**0.0470 J**	0.100 U	**0.0850 J**	0.0520 U	**0.470 J**	**0.0730 J**	0.100 U	**0.0260 J**	**0.0510 J**
31SB-21-30	31SB-21-30-6-8	6	8	11/16/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-30 (FD)	31SB-21-30-6-8-DUP08	6	8	11/16/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-30	31SB-21-30-8-10	8	10	11/16/2022	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0960 U	0.0480 U	0.0960 U	0.140 U	0.0960 U	0.0480 U	0.0960 U
31SB-21-31	31SB-21-31-10-12	10	12	11/17/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.800 J**	**0.0520 J**	0.0980 U	0.0490 U	0.0980 U
31SB-21-31 (FD)	31SB-21-31-10-12-DUP09	10	12	11/17/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	**0.680**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-31	31SB-21-31-12-14	12	14	11/17/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0350 J**	0.100 U	0.0510 U	**0.800**	**0.0750 J**	0.100 U	0.0510 U	0.100 U
31SB-21-31	31SB-21-31-14-16	14	16	11/17/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0420 J**	0.100 U	0.0500 U	0.100 U	**0.0710 J**	0.100 U	0.0500 U	0.100 U
31SB-21-31	31SB-21-31-16-18	16	18	11/17/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0360 J**	0.100 U	0.0520 U	**0.960**	**0.0610 J**	0.100 U	0.0520 U	0.100 U
31SB-21-31	31SB-21-31-18-20	18	20	11/17/2022	0.0990 U	0.0990 U	0.0990 U	0.0490 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	**0.0470 J**	0.0990 U	0.0490 U	0.0990 U	**0.0570 J**	0.0990 U	0.0490 U	0.0990 U
31SB-21-32	31SB-21-32-0-2	0	2	11/16/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.100 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-32	31SB-21-32-10-12	10	12	11/16/2022	0.110 U	0.110 U	0.110 U	0.0530 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.110 U	0.0530 U	**0.410**	0.160 U	0.110 U	0.0530 U	0.110 U
31SB-21-32	31SB-21-32-12-14	12	14	11/16/2022	0.0950 U	0.0950 U	0.0950 U	0.0470 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0950 U	0.0470 U	**0.340**	0.140 U	0.0950 U	0.0470 U	0.0950 U
31SB-21-32	31SB-21-32-14-16	14	16	11/16/2022	0.100 U	0.100 U	0.100 U	0.0510 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0510 U	**0.230 J**	0.150 U	0.100 U	0.0510 U	0.100 U
31SB-21-32	31SB-21-32-16-18	16	18	11/16/2022	0.100 U	0.100 U	0.100 U	0.0520 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0520 U	**0.470**	0.160 U	0.100 U	0.0520 U	0.100 U
31SB-21-32 (FD)	31SB-21-32-16-18-DUP07	16	18	11/16/2022	0.0990 U	0.0990 U	0.0990 U	0.0500 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0990 U	0.0500 U	**0.230 J**	0.150 U	0.0990 U	0.0500 U	0.0990 U
31SB-21-32	31SB-21-32-18-20	18	20	11/16/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0490 U	**1.40**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-32	31SB-21-32-2-4	2	4	11/16/2022	0.100 U	0.100 U	0.100 U	0.0500 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.0270 J**	**0.280 J**	0.150 U	0.100 U	0.0500 U	0.100 U
31SB-21-32	31SB-21-32-4-6	4	6	11/16/2022	0.0970 U	0.0970 U	0.0970 U	0.0490 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0970 U	0.0490 U	**0.210 J**	0.150 U	0.0970 U	0.0490 U	0.0970 U
31SB-21-32	31SB-21-32-6-8	6	8	11/16/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.510**	0.150 U	0.0980 U	0.0490 U	0.0980 U
31SB-21-32	31SB-21-32-8-10	8	10	11/16/2022	0.0980 U	0.0980 U	0.0980 U	0.0490 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0980 U	0.0490 U	**0.480**	0.150 U	0.0980 U	0.0490 U	0.0980 U

Notes:
Detects are displayed in bold font

Acronyms and Abbreviations:
µg/kg = micrograms per kilogram

Qualifiers:
J Estimated Value
U Undetected: The analyte was analyzed for, but not detected.
UJ The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

PFAS Remedial Investigation
Supplemental Data (Groundwater)
AOC 31
Former Fort Devens, Massachusetts

ARCADIS

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (ng/L)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
31VP-21-01	31VP-21-01-68-72	68	72	07/06/2022	**15.0**	**17.0**	0.850 U	0.850 U	**0.940 J**	0.850 U	0.850 U	**4.60**	**19.0**	**14.0**	**0.620 J**	**120**	**12.0**	1.30 U	1.30 U	1.30 U
31VP-21-02	31VP-21-02-68-72	68	72	07/06/2022	**5.70**	**17.0**	0.890 U	0.890 U	**1.50 J**	0.890 U	0.890 U	**11.0**	**180**	**96.0**	**2.00**	**420**	**41.0**	1.30 U	1.30 U	1.30 U
31VP-21-03	31VP-21-03-68-72	68	72	07/05/2022	**1.50 J**	**1.50 J**	0.890 U	0.890 U	**0.880 J**	0.890 U	0.890 U	**5.00**	**18.0**	**7.90**	**0.600 J**	**37.0**	**13.0**	1.30 U	1.30 U	1.30 U
31VP-21-04	31VP-21-04-68-72	68	72	06/30/2022	**12.0**	**110**	0.870 U	0.870 U	**2.20**	0.870 U	0.870 U	**5.20**	**26.0**	**16.0**	**0.870 J**	**210**	**12.0**	1.30 U	1.30 U	1.30 U
31VP-21-05	31VP-21-05-68-72	68	72	07/01/2022	**300**	**200**	0.880 U	0.880 U	**4.60**	**0.870 J**	0.880 U	**91.0**	**870**	**120**	**3.30**	**4,300**	**250**	1.30 U	1.30 U	1.30 U
31VP-21-05 (FD)	AOC31VP-21-05-6872 DUP02	68	72	07/01/2022	**260**	**200**	0.870 U	0.870 U	**5.30**	0.870 U	0.870 U	**88.0**	**710**	**150**	**3.40**	**3,900**	**240**	1.30 U	1.30 U	1.30 U
31VP-21-06	31VP-21-06-68-72	68	72	06/30/2022	**3.50 J**	**87.0**	0.930 U	0.930 U	**3.80**	0.930 U	0.930 U	**8.10**	**35.0**	**38.0**	1.40 U	**540**	**7.30**	1.40 U	1.40 U	1.40 U
31VP-21-07	31VP-21-07-66-70	66	70	06/24/2022	**1.40 J**	**3.80**	0.900 U	0.900 U	0.900 U	**1.90 J**	0.900 U	**4.70**	**22.0**	**8.00**	**1.90**	**130**	**10.0**	1.40 U	1.40 U	1.40 U
31VP-21-08	31VP-21-08-66-70	66	70	06/28/2022	**0.400 J**	**1.60 J**	0.880 U	0.880 U	0.880 U	**0.870 J**	0.880 U	**7.50**	**30.0 J**	**21.0**	**0.600 J**	**87.0**	**8.20**	1.30 U	1.30 U	1.30 U
31VP-21-08 (FD)	AOC31VP-21-08-66-70DUP1	66	70	06/28/2022	**0.660 J**	**1.90**	0.950 U	0.950 U	0.950 U	**1.30 J**	0.950 U	**6.10**	**16.0 J**	**16.0**	**0.710 J**	**67.0**	**8.60**	1.40 U	1.40 U	1.40 U
31VP-21-09	31VP-21-09-68-72	68	72	06/29/2022	**2.50 J**	**110**	0.920 U	0.920 U	**3.70**	0.920 U	0.920 U	**15.0**	**74.0**	**24.0**	**1.10 J**	**1,200**	**18.0**	1.40 U	1.40 U	1.40 U
31VP-21-10	31VP-21-10-66-70	66	70	06/24/2022	**1.30 J**	**0.750 J**	**0.710 J**	1.00 U	**9.80**	**2.20**	1.00 U	**2.30**	**5.90**	**11.0**	**1.10 J**	**12.0**	**8.30**	1.50 U	1.50 U	1.50 U
31VP-21-11	31VP-21-11-66-70	66	70	06/27/2022	**0.990 J**	**2.50**	0.880 U	0.880 U	**4.60**	**1.30 J**	0.880 U	**6.50**	**4.70**	**9.30**	**0.770 J**	**41.0**	**7.80**	1.30 U	1.30 U	1.30 U
31VP-21-12	31VP-21-12-66-70	66	70	06/28/2022	0.910 U	1.40 U	0.910 U	0.910 U	0.910 U	0.910 U	0.910 U	**1.90**	**11.0**	**6.70**	1.40 U	**7.80 J**	**3.50**	1.40 U	1.40 U	1.40 U
31VP-21-13	31VP-21-13-68-72	68	72	06/29/2022	**84.0**	**31.0**	0.840 U	0.840 U	**7.10**	0.840 U	0.840 U	**36.0**	**310**	**48.0**	**2.40**	**710**	**120**	1.30 U	1.30 U	1.30 U
AFT-A-1	31VP-AFT-A-1-108-112	108	112	07/08/2022	**51.0**	1.40 U	0.910 U	0.910 U	**25.0**	0.910 U	0.910 U	**65.0**	**1,700**	**530**	**1.70 J**	**530**	**1,100**	1.40 U	1.40 U	1.40 U
AFT-A-1	31VP-AFT-A-1-118-122	118	122	07/11/2022	**15.0**	**8.90**	1.30 U	1.30 U	**87.0**	**0.760 J**	1.30 U	**140**	**4,700**	**2,000**	**7.10**	**1,000**	**2,800**	2.00 U	2.00 U	2.00 U
AFT-A-1	31VP-AFT-A-1-128-132	128	132	07/11/2022	**6.40**	**0.910 J**	1.20 U	1.20 U	**25.0**	1.20 U	1.20 U	**18.0**	**390**	**68.0**	**1.20 J**	**530**	**140**	1.80 U	1.80 U	1.80 U
AFT-A-1	31VP-AFT-A-1-138-142	138	142	07/12/2022	**2.60 J**	1.80 U	1.20 U	1.20 U	**38.0**	1.20 U	1.20 U	**22.0**	**490**	**77.0**	**0.750 J**	**220**	**170**	1.80 U	1.80 U	1.80 U
AFT-A-1	31VP-AFT-A-1-148-152	148	152	07/12/2022	1.00 U	1.60 U	1.00 U	1.00 U	**1.10 J**	1.00 U	1.00 U	**1.90 J**	**53.0 J**	**12.0**	1.60 U	**8.10**	**25.0**	1.60 U	1.60 U	1.60 U
AFT-A-1	31VP-AFT-A-1-158-162	158	162	07/13/2022	3.50 U	5.30 U	3.50 U	3.50 U	3.50 U	3.50 U	3.50 U	3.50 U	**27.0**	**7.50**	5.30 U	**18.0**	**18.0**	5.30 U	5.30 U	5.30 U
AFT-A-1	31VP-AFT-A-1-68-72	68	72	07/07/2022	**3.00 J**	**5.80**	1.20 U	1.20 U	**0.910 J**	1.20 U	1.20 U	**2.40 J**	**17.0**	**13.0**	1.90 U	**37.0**	**2.10 J**	1.90 U	1.90 U	1.90 U
AFT-A-1	31VP-AFT-A-1-78-82	78	82	07/07/2022	**0.420 J**	1.60 U	1.00 U	1.00 U	**0.550 J**	1.00 U	1.00 U	**2.90**	**6.40**	**3.50**	1.60 U	**4.80**	**4.20**	1.60 U	1.60 U	1.60 U
AFT-A-1	31VP-AFT-A-1-88-92	88	92	07/08/2022	**1.20 J**	**1.90 J**	1.00 U	1.00 U	**0.570 J**	1.00 U	1.00 U	**1.50 J**	**17.0**	**6.70**	1.60 U	**11.0**	**15.0**	1.60 U	1.60 U	1.60 U
AFT-A-1	31VP-AFT-A-1-98-102	98	102	07/08/2022	**8.80**	**4.70**	1.10 U	1.10 U	**25.0**	**0.830 J**	1.10 U	**170**	**3,100**	**430**	1.70 U	**37.0**	**1,200**	1.70 U	1.70 U	1.70 U
AFT-A-2	31VP-AFT-A-2-108-112	108	112	07/14/2022	**400**	**8.60**	1.50 U	1.50 U	**47.0**	1.50 U	1.50 U	**140**	**3,100**	**1,400**	**4.60**	**1,300**	**3,600**	2.30 U	2.30 U	2.30 U
AFT-A-2	31VP-AFT-A-2-118-122	118	122	07/15/2022	**96.0**	**22.0**	0.940 U	0.940 U	**34.0**	**0.560 J**	0.940 U	**72.0**	**1,800**	**540**	**8.00**	**2,000**	**1,200**	1.40 U	1.40 U	1.40 U
AFT-A-2	31VP-AFT-A-2-128-132	128	132	07/15/2022	**38.0**	**10.0**	1.60 U	1.60 U	**100**	**0.600 J**	1.60 U	**160**	**3,400**	**1,500**	**7.70**	**1,700**	**2,300**	2.40 U	2.40 U	2.40 U
AFT-A-2	31VP-AFT-A-2-138-142	138	142	07/18/2022	**4.00 J**	**0.980 J**	1.30 U	1.30 U	**37.0**	1.30 U	1.30 U	**23.0**	**440**	**100**	**1.10 J**	**200**	**190**	1.90 U	1.90 U	1.90 U
AFT-A-2	31VP-AFT-A-2-148-152	148	152	07/18/2022	**3.00 J**	2.90 U	1.90 U	1.90 U	**15.0**	1.90 U	1.90 U	**10.0**	**180**	**54.0**	2.90 U	**47.0**	**100**	2.90 U	2.90 U	2.90 U
AFT-A-2	31VP-AFT-A-2-158-162	158	162	07/19/2022	**3.60 J**	3.70 U	2.40 U	2.40 U	2.40 U	2.40 U	2.40 U	**1.60 J**	**34.0**	**15.0**	3.70 U	**14.0**	**43.0**	3.70 U	3.70 U	3.70 U
AFT-A-2	31VP-AFT-A-2-168-172	168	172	07/19/2022	**10.0**	**1.30 J**	1.50 U	1.50 U	**14.0**	1.50 U	1.50 U	**15.0**	**220**	**90.0**	2.30 U	**130**	**150**	2.30 U	2.30 U	2.30 U
AFT-A-2	31VP-AFT-A-2-178-182	178	182	07/20/2022	**19.0**	**1.60 J**	1.20 U	1.20 U	**29.0**	1.20 U	1.20 U	**32.0**	**550**	**170**	**0.930 J**	**240**	**420**	1.70 U	1.70 U	1.70 U
AFT-A-2	31VP-AFT-A-2-187-191	197	191	07/20/2022	**32.0**	**1.20 J**	0.850 U	0.850 U	**54.0**	0.850 U	0.850 U	**50.0**	**500**	**170**	**1.70**	**500**	**260**	1.30 U	1.30 U	1.30 U
AFT-A-2	31VP-AFT-A-2-68-72	68	72	07/13/2022	0.980 U	1.50 U	0.980 U	0.980 U	**0.680 J**	0.980 U	0.980 U	**2.40**	**7.20**	**4.10**	1.50 U	**1.10 J**	**2.40**	1.50 U	1.50 U	1.50 U
AFT-A-2	31VP-AFT-A-2-78-82	78	82	07/14/2022	1.00 U	1.50 U	1.00 U	1.00 U	**1.10 J**	1.00 U	1.00 U	**3.70**	**8.60**	**8.00**	1.50 U	**2.60**	**4.20**	1.50 U	1.50 U	1.50 U
AFT-A-2	31VP-AFT-A-2-88-92	88	92	07/14/2022	0.960 U	1.40 U	0.960 U	0.960 U	**3.10**	0.960 U	0.960 U	**3.40**	**120**	**38.0**	1.40 U	1.40 U	**73.0**	1.40 U	1.40 U	1.40 U
AFT-A-2	31VP-AFT-A-2-98-102	98	102	07/14/2022	**17.0**	1.40 U	0.960 U	0.960 U	**31.0**	0.960 U	0.960 U	**78.0**	**3,700**	**620**	1.40 U	1.40 U	**2,300**	1.40 U	1.40 U	1.40 U
AFT-A-2 (FD)	AOC31VP-AFT-A-2-178-182-DUP04	178	182	07/20/2022	**18.0**	**1.70 J**	1.20 U	1.20 U	**31.0**	1.20 U	1.20 U	**32.0**	**630**	**190**	**0.930 J**	**220**	**500**	1.80 U	1.80 U	1.80 U
AFT-A-2 (FD)	AOC31VP-AFT-A-2-98-102-DUP03	98	102	07/14/2022	**16.0**	1.40 U	0.930 U	0.930 U	**30.0**	0.930 U	0.930 U	**77.0**	**3,600**	**630**	1.40 U	1.40 U	**2,800**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-108-112	108	112	07/22/2022	**560**	1.30 U	0.860 U	0.860 U	**57.0**	0.860 U	0.860 U	**220**	**4,000**	**1,000**	**1.20 J**	**1,400 J**	**3,900**	1.30 U	1.30 U	1.30 U
AFT-A-3	31VP-AFT-A-3-118-122	118	122	07/22/2022	**190**	**16.0**	0.850 U	0.850 U	**37.0**	**0.340 J**	0.850 U	**88.0**	**1,400**	**620**	**9.10**	**1,600**	**1,100**	1.30 U	1.30 U	1.30 U
AFT-A-3	31VP-AFT-A-3-128-132	128	132	07/22/2022	**71.0**	**2.30**	0.920 U	0.920 U	**140**	**0.350 J**	0.920 U	**200**	**3,700**	**1,800**	**5.80**	**1,100**	**3,700**	1.40 U	1.40 U	1.40 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (ng/L)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
AFT-A-3	31VP-AFT-A-3-138-142	138	142	07/26/2022	**5.50**	1.40 U	0.910 U	0.910 U	**25.0**	0.910 U	0.910 U	**21.0**	**460**	**71.0**	**1.30 J**	**360**	**150**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-148-152	148	152	07/26/2022	**3.70 J**	1.50 U	0.970 U	0.970 U	**38.0**	0.970 U	0.970 U	**25.0**	**590**	**100**	**0.670 J**	**180**	**240**	1.50 U	1.50 U	1.50 U
AFT-A-3	31VP-AFT-A-3-158-162	158	162	07/27/2022	**6.80**	1.40 U	0.910 U	0.910 U	**9.60**	0.910 U	0.910 U	**9.50**	**240**	**67.0**	1.40 U	**49.0**	**200**	1.40 U	1.40 U	1.40 U
AFT-A-3 (FD)	31VP-AFT-A-3-158-162-DUP05	158	162	07/27/2022	**6.90**	1.40 U	0.920 U	0.920 U	**8.70**	0.920 U	0.920 U	**11.0**	**240**	**69.0**	1.40 U	**50.0**	**190**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-168-172	168	172	07/27/2022	**5.40**	**1.20 J**	0.950 U	0.950 U	**9.50 J**	**0.310 J**	0.950 U	**42.0**	**170**	**85.0**	1.40 U	**19.0**	**160**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-178-182	178	182	07/28/2022	**7.70**	**1.30 J**	0.960 U	0.960 U	**17.0 J**	**1.50 J**	0.960 U	**22.0**	**670**	**160**	**1.10 J**	**36.0**	**790**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-183-187	183	187	07/28/2022	**33.0**	**0.640 J**	0.960 U	0.960 U	**20.0**	0.960 U	0.960 U	**68.0**	**2,000**	**610**	1.40 U	**83.0**	**3,000**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-68-72	68	72	07/21/2022	4.60 U	1.40 U	0.910 U	0.910 U	**0.800 J**	0.910 U	0.910 U	**3.10**	**12.0**	**5.00**	1.40 U	**0.660 J**	**5.90**	1.40 U	1.40 U	1.40 U
AFT-A-3	31VP-AFT-A-3-78-82	78	82	07/21/2022	**8.00**	1.30 U	0.850 U	0.850 U	**5.40**	0.850 U	0.850 U	**21.0**	**91.0**	**64.0**	1.30 U	1.30 U	**210**	1.30 U	1.30 U	1.30 U
AFT-A-3	31VP-AFT-A-3-88-92	88	92	07/21/2022	**20.0**	1.30 U	0.850 U	0.850 U	**5.50**	0.850 U	0.850 U	**59.0**	**230**	**87.0**	1.30 U	1.30 U	**370**	1.30 U	1.30 U	1.30 U
AFT-A-3	31VP-AFT-A-3-98-102	98	102	07/22/2022	**12.0**	1.40 U	0.910 U	0.910 U	**98.0**	0.910 U	0.910 U	**230**	**11,000**	**2,700**	1.40 U	1.40 U	**15,000**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-108-112	108	112	08/01/2022	**140**	**0.900 J**	1.20 U	1.20 U	**31.0**	**0.520 J**	1.20 U	**100**	**2,200**	**640**	**0.930 J**	**210**	**3,200**	1.80 U	1.80 U	1.80 U
AFT-A-4	31VP-AFT-A-4-118-122	118	122	08/01/2022	**87.0**	**14.0**	0.940 U	0.940 U	**52.0**	**0.700 J**	0.940 U	**87.0**	**1,100**	**470**	**7.50**	**1,300**	**680**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-128-132	128	132	08/01/2022	**19.0**	1.40 U	0.940 U	0.940 U	**44.0**	0.940 U	0.940 U	**35.0**	**540**	**130**	**0.800 J**	**590**	**280**	1.40 U	1.40 U	1.40 U
AFT-A-4 (FD)	31VP-AFT-A-4-128-132-DUP06	128	132	08/01/2022	**22.0**	1.40 U	0.950 U	0.950 U	**47.0**	0.950 U	0.950 U	**35.0**	**570**	**130**	**0.870 J**	**610**	**280**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-138-142	138	142	08/02/2022	**77.0**	**3.80**	1.10 U	1.10 U	**34.0**	1.10 U	1.10 U	**47.0**	**720**	**240**	**1.80 J**	**390**	**410**	1.60 U	1.60 U	1.60 U
AFT-A-4	31VP-AFT-A-4-148-152	148	152	08/02/2022	**8.40**	**5.60**	0.980 U	0.980 U	**6.70**	**0.700 J**	0.980 U	**8.30**	**120**	**34.0**	**0.850 J**	**320**	**63.0**	1.50 U	1.50 U	1.50 U
AFT-A-4	31VP-AFT-A-4-68-72	68	72	07/29/2022	0.950 U	1.40 U	0.950 U	0.950 U	**1.90**	0.950 U	0.950 U	**5.80**	**63.0**	**20.0**	1.40 U	1.40 U	**200**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-78-82	78	82	07/29/2022	0.950 U	1.40 U	0.950 U	0.950 U	**0.810 J**	0.950 U	0.950 U	**5.60**	**43.0**	**7.70**	1.40 U	**1.20 J**	**19.0**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-88-92	88	92	07/29/2022	0.940 U	1.40 U	0.940 U	0.940 U	**1.50 J**	0.940 U	0.940 U	**5.30**	**55.0**	**14.0**	1.40 U	**2.30**	**17.0**	1.40 U	1.40 U	1.40 U
AFT-A-4	31VP-AFT-A-4-98-102	98	102	07/29/2022	**5.70**	1.40 U	0.950 U	0.950 U	**6.40**	0.950 U	0.950 U	**24.0**	**280**	**81.0**	1.40 U	**16.0**	**14.0**	1.40 U	1.40 U	1.40 U
AFT-A-5	31VP-AFT-A-5-108-112	108	112	08/04/2022	**95.0**	1.80 U	1.20 U	1.20 U	**150**	1.20 U	1.20 U	**150**	**830**	**950**	1.80 U	**110**	**540**	1.80 U	1.80 U	1.80 U
AFT-A-5	31VP-AFT-A-5-118-122	118	122	08/04/2022	**4.00 J**	**2.90**	1.00 U	1.00 U	**25.0 J**	**0.670 J**	1.00 U	**27.0**	**400**	**72.0**	**1.80 J**	**450**	**150**	1.50 U	1.50 U	1.50 U
AFT-A-5	31VP-AFT-A-5-128-132	128	132	08/05/2022	**1.60 J**	1.40 U	0.960 U	0.960 U	**16.0**	0.960 U	0.960 U	**12.0**	**190**	**52.0**	1.40 U	**160**	**81.0**	1.40 U	1.40 U	1.40 U
AFT-A-5	31VP-AFT-A-5-138-142	138	142	08/05/2022	**21.0**	1.60 U	1.10 U	1.10 U	**53.0**	1.10 U	1.10 U	**47.0**	**380**	**300**	**0.610 J**	**94.0**	**180**	1.60 U	1.60 U	1.60 U
AFT-A-5	31VP-AFT-A-5-147-151	147	151	08/08/2022	**23.0**	1.50 U	0.990 U	0.990 U	**31.0**	0.990 U	0.990 U	**39.0**	**340**	**230**	1.50 U	**44.0**	**140**	1.50 U	1.50 U	1.50 U
AFT-A-5	31VP-AFT-A-5-68-72	68	72	08/03/2022	0.960 U	1.40 U	0.960 U	0.960 U	**0.470 J**	0.960 U	0.960 U	**1.70 J**	**10.0**	**3.10**	1.40 U	**1.30 J**	**4.00**	1.40 U	1.40 U	1.40 U
AFT-A-5	31VP-AFT-A-5-78-82	78	82	08/03/2022	**16.0**	1.40 U	0.940 U	0.940 U	**6.10**	0.940 U	0.940 U	**16.0**	**450**	**41.0**	1.40 U	**23.0**	**50.0**	1.40 U	1.40 U	1.40 U
AFT-A-5	31VP-AFT-A-5-88-92	88	92	08/03/2022	**4.10 J**	1.60 U	1.00 U	1.00 U	**3.30**	1.00 U	1.00 U	**11.0**	**180**	**28.0**	1.60 U	**57.0**	**53.0**	1.60 U	1.60 U	1.60 U
AFT-A-5 (FD)	31VP-AFT-A-5-88-92 DUP07	88	92	08/03/2022	**4.10 J**	1.50 U	**0.790 J**	0.970 U	**3.50**	0.970 U	0.970 U	**11.0**	**190**	**27.0**	1.50 U	**61.0**	**52.0**	1.50 U	1.50 U	1.50 U
AFT-A-5	31VP-AFT-A-5-98-102	98	102	08/04/2022	**200**	1.40 U	0.960 U	0.960 U	**310**	0.960 U	0.960 U	**270**	**1,500**	**1,900**	**3.50**	**840**	**880**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-108-112	108	112	08/09/2022	**35.0**	1.50 U	0.980 U	0.980 U	**16.0**	0.980 U	0.980 U	**68.0**	**960**	**240**	1.50 U	**67.0**	**820**	1.50 U	1.50 U	1.50 U
AFT-B-1	31VP-AFT-B-1-118-122	118	122	08/10/2022	**140**	1.30 U	0.840 U	0.840 U	**34.0**	0.840 U	0.840 U	**110**	**2,700**	**750**	**0.750 J**	**220**	**3,100**	1.30 U	1.30 U	1.30 U
AFT-B-1	31VP-AFT-B-1-128-132	128	132	08/10/2022	**9.30**	1.30 U	0.850 U	0.850 U	**55.0**	0.850 U	0.850 U	**100**	**1,900**	**670**	**0.810 J**	**160**	**1,500**	1.30 U	1.30 U	1.30 U
AFT-B-1 (FD)	31VP-AFT-B-1-128-132-DUP09	128	132	08/10/2022	**8.50**	1.30 U	0.880 U	0.880 U	**57.0**	0.880 U	0.880 U	**93.0**	**2,000**	**590**	**0.780 J**	**170**	**1,600**	1.30 U	1.30 U	1.30 U
AFT-B-1	31VP-AFT-B-1-138-142	138	142	08/11/2022	**29.0**	**3.70**	0.960 U	0.960 U	**89.0**	0.960 U	0.960 U	**120**	**1,900**	**820**	**5.70**	**1,500**	**1,300**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-148-152	148	152	08/11/2022	**4.60 J**	1.40 U	0.940 U	0.940 U	**39.0**	0.940 U	0.940 U	**29.0**	**450**	**110**	**0.690 J**	**250**	**190**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-158-162	158	162	08/18/2022	**3.40 J**	1.50 U	0.980 U	0.980 U	**11.0**	0.980 U	0.980 U	**8.70**	**120**	**29.0**	1.50 U	**68.0**	**47.0**	1.50 U	1.50 U	1.50 U
AFT-B-1 (FD)	31VP-AFT-B-1-158-162-DUP11	158	162	08/18/2022	**3.70 J**	1.50 U	0.970 U	0.970 U	**11.0**	0.970 U	0.970 U	**8.70**	**130**	**29.0**	1.50 U	**67.0**	**46.0**	1.50 U	1.50 U	1.50 U
AFT-B-1	31VP-AFT-B-1-168-172	168	172	08/18/2022	**69.0**	1.60 U	1.10 U	1.10 U	**28.0**	1.10 U	1.10 U	**130**	**2,000**	**380**	1.60 U	**140**	**2,000**	1.60 U	1.60 U	1.60 U
AFT-B-1	31VP-AFT-B-1-178-182	178	182	08/19/2022	**11.0**	1.50 U	0.990 U	0.990 U	**12.0**	0.990 U	0.990 U	**29.0**	**540**	**98.0**	1.50 U	**55.0**	**610**	1.50 U	1.50 U	1.50 U
AFT-B-1	31VP-AFT-B-1-186-190	186	190	08/22/2022	**10.0**	1.40 U	0.970 U	0.970 U	**81.0**	**0.370 J**	0.970 U	**110**	**1,900**	**910**	**1.30 J**	**230**	**1,500**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-68-72	68	72	08/08/2022	**72.0**	**0.610 J**	0.930 U	0.930 U	**26.0**	0.930 U	0.930 U	**120**	**1,200**	**260**	**1.10 J**	**140**	**150**	1.40 U	1.40 U	1.40 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (ng/L)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
AFT-B-1	31VP-AFT-B-1-78-82	78	82	08/08/2022	**2.60 J**	1.40 U	0.910 U	0.910 U	**0.510 J**	0.910 U	0.910 U	**3.40**	**6.40**	**4.50**	1.40 U	**0.540 J**	**3.00**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-88-92	88	91	08/09/2022	0.920 U	1.40 U	0.920 U	0.920 U	**8.30**	0.920 U	0.920 U	**58.0**	**1,300**	**180**	1.40 U	1.40 U	**590**	1.40 U	1.40 U	1.40 U
AFT-B-1 (FD)	31VP-AFT-B-1-88-92-DUP08	88	91	08/09/2022	0.940 U	1.40 U	0.940 U	0.940 U	**7.70**	0.940 U	0.940 U	**57.0**	**1,200**	**180**	1.40 U	1.40 U	**600**	1.40 U	1.40 U	1.40 U
AFT-B-1	31VP-AFT-B-1-98-102	98	102	08/09/2022	1.10 U	1.60 U	1.10 U	1.10 U	**28.0**	1.10 U	1.10 U	**270**	**3,300**	**560**	1.60 U	**1.20 J**	**700**	1.60 U	1.60 U	1.60 U
AFT-B-2	31VP-AFT-B-2-108-112	108	112	08/24/2022	**130**	1.40 U	0.940 U	0.940 U	**33.0**	0.940 U	0.940 U	**120**	**2,200**	**540**	1.40 U	**150**	**3,500**	1.40 U	1.40 U	1.40 U
AFT-B-2	31VP-AFT-B-2-118-122	118	122	08/24/2022	**170**	**6.30**	1.00 U	1.00 U	**32.0**	**0.380 J**	1.00 U	**97.0**	**2,000**	**690**	**2.30**	**840**	**2,900**	1.60 U	1.60 U	1.60 U
AFT-B-2	31VP-AFT-B-2-128-132	128	132	08/24/2022	**34.0**	**6.70**	1.60 U	1.60 U	**9.20 J**	**0.590 J**	1.60 U	**28.0**	**560**	**190**	**0.890 J**	**580**	**560**	2.40 U	2.40 U	2.40 U
AFT-B-2	31VP-AFT-B-2-138-142	138	142	08/25/2022	**120**	**1.20 J**	0.920 U	0.920 U	**67.0**	0.920 U	0.920 U	**130**	**3,100**	**1,100**	**3.00**	**820**	**3,400**	1.40 U	1.40 U	1.40 U
AFT-B-2 (FD)	31VP-AFT-B-2-138-142-DUP13	138	142	08/25/2022	**110**	**1.20 J**	0.950 U	0.950 U	**68.0**	0.950 U	0.950 U	**130**	**3,300**	**1,200**	**2.80**	**770**	**3,300**	1.40 U	1.40 U	1.40 U
AFT-B-2	31VP-AFT-B-2-148-152	148	152	08/25/2022	**61.0**	**2.30**	0.980 U	0.980 U	**130**	0.980 U	0.980 U	**190**	**2,500**	**1,400**	**5.10**	**1,100**	**2,300**	1.50 U	1.50 U	1.50 U
AFT-B-2	31VP-AFT-B-2-158-162	158	162	08/26/2022	**41.0**	**0.860 J**	1.30 U	1.30 U	**47.0**	1.30 U	1.30 U	**76.0**	**1,300**	**570**	**1.90 J**	**370**	**1,300**	1.90 U	1.90 U	1.90 U
AFT-B-2	31VP-AFT-B-2-168-172	168	172	08/26/2022	**16.0**	**0.710 J**	1.00 U	1.00 U	**42.0**	1.00 U	1.00 U	**45.0**	**710**	**200**	**3.30**	**1,000**	**380**	1.50 U	1.50 U	1.50 U
AFT-B-2	31VP-AFT-B-2-178-182	178	182	08/29/2022	**3.30 J**	1.50 U	1.00 U	1.00 U	**11.0**	1.00 U	1.00 U	**9.70**	**170**	**48.0**	1.50 U	**110**	**96.0**	1.50 U	1.50 U	1.50 U
AFT-B-2	31VP-AFT-B-2-68-72	68	72	08/23/2022	0.950 U	1.40 U	0.950 U	0.950 U	**0.620 J**	0.950 U	0.950 U	**2.20**	**25.0**	**5.90**	1.40 U	1.40 U	**3.60**	1.40 U	1.40 U	1.40 U
AFT-B-2	31VP-AFT-B-2-78-82	78	82	08/23/2022	**2.90 J**	1.40 U	0.940 U	0.940 U	**16.0**	0.940 U	0.940 U	**36.0**	**1,500**	**310**	1.40 U	1.40 U	**1,600**	1.40 U	1.40 U	1.40 U
AFT-B-2	31VP-AFT-B-2-88-92	88	92	08/23/2022	**2.20 J**	1.40 U	0.930 U	0.930 U	**19.0**	0.930 U	0.930 U	**70.0**	**770**	**150**	1.40 U	**1.20 J**	**1,100**	1.40 U	1.40 U	1.40 U
AFT-B-2 (FD)	31VP-AFT-B-2-88-92-DUP12	88	92	08/23/2022	**1.90 J**	1.80 U	1.20 U	1.20 U	**19.0**	1.20 U	1.20 U	**66.0**	**710**	**150**	1.80 U	**1.60 J**	**1,200**	1.80 U	1.80 U	1.80 U
AFT-B-2	31VP-AFT-B-2-98-102	98	102	08/23/2022	**120**	**15.0**	0.950 U	0.950 U	**35.0**	**0.570 J**	0.950 U	**120**	**2,100**	**610**	**0.640 J**	**420**	**3,400**	1.40 U	1.40 U	**1.10 J**
AFT-B-3	31VP-AFT-B-3-108-112	108	112	08/31/2022	**590**	**5.00**	0.930 U	0.930 U	**60.0**	0.930 U	0.930 U	**210**	**4,300**	**1,700**	**6.70**	**1,600**	**4,700**	1.40 U	1.40 U	1.40 U
AFT-B-3	31VP-AFT-B-3-118-122	118	122	08/31/2022	**440**	**5.20**	0.840 U	0.840 U	**57.0**	0.840 U	0.840 U	**190**	**4,000**	**1,600**	**7.30**	**1,300**	**4,300**	1.30 U	1.30 U	1.30 U
AFT-B-3	31VP-AFT-B-3-128-132	128	132	09/01/2022	**200**	**3.10**	0.830 U	0.830 U	**67.0**	0.830 U	0.830 U	**150**	**3,800**	**1,300**	**6.10**	**1,800**	**4,200**	1.30 U	1.30 U	1.30 U
AFT-B-3	31VP-AFT-B-3-138-142	138	142	09/01/2022	**62.0**	**6.60**	0.820 U	0.820 U	**350**	0.820 U	0.820 U	**510**	**5,200**	**4,300**	**1.10 J**	**180**	**10,000**	1.20 U	1.20 U	1.20 U
AFT-B-3	31VP-AFT-B-3-148-152	148	152	09/02/2022	**87.0**	**7.10**	0.880 U	0.880 U	**110**	0.880 U	0.880 U	**180**	**2,700**	**1,300**	**5.20**	**890**	**2,800**	1.30 U	1.30 U	1.30 U
AFT-B-3 (FD)	31VP-AFT-B-3-148-152-DUP15	148	152	09/02/2022	**86.0**	**7.60**	0.840 U	0.840 U	**120**	0.840 U	0.840 U	**180**	**2,700**	**1,200**	**4.80**	**810**	**2,900**	1.30 U	1.30 U	1.30 U
AFT-B-3	31VP-AFT-B-3-155-159	155	159	09/02/2022	**9.60**	**8.70**	0.900 U	0.900 U	**51.0**	0.900 U	0.900 U	**50.0**	**680**	**340**	**0.810 J**	**260**	**570**	1.30 U	1.30 U	1.30 U
AFT-B-3	31VP-AFT-B-3-68-72	68	72	08/30/2022	**46.0**	**44.0**	0.970 U	0.970 U	**2.20**	0.970 U	0.970 U	**49.0**	**320**	**39.0**	**1.60 J**	**790**	**68.0**	1.50 U	1.50 U	1.50 U
AFT-B-3	31VP-AFT-B-3-78-82	78	82	08/30/2022	4.90 U	1.50 U	0.980 U	0.980 U	**37.0**	0.980 U	0.980 U	**110**	**2,900**	**1,000**	1.50 U	**3.20**	**2,400**	1.50 U	1.50 U	1.50 U
AFT-B-3	31VP-AFT-B-3-88-92	88	92	08/30/2022	**79.0**	1.50 U	0.980 U	0.980 U	**37.0**	0.980 U	0.980 U	**160**	**2,600**	**480**	1.50 U	**25.0 J**	**3,600**	1.50 U	1.50 U	1.50 U
AFT-B-3 (FD)	31VP-AFT-B-3-88-92-DUP14	88	92	08/30/2022	**87.0**	1.40 U	0.950 U	0.950 U	**36.0**	0.950 U	0.950 U	**160**	**2,700**	**500**	1.40 U	**23.0 J**	**3,600**	1.40 U	1.40 U	1.40 U
AFT-B-3	31VP-AFT-B-3-98-102	98	102	08/31/2022	**290**	**0.980 J**	0.910 U	0.910 U	**59.0**	0.910 U	0.910 U	**190**	**4,000**	**1,300**	**5.30**	**1,300**	**5,000**	1.40 U	1.40 U	1.40 U
AFT-B-4	31VP-AFT-B-4-108-112	108	112	09/08/2022	**700**	**4.00**	0.980 U	0.980 U	**90.0**	0.980 U	0.980 U	**210**	**4,000**	**1,700**	**5.30**	**1,000**	**3,800**	1.50 U	1.50 U	1.50 U
AFT-B-4	31VP-AFT-B-4-118-122	118	122	09/08/2022	**480**	**3.90**	0.960 U	0.960 U	**76.0**	0.960 U	0.960 U	**180**	**3,600**	**1,400**	**8.30**	**1,600**	**3,100**	1.40 U	1.40 U	1.40 U
AFT-B-4 (FD)	31VP-AFT-B-4-118-122-DUP16	118	122	09/08/2022	**490**	**4.40**	0.950 U	0.950 U	**75.0**	0.950 U	0.950 U	**180**	**3,500**	**1,300**	**8.50**	**1,600**	**3,300**	1.40 U	1.40 U	1.40 U
AFT-B-4	31VP-AFT-B-4-128-132	128	132	09/09/2022	**290**	**0.910 J**	0.970 U	0.970 U	**69.0**	0.970 U	0.970 U	**160**	**4,100**	**1,300**	**8.60**	**2,000**	**4,800**	1.50 U	1.50 U	1.50 U
AFT-B-4	31VP-AFT-B-4-138-142	138	142	09/09/2022	**220**	**1.10 J**	1.20 U	1.20 U	**98.0**	1.20 U	1.20 U	**180**	**3,100**	**1,200**	**5.60**	**1,000**	**3,000**	1.80 U	1.80 U	1.80 U
AFT-B-4	31VP-AFT-B-4-148-152	148	152	09/12/2022	**250**	**6.60**	1.60 U	1.60 U	**44.0**	1.60 U	1.60 U	**180**	**3,500**	**1,200**	**1.50 J**	**530**	**5,000**	2.40 U	2.40 U	2.40 U
AFT-B-4	31VP-AFT-B-4-158-162	158	162	09/12/2022	**1.50 J**	1.50 U	1.00 U	1.00 U	**14.0**	1.00 U	1.00 U	**7.40**	**160**	**37.0**	1.50 U	**14.0**	**76.0**	1.50 U	1.50 U	1.50 U
AFT-B-4	31VP-AFT-B-4-168-172	168	172	09/13/2022	0.950 U	1.40 U	0.950 U	0.950 U	**3.50**	0.950 U	0.950 U	**1.80 J**	**52.0**	**6.40**	1.40 U	**13.0**	**15.0**	1.40 U	1.40 U	1.40 U
AFT-B-4	31VP-AFT-B-4-178-182	178	182	09/14/2022	**79.0**	**2.80 J**	1.40 U	1.40 U	**31.0**	1.40 U	1.40 U	**58.0**	**910**	**360**	**0.980 J**	**270**	**1,000**	2.20 U	2.20 U	2.20 U
AFT-B-4	31VP-AFT-B-4-188-192	188	192	09/14/2022	**130**	**2.20 J**	1.30 U	1.30 U	**21.0 J**	1.30 U	1.30 U	**65.0**	**1,200**	**500**	1.90 U	**320**	**1,200**	1.90 U	1.90 U	1.90 U
AFT-B-4	31VP-AFT-B-4-68-72	68	72	09/07/2022	**9.00**	**20.0**	1.00 U	1.00 U	**1.20 J**	1.00 U	1.00 U	**13.0**	**82.0**	**20.0**	**1.30 J**	**510**	**28.0**	1.50 U	1.50 U	1.50 U
AFT-B-4	31VP-AFT-B-4-78-82	78	82	09/07/2022	**17.0**	1.50 U	0.980 U	0.980 U	**8.90**	0.980 U	0.980 U	**35.0**	**240**	**97.0**	1.50 U	**11.0**	**320**	1.50 U	1.50 U	1.50 U
AFT-B-4	31VP-AFT-B-4-88-92	88	92	09/07/2022	**210**	1.50 U	0.990 U	0.990 U	**92.0**	0.990 U	0.990 U	**370**	**9,400**	**3,100**	1.50 U	**110 J**	**13,000**	1.50 U	1.50 U	1.50 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (ng/L)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
AFT-B-4	31VP-AFT-B-4-98-102	98	102	09/08/2022	**760**	**0.800 J**	0.970 U	0.970 U	**68.0**	0.970 U	0.970 U	**250**	**5,200**	**2,000**	**5.90**	**1,400**	**5,500**	1.50 U	1.50 U	1.50 U
AFT-B-5	31VP-AFT-B-5-108-112	108	112	09/16/2022	**740**	**3.70**	0.970 U	0.970 U	**140**	0.970 U	0.970 U	**210**	**3,100**	**1,600**	**4.80**	**830**	**3,200**	1.50 U	1.50 U	1.50 U
AFT-B-5 (FD)	31VP-AFT-B-5-108-112-DUP-18	108	112	09/16/2022	**780**	**3.90**	1.00 U	1.00 U	**140**	1.00 U	1.00 U	**210**	**3,100**	**1,600**	**4.90**	**880**	**3,300**	1.60 U	1.60 U	1.60 U
AFT-B-5	31VP-AFT-B-5-118-122	118	122	09/16/2022	**340**	**4.00**	0.920 U	0.920 U	**87.0**	0.920 U	0.920 U	**160**	**2,500**	**1,000**	**6.60**	**1,000**	**2,500**	1.40 U	1.40 U	1.40 U
AFT-B-5	31VP-AFT-B-5-128-132	128	132	09/19/2022	**180**	**1.50 J**	0.990 U	0.990 U	**71.0**	0.990 U	0.990 U	**160**	**3,200**	**1,000**	**8.20**	**1,100**	**2,900**	1.50 U	1.50 U	1.50 U
AFT-B-5	31VP-AFT-B-5-138-142	138	142	09/19/2022	**130**	**1.40 J**	1.00 U	1.00 U	**72.0**	1.00 U	1.00 U	**150**	**2,000**	**810**	**5.20**	**1,100**	**2,100**	1.50 U	1.50 U	1.50 U
AFT-B-5	31VP-AFT-B-5-148-152	148	152	09/20/2022	**260**	1.70 U	1.10 U	1.10 U	**36.0**	1.10 U	1.10 U	**84.0**	**1,300**	**590**	**1.30 J**	**450**	**1,400**	1.70 U	1.70 U	1.70 U
AFT-B-5	31VP-AFT-B-5-158-162	158	162	09/20/2022	**290**	1.70 U	1.20 U	1.20 U	**45.0**	1.20 U	1.20 U	**110**	**1,800**	**760**	**2.10 J**	**600**	**1,600**	1.70 U	1.70 U	1.70 U
AFT-B-5	31VP-AFT-B-5-68-72	68	72	09/15/2022	4.90 U	1.50 U	0.970 U	0.970 U	**5.70**	0.970 U	0.970 U	**12.0**	**140**	**33.0**	1.50 U	**250**	**83.0**	1.50 U	1.50 U	1.50 U
AFT-B-5	31VP-AFT-B-5-78-82	78	82	09/15/2022	4.80 U	1.40 U	0.950 U	0.950 U	**3.40**	0.950 U	0.950 U	**24.0**	**140**	**43.0**	1.40 U	**29.0**	**96.0**	1.40 U	1.40 U	1.40 U
AFT-B-5	31VP-AFT-B-5-88-92	88	92	09/15/2022	**560**	1.40 U	0.930 U	0.930 U	**44.0**	0.930 U	0.930 U	**170**	**2,900**	**750**	**4.40**	**2,500**	**2,000**	1.40 U	1.40 U	1.40 U
AFT-B-5	31VP-AFT-B-5-98-102	98	102	09/16/2022	**800**	**2.50**	0.900 U	0.900 U	**120**	0.900 U	0.900 U	**250**	**3,700**	**1,700**	**5.30**	**830**	**4,400**	1.40 U	1.40 U	1.40 U
AFT-B-5 (FD)	31VP-AFT-B-5-DUP-17	78	82	09/15/2022	4.50 U	1.40 U	0.900 U	0.900 U	**3.50**	0.900 U	0.900 U	**24.0**	**150**	**43.0**	1.40 U	**32.0 J**	**100**	1.40 U	1.40 U	1.40 U
PFT-A-1	31VP-PFT-A-1-108-112	108	112	08/02/2022	**1,500**	1.50 U	1.00 U	1.00 U	**150**	1.00 U	1.00 U	**350**	**5,400**	**2,400**	**3.10**	**2,200**	**4,800**	1.50 U	1.50 U	1.50 U
PFT-A-1	31VP-PFT-A-1-118-122	118	122	08/02/2022	**220**	1.40 U	0.950 U	0.950 U	**40.0**	0.950 U	0.950 U	**110**	**3,900**	**1,100**	**2.40**	**780**	**4,000**	1.40 U	1.40 U	1.40 U
PFT-A-1	31VP-PFT-A-1-128-132	128	132	08/02/2022	**15.0**	1.50 U	0.990 U	0.990 U	**82.0**	0.990 U	0.990 U	**110**	**2,700**	**960**	**1.40 J**	**320**	**2,200**	1.50 U	1.50 U	1.50 U
PFT-A-1	31VP-PFT-A-1-138-142	138	142	08/03/2022	**14.0 J**	**0.730 J**	0.940 UJ	0.940 UJ	**92.0 J**	0.940 UJ	0.940 UJ	**95.0 J**	**1,700 J**	**870 J**	**1.30 J**	**260 J**	**1,200 J**	1.40 UJ	1.40 UJ	1.40 UJ
PFT-A-1	31VP-PFT-A-1-148-152	148	152	08/03/2022	**6.80**	1.60 U	1.10 U	1.10 U	**43.0**	1.10 U	1.10 U	**27.0**	**470**	**100**	**0.900 J**	**390**	**210**	1.60 U	1.60 U	1.60 U
PFT-A-1	31VP-PFT-A-1-158-162	158	162	08/04/2022	**4.90 J**	1.60 U	1.00 U	1.00 U	**15.0**	1.00 U	1.00 U	**11.0**	**140**	**39.0**	1.60 U	**83.0**	**56.0**	1.60 U	1.60 U	1.60 U
PFT-A-1	31VP-PFT-A-1-168-172	168	172	08/04/2022	**1.20 J**	1.40 U	0.960 U	0.960 U	**6.10**	0.960 U	0.960 U	**3.90**	**78.0**	**13.0**	1.40 U	**46.0**	**25.0**	1.40 U	1.40 U	1.40 U
PFT-A-1	31VP-PFT-A-1-176-180	176	180	08/05/2022	**1.90 J**	1.50 U	0.980 U	0.980 U	**7.70**	**0.380 J**	0.980 U	**5.50**	**110**	**26.0**	1.50 U	**50.0**	**56.0**	1.50 U	1.50 U	1.50 U
PFT-A-1	31VP-PFT-A-1-68-72	68	72	08/01/2022	**48.0**	**15.0**	0.970 U	0.970 U	**19.0**	0.970 U	0.970 U	**150**	**610**	**200**	**1.60 J**	**590**	**110**	1.50 U	1.50 U	1.50 U
PFT-A-1	31VP-PFT-A-1-78-82	78	82	08/01/2022	0.980 U	1.50 U	0.980 U	0.980 U	0.980 U	0.980 U	0.980 U	**3.90**	**29.0**	**6.40**	1.50 U	**8.50**	**5.30**	1.50 U	1.50 U	1.50 U
PFT-A-1	31VP-PFT-A-1-88-92	88	92	08/01/2022	**3.90 J**	**1.40 J**	1.10 U	1.10 U	**32.0 J**	**0.370 J**	1.10 U	**130**	**2,700**	**570**	1.60 U	**51.0**	**1,600**	1.60 U	1.60 U	1.60 U
PFT-A-1	31VP-PFT-A-1-98-102	98	102	08/01/2022	0.950 U	1.40 U	0.950 U	0.950 U	**14.0**	0.950 U	0.950 U	**120**	**690**	**180**	1.40 U	1.40 U	**260**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-108-112	108	112	08/09/2022	**400**	**1.20 J**	0.940 U	0.940 U	**50.0**	0.940 U	0.940 U	**140**	**3,900**	**1,600**	**3.40**	**1,100**	**5,700**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-118-122	118	122	08/09/2022	**96.0**	**7.30**	0.990 U	0.990 U	**100**	0.990 U	0.990 U	**170**	**3,600**	**1,900**	**3.30**	**850**	**3,100**	1.50 U	1.50 U	1.50 U
PFT-A-2	31VP-PFT-A-2-128-132	128	132	08/10/2022	**7.70**	**20.0**	0.990 U	0.990 U	**170**	0.990 U	0.990 U	**210**	**4,700**	**2,500**	**2.50**	**540**	**3,800**	1.50 U	1.50 U	1.50 U
PFT-A-2	31VP-PFT-A-2-136-140	136	140	08/11/2022	**38.0**	**6.10**	0.960 U	0.960 U	**150**	0.960 U	0.960 U	**210**	**3,500**	**1,700**	**6.00**	**1,200**	**2,800**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-68-72	68	72	08/08/2022	**43.0**	**23.0**	0.910 U	0.910 U	**5.50**	0.910 U	0.910 U	**39.0**	**200**	**120**	**1.00 J**	**480**	**55.0**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-78-82	78	82	08/08/2022	0.920 U	1.40 U	0.920 U	0.920 U	**0.970 J**	0.920 U	0.920 U	**3.00**	**22.0**	**9.70**	1.40 U	**7.20**	**2.80**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-88-92	88	92	08/08/2022	**3.80 J**	1.40 U	0.950 U	0.950 U	**15.0**	0.950 U	0.950 U	**39.0**	**1,300**	**240**	1.40 U	**1.40 J**	**1,200**	1.40 U	1.40 U	1.40 U
PFT-A-2	31VP-PFT-A-2-98-102	98	102	08/09/2022	**18.0**	**0.640 J**	0.940 U	0.940 U	**18.0**	0.940 U	0.940 U	**39.0**	**860**	**160**	1.40 U	**12.0**	**1,300**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-108-112	108	112	08/12/2022	**730**	**5.70**	0.930 U	0.930 U	**64.0**	0.930 U	0.930 U	**250**	**4,000**	**1,900**	**6.10**	**1,500**	**4,500**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-118-122	118	122	08/12/2022	**610**	**12.0**	5.00 U	5.00 U	**61.0**	5.00 U	5.00 U	**210**	**3,400**	**1,500**	**5.80 J**	**1,600**	**3,500**	7.50 U	7.50 U	7.50 U
PFT-A-3	31VP-PFT-A-3-128-132	128	132	08/15/2022	**100**	**4.80 J**	5.00 U	5.00 U	**100**	5.00 U	5.00 U	**160**	**4,000**	**1,500**	**6.10 J**	**1,400**	**3,800**	7.50 U	7.50 U	7.50 U
PFT-A-3	31VP-PFT-A-3-138-142	138	142	08/15/2022	**100**	15.0 U	10.0 U	10.0 U	**190**	10.0 U	10.0 U	**260**	**3,600**	**2,200**	15.0 U	**1,100**	**3,800**	15.0 U	15.0 U	15.0 U
PFT-A-3	31VP-PFT-A-3-148-152	148	152	08/16/2022	**9.30**	**0.620 J**	0.950 U	0.950 U	**35.0**	0.950 U	0.950 U	**27.0**	**440**	**100**	**0.790 J**	**420**	**180**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-158-162	158	162	08/16/2022	0.920 U	1.40 U	0.920 U	0.920 U	**1.00 J**	0.920 U	0.920 U	0.920 U	**6.30**	**2.20**	1.40 U	**1.60 J**	**2.30**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-168-172	168	172	08/17/2022	**0.900 J**	**1.40 J**	0.970 U	0.970 U	**3.30**	0.970 U	0.970 U	**2.30**	**47.0**	**12.0**	1.50 U	**51.0**	**19.0 J**	1.50 U	1.50 U	1.50 U
PFT-A-3 (FD)	31VP-PFT-A-3-168-172-DUP10	168	172	08/17/2022	**1.30 J**	**1.30 J**	1.00 U	1.00 U	**4.00**	1.00 U	1.00 U	**3.40**	**60.0**	**15.0**	1.50 U	**52.0**	**32.0 J**	1.50 U	1.50 U	1.50 U
PFT-A-3	31VP-PFT-A-3-178-182	178	182	08/17/2022	**5.90**	**0.780 J**	1.10 U	1.10 U	**7.80 J**	1.10 U	1.10 U	**9.70**	**210**	**53.0**	1.70 U	**82.0**	**150**	1.70 U	1.70 U	1.70 U
PFT-A-3	31VP-PFT-A-3-188-192	188	192	08/18/2022	**170**	**19.0**	0.990 U	0.990 U	**33.0**	**0.500 J**	0.990 U	**85.0**	**1,700**	**540**	**2.70**	**1,400**	**1,600**	1.50 U	1.50 U	1.50 U

Locations	Field Sample ID	Sample Begin Depth	Sample End Depth	Sample Date	PFAS (ng/L)															
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctanesulfona-midoacetic acid (NEtFOSAA)	N-Methyl perfluorooctanesulfona-midoacetic acid (NMeFOSAA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
PFT-A-3	31VP-PFT-A-3-68-72	68	72	08/11/2022	**46.0**	**55.0**	0.960 U	0.960 U	**1.50 J**	0.960 U	0.960 U	**29.0**	**250**	**28.0**	**0.920 J**	**880**	**63.0**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-78-82	78	82	08/11/2022	0.970 U	1.50 U	0.970 U	0.970 U	**0.960 J**	0.970 U	0.970 U	**4.40**	**31.0**	**6.20**	1.50 U	**3.20**	**9.10**	1.50 U	1.50 U	1.50 U
PFT-A-3	31VP-PFT-A-3-88-92	88	92	08/12/2022	**210**	1.40 U	0.970 U	0.970 U	**49.0**	0.970 U	0.970 U	**230**	**5,200**	**1,300**	1.40 U	**87.0 J**	**4,500**	1.40 U	1.40 U	1.40 U
PFT-A-3	31VP-PFT-A-3-98-102	98	102	08/12/2022	**400**	1.50 U	0.970 U	0.970 U	**54.0**	0.970 U	0.970 U	**210**	**3,600**	**1,300**	**2.90**	**690**	**4,000**	1.50 U	1.50 U	1.50 U
PFT-A-4	31VP-PFT-A-4-108-112	108	112	08/22/2022	**1,000**	**3.70**	0.960 U	0.960 U	**180**	0.960 U	0.960 U	**260**	**3,200**	**2,100**	**2.30**	**620**	**4,000**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-118-122	118	122	08/23/2022	**350**	**8.90**	0.950 U	0.950 U	**93.0**	**0.390 J**	0.950 U	**140**	**1,600**	**840**	**6.10**	**1,000**	**1,700**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-128-132	128	132	08/23/2022	**170**	**6.00**	0.950 U	0.950 U	**65.0**	0.950 U	0.950 U	**140**	**1,900**	**650**	**7.60**	**1,200**	**1,800**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-138-142	138	142	08/24/2022	**2.90 J**	1.40 U	0.950 U	0.950 U	**33.0**	0.950 U	0.950 U	**24.0**	**420**	**110**	**0.540 J**	**220**	**220**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-148-152	148	152	08/24/2022	**130**	1.70 U	1.10 U	1.10 U	**36.0**	1.10 U	1.10 U	**61.0**	**830**	**350**	**0.960 J**	**270**	**660**	1.70 U	1.70 U	1.70 U
PFT-A-4	31VP-PFT-A-4-158-162	158	162	08/25/2022	**5.10**	1.50 U	1.00 U	1.00 U	**1.80 J**	1.00 U	1.00 U	**2.30**	**32.0**	**15.0**	1.50 U	**15.0**	**25.0**	1.50 U	1.50 U	1.50 U
PFT-A-4	31VP-PFT-A-4-168-172	168	172	08/25/2022	**19.0**	1.50 U	1.00 U	1.00 U	**3.50**	1.00 U	1.00 U	**6.40**	**100**	**43.0**	1.50 U	**37.0**	**76.0**	1.50 U	1.50 U	1.50 U
PFT-A-4	31VP-PFT-A-4-178-182	178	182	08/26/2022	**1.60 J**	1.50 U	0.970 U	0.970 U	**3.00**	0.970 U	0.970 U	**2.40**	**45.0**	**11.0**	1.50 U	**7.70**	**16.0**	1.50 U	1.50 U	1.50 U
PFT-A-4	31VP-PFT-A-4-68-72	68	72	08/19/2022	**1.10 J**	1.40 U	0.960 U	0.960 U	**4.00**	0.960 U	0.960 U	**13.0**	**110**	**31.0**	1.40 U	**170**	**120**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-78-82	78	82	08/19/2022	**1.80 J**	1.50 U	0.980 U	0.980 U	**5.80**	0.980 U	0.980 U	**20.0**	**130**	**48.0**	1.50 U	**12.0**	**220**	1.50 U	1.50 U	1.50 U
PFT-A-4	31VP-PFT-A-4-88-92	88	92	08/23/2022	**780**	1.40 U	0.940 U	0.940 U	**55.0**	0.940 U	0.940 U	**200**	**3,000**	**850**	**3.40**	**2,300**	**2,500**	1.40 U	1.40 U	1.40 U
PFT-A-4	31VP-PFT-A-4-98-102	98	102	08/22/2022	**1,300**	**0.760 J**	0.970 U	0.970 U	**220**	0.970 U	0.970 U	**360**	**4,300**	**2,900**	**2.90**	**740**	**5,600**	1.50 U	1.50 U	1.50 U
PFT-A-5	31VP-PFT-A-5-108-112	108	112	08/30/2022	**230**	**6.10**	0.940 U	0.940 U	**99.0**	0.940 U	0.940 U	**120**	**1,300**	**780**	**3.20**	**670**	**1,300**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-118-122	118	122	08/31/2022	**48.0**	**3.10**	0.990 U	0.990 U	**61.0**	**0.590 J**	0.990 U	**91.0**	**970**	**340**	**5.00**	**1,200**	**650**	1.50 U	1.50 U	1.50 U
PFT-A-5	31VP-PFT-A-5-128-132	128	132	08/31/2022	**17.0**	**1.30 J**	0.940 U	0.940 U	**42.0**	**0.470 J**	0.940 U	**65.0**	**770**	**200**	**4.60 J**	**1,300**	**470**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-138-142	138	142	09/01/2022	**15.0**	1.40 U	0.920 U	0.920 U	**31.0**	0.920 U	0.920 U	**20.0**	**320**	**120**	1.40 U	**94.0**	**180**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-148-152	148	152	09/01/2022	**21.0**	1.50 U	1.00 U	1.00 U	**12.0**	1.00 U	1.00 U	**14.0**	**180**	**95.0**	1.50 U	**83.0**	**160**	1.50 U	1.50 U	1.50 U
PFT-A-5	31VP-PFT-A-5-68-72	68	72	08/29/2022	4.60 U	1.40 U	0.910 U	0.910 U	**2.00**	0.910 U	0.910 U	**13.0**	**100**	**25.0**	1.40 U	**18.0**	**59.0**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-78-82	78	82	08/29/2022	**210**	1.40 U	0.940 U	0.940 U	**27.0**	0.940 U	0.940 U	**89.0**	**1,200**	**370**	**4.00**	**1,200**	**730**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-88-92	88	92	08/29/2022	**1,200**	**1.30 J**	0.940 U	0.940 U	**310**	0.940 U	0.940 U	**400**	**4,000**	**3,200**	**2.80**	**700**	**4,700**	1.40 U	1.40 U	1.40 U
PFT-A-5	31VP-PFT-A-5-98-102	98	102	08/30/2022	**800**	**1.90**	0.950 U	0.950 U	**240**	0.950 U	0.950 U	**290**	**3,100**	**2,000**	**3.10**	**620**	**3,800**	1.40 U	1.40 U	1.40 U

Notes:
Detects are displayed in bold font

Acronyms and Abbreviations:
ng/L = nanograms per liter

Qualifiers:
J Estimated Value
U Undetected: The analyte was analyzed for, but not detected.
UJ The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

Appendix B

TGI – Procedures for Suction Lysimeter Installation and O&M

TGI – Procedures for Suction Lysimeter Installation and O&M

Rev: 1

Rev Date: January 25, 2023

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	0	March 26, 2020	All	TGI Development	
	1	January 25, 2023	All	TGI content updated by SME. TGI Templated updated by QMS	Jay Erickson Rosario Varrella

Approval Signatures

Prepared by:		1/25/2023
	Jay Erickson, PG (Subject Matter Expert)	Date
Reviewed by:		1/25/2023
	Duncan Martineau, Staff Environmental Scientist (Technical Expert Reviewer)	Date

1 Introduction

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or for the installation and O&M for suction lysimeters. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to any and all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, state-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this

document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

This TGI has been prepared to outline procedures for the installation and operation and maintenance (O&M) of porous ceramic cup suction lysimeters used for collecting pore water samples from the vadose zone. The porous cup suction lysimeter is designed for installation at any depth to a maximum of 50 feet. The working range may be extended beyond 50 feet by modifying sample collection procedures. A typical construction log is shown below in **Figure 1.**

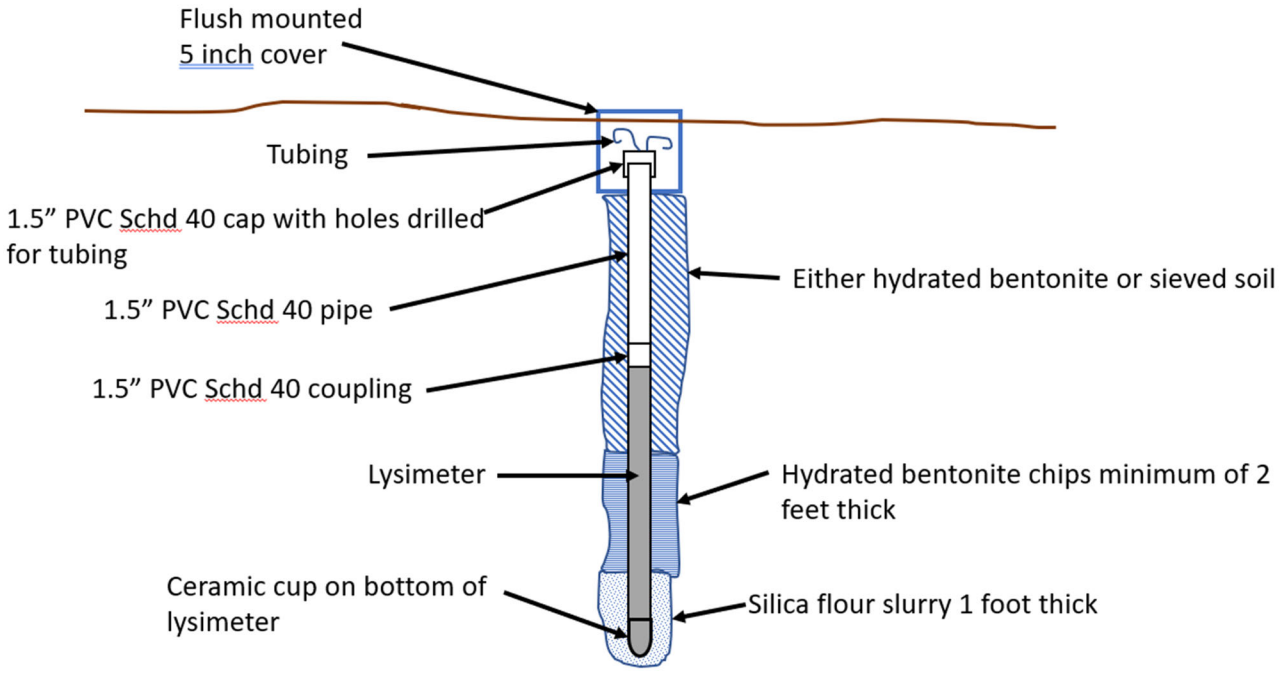


Figure 1. Typical construction details for a lysimeter

4 Personnel Qualifications

All staff involved with lysimeter assembly, installation, and sampling shall be familiar with this TGI. Staff assembling lysimeters should be trained by experienced staff members. Lysimeters will be installed by field geoscientists with experience performing drilling oversight. Field staff performing lysimeter sampling shall have

experience performing groundwater or other types of water sampling and shall be familiar with chain of custody, sample shipping, etc.

5 Equipment List

- SoilMoisture 1920F1L36-B02M2 Pressure/Vacuum Soil Water Samplers
    - 2-bar (29 psi) porous ceramic cup
    - PVC Tube
        - 36 inches long
        - 1.9-inch outer diameter (O.D.)
        - 150 to 1,000-mL typical sample volume
    - Top cap assembly with two 0.25-inch tubing connectors
- Access Tubing (both colors required for each lysimeter, length dependent on installation depth):
    - Black 0.25-inch O.D. polyethylene tubing for air (SoilMoisture Model 1901PECNL0500)
    - Green 0.25-inch O.D. polyethylene tubing for water (SoilMoisture Model 1901PECGL0500)
- Ten-foot roll of 3/16-inch inner diameter (I.D.) neoprene tubing (SoilMoisture Model MRT003L10)
- Clamping rings for neoprene tubing, 2 per lysimeter (SoilMoisture Model 2031G2)
- 50-pound bags of Silica Flour, 200 mesh (SoilMoisture Model 0930W050)
- 1.5-inch PVC pipe, length dependent on lysimeter depth
- 1.5-inch PVC slip coupling adapters for lysimeter-to-riser couplings can be attached to pipe using pop rivets or PVC tape, primer and solvents should be avoided.
- 1.5-inch caps with two holes drilled for the two access tubes.
- Centralizer (SoilMoisture Model 1902K3), 1 per lysimeter (depending on depth)
- Bentonite (sufficient quantity for installation)
- Distilled water
- Hand Pump or electric pump such as a Rocker 300 (with pressure & vacuum ports & vacuum gauge)

If using a salt tracer (see below):

- Sodium Bromide
- Sodium Bromide test strips

6 Cautions

Porous ceramic cup lysimeters are fragile. If cracked, the ceramic cup will not hold vacuum or pressure and no sample can be collected. The cup must be handled with care during transport and installation. In addition, tubing connections must be tight. To document functionality of the lysimeter, pressure testing should be performed at several points during the installation process, as described below.

7 Health and Safety Considerations

Field personnel will follow the HASP. Proper personal protection equipment (PPE) will be worn during lysimeter assembly, installation, and sampling. Of particular importance is to use care cutting lysimeter tubing.

8 Procedure

Pre-Installation Assembly, Testing, and Transportation

- **General**
  - The porous ceramic cup lysimeter is a fragile device. The ceramic cup should be wrapped in bubble-wrap secured with a rubber band during storage and transportation. One or two spare lysimeters should be tested, kept wet, and transported to the installation site to enable rapid replacement should breakage occur during handling or installation. The ceramic cup will not hold vacuum or pressure if it is dry.
- **Assembly**
  - The suction lysimeters will ship completely assembled and ready for the polyethylene access tubes to be attached to the “Pressure/Vacuum” and “Sample Recovery” access ports. The Soilmoisture 1920F1 operating instructions are provided as **Attachment 1**.
  - Inspect all materials, including spares, for potential damage. Carefully inspect the ceramic cup for cracks and photodocument.
  - Once the installation depth and sampling setup has been established, determine the required length of the access tubes prior to cutting them.
  - Insert each tube (total of two tubes per suction lysimeter) into the loosened connectors of the serviceable end of the suction lysimeter and tighten to finger tightness.
  - Two different colors of tubing (i.e., black for air and green for water) shall be used to differentiate between the two connectors once the suction lysimeter is placed in the soil. This differentiation shall be labeled or recorded prior to installation.
- **Pressure and Initial Vacuum/Sampling and Testing**
  - Each suction lysimeter assembly (including spares) should be pressure tested prior to installation to check for leaks. Record data on Pressure and Vacuum/Water Test form (**Attachment 2**).
  - Allow the ceramic portion of the suction lysimeter to soak in distilled water for approximately 2 hours.
  - Using the hand pump, apply a sustained pressure of 20 psi (1.4 bars) to the suction lysimeter, associated tubing, and connectors.
  - Submerge the suction lysimeter, tubing, and fittings in distilled water to test for leaks. The formation of bubbles indicates a leak and repairs should be made prior to installation.
  - Maintain the pressure for 24 hours. Record the pressure after 24 hours.
  - Using the hand pump, apply a vacuum of (7.3 psi) 50 cb. Keep the lysimeter submerged in water.
  - After 20 minutes, record the vacuum.
  - Connect the black tubing to the pressure side of the hand pump; insert end of green tubing in sample container/beaker and pump several times to evacuate collected water from the lysimeter. Record estimated water volume on field form.
  - Lysimeter passes testing if vacuum holds within 10% and a water sample is collected.

- Upon completion of the pressure test and until installation, the ceramic cup should be kept moist. For example, the lysimeter may be stored in a bucket of distilled water, with the ceramic cup loosely wrapped in bubble wrap.

- **Transportation**
  - Prior to transportation, take a photo of the lysimeter.
  - During transportation, the ceramic cup should be kept moist but also should be wrapped in bubble wrap (bubble side toward the ceramic cup) secured with a rubber band. To keep the ceramic cup moist, either keep the lysimeter in a bucket of DI water or cover the ceramic cup with a towel soaked with DI water.
  - Upon arrival to the installation site, inspect the lysimeter cup and take another photo for documentation.
  - Spare lysimeters should be handled in the same fashion as those intended for installation.
- **Centralizer – if needed based on depth and installation method- (to be attached at Installation)**
  - A well centralizer will be placed on the suction lysimeter to prevent the ceramic cup from coming into contact with the sides of the casing during installation. It should be noted that no tools can be inserted beyond the depth of the centralizer. Therefore, a single centralizer will be placed on the lysimeter itself to protect the ceramic cup.
  - The centralizer should be placed along the center / bottom third of the lysimeter (depending on dimensions) to afford the most protection of the ceramic cup and to allow placement of the moisture sensor near the ceramic cup.
- **Installation**

  Borehole Preparation
  - A 2- to 4-inch diameter borehole should be installed by hollow stem auger, Direct Push rig, or another appropriate drilling method. Very shallow borings (several feet deep) may be installed by hand auger.
  - Measure to within 1 inch the total borehole depth and compare to the total length of lysimeter and risers, to ensure the lysimeter cup will be placed safely at the bottom.

  Lysimeter Installation
  - Prior to lowering the suction lysimeter into the borehole, conduct a 5-minute pressure test, as described above.
  - Mix the silica flour with distilled water to a consistency of pancake batter and place enough slurry in the bottom of the borehole so that the porous ceramic cup will be fully embedded in the slurry. The goal is to have at least the bottom one foot of the lysimeter embedded in the silica slurry.

  OPTIONAL TRACER TESTING

  If there is concern about residual distilled water diluting the sample, a salt tracer can be added to the distilled water used to hydrate the silica flour. ***Note – do not add a salt to the water used to hydrate the bentonite, as this can prevent the bentonite from hydrating properly****.*
  - *Add the sodium bromide to the distilled water at a concentration of approximately 500 ppm. Use this solution to hydrate the silica flour as described above.*
  - Install the suction lysimeter assembly to the desired depth. The access tubes can be protected inside a 1.5-inch PVC pipe running from the top of the suction lysimeter to the termination at the

surface. The PVC conduit can be attached to the lysimeter using 1.5-inch PVC slip coupling and fernco coupler (or equivalent). Below ground, the lysimeter should be held by the pipe, not by the access tubing.

- If using hollow stem augers for installation, a centralizer should be placed on the suction lysimeter to prevent the ceramic cup from coming into contact with the sides of the auger barrel during installation. It should be noted that in a hollow stem auger installation, no tools can be inserted beyond the depth of the centralizer. Therefore, a single centralizer will be placed on the lysimeter itself to protect the ceramic cup.
    - The centralizer should be placed as near to the ceramic cup as possible, within constraints of materials compatibility noted below.
    - Centralizers are typically constructed of stainless steel. Potential interaction with analytes of interest should be considered before use, depending on project objectives.
    - If soil solutions will be analyzed for metals, it is recommended that the centralizer be placed near the top of the lysimeter (approximately 3 feet from the bottom of the lysimeter) rather than just above the ceramic cup. This location will minimize any potential interaction between the centralizer and soil solution drawn into the ceramic cup.

Backfilling

- Before the backfilling process begins, conduct a 5-minute pressure test, as described above. If the lysimeter does not hold pressure, as indicated by the pressure gage on the hand pump, remove it from the borehole and inspect it to identify the source of the leak. Do not leave the hand pump connected for the duration of the test as it is not a fully closed system; set pressure and disconnect, then reconnect and record initial vacuum.
- For deep installations, place tremie 5 feet above the bottom of borehole. Tremie enough silica slurry into the borehole to sufficiently cover the suction lysimeter by approximately 3 feet. The first gallon should be poured very slowly to minimize impact to the ceramic cup. Allow the silica slurry to harden overnight.
- If during hardening the slurry level drops below the top of the suction lysimeter, native soil may be sieved and the fine fraction backfilled as a slurry to cover the suction lysimeter to approximately 3 feet above the lysimeter. Alternatively, additional silica slurry may be mixed and backfilled, but hardening overnight is still required.
- Thick bentonite grout should be used to backfill the remainder of the borehole.
- For shallow installations, tremie enough silica slurry to cover the suction lysimeter by approximately one foot, since it will be easier to measure the top of the slurry. Backfill the remaining area around the sampler with thick bentonite grout for a thickness of at least two feet. Sifted soil which is free of pebbles and rocks can be used to bring the backfill up to within one foot of the surface. A bentonite plug should be installed at the surface to prevent surface water from running down the cored hole.

Protecting Access Tubes

- After installation, terminate each access tube with a 6-inch length of neoprene tubing and clamp to maintain a negative pressure in the suction lysimeter.
- Further installation requirements at grade shall be determined based on the nature of the activities anticipated in the area.

- **Installation water purging**

  Water used to create the silica slurry and to hydrate the bentonite may enter the lysimeter and must be purged prior to sample collection. Wait at least overnight to remove any installation water from the lysimeter.

  If sodium bromide was used for hydrating the silica flour, purge the lysimeter as above and test this purged water for sodium bromide using the test strips. Even if the sodium bromide concentrations are non-detect, dispose of this sample. Reapply a vacuum and allow the lysimeter to sit, the time will depend on site conditions. Again, purge the lysimeter and test for sodium bromide using the test strips or by having the sample analyzed at a lab using EPA Method 300.1.

  Collecting installation water in the suction lysimeter

  - Close the "Sample Recovery" (green) access tubing using a clamping ring
  - Connect the "Pressure/Vacuum" (black) access tubing the peristaltic pump or vacuum port of a hand pump. Additional polyethylene tubing will likely be required to extend from the neoprene tubing to the sample pump location. A pressure/vacuum gauge should also be used connected to the tubing.
  - Use the pump to create a vacuum of 0.6 bars (60 centibars, 9 psi) inside the suction lysimeter. This vacuum causes the water to move from the soil, through the pores of the porous ceramic cup, and into the suction lysimeter.
  - Depending on the amount of soil moisture available, vacuum may need to be applied for a few hours or days to collect sufficient sample volume for collection. A 24-hour to 48-hour period is generally used.

  Recovering a installation water from the suction lysimeter (depth of 50 feet or less):

  - The "Pressure/Vacuum" access tubing shall be reversed from vacuum to pressure using the hand pump.
  - The "Sample Recovery" access tubing should be unclamped and placed in the sample container.
  - Develop enough pressure within the suction lysimeter to force the collected water out and into the collection bottle. Apply several strokes to the hand pump and wait for the pressure to decrease as water begins to rise through the tubing. Apply additional strokes as needed.
  - Note: Sample collection efficiency may be optimized by adjusting the vacuum applied and/or time it is applied. In soils having higher porosity such as sandy soils, sample volumes may collect faster using a lower vacuum. In lower porosity materials such as silts and clays, higher vacuums may increase the rate of sample collection. However, do not exceed 2 bars (29 psi) vacuum.
  - **If sodium bromide was used for hydrating the silica flour, purge the lysimeter as above and test this purged water for sodium bromide using the test strips. Even if the sodium bromide concentrations are non-detect, dispose of this sample.**

- **Sample Collection**

  Collecting a sample in the suction lysimeter

  - Close the "Sample Recovery" (green) access tubing using a clamping ring
  - Connect the "Pressure/Vacuum" (black) access tubing the peristaltic pump or vacuum port of a hand pump. Additional polyethylene tubing will likely be required to extend from the neoprene

tubing to the sample pump location. A pressure/vacuum gauge should also be used connected to the tubing.

- Use the pump to create a vacuum of 0.6 bars (60 centibars, 9 psi) inside the suction lysimeter. This vacuum causes the water to move from the soil, through the pores of the porous ceramic cup, and into the suction lysimeter.
- Depending on the amount of soil moisture available, vacuum may need to be applied for a few hours or days to collect sufficient sample volume for collection. A 24-hour to 48-hour period is generally used.
- **If sodium bromide was used for hydrating the silica flour, purge the lysimeter and test for sodium bromide using the test strips and/or by having the sample analyzed at a lab using EPA Method 300.1. The project team will need to decide if a non-detect result from the lab is required prior to collecting the sample.**

Recovering a sample from the suction lysimeter (depth of 50 feet or less):

- The "Pressure/Vacuum" access tubing shall be reversed from vacuum to pressure using the hand pump.
- The "Sample Recovery" access tubing should be unclamped and placed in the sample container.
- Develop enough pressure within the suction lysimeter to force the collected water out and into the collection bottle. Apply several strokes to the hand pump and wait for the pressure to decrease as water begins to rise through the tubing. Apply additional strokes as needed.
- Subsequent samples are collected by repeating the steps above.
- Note: Sample collection efficiency may be optimized by adjusting the vacuum applied and/or time it is applied. In soils having higher porosity such as sandy soils, sample volumes may collect faster using a lower vacuum. In lower porosity materials such as silts and clays, higher vacuums may increase the rate of sample collection. However, do not exceed 2 bars (29 psi) vacuum.
- **If sodium bromide was used for hydrating the silica flour, purge the lysimeter and test for sodium bromide using the test strips and/or by having the sample analyzed at a lab using EPA Method 300.1. The project team will need to decide if a non-detect result from the lab is required prior to collecting the sample.**

Recovering a sample from the suction lysimeter (depth greater than 50 feet):

- Both pressure and vacuum must be applied to bring the sample to the surface using the hand pump. The gauge of the hand pump will only read vacuum when both Pressure and Vacuum ports are used. Do not exceed 65 centibars of vacuum.
- The "Sample Recovery" access tubing should be unclamped and attached to a side-arm flask used for sample collection. Using neoprene tubing as a connector, attach the side-arm to the "Sample Recovery" access tubing. Attach tubing to the stopper and connect to the Vacuum side of the hand pump.
- Attach the "Pressure/Vacuum" access tubing to the Pressure side of the hand pump.
- Apply several strokes to the pump and watch the vacuum gauge. Do not exceed 65 centibars vacuum. As the vacuum gauge starts to fall, it indicates movement of the water sample toward the surface. Apply several more strokes as needed to force the collected water out and into the flask.

- Subsequent samples are collected by repeating the steps above.
- **If sodium bromide was used for hydrating the silica flour, purge the lysimeter and test for sodium bromide using the test strips and/or by having the sample analyzed at a lab using EPA Method 300.1. The project team will need to decide if a non-detect result from the lab is required prior to collecting the sample.**

- **Rewetting the suction lysimeter**
  - The ceramic cup may need to be rewetted if the soil suction exceeds 2 bars (29 psi) or the sampler otherwise ceases to hold a vacuum.
  - The wetted meniscus in the pores of the ceramic cup may break at vacuum pressures in excess of 2 bars.
  - Pour approximately 250 milliliters (mL) of deionized water down the sample line (both the pressure-vacuum and the sample lines must be open). A squeezable condiment bottle or large syringe is recommended to ensure water is pushed down tubing.
  - Wait approximately one hour and then pressurize the pressure-vacuum line to remove any excess water.
  - A vacuum can be applied after the ceramic cup has been rewetted.
  - If sample recovery is still insufficient after rewetting, available soil moisture may be insufficient.

9 Waste Management

Excess soil generated during the lysimeter installation will be thin spread on the ground near the lysimeters, if allowed by the project, otherwise will be containerized. Porewater purged from the lysimeters will be containerized and disposed of following the project requirements.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

The field logs to be completed during installation include Boring Log, Lysimeter Construction Log, and Daily Log. The Daily Log will include a log of photos taken during lysimeter installation. An Arcadis site-specific lysimeter sampling form will be used to document lysimeter sample collection.

11 Quality Assurance

Field logs will be reviewed by the Task Manager. Quality Assurance of analytical data is handled under the Quality Assurance Project Plan.

12 References

American Society for Testing and Materials (ASTM), Standard Guide for Pore-Liquid Sampling from the Vadose Zone, ASTM Designation D-4696-92, October 2008.

Geraghty and Miller Environmental Science and Engineering Series, Handbook of Vadose Zone Characterization and Monitoring, Chapter 26 – In Situ Pore-Liquid Sampling in the Vadose Zone, CRC Press, 1994.

SoilMoisture Equipment Corp., 1920F1/1920F1K1 Operating Instructions, March 2017.

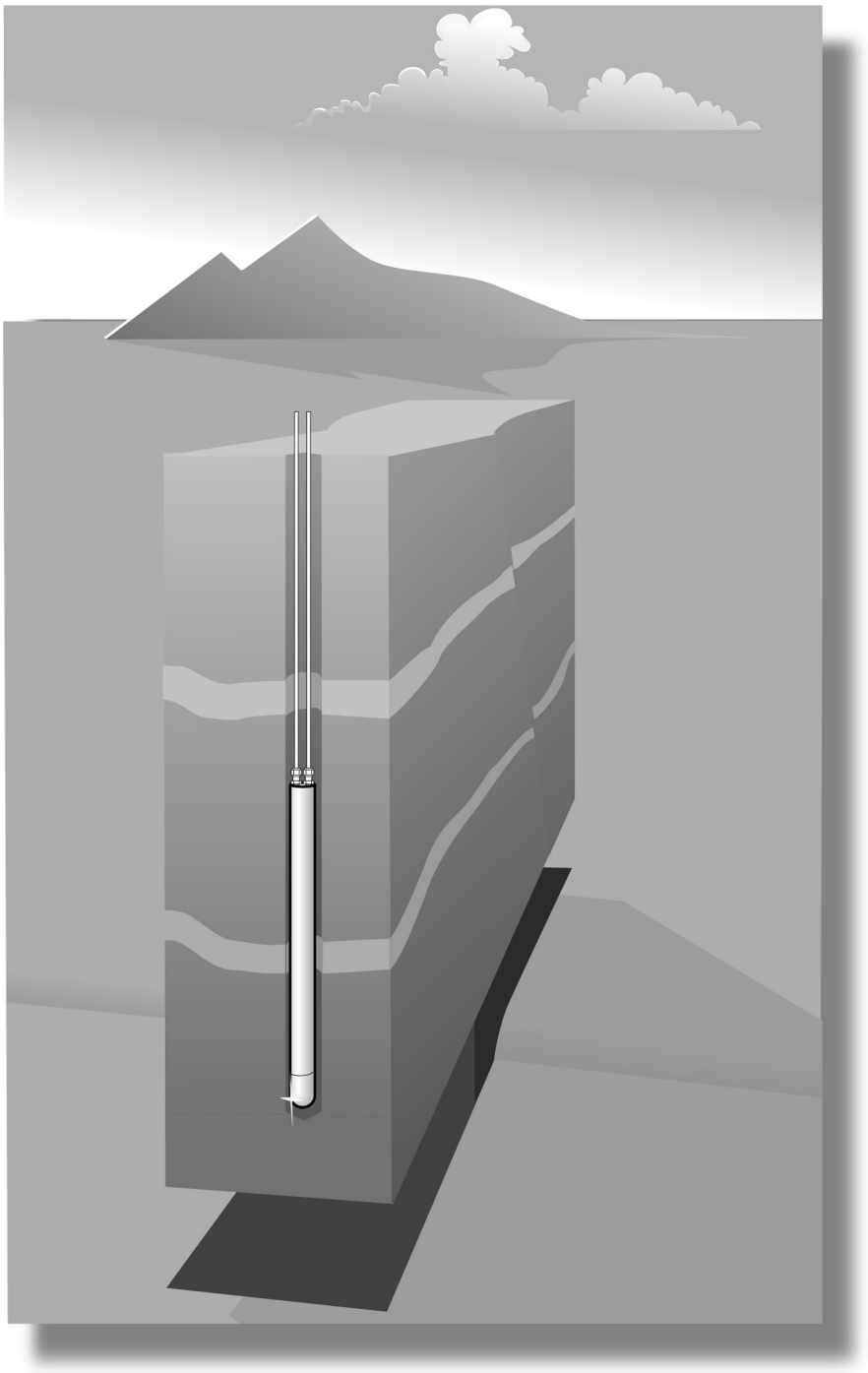
Attachment 1

Soilmoisture 1920F1 Operating instructions

1920F1

OPERATING INSTRUCTIONS

1920F1 Pressure-Vacuum Soil Water Samplers **March 2017**



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HISTORY/GENERAL USES

Soil Water Samplers had their origin back in 1961 when we cooperated with Dr. George H. Wagner at the University of Missouri to manufacture a porous ceramic cup for collecting soil water samples. The outgrowth of this work was our first commercial Soil Water Sampler, Model 1900 Soil Water Sampler. Since that time, these samplers have been generally accepted as an ideal tool for in situ collection of soil water samples for a great variety of soil moisture monitoring work.

The initial and most extensive use of these Samplers was made by Pennsylvania State University, largely under the direction of Dr. L. T. Kardos and others, on the Pennsylvania Waste Water Project. Modifications of the original 1900 Soil Water Sampler by Richard R. Parizek and Burke E. Lane at Pennsylvania State University, reported on in the Journal of Hydrology, produced a pressure-vacuum type unit. Since that time, we have made available commercially the Model 1920 Pressure-Vacuum Soil Water Sampler. Some of our Soil Water Samplers have been in continuous use for several years and still yield satisfactory soil moisture samples.

All of our ceramics are made from formulations which contain various proportions of kaolin, talc, alumina, ball clay, and other feldspathic materials, using proprietary formulas developed through research and experience accumulated over more than 4 decades.

Our samplers find applications not only in research work such as quantitative chemical analysis of soil water, but also for pollution control purposes in monitoring moisture under sanitary landfills, irrigated areas with wastewater, and areas where reclaimed or recycled water is used on a routine basis to assure compliance with government standards.

Soilmoisture's line of Soil Water Samplers has proven to be an excellent and reliable means for obtaining soil water samples from both saturated and unsaturated soils at depths ranging up to several hundred feet.
Soilmoisture's Soil Water Samplers, which are also referred to as

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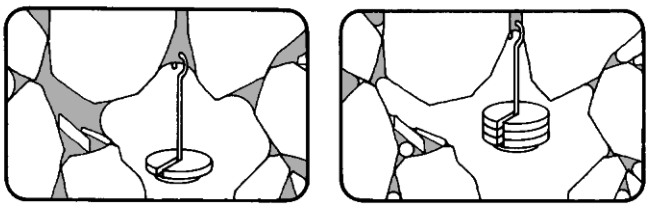
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"suction lysimeters" or "lysimeters", have been in general use around the world for many years.

Soil water is held largely under a state of tension (negative pressure) within the soil by capillary forces. The capillary force is the sum of the adhesive and cohesive forces. The adhesive force is characterized as the attraction of water for soil solids (soil and organic matter). Cohesive force is characterized as the attraction of water for itself. Adhesive force is far greater than the cohesive force.

Water is naturally attracted to soil particles (by its adhesive quality) and "sticks" to the surface of each particle and in the various sized "capillary" spaces or "pores" between the soil particles. When the soil is very wet, the large pores fill with water. This "excess" water has no direct surface contact with the soil and is held cohesively, one water molecule to another, and can move quite freely. As a soil dries out, the "excess" water first evaporates as it requires less energy to break the cohesive bonds. The remaining water, held tightly inside the capillary spaces by adhesive qualities, requires more energy to remove it from the soil.

The following illustration (see Figure 1) shows the increasing force required to remove water from the small-sized capillary pores compared to the large pores as the soil dries out. When the remaining water is held only in extremely small pore spaces, it requires more energy to remove the water from these pores. Even though there may be a considerable volume of water in the soil, the tension that holds the water determines how readily it can be removed.



Wet Soil Dry Soil

Figure 1

This tension that determines how moisture moves in the soil is referred to as "soil water tension", "negative pore pressure", or "soil suction". For simplicity's sake we refer to this tension as "soil suction" in these instructions, but keep in mind that negative pressure is the most descriptive term.

The following graph shows the relationship between the percent of moisture in a soil and the soil suction required to remove the moisture from three types of soil: clay, loam, and sand.
The graph (see Figure 2) illustrates that it is easier to remove water

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from a sandy soil with 10% moisture, than it is to remove water from a clay soil with 30% moisture. This is because the water in the clay soil is held in very small capillary spaces within the soil particles under a higher soil suction, whereas the sandy soil holds water in large capillary spaces under a lower soil suction.

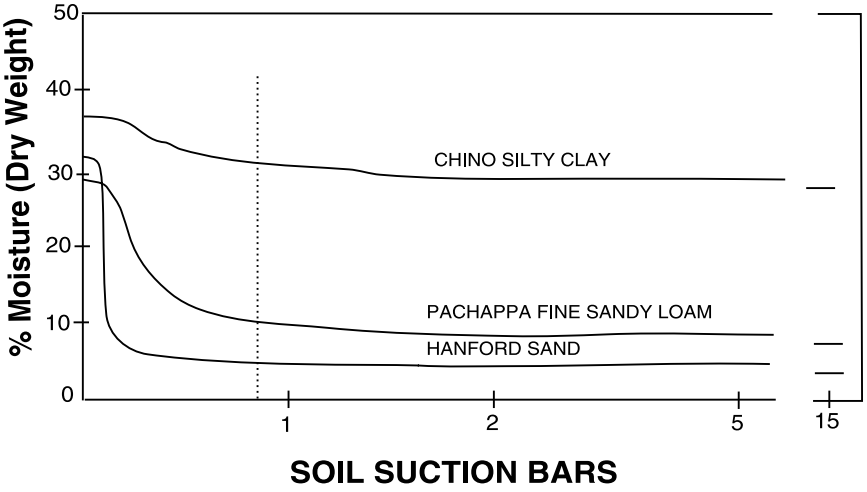


Figure 2.

Soilmoisture's Soil Water Samplers allow water to be removed from the soil by creating a vacuum (negative pressure or suction) inside the sampler greater than the soil suction holding the water in the capillary spaces. This establishes a hydraulic gradient for the water to flow through the porous ceramic cup and into the sampler. Note: when evaluating soil suction ratings of a ceramic plate or cup, a positive pressure rating is used. Water can be held at tensions far greater than 1 atm (the limit for vacuum-type measurements). Positive pressure can force water out of capillary pores equivalently as negative pressures, and is the practical method for evaluation of soil suction.

In practice, a vacuum is drawn in the Soil Water Sampler that exceeds the soil water tension. Then liquid water will flow to the ceramic cup due to the potential gradient (i.e. water will move from less negative potential to more negative potential). The practical limit for water flow in soils is about 65 cb (centibar) (although in some soils, the value can approach 85 cb). When soil moisture tensions exceed 2 bars, the wetted meniscus in the ceramic pores will break and the Soil Water Sampler will appear to be unable to hold vacuum. The ceramic cup will have to be rewetted to hold a vacuum and soil moisture tensions will have to decrease to less than 85 cb before water can again be moved toward the ceramic cup.

Additional information on the advantages and disadvantages of Soil

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Water Samplers in general can be found in Chapter 19, “Compendium of In Situ Pore-Liquid Samplers for Vadose Zone” (Dorrance et al.), of the ACS Symposium on Groundwater Residue Sampling Design (April 22-27, 1990) and the ASTM Designation D4696-92 “Standard Guide for Pore-Liquid Sampling from the Vadose Zone" (Vol. 04.08 Soil and Rock (I): D4696).

Remove all packing materials and check the Soil Water Sampler for

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YOUR NEW PRESSURE-VACUUM SOIL WATER SAMPLER

Unpacking

any damage that may have occurred during shipment.

If the Sampler is damaged, call the carrier immediately to report it. Keep the shipping container and all evidence to support your claim.

Assembly

The standard 1920F1 Pressure-Vacuum Soil Water Sampler was assembled and testedprior to shipment.

All other accessory items necessary for proper use are discussed later in these instructions and are listed on page 16. Please read all instructions thoroughly before installing the Sampler. To assure optimum cleanliness of the assembly, no grease or organic solvents have been used in its manufacture.

Not Liable for Improper Use

Soilmoisture Equipment Corp. is not responsible for any damage, actual or inferred, for misuse or improper handling of this equipment. The Pressure-Vacuum Soil Water Samplers, Models 1920F1, are to be used solely as directed by a prudent individual under normal conditions in the applications intended for this equipment.

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ACQUAINT YOURSELF WITH THE PARTS

The Pressure-Vacuum Soil Water Sampler (Model 1920F1) comes fully assembled. The Pressure-Vacuum Soil Water Sampler (see Figure 3) is constructed of a 1.9 inch O.D. PVC tube (made of FDA-approved material) with a 2 bar porous ceramic cup bonded to one end. The serviceable end of the Sampler is completely sealed and two 1/4-inch tube connectors protrude from the top. The white tube connector indicates the "Pressure/Vacuum" side and is used exclusively for pressurizing and evacuating the Sampler. The green tube connector is used to recover the collected sample.

Two 1/4-inch O.D. polyethylene access tubes are used for pressurizing and recovering samples which are terminated in neoprene tubing. Clamping rings are used to clamp the neoprene to keep the Sampler

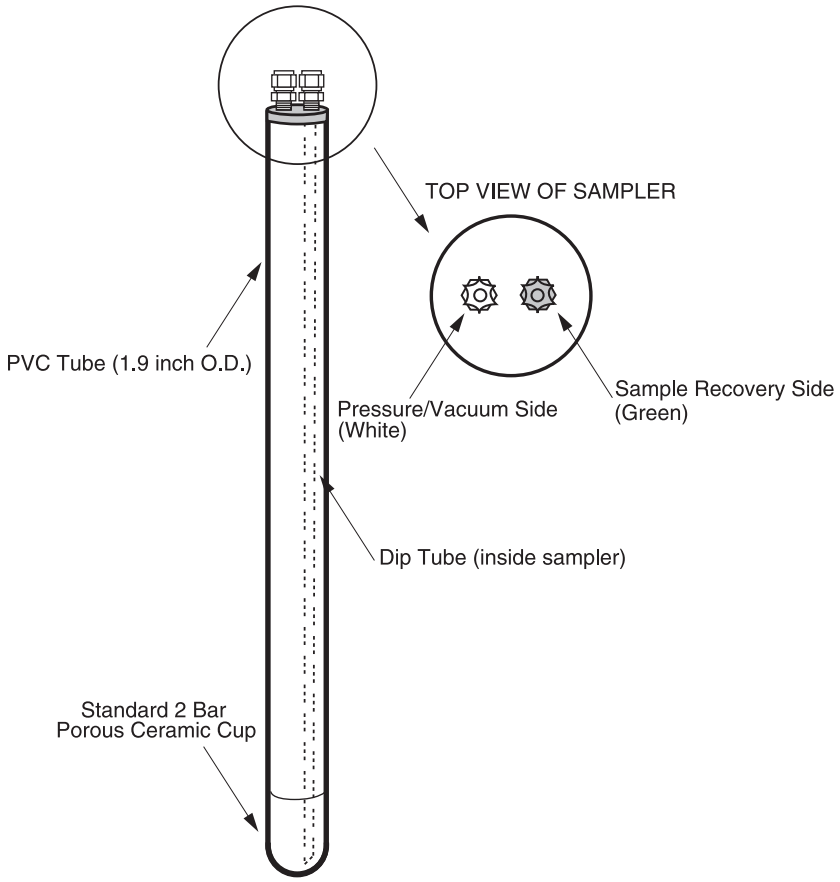


Figure 3. Pressure-Vacuum Soil Water Sampler

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REQUIREMENTS PRIOR TO USE AND HOW TO OPERATE

Attaching the Access Tubes

under negative pressure (not shown here).
Once the depth and location for the Pressure-Vacuum Soil Water Sampler have been established, you must determine the required length for the access tubes before they are cut and attached to the Soil Water Sampler.

The access tubes are generally made of 1/4-inch O.D. polyethylene, nylon tubing. Each access tube is inserted into the loosened top portion of the tube connector located on the serviceable end of the Soil Water Sampler. Tighten the fittings to finger tightness. We recommend using 2 different colors of tubing to differentiate between the two connectors in order to eliminate mistakes in identifying the access tubes once the Sampler is placed in the soil. Soilmoisture offers both black and green polyethylene tubing, models 1903L and 1904L respectively.

Pressure Testing Before Installation

We highly recommend pressure testing the complete Sampler assembly prior to installation. Your prior testing will confirm the integrity of all joints and components.

After allowing the ceramic portion of the Sampler to soak in water for approximately two hours, a sustained pressure of 20 psi can be applied to the submerged Sampler, associated tubing, and connectors. Continuous bubble formation indicates leakage and shows the exact location of any leak.

Coring the Hole

The Pressure-Vacuum Soil Water Sampler, Model 1920F1, may be installed at any depth up to a maximum of 50 feet.

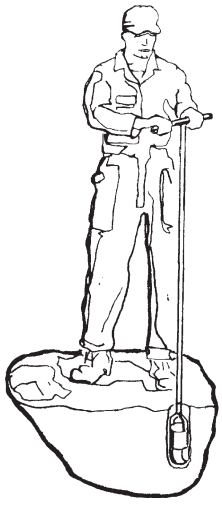


Figure 4a.

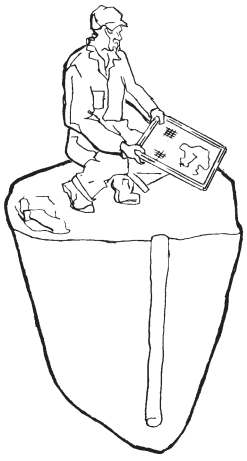


Figure 4b.

In rock-free, uniform soils at shallow depths, use a 2-inch screw or bucket auger for coring the hole (Figure 4a). If the soil is rocky, a 4-inch auger should be used. The soil is then sifted (Figure 4b) through a 2mm mesh screen or 2mm sieve to free it of pebbles and rocks.

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This will provide a reasonably uniform backfill soil for filling in around the Soil Water Sampler. Soilmoisture has suitable soil augers for this purpose (234 Series augers). There are other methods for installing the Soil Water Sampler to be used, largely dictated by the type of soil you are dealing with and the tools available. The primary concern in any method of installation is that the porous ceramic cup of the Sampler be in tight, intimate contact with the soil so that soil water can move readily from the pores of the soil through the pores in the ceramic cup and into the Soil Water Sampler.

Preparing The Hole Using a Slurry and Backfilling The Hole

After the hole has been cored, mix sifted soil with water to make a slurry which has a consistency of cement mortar. This slurry is then poured down to the bottom of the cored hole to insure a good soil contact with the porous ceramic cup (see Figure 5a).

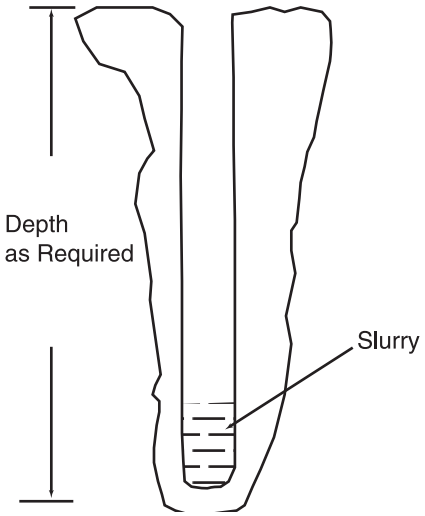


Figure 5a.

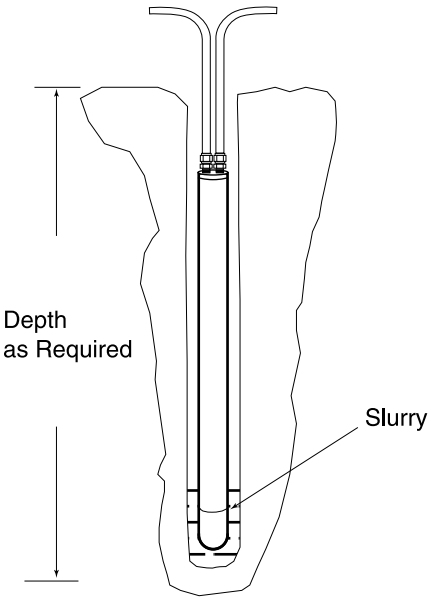


Figure 5b.

Immediately after the slurry has been poured, insert the Soil Water Sampler down into the hole so that the porous ceramic cup is completely embedded in the soil slurry (see Figure 5b).

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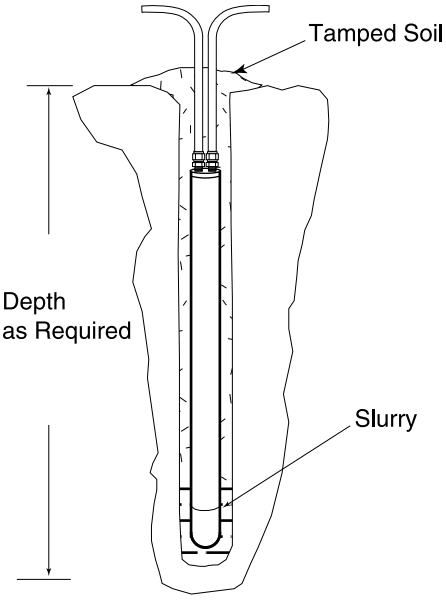


Figure 6.

Backfill the remaining area around the Sampler with sifted soil which is free of pebbles and rocks, a 2mm sieve is popular for this. Tamp the soil firmly to prevent surface water from running down the cored hole, or make a bentonite seal. (see Fig. 6)

Alternate Methods for Sampler Installation

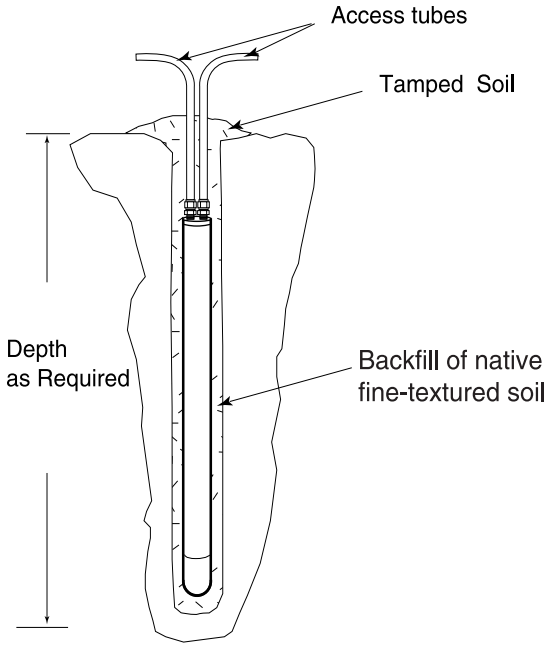


Figure 7.

If the soil into which the Sampler is being installed is fine-textured and free of rocks, a slurry may not be necessary. Core the hole to the desired depth, insert the Soil Water Sampler and backfill the hole with native soil, tamping continuously to insure good soil contact with the porous ceramic cup and complete sealing of the cored hole (see Figure 7).

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In a coarse-textured or rocky soil, it may be difficult to make a suitable slurry from the existing soil. A slurry can be made using silica flour, which is then used to establish good contact between the ceramic cup and the soil. For a 2-inch diameter hole, 1 lb. of silica flour is needed, while a 4-inch diameter hole will require 4 lbs. of silica. Mix the silica with water to produce a slurry with a consistency of cement mortar.

Core the hole to the desired depth, and pour in about 1/4 of the silica slurry. Insert the Soil Water Sampler and pour in the remainder of the slurry so that the slurry completely covers the ceramic cup. Backfill the hole with sifted soil (free of pebbles and rocks), tamping continuously with a metal rod to prevent surface water from channeling down between the soil and the body tube of the Sampler (see Figure 8).

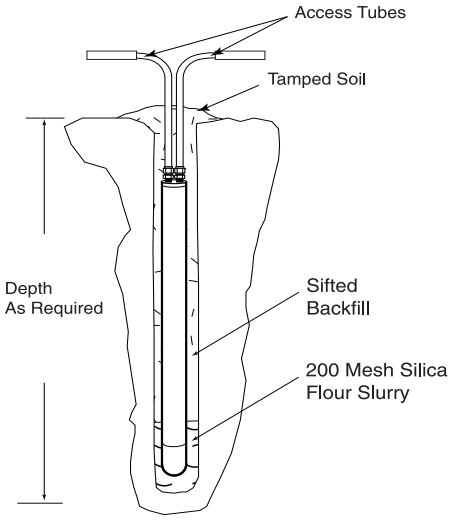


Figure 8.

To ensure that disturbed soil resulting from the installation of the Sampler does not affect the movement of water to the Sampler, Bentonite clay plugs can be installed. Core the hole a few inches deeper than the desired depth, and pour in several inches of wet Bentonite clay (see Fig. 9). This will isolate the Sampler from the soil below. Pour in 1/4 of the slurry, either of soil or of Silica, and insert the Soil Water Sampler. Pour the remainder of the slurry around the cup of the Soil Water Sampler. Backfill with native soil to a level just above the Soil Water Sampler and again add sufficient Bentonite as a plug to further isolate the Soil Water Sampler and guard against possible channeling of water down the hole. Backfill the remainder of the hole slowly, tamping continuously with a metal rod using native soil, free of pebbles and rocks.

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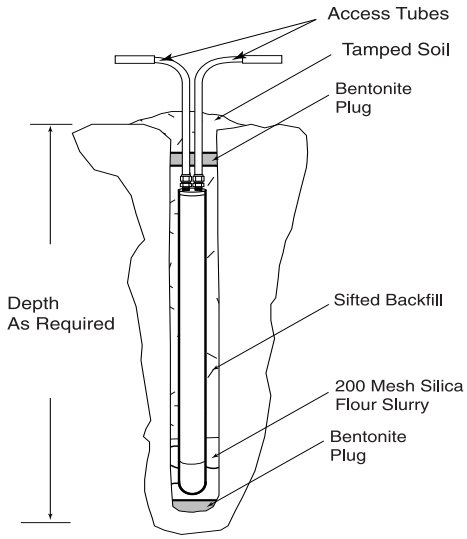


Figure 9.

Protecting the Access Tubes

After installation, the access tubes from the Sampler are terminated with a 6-inch length of neoprene tubing (MRT003)above the Sampler installation. Or, if conditions require, place the neoprene-terminated access tubes in a trench, terminating above the soil surface at a remote location. We recommend that the access tubes be protected inside a conduit tube running from the top of the Sampler to the termination at the surface. At the surface level, take care that the access tubes are safe from damage by mechanical equipment or animals. Do not cover the surface area directly above the Sampler in any manner that would interfere with the normal percolation of soil water down to the depth of the Sampler, otherwise the obstruction could have an adverse affect on your soil water sample.

Collecting A Sample in the Sampler

To collect a sample, the discharge access tube is closed using a clamping ring, and the vacuum port of the hand pump is connected to the Pressure-Vacuum access tube. The pump is then used to create a vacuum of about 60 cb inside the Sampler, which is indicated on the gauge connected to the pump (see Fig. 10).

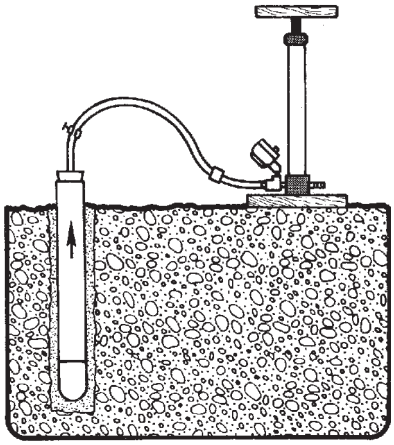


Figure 10.

The vacuum within the Sampler causes the water to move from the soil,

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through the pores of the porous ceramic cup, and into the Sampler. The rate at which the soil solution will collect within the Sampler depends on the capillary conductivity of the soil, the soil suction value within the soil (as measured with tensiometers), and the amount of vacuum within the Sampler. In moist soils of good conductivity, at field capacity (10 to 30 cb of soil suction as read on a tensiometer) substantial soil water samples can be collected within a few hours. Under more difficult conditions it may require several days to collect an adequate sample.

Recovering a Sample from the Soil Water Sampler

In general, a vacuum of 50 to 85 cb is normally applied to the Soil Water Sampler. In very sandy soils, however, it has been noted that very high vacuums applied to the Soil Water Sampler seem to result in a lower rate of collection of the sample than a lower vacuum. It is our opinion that in these coarse, sandy soils, the high vacuum within the Sampler may deplete the moisture in the immediate vicinity of the porous ceramic cup reducing the capillary conductivity, which creates a barrier to the flow of water to the cup. In loams and gravelly clay loams, users have reported collection of 300 to 500 ml of solution over a period of a day with an applied vacuum of 50 cb, when soils are at field capacity. At waste water disposal sites, users have obtained 1500 ml of sample solution in 24 hours following cessation of irrigation with 1 to 2 inches of waste water on sandy or clay loam soil.

To recover a soil water sample, remove the Pressure-Vacuum tube from the vacuum port of the pump, and attach the tube to the pressure port. Place the discharge access tube in a small collection bottle and remove both clamping rings. Apply a few strokes on the hand pump to develop enough pressure within the Sampler to force the collected water out of the Sampler and into the collection bottle (see Fig. 11).

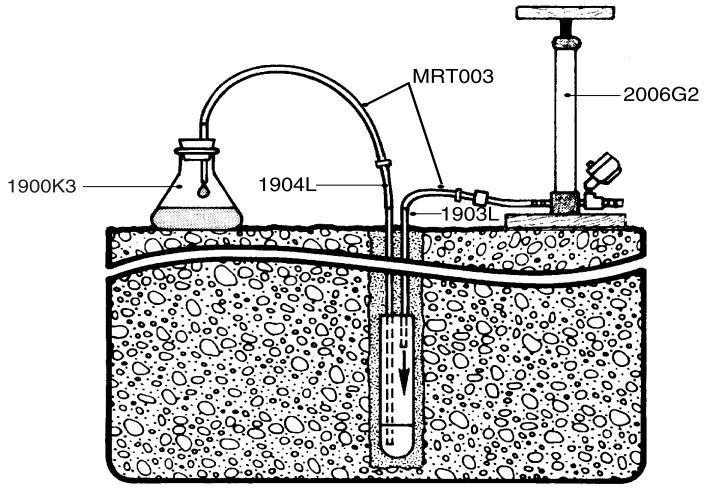


Figure 11

Subsequent ... uum within the Sampler and following the steps as outlined above.

There are no maintenance requirements for the Pressure-Vacuum Soil Water Sampler other than protecting the access tubes from damage.

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Tube ends should be covered or plugged to prevent debris from entering the tubes and later contaminating the Sampler.

Freezing conditions will not damage the subsurface parts of the Samplers. The Samplers are normally left permanently in place all year round. Water may freeze in the sample line near the surface during saturated freezing conditions. Be sure all the water is removed from the sample line before clamping it for the next sample.

Rewetting The Sampler

If the soil suction exceeds 2 bars, the ceramic cup may need to be rewetted to obtain a sample. This is accomplished by pouring approximately 250 ml of deionized water down the sample line (both the pressure-vacuum and the sample lines must be open). After waiting approximately one hour, pressurize the pressure-vacuum line to remove any excess water. A vacuum can be applied after the ceramic cup has been rewetted. If no sample is obtained after following the above rewetting procedure, the soil suction is probably in excess of 85 cb.

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SPARE PARTS AND ACCESSORIES LIST

0922W_	Bentonite (5 lb., 10 lb., or 50 lb. bag sizes)
0930W_	Silica Flour (5 lb., 10 lb., or 50 lb. bag sizes)
1900K4	Wide-mouth Sample Bottle, polypropylene - 1,000 ml (autoclavable)
1902K3	Centralizer with Centralizer Adapter Kit
1902K4	1-1/2" Stainless Steel Coupling Assembly
1903L_	Black Polyethylene Tubing (100 ft., 500 ft., or 1,000 ft. rolls)
1904L_	Green Polyethylene Tubing (100 ft., 500 ft., or 1,000 ft. rolls)
2006G2	Pressure-Vacuum Hand Pump (with gauge)
2031G2	Clamping Rings (per doz.)
MRT003	Neoprene Tubing, 3/16-inch I.D. x 1/16-inch wall (10ft, 25ft, or 50ft, rolls)

Note:
All Pressure-Vacuum Soil Water Samplers come in 6-inch, 12-inch, 24-inch or 36-inch lengths. They can also be special ordered with either a 1 Bar High Flow (30 ft. maximum depth range) or 1/2 Bar Standard (15 ft. maximum depth range) porous cup instead of the standard 2 Bar cup. Please contact our Sales Department for further details.

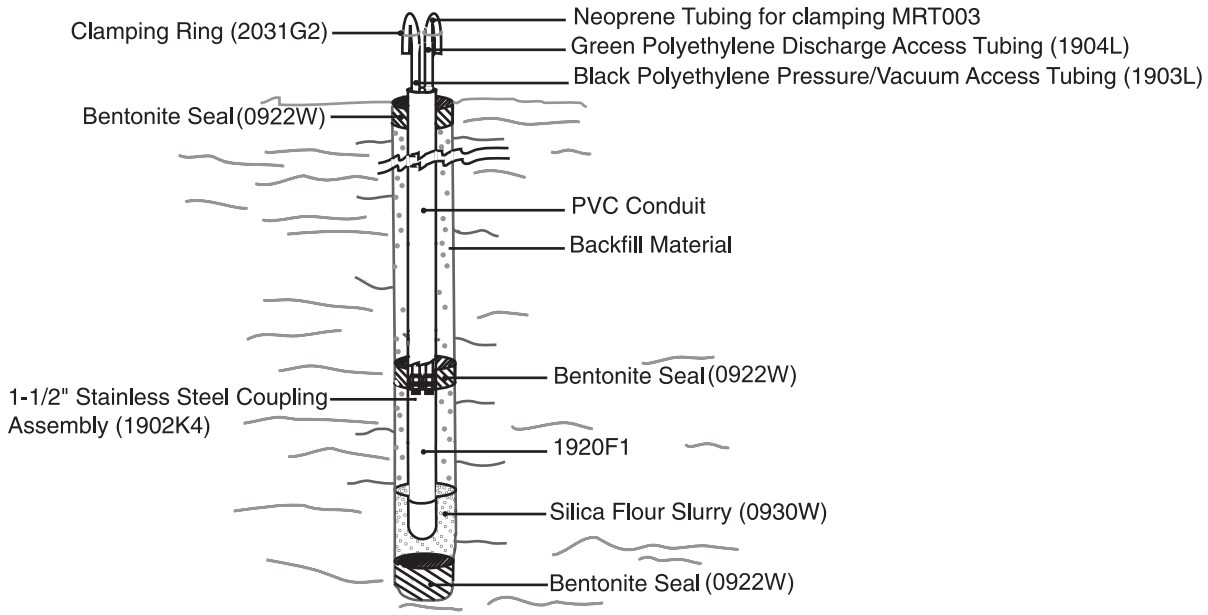


Figure 12. Complete sampler installation with accessories

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Attachment 2

Record Data on Pressure and Vacuum/Water Test form

Lysimeter Pre-Installation Pressure and Vacuum/Water Test Form

Monitoring personnel: _____

Weather: _____

	Pre-Installation Pressure Test				Pre-Installation Vacuum/Water Test				
Vadose Point ID	**Date**	**Time Start / End**	**Pressure**	**Test Result**	**Date**	**Time Start / End**	**Vacuum**	**Water Collected?**	**Test Result**
Target		24 hr	140 cb (20 psi)	Pass/Fail		20 min	50 cb (7.3 psi)	Y/N	Pass/Fail
Target		10 min	140 cb (20 psi)	Pass/Fail	**Comments:**				

Notes:

100 cb = 14.5 psi

10% reduction in pressure or vacuum over sampling period is acceptable.

Arcadis U.S., Inc.
630 Plaza Drive, Suite 200
Highlands Ranch
Colorado 80129
Phone: 720 344 3500
Fax: 720 344 3535
www.arcadis.com

Appendix C

AOC 31 Lysimeter Installation Forms

Devens - AOC31

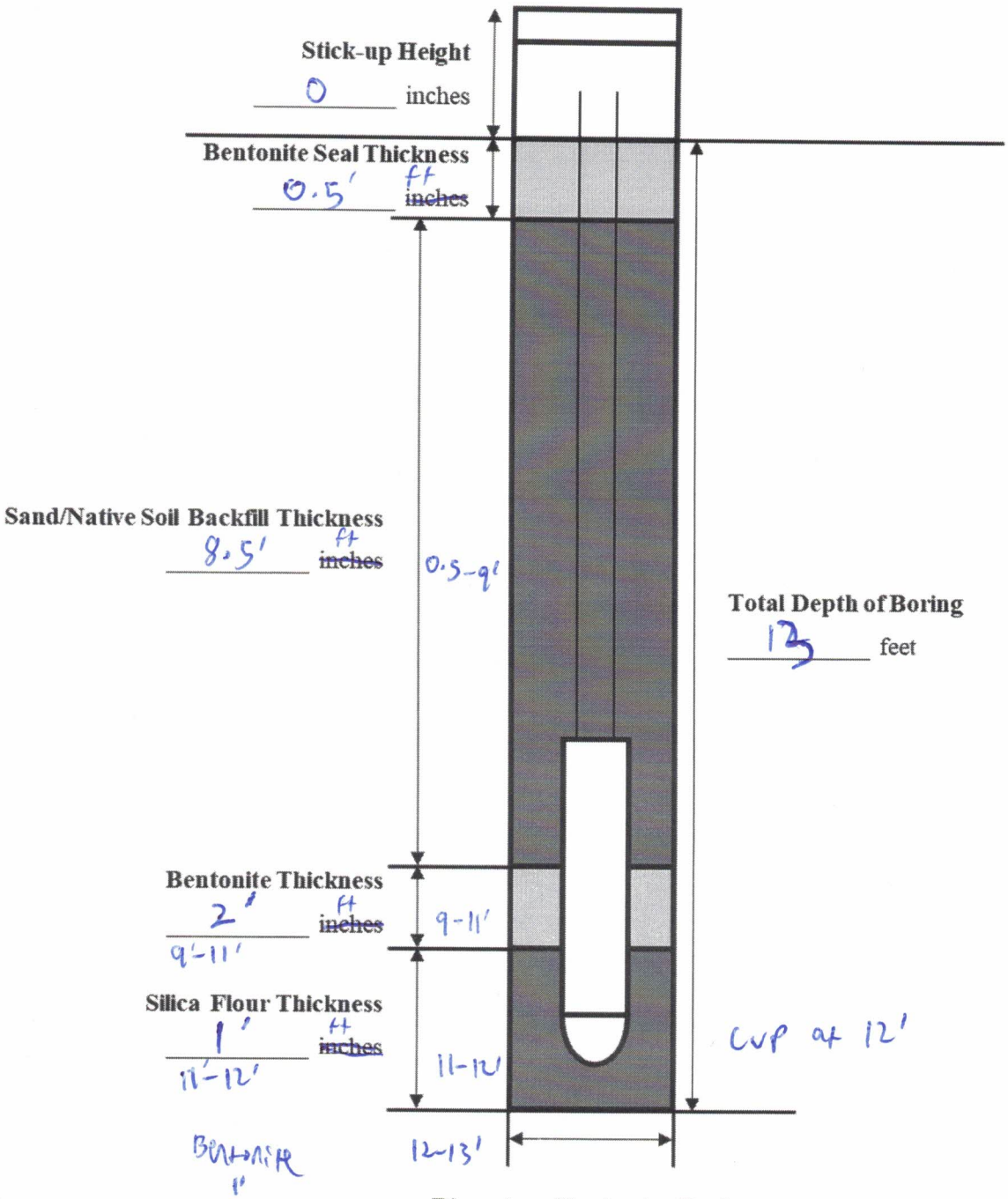
Lysimeter Installation Form

Lysimeter Unit ID: 315B-23-08

Unit Installed By: Duncan Marthinsen Date: 09/11/2023

Lysimeter Type: Soil moisture ceramic cup, 2Bar, 24" Silica Flour Type: 90 micron

Bentonite Type: chips Sand Type: Play sand



Completed By: Duncan Marthinsen Date: 09/11/2023

Devens - AOC 31

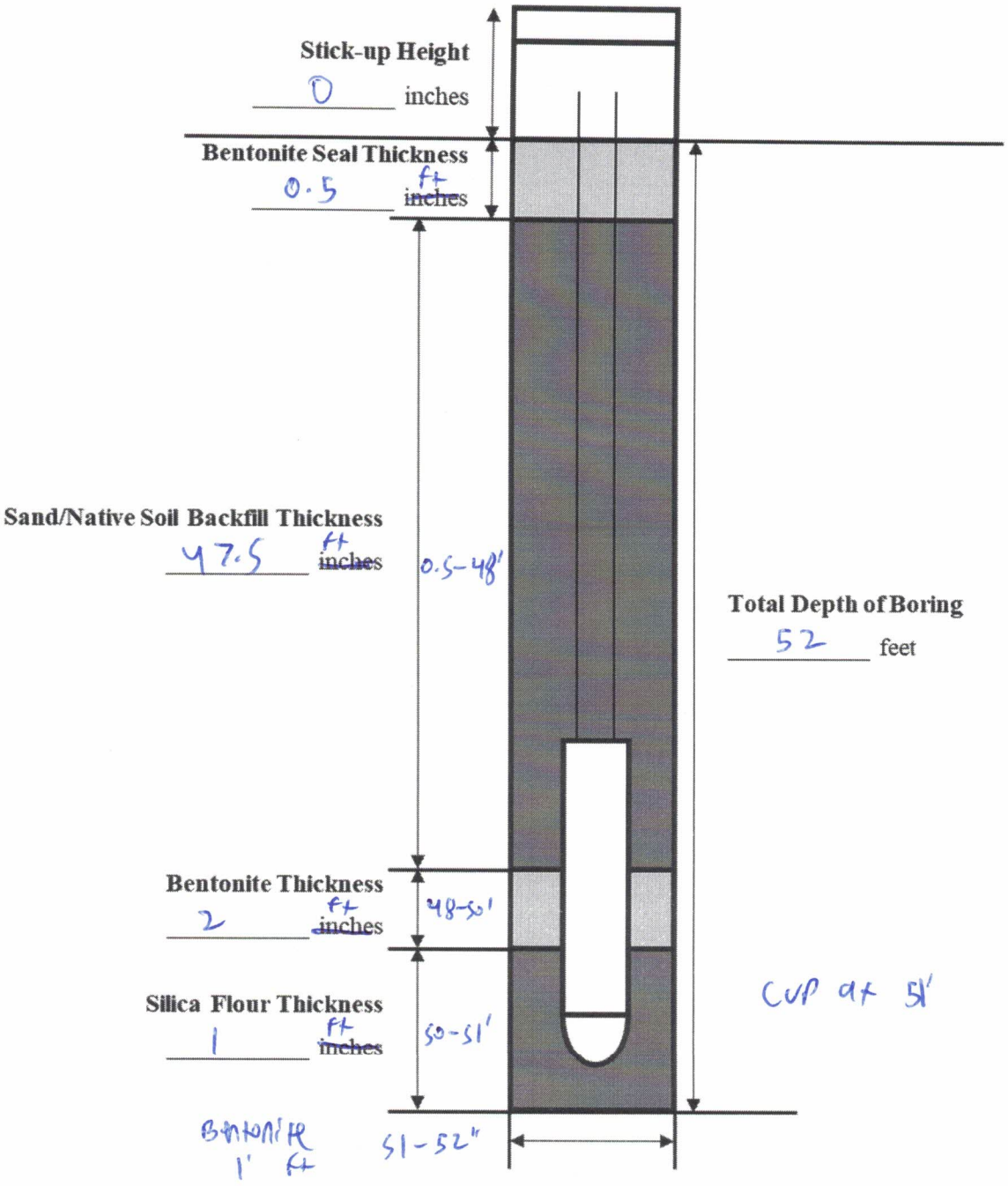
Lysimeter Installation Form

Lysimeter Unit ID: 31SB-23-07

Unit Installed By: Duncan Marthews - Arcadis Date: 09/12/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 micron

Bentonite Type: Chips Sand Type: Play Sand



Completed By: Duncan Marthews Date: 9/12/2023

* 3.5" DPT tooling refusal @ 47', switch to 4" auger for install.

Devens - AOC 31

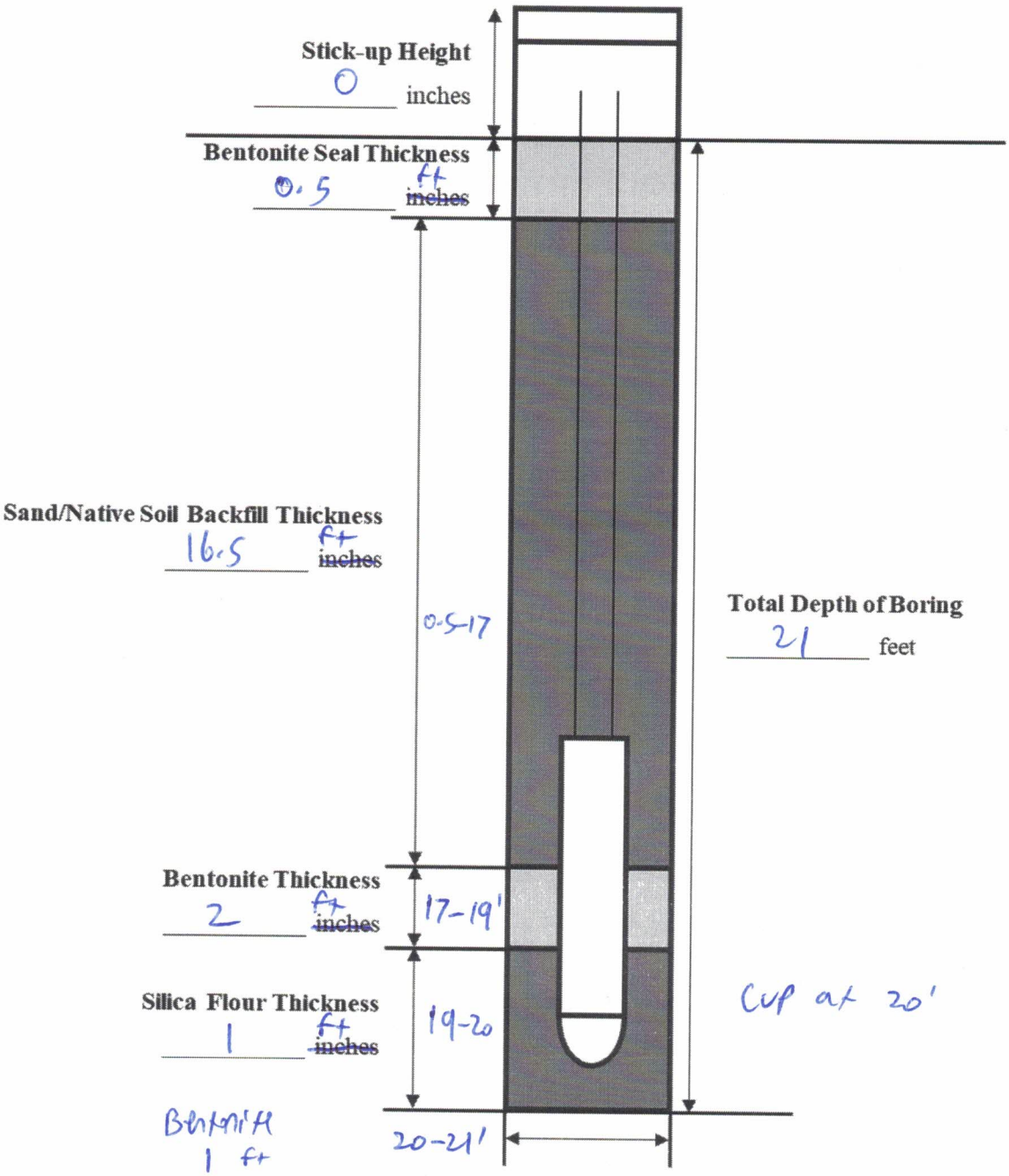
Lysimeter Installation Form

Lysimeter Unit ID: 315B-23-06

Unit Installed By: Duncan Marthrear - Arcadis Date: 09/12/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 micron

Bentonite Type: Chips Sand Type: Play Sand



Completed By: Duncan Marthrear Date: 09/12/2023

Devens - AOC 31

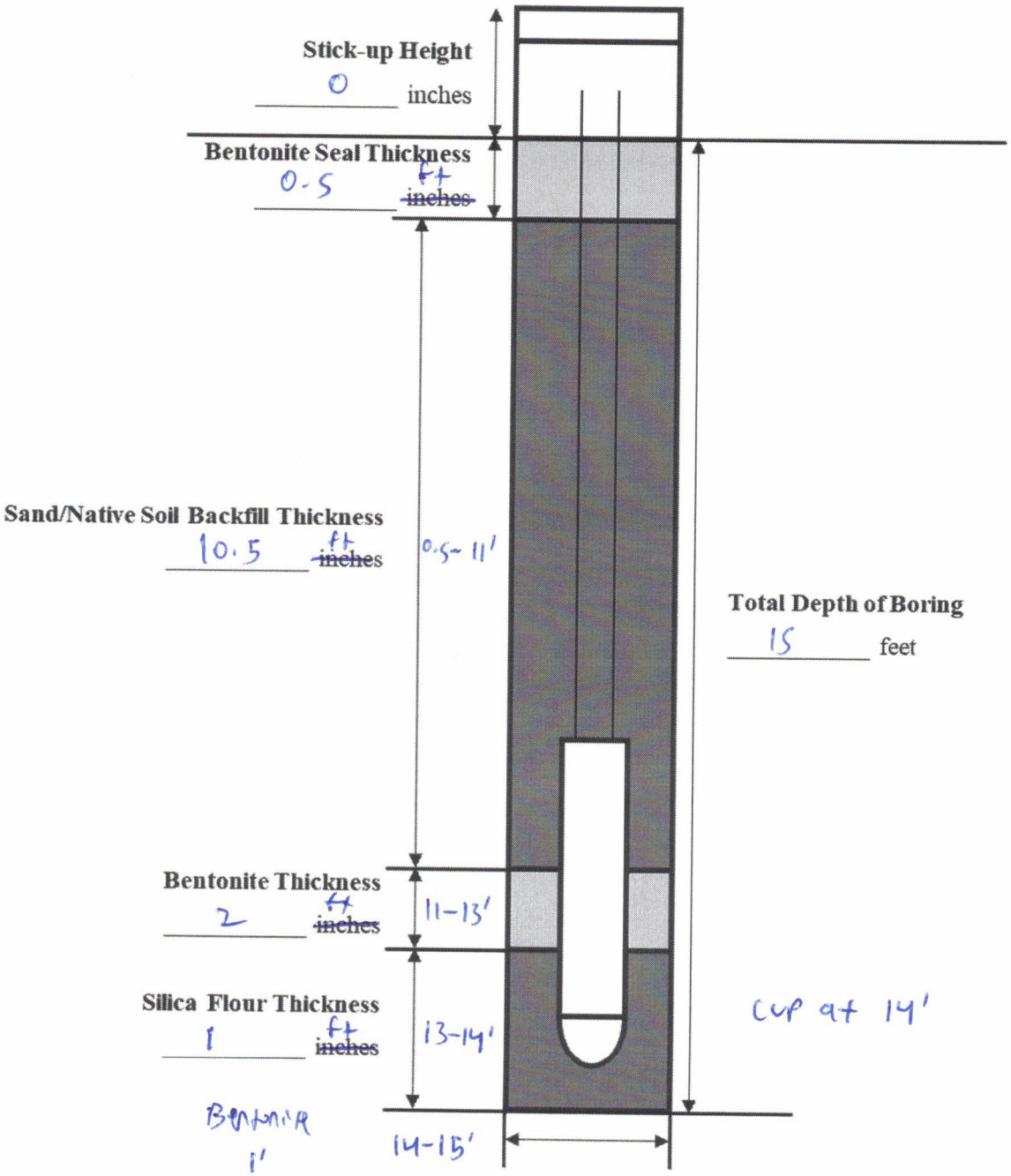
Lysimeter Installation Form

Lysimeter Unit ID: 31SB-23-05

Unit Installed By: Duncan Marthews - Arcadis Date: 09/11/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 micron

Bentonite Type: chips Sand Type: Play Sand



Completed By: Duncan Marthews Date: 09/11/2023

Dennis - AOC31

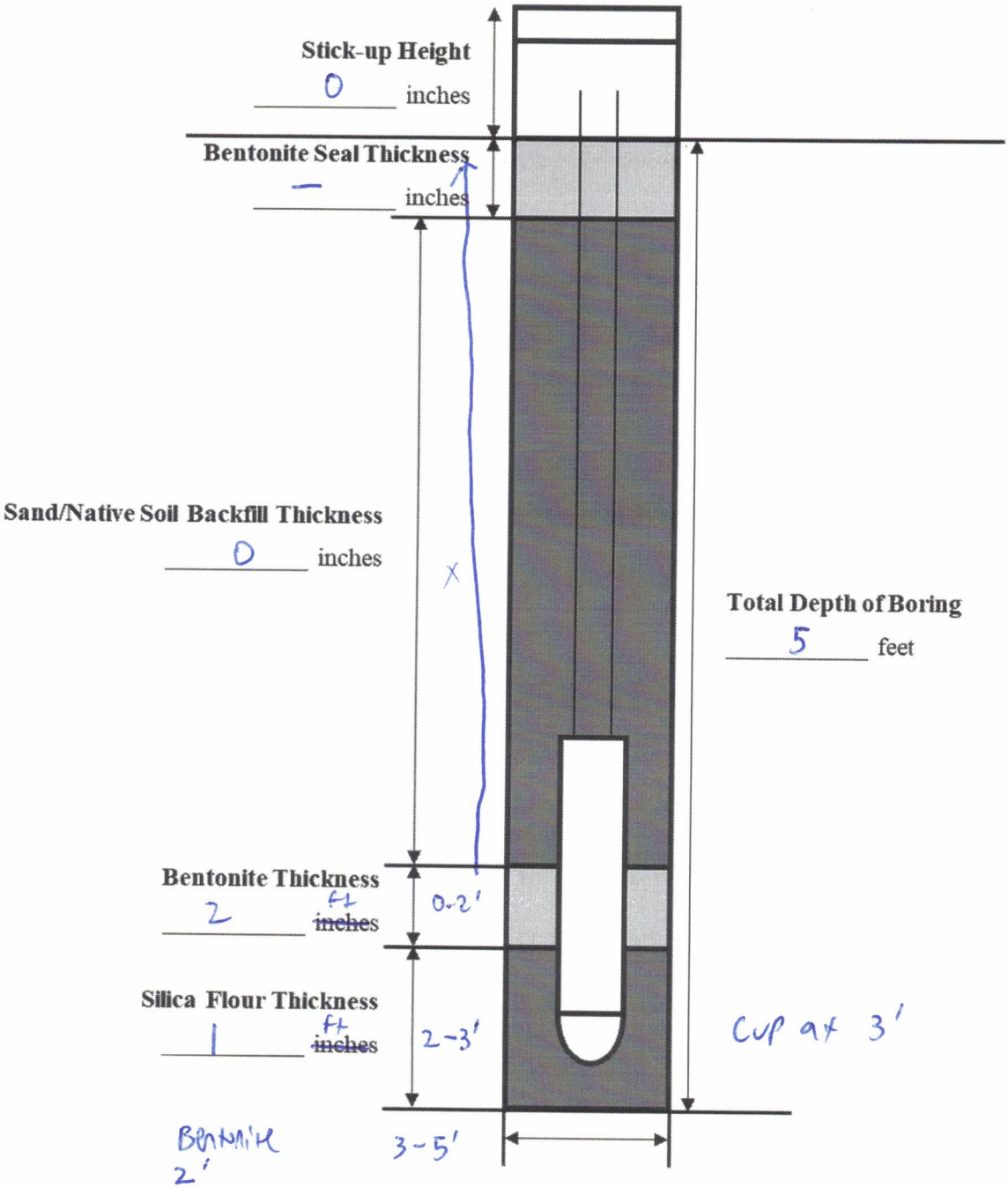
Lysimeter Installation Form

Lysimeter Unit ID: 31SB-23-04

Unit Installed By: Duncan Martineau - Arcadis Date: 09/11/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 Micron

Bentonite Type: chips Sand Type: Play Sand



Completed By: Duncan Martineau Date: 9/11/2023

Devens - AOC31

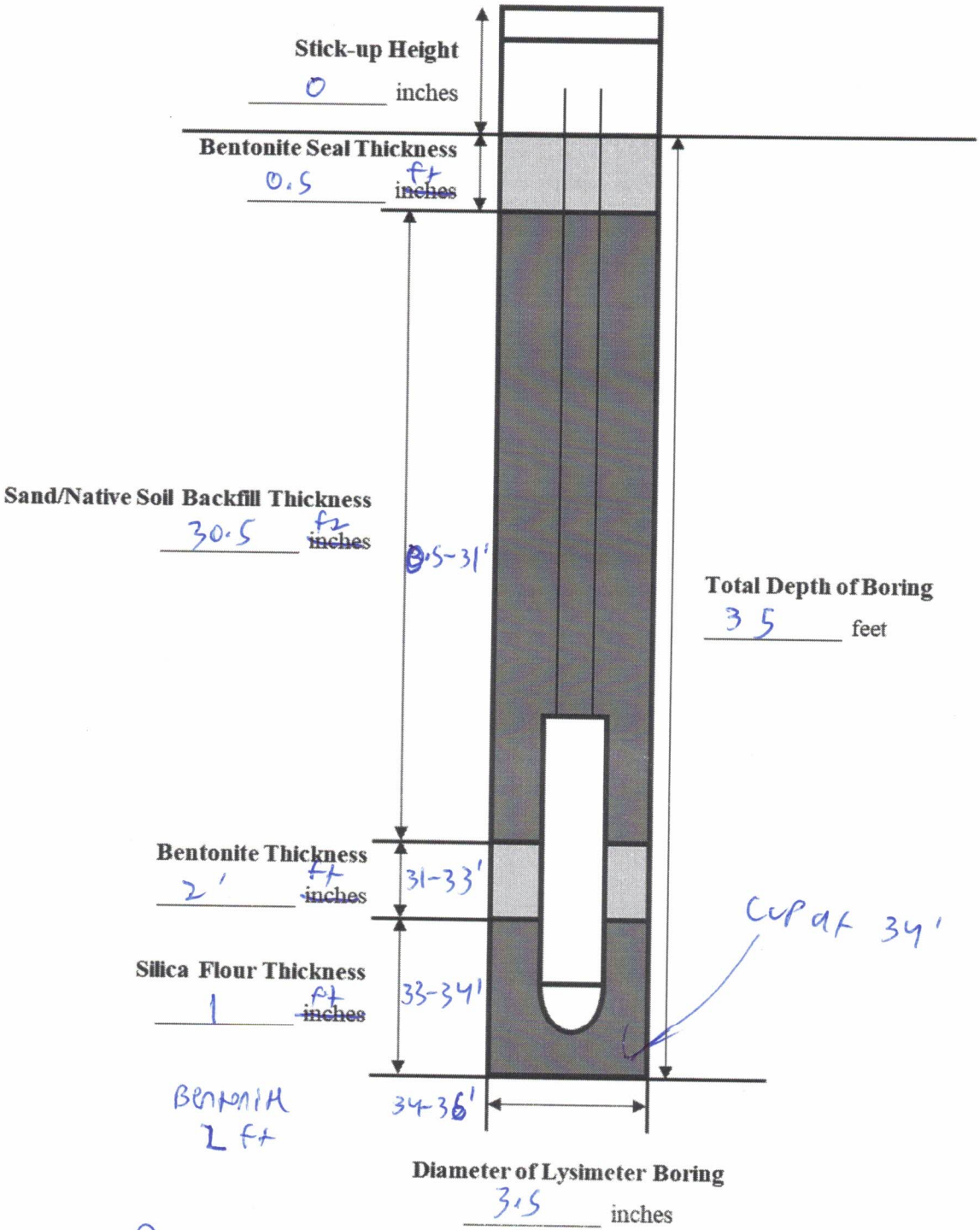
Lysimeter Installation Form

Lysimeter Unit ID: 315B-23-03

Unit Installed By: Duncan Matheu - Arcadis Date: 09/13/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 Micron

Bentonite Type: Chips Sand Type: Play sand



Completed By: Duncan Martinez Date: 09/13/2023

Devens - AOC 31

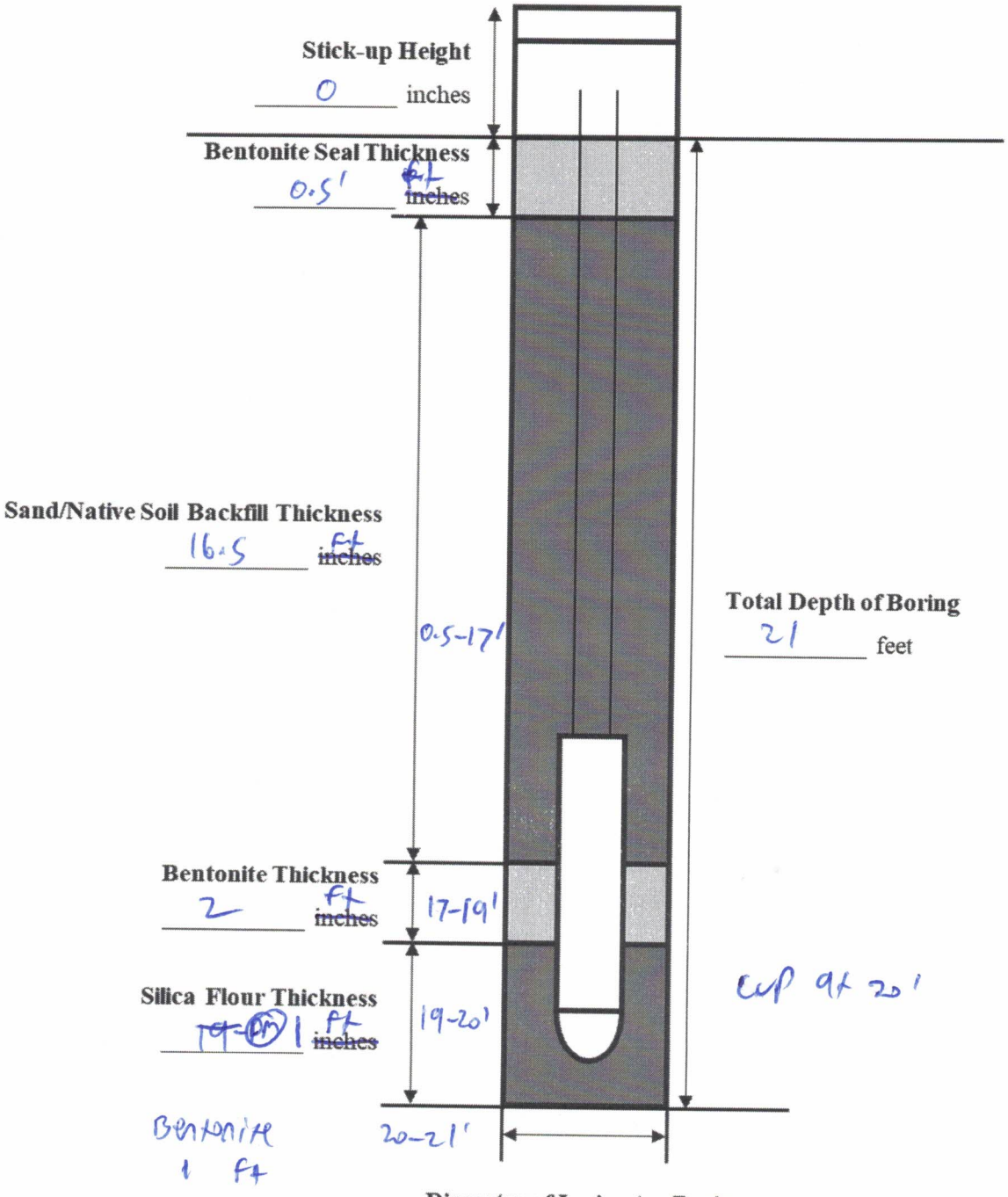
Lysimeter Installation Form

Lysimeter Unit ID: ~~315B-23-06~~ 315B-23-02

Unit Installed By: Duncan Markhead - Arcadis Date: 09/13/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 micron

Bentonite Type: Chips Sand Type: Play sand



Completed By: Duncan Markhead Date: 09/13/2023

Devens - AOC 31

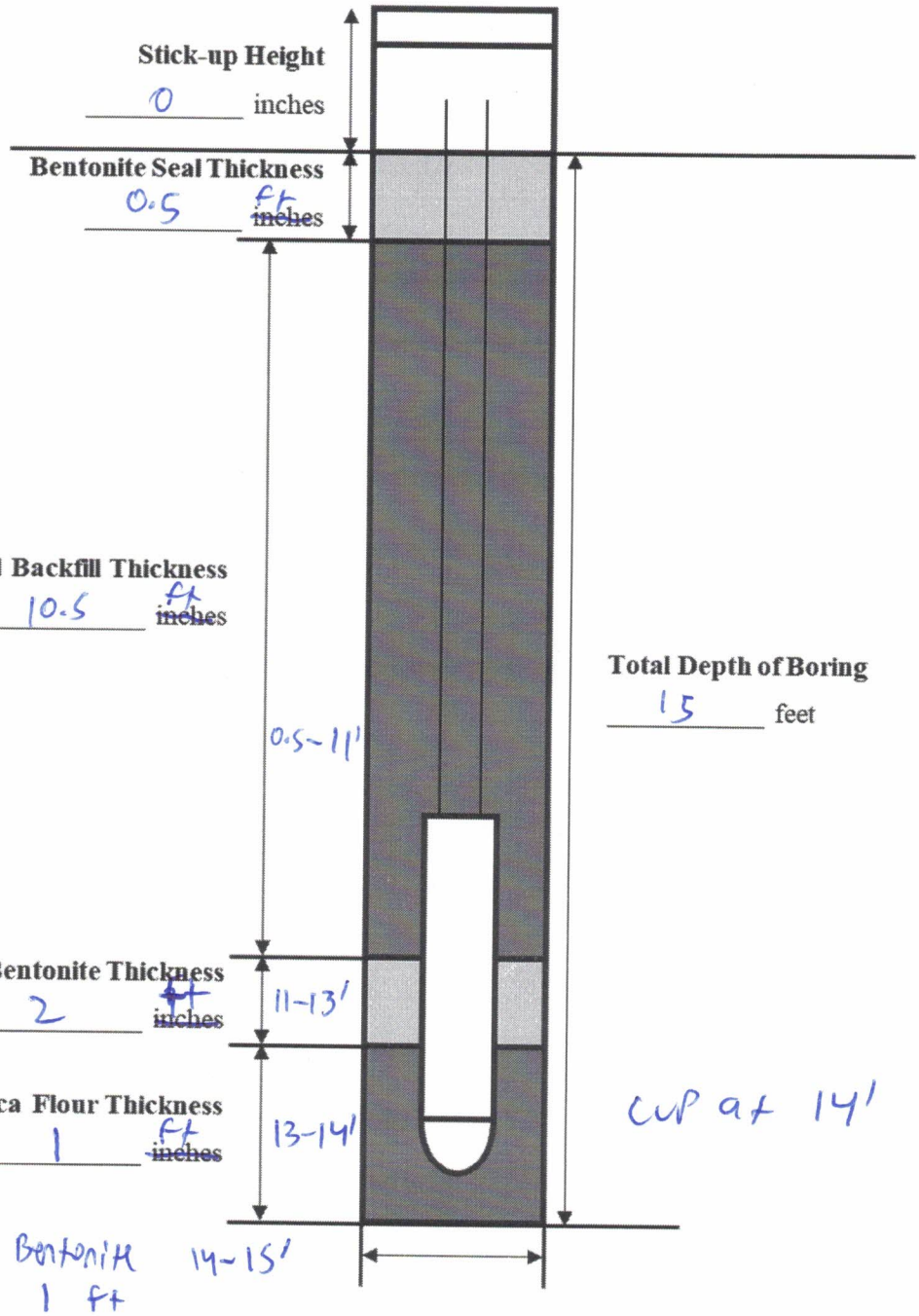
Lysimeter Installation Form

Lysimeter Unit ID: 31SB-23-01

Unit Installed By: Duncan Marthrean - Arcadis Date: 09/12/2023

Lysimeter Type: 24" 2-bar ceramic cup Silica Flour Type: 90 micron

Bentonite Type: chips Sand Type: Play Sand



Completed By: Duncan Marthrean Date: 09/12/2023

Appendix D

AOC 31 Lysimeter Soils & Porewater Laboratory Analytical Reports

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Heather Levesque
Seres Engineering & Services LLC
669 Marina Drive
Suite B7
Charleston, South Carolina 29492

Generated 11/16/2023 9:03:19 AM Revision 1

JOB DESCRIPTION

AOC 31

JOB NUMBER

410-142725-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

my EOL

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization



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Revision 1

Authorized for release by
Kerri Sachtleben, Client Services Group Leader
Kerri.Sachtleben@et.eurofinsus.com
(717)556-7376

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.
· QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
· Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
· Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Qualifiers

LCMS

Qualifier	Qualifier Description
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
^c	CCV Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
cn	Refer to Case Narrative for further detail
D	The reported value is from a dilution.
E	Result exceeded calibration range.
F2	MS/MSD RPD exceeds control limits
FH	MS and/or MSD recovery above control limits.
FL	MS and/or MSD recovery below control limits.
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M	Manual integrated compound.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 410-142725-1

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Narrative

Job Narrative
410-142725-1

REVISION

The report being provided is a revision of the original report sent on 11/6/2023. The report (revision 1) is being revised due to update to reporting units per client request.

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 9/14/2023 10:10 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 1.8°C

Receipt Exceptions
Samples extracts in login 410-142725 are initially analyzed and the extracted internal standards (EIS) evaluated. Samples that have EIS recovering outside of QC acceptance limits, a fresh aliquot of the sample extract is analyzed. If EIS recoveries in these samples are again outside of QC acceptance limits, a 10-fold dilution of the sample extract is prepared and analyzed. If EIS recoveries in the 10-fold dilution are outside the of QC acceptance limits, the sample is re-extracted at a reduced volume and analyzed

The following sample was received at the laboratory without a sample collection time documented on the chain of custody: 31SB-DUP-23 (410-142725-9). Entered as 00:00.

Sample ID updated per client request: 31SB-23-03-33-34 (410-142725-7)

PFAS
Method 1633_DOD5: The recovery for labeled isotope: M2-8:2 FTS is outside the QC acceptance limits in the opening continuing calibration verification standard, biased high. Since the recovery for the labeled isotope is within QC limits in the following samples: 31SB-23-08-11-12 (410-142725-1), 31SB-23-05-13-14 (410-142725-2) and 31SB-23-07-50-51 (410-142725-3), the data is reported.

Method 1633_DOD5: The recovery for labeled isotope: M2-6:2 FTS is outside the QC acceptance limits in the closing continuing calibration verification standard, biased high. Since the recovery for the labeled isotope is within QC limits in the following samples: 31SB-23-08-11-12 (410-142725-1), 31SB-23-05-13-14 (410-142725-2) and 31SB-23-07-50-51 (410-142725-3), the data is reported.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31SB-23-08-11-12 (410-142725-1), 31SB-23-05-13-14 (410-142725-2) and 31SB-23-07-50-51 (410-142725-3) due to limited sample volume.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31SB-23-04-2-3 (410-142725-4), 31SB-23-01-13-14 (410-142725-6), 31SB-23-03-33-34 (410-142725-7), 31SB-23-02-19-20 (410-142725-8), 31SB-MS-23-02-19-20 (410-142725-8[MS]), 31SB-MSD-23-02-19-20 (410-142725-8[MSD]) and 31SB-DUP-23 (410-142725-9) due to limited sample volume.

Method 1633_DOD5: Reporting limits were raised for the following sample: 31SB-23-06-19-20 (410-142725-5) due to interference from the sample matrix.

Job ID: 410-142725-1 (Continued)

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC (Continued)

Method 1633_DOD5: The recovery for labeled isotope: 13C5 PFHxA is outside the QC acceptance limits in the closing continuing calibration verification standard. Since the recovery for the labeled isotope is within QC limits in the following sample: 31SB-DUP-23 (410-142725-9), the data is reported.

Method 1633_DOD5: Target analyte(s) Perfluorobutanoic acid (PFBA) were detected in the method blank associated with the following samples: 31SB-23-08-11-12 (410-142725-1) and 31SB-23-07-50-51 (410-142725-3). Since the target Perfluorobutanoic acid (PFBA) is not detected in the following samples: 31SB-23-08-11-12 (410-142725-1) and 31SB-23-07-50-51 (410-142725-3), the data is reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-08-11-12

Lab Sample ID: 410-142725-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	18		0.99	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.16	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamide (NMeFOSA)	2.8	M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	1.1	I	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	1.2		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.51		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorododecanesulfonic acid (PFDoS)	0.51		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.15	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.077	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.6		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.29		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.23		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	0.78		0.20	0.099	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluoroundecanoic acid (PFUnA)	0.13	J	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	140	D	2.0	0.99	0.50	ug/Kg	10	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	67	D	2.0	0.99	0.51	ug/Kg	10	☼	1633	Total/NA
Perfluoropentanoic acid (PFPeA)	3.0	J M cn	4.7	2.3	1.2	ng/L	1		1633	SPLP East
Perfluorohexanoic acid (PFHxA)	4.9	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	4.3	cn	2.3	1.2	0.61	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	30	cn	2.3	1.5	0.75	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	6.4	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	16	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoroundecanoic acid (PFUnA)	3.3	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorododecanoic acid (PFDoA)	2.3	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoropentanesulfonic acid (PFPeS)	0.59	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	75	cn	2.3	1.3	0.66	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	4.9	cn	2.3	1.2	0.47	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	8.1	cn	2.3	1.2	0.47	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-08-11-12 (Continued) — Lab Sample ID: 410-142725-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorododecanesulfonic acid (PFDoS)	2.2	J cn	2.3	2.2	1.0	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	9.0	J cn	9.3	8.8	2.9	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	500	cn	9.3	9.0	3.0	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamide (NMeFOSA)	5.7	M cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	48	I M cn	4.7	2.8	1.4	ng/L	1		1633	SPLP East
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	3.8	cn	2.3	1.6	0.81	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	27	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL	2200	D cn	23	12	5.8	ng/L	10		1633	SPLP East
Perfluorooctanesulfonamide (FOSA) - DL	3400	D M cn	23	12	5.8	ng/L	10		1633	SPLP East

Client Sample ID: 31SB-23-05-13-14 — Lab Sample ID: 410-142725-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	55		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.16	J	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.13	J	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.094	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.2		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.15	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	28		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	0.82		0.20	0.099	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	220	D	2.0	0.99	0.51	ug/Kg	10	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	3.2	cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	5.4	cn	2.3	1.1	0.59	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	33	cn	2.3	1.5	0.73	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	5.5	cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	4.7	cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	62	cn	2.3	1.3	0.65	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	6.1	cn	2.3	1.1	0.45	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	5.5	cn	2.3	1.1	0.45	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-05-13-14 (Continued) — Lab Sample ID: 410-142725-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	9.3	cn	9.1	8.6	2.8	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	2000	cn	9.1	8.8	3.0	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamide (NMeFOSA)	9.3	M cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	11	I M cn	4.5	2.7	1.4	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	0.93	J cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorooctanesulfonamide (FOSA) - DL	1400	D M cn	23	11	5.7	ng/L	10		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL2	8700	D cn	230	110	57	ng/L	100		1633	SPLP East

Client Sample ID: 31SB-23-07-50-51 — Lab Sample ID: 410-142725-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.2		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	11		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.060	J	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	0.067	J	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.21	M	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.083	J M	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.5		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	18		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	55		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	0.32		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	0.10	J	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoropentanoic acid (PFPeA)	4.5	J I cn	4.6	2.3	1.1	ng/L	1		1633	SPLP East
Perfluorohexanoic acid (PFHxA)	8.3	cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	3.9	cn	2.3	1.1	0.60	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	11	cn	2.3	1.5	0.73	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	1.4	J M cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	0.87	J cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorobutanesulfonic acid (PFBS)	0.51	J cn	2.3	1.1	0.34	ng/L	1		1633	SPLP East
Perfluoropentanesulfonic acid (PFPeS)	1.6	J cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-07-50-51 (Continued)

Lab Sample ID: 410-142725-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanesulfonic acid (PFHxS)	38	cn	2.3	1.3	0.65	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	3.1	cn	2.3	1.1	0.46	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	2.5	cn	2.3	1.1	0.46	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	13	cn	9.2	8.7	2.9	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	330	cn	9.2	8.8	3.0	ng/L	1		1633	SPLP East
Perfluorooctanesulfonamide (FOSA)	690	cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
N-methylperfluorooctanesulfonamide (NMeFOSA)	2.9	M cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	6.9	I cn	4.6	2.8	1.4	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	1.7	J cn	2.3	1.1	0.57	ng/L	1		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL	1800	D cn	23	11	5.7	ng/L	10		1633	SPLP East

Client Sample ID: 31SB-23-04-2-3

Lab Sample ID: 410-142725-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2.1		1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	33		1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.053	J M	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamide (NMeFOSA)	0.61		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	0.53		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.59		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorododecanesulfonic acid (PFDoS)	0.77		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorododecanoic acid (PFDoA)	0.11	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.11	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.72		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.1		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	0.62		0.20	0.12	0.059	ug/Kg	1	☼	1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.12	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.52		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	38		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	16		0.20	0.10	0.051	ug/Kg	1	☼	1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-04-2-3 (Continued)

Lab Sample ID: 410-142725-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanoic acid (PFOA)	1.5		0.20	0.10	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	0.096	J I	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoropentanoic acid (PFPeA)	0.47	I M	0.40	0.20	0.10	ug/Kg	1	☼	1633	Total/NA
Perfluoroundecanoic acid (PFUnA)	0.24		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorobutanoic acid (PFBA)	8.0	J cn	9.5	4.7	2.4	ng/L	1		1633	SPLP East
Perfluoropentanoic acid (PFPeA)	26	cn	4.7	2.4	1.2	ng/L	1		1633	SPLP East
Perfluorohexanoic acid (PFHxA)	36	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	43	cn	2.4	1.2	0.62	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	97	cn	2.4	1.5	0.76	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	30	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	28	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluoroundecanoic acid (PFUnA)	8.1	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorododecanoic acid (PFDoA)	2.3	J cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorobutanesulfonic acid (PFBS)	1.5	J cn	2.4	1.2	0.36	ng/L	1		1633	SPLP East
Perfluoropentanesulfonic acid (PFPeS)	3.6	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	110	cn	2.4	1.3	0.67	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	4.0	I cn	2.4	1.2	0.47	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	5.0	cn	2.4	1.2	0.47	ng/L	1		1633	SPLP East
Perfluorododecanesulfonic acid (PFDoS)	1.2	J cn	2.4	2.2	1.1	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	51	cn	9.5	9.0	3.0	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamide (NMeFOSA)	17	M cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	8.5	I cn	4.7	2.8	1.4	ng/L	1		1633	SPLP East
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.6	cn	2.4	1.7	0.83	ng/L	1		1633	SPLP East
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	20	J cn	59	30	12	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	10	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL	600	D cn	24	12	5.9	ng/L	10		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS) - DL	1200	D cn	95	91	31	ng/L	10		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-04-2-3 (Continued)

Lab Sample ID: 410-142725-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanesulfonamide (FOSA) - DL	1500	D cn	24	12	5.9	ng/L	10		1633	SPLP East

Client Sample ID: 31SB-23-06-19-20

Lab Sample ID: 410-142725-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.86	J	1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	110		1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.078	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.65	I	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	0.18	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.58		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	2.5		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.18	J	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	3.3		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.44		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.85		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	61		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	1.7		0.20	0.10	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1900	D	20	10	5.1	ug/Kg	100	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	22	cn	20	10	5.0	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	9.8	J cn	20	10	5.2	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	110	cn	20	13	6.4	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	36	cn	20	10	5.0	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	23	cn	20	10	5.0	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	180	cn	20	11	5.7	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	78	cn	20	10	4.0	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	14	J cn	20	10	4.0	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	39	J cn	80	76	25	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	4500	cn	80	77	26	ng/L	1		1633	SPLP East
Perfluorooctanesulfonamide (FOSA)	2600	cn	20	10	5.0	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-06-19-20 (Continued) — Lab Sample ID: 410-142725-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
N-methylperfluorooctane sulfonamide (NMeFOSA)	9.3	J cn	20	10	5.0	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	49	I cn	40	24	12	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	5.8	J cn	20	10	5.0	ng/L	1		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL2	61000	D cn	2000	1000	500	ng/L	100		1633	SPLP East

Client Sample ID: 31SB-23-01-13-14 — Lab Sample ID: 410-142725-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.81	J	0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	41		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.12	J M	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.51	I	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	0.29		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.22		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorododecanesulfonic acid (PFDoS)	0.065	J I	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.85		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.11	J	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.2		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	0.10	J M	0.20	0.12	0.058	ug/Kg	1	☼	1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.22		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.42	M	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	39		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	1.1		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	190	D	2.0	0.99	0.50	ug/Kg	10	☼	1633	Total/NA
Perfluoropentanoic acid (PFPeA)	2.1	J I cn	4.6	2.3	1.2	ng/L	1		1633	SPLP East
Perfluorohexanoic acid (PFHxA)	8.2	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	7.5	cn	2.3	1.2	0.60	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	66	cn	2.3	1.5	0.74	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	24	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-01-13-14 (Continued) — Lab Sample ID: 410-142725-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorodecanoic acid (PFDA)	12	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoropentanesulfonic acid (PFPeS)	0.87	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	72	cn	2.3	1.3	0.66	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	35	cn	2.3	1.2	0.46	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	9.2	cn	2.3	1.2	0.46	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	41	cn	9.2	8.8	2.9	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	38	I cn	4.6	2.8	1.4	ng/L	1		1633	SPLP East
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	5.6	cn	2.3	1.6	0.81	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	10	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS) - DL	1400	D	92	89	30	ng/L	10		1633	SPLP East
Perfluorooctanesulfonamide (FOSA) - DL	1400	D	23	12	5.8	ng/L	10		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL2	7400	D cn	230	120	58	ng/L	100		1633	SPLP East

Client Sample ID: 31SB-23-03-33-34 — Lab Sample ID: 410-142725-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.63	J	0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	2.2		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.41		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.10	J	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.1		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.14	J M	0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	0.44		0.20	0.099	0.049	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	0.62		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	88	D	2.0	0.99	0.50	ug/Kg	10	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	6.0	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	6.4	cn	2.3	1.2	0.61	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	39	cn	2.3	1.5	0.75	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	4.2	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-03-33-34 (Continued) — Lab Sample ID: 410-142725-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanesulfonic acid (PFPeS)	0.85	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	100	cn	2.3	1.3	0.66	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	13	cn	2.3	1.2	0.47	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	24	cn	9.3	8.9	2.9	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	69	cn	9.3	9.0	3.0	ng/L	1		1633	SPLP East
Perfluorooctanesulfonamide (FOSA)	10	M cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL	3500	D cn	23	12	5.8	ng/L	10		1633	SPLP East

Client Sample ID: 31SB-23-02-19-20 — Lab Sample ID: 410-142725-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.3		1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39		1.0	0.80	0.35	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.12	J I M	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.11	J M	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	1.4		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.26		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2.9		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	0.24	M	0.20	0.12	0.059	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.50		0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	10	F2	0.20	0.10	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	1.4		0.20	0.10	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	560	D	2.0	1.0	0.51	ug/Kg	10	☼	1633	Total/NA
Perfluoropentanoic acid (PFPeA)	4.9	cn	4.7	2.4	1.2	ng/L	1		1633	SPLP East
Perfluorohexanoic acid (PFHxA)	22	FH cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluoroheptanoic acid (PFHpA)	13	cn	2.4	1.2	0.61	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	58	FH cn	2.4	1.5	0.75	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	19	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	4.3	FH cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorobutanesulfonic acid (PFBS)	0.72	J cn	2.4	1.2	0.35	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-23-02-19-20 (Continued)

Lab Sample ID: 410-142725-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanesulfonic acid (PFPeS)	2.5	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	160	cn	2.4	1.3	0.67	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	65	cn	2.4	1.2	0.47	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	4.2	FH cn	2.4	1.2	0.47	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	55	cn	9.4	9.0	2.9	ng/L	1		1633	SPLP East
Perfluorooctanesulfonamide (FOSA)	420	cn	2.4	1.2	0.59	ng/L	1		1633	SPLP East
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	8.0	I cn	4.7	2.8	1.4	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS) - DL	1200	D cn	94	91	31	ng/L	10		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL2	21000	D cn	240	120	59	ng/L	100		1633	SPLP East

Client Sample ID: 31SB-DUP-23

Lab Sample ID: 410-142725-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	33		0.99	0.79	0.35	ug/Kg	1	☼	1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.13	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamide (NMeFOSA)	2.1		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	1.3	I M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanesulfonic acid (PFDS)	0.57		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.31	M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorododecanesulfonic acid (PFDoS)	0.23		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	0.21		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.11	J	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.9		0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.19	J	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorononanoic acid (PFNA)	0.13	J M	0.20	0.099	0.050	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanoic acid (PFOA)	0.81		0.20	0.099	0.051	ug/Kg	1	☼	1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	100	D	2.0	0.99	0.50	ug/Kg	10	☼	1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	150	D	2.0	0.99	0.51	ug/Kg	10	☼	1633	Total/NA
Perfluorohexanoic acid (PFHxA)	7.7	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31SB-DUP-23 (Continued)

Lab Sample ID: 410-142725-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	7.0	cn	2.3	1.2	0.60	ng/L	1		1633	SPLP East
Perfluorooctanoic acid (PFOA)	48	cn	2.3	1.5	0.74	ng/L	1		1633	SPLP East
Perfluorononanoic acid (PFNA)	8.4	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorodecanoic acid (PFDA)	16	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluoroundecanoic acid (PFUnA)	1.8	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorododecanoic acid (PFDoA)	0.86	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorobutanesulfonic acid (PFBS)	0.44	J I cn	2.3	1.2	0.35	ng/L	1		1633	SPLP East
Perfluoropentanesulfonic acid (PFPeS)	0.83	J cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
Perfluorohexanesulfonic acid (PFHxS)	110	cn	2.3	1.3	0.66	ng/L	1		1633	SPLP East
Perfluoroheptanesulfonic acid (PFHpS)	7.3	cn	2.3	1.2	0.46	ng/L	1		1633	SPLP East
Perfluorononanesulfonic acid (PFNS)	7.7	cn	2.3	1.2	0.46	ng/L	1		1633	SPLP East
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	9.4	cn	9.3	8.8	2.9	ng/L	1		1633	SPLP East
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	60	I cn	4.6	2.8	1.4	ng/L	1		1633	SPLP East
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.8	M cn	2.3	1.6	0.81	ng/L	1		1633	SPLP East
Perfluorodecanesulfonic acid (PFDS)	15	cn	2.3	1.2	0.58	ng/L	1		1633	SPLP East
8:2 Fluorotelomer sulfonic acid (8:2 FTS) - DL	850	D	93	89	30	ng/L	10		1633	SPLP East
Perfluorooctanesulfonamide (FOSA) - DL	3000	D	23	12	5.8	ng/L	10		1633	SPLP East
Perfluorooctanesulfonic acid (PFOS) - DL2	5600	D cn	230	120	58	ng/L	100		1633	SPLP East

This Detection Summary does not include radiochemical test results.

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-08-11-12
Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.7	U cn	9.3	4.7	2.3	ng/L		10/22/23 23:35	1
Perfluoropentanoic acid (PFPeA)	**3.0**	**J M cn**	4.7	2.3	1.2	ng/L		10/22/23 23:35	1
Perfluorohexanoic acid (PFHxA)	**4.9**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluoroheptanoic acid (PFHpA)	**4.3**	**cn**	2.3	1.2	0.61	ng/L		10/22/23 23:35	1
Perfluorooctanoic acid (PFOA)	**30**	**cn**	2.3	1.5	0.75	ng/L		10/22/23 23:35	1
Perfluorononanoic acid (PFNA)	**6.4**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorodecanoic acid (PFDA)	**16**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluoroundecanoic acid (PFUnA)	**3.3**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorododecanoic acid (PFDoA)	**2.3**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorobutanesulfonic acid (PFBS)	1.2	U cn	2.3	1.2	0.35	ng/L		10/22/23 23:35	1
Perfluoropentanesulfonic acid (PFPeS)	**0.59**	**J cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluorohexanesulfonic acid (PFHxS)	**75**	**cn**	2.3	1.3	0.66	ng/L		10/22/23 23:35	1
Perfluoroheptanesulfonic acid (PFHpS)	**4.9**	**cn**	2.3	1.2	0.47	ng/L		10/22/23 23:35	1
Perfluorononanesulfonic acid (PFNS)	**8.1**	**cn**	2.3	1.2	0.47	ng/L		10/22/23 23:35	1
Perfluorododecanesulfonic acid (PFDoS)	**2.2**	**J cn**	2.3	2.2	1.0	ng/L		10/22/23 23:35	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.3	4.4	2.0	ng/L		10/22/23 23:35	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**9.0**	**J cn**	9.3	8.8	2.9	ng/L		10/22/23 23:35	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**500**	**cn**	9.3	9.0	3.0	ng/L		10/22/23 23:35	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**5.7**	**M cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**48**	**I M cn**	4.7	2.8	1.4	ng/L		10/22/23 23:35	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	**3.8**	**cn**	2.3	1.6	0.81	ng/L		10/22/23 23:35	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	23	12	5.8	ng/L		10/22/23 23:35	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	23	12	5.8	ng/L		10/22/23 23:35	1
HFPODA	4.7	U cn	9.3	4.7	2.3	ng/L		10/22/23 23:35	1
DONA	4.4	U cn	9.3	4.4	1.7	ng/L		10/22/23 23:35	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.7	2.3	1.2	ng/L		10/22/23 23:35	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.7	2.3	1.2	ng/L		10/22/23 23:35	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.3	4.4	1.2	ng/L		10/22/23 23:35	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.8	U cn	9.3	8.8	2.3	ng/L		10/22/23 23:35	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.7	2.1	0.58	ng/L		10/22/23 23:35	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.8	U cn	12	5.8	1.7	ng/L		10/22/23 23:35	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	58	29	12	ng/L		10/22/23 23:35	1

Client Sample ID: 31SB-23-08-11-12

Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	58	29	12	ng/L		10/22/23 23:35	1
Perfluorodecanesulfonic acid (PFDS)	**27**	**cn**	2.3	1.2	0.58	ng/L		10/22/23 23:35	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.7	2.3	0.58	ng/L		10/22/23 23:35	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*88.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C4 PFBA	*83.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C5 PFPeA	*76.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C5 PFHxA	*93.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C4 PFHpA	*94.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C8 PFOA	*74.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C9 PFNA	*83.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C6 PFDA	*85.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C7 PFUnA	*89.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C2 PFTeDA	*67.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C3 PFBS	*79.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C3 PFHxS	*81.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C8 PFOS	*84.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d3-NMeFOSAA	*84.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d5-NEtFOSAA	*78.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
M2-4:2 FTS	*88.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
M2-6:2 FTS	*90.2*	*^c cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
M2-8:2 FTS	*104*	*^c cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
13C3 HFPO-DA	*85.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d7-N-MeFOSE-M	*56.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d9-N-EtFOSE-M	*53.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d5-NEtPFOSA	*66.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*
d3-NMePFOSA	*70.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:35*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**2200**	**D cn**	23	12	5.8	ng/L		10/24/23 16:08	10
Perfluorooctanesulfonamide (FOSA)	**3400**	**D M cn**	23	12	5.8	ng/L		10/24/23 16:08	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*83.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/24/23 16:08*	*10*
13C8 FOSA	*80.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/24/23 16:08*	*10*

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**4.9**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-08-11-12

Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1

Matrix: Solid
Percent Solids: 95.1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/13/23 23:31	1

Client Sample ID: 31SB-23-08-11-12
Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1
Matrix: Solid
Percent Solids: 95.1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/13/23 23:31	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/13/23 23:31	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	0.99	0.50	0.25	ug/Kg	☼	10/13/23 23:31	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/13/23 23:31	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.80	U	0.99	0.80	0.35	ug/Kg	☼	10/13/23 23:31	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**18**		0.99	0.80	0.35	ug/Kg	☼	10/13/23 23:31	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/13/23 23:31	1
DONA	0.40	U cn	0.80	0.40	0.20	ug/Kg	☼	10/13/23 23:31	1
HFPODA	0.40	U	0.80	0.40	0.099	ug/Kg	☼	10/13/23 23:31	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/13/23 23:31	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.16**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**2.8**	**M**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/13/23 23:31	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**1.1**	**I**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/13/23 23:31	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/13/23 23:31	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/13/23 23:31	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/13/23 23:31	1
Perfluorobutanesulfonic acid (PFBS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorodecanesulfonic acid (PFDS)	**1.2**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorodecanoic acid (PFDA)	**0.51**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorododecanesulfonic acid (PFDoS)	**0.51**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.15**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluoroheptanoic acid (PFHpA)	**0.077**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorohexanesulfonic acid (PFHxS)	**1.6**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.059	ug/Kg	☼	10/13/23 23:31	1
Perfluorononanesulfonic acid (PFNS)	**0.29**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorononanoic acid (PFNA)	**0.23**		0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorooctanoic acid (PFOA)	**0.78**		0.20	0.099	0.051	ug/Kg	☼	10/13/23 23:31	1
Perfluoropentanesulfonic acid (PFPeS)	0.099	U M	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluoropentanoic acid (PFPeA)	0.20	U M	0.40	0.20	0.099	ug/Kg	☼	10/13/23 23:31	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1
Perfluoroundecanoic acid (PFUnA)	**0.13**	**J**	0.20	0.099	0.050	ug/Kg	☼	10/13/23 23:31	1

Client Sample ID: 31SB-23-08-11-12

Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1

Matrix: Solid
Percent Solids: 95.1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2 PFTeDA	59.6		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C2-PFDoDA	79.7		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C3 HFPO-DA	88.9		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C3 PFBS	89.1		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C3 PFHxS	84.1		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C4 PFHpA	98.8		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C5 PFHxA	95.9		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C5 PFPeA	79.9		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C6 PFDA	89.2		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C7 PFUnA	88.2		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C8 FOSA	87.8		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C8 PFOA	104		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C8 PFOS	86.4		20 - 150	09/19/23 08:46	10/13/23 23:31	1
13C9 PFNA	91.6		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d3-NMeFOSAA	83.3		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d3-NMePFOSA	74.3		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d5-NEtFOSAA	89.7		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d5-NEtPFOSA	61.4		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d7-N-MeFOSE-M	76.2		20 - 150	09/19/23 08:46	10/13/23 23:31	1
d9-N-EtFOSE-M	76.4		20 - 150	09/19/23 08:46	10/13/23 23:31	1
M2-4:2 FTS	93.7		20 - 150	09/19/23 08:46	10/13/23 23:31	1
M2-6:2 FTS	94.4		20 - 150	09/19/23 08:46	10/13/23 23:31	1
M2-8:2 FTS	99.3		20 - 150	09/19/23 08:46	10/13/23 23:31	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	**140**	**D**	2.0	0.99	0.50	ug/Kg	☼	10/13/23 23:57	10
Perfluorooctanesulfonic acid (PFOS)	**67**	**D**	2.0	0.99	0.51	ug/Kg	☼	10/13/23 23:57	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	60.5		20 - 150	09/19/23 08:46	10/13/23 23:57	10
13C8 PFOS	71.9		20 - 150	09/19/23 08:46	10/13/23 23:57	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RE

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	2.0	U B cn	4.1	2.0	0.51	ug/Kg	☼	10/24/23 23:19	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	106		20 - 150	10/23/23 07:32	10/24/23 23:19	1

Client Sample ID: 31SB-23-05-13-14

Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.5	U cn	9.1	4.5	2.3	ng/L		10/22/23 23:47	1
Perfluoropentanoic acid (PFPeA)	2.3	U M cn	4.5	2.3	1.1	ng/L		10/22/23 23:47	1
Perfluorohexanoic acid (PFHxA)	**3.2**	**cn**	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluoroheptanoic acid (PFHpA)	**5.4**	**cn**	2.3	1.1	0.59	ng/L		10/22/23 23:47	1
Perfluorooctanoic acid (PFOA)	**33**	**cn**	2.3	1.5	0.73	ng/L		10/22/23 23:47	1
Perfluorononanoic acid (PFNA)	**5.5**	**cn**	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorodecanoic acid (PFDA)	**4.7**	**cn**	2.3	1.1	0.57	ng/L		10/22/23 23:47	1

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorobutanesulfonic acid (PFBS)	1.1	U cn	2.3	1.1	0.34	ng/L		10/22/23 23:47	1
Perfluoropentanesulfonic acid (PFPeS)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluorohexanesulfonic acid (PFHxS)	**62**	**cn**	2.3	1.3	0.65	ng/L		10/22/23 23:47	1
Perfluoroheptanesulfonic acid (PFHpS)	**6.1**	**cn**	2.3	1.1	0.45	ng/L		10/22/23 23:47	1
Perfluorononanesulfonic acid (PFNS)	**5.5**	**cn**	2.3	1.1	0.45	ng/L		10/22/23 23:47	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.3	2.2	1.0	ng/L		10/22/23 23:47	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.3	U cn	9.1	4.3	1.9	ng/L		10/22/23 23:47	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**9.3**	**cn**	9.1	8.6	2.8	ng/L		10/22/23 23:47	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**2000**	**cn**	9.1	8.8	3.0	ng/L		10/22/23 23:47	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**9.3**	**M cn**	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**11**	**I M cn**	4.5	2.7	1.4	ng/L		10/22/23 23:47	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.6	U cn	2.3	1.6	0.80	ng/L		10/22/23 23:47	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	23	11	5.7	ng/L		10/22/23 23:47	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	23	11	5.7	ng/L		10/22/23 23:47	1
HFPODA	4.5	U cn	9.1	4.5	2.3	ng/L		10/22/23 23:47	1
DONA	4.3	U cn	9.1	4.3	1.7	ng/L		10/22/23 23:47	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.5	2.3	1.1	ng/L		10/22/23 23:47	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.5	2.3	1.1	ng/L		10/22/23 23:47	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.3	U cn	9.1	4.3	1.1	ng/L		10/22/23 23:47	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.6	U cn	9.1	8.6	2.3	ng/L		10/22/23 23:47	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.0	U cn	4.5	2.0	0.57	ng/L		10/22/23 23:47	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.7	U cn	11	5.7	1.7	ng/L		10/22/23 23:47	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	28	U cn	57	28	11	ng/L		10/22/23 23:47	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	28	U cn	57	28	11	ng/L		10/22/23 23:47	1
Perfluorodecanesulfonic acid (PFDS)	**0.93**	**J cn**	2.3	1.1	0.57	ng/L		10/22/23 23:47	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.5	2.3	0.57	ng/L		10/22/23 23:47	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*81.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:47*	*1*
13C4 PFBA	*82.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:47*	*1*
13C5 PFPeA	*73.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:47*	*1*

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFHxA	95.0	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C4 PFHpA	88.1	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C8 PFOA	96.0	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C9 PFNA	76.8	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C6 PFDA	86.3	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C7 PFUnA	82.9	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C2 PFTeDA	58.7	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C3 PFBS	74.3	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C3 PFHxS	85.8	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C8 PFOS	81.5	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d3-NMeFOSAA	77.8	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d5-NEtFOSAA	69.1	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
M2-4:2 FTS	105	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
M2-6:2 FTS	92.9	^c cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
M2-8:2 FTS	110	^c cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
13C3 HFPO-DA	83.7	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d7-N-MeFOSE-M	59.1	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d9-N-EtFOSE-M	57.3	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d5-NEtPFOSA	68.5	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1
d3-NMePFOSA	71.2	cn	20 - 150	10/17/23 07:00	10/22/23 23:47	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	1400	D M cn	23	11	5.7	ng/L		10/24/23 16:20	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	65.8	cn	20 - 150	10/17/23 07:00	10/24/23 16:20	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	8700	D cn	230	110	57	ng/L		10/24/23 19:09	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	89.1	cn	20 - 150	10/17/23 07:00	10/24/23 19:09	100

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	3.8		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid
Percent Solids: 96.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:10	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/14/23 00:10	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/14/23 00:10	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	0.99	0.50	0.25	ug/Kg	☼	10/14/23 00:10	1

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid
Percent Solids: 96.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:10	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.79	U	0.99	0.79	0.35	ug/Kg	☼	10/14/23 00:10	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**55**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 00:10	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:10	1
DONA	0.40	U cn	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:10	1
HFPODA	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 00:10	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/14/23 00:10	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/14/23 00:10	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 00:10	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:10	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:10	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:10	1
Perfluorobutanesulfonic acid (PFBS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 00:10	1
Perfluorodecanesulfonic acid (PFDS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorodecanoic acid (PFDA)	**0.16**	**J**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorododecanesulfonic acid (PFDoS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.13**	**J**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluoroheptanoic acid (PFHpA)	**0.094**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorohexanesulfonic acid (PFHxS)	**1.2**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.059	ug/Kg	☼	10/14/23 00:10	1
Perfluorononanesulfonic acid (PFNS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorononanoic acid (PFNA)	**0.15**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorooctanesulfonamide (FOSA)	**28**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorooctanoic acid (PFOA)	**0.82**		0.20	0.099	0.051	ug/Kg	☼	10/14/23 00:10	1
Perfluoropentanesulfonic acid (PFPeS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:10	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1
Perfluoroundecanoic acid (PFUnA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:10	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*38.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:10*	*1*
13C2-PFDoDA	*61.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:10*	*1*
13C3 HFPO-DA	*88.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:10*	*1*

Client Sample ID: 31SB-23-05-13-14

Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2

Matrix: Solid
Percent Solids: 96.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFBS	91.8		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C3 PFHxS	84.8		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C4 PFBA	87.5		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C4 PFHpA	94.4		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C5 PFHxA	96.3		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C5 PFPeA	85.0		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C6 PFDA	89.0		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C7 PFUnA	78.2		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C8 FOSA	94.3		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C8 PFOA	102		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C8 PFOS	85.0		20 - 150	09/19/23 08:46	10/14/23 00:10	1
13C9 PFNA	86.9		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d3-NMeFOSAA	90.3		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d3-NMePFOSA	62.7		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d5-NEtFOSAA	93.7		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d5-NEtPFOSA	52.4		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d7-N-MeFOSE-M	67.4		20 - 150	09/19/23 08:46	10/14/23 00:10	1
d9-N-EtFOSE-M	61.1		20 - 150	09/19/23 08:46	10/14/23 00:10	1
M2-4:2 FTS	95.8		20 - 150	09/19/23 08:46	10/14/23 00:10	1
M2-6:2 FTS	89.9		20 - 150	09/19/23 08:46	10/14/23 00:10	1
M2-8:2 FTS	92.3		20 - 150	09/19/23 08:46	10/14/23 00:10	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**220**	**D**	2.0	0.99	0.51	ug/Kg	☼	10/14/23 00:23	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	63.5		20 - 150	09/19/23 08:46	10/14/23 00:23	10

Client Sample ID: 31SB-23-07-50-51

Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.6	U cn	9.2	4.6	2.3	ng/L		10/22/23 23:59	1
Perfluoropentanoic acid (PFPeA)	**4.5**	**J I cn**	4.6	2.3	1.1	ng/L		10/22/23 23:59	1
Perfluorohexanoic acid (PFHxA)	**8.3**	**cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluoroheptanoic acid (PFHpA)	**3.9**	**cn**	2.3	1.1	0.60	ng/L		10/22/23 23:59	1
Perfluorooctanoic acid (PFOA)	**11**	**cn**	2.3	1.5	0.73	ng/L		10/22/23 23:59	1
Perfluorononanoic acid (PFNA)	**1.4**	**J M cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorodecanoic acid (PFDA)	**0.87**	**J cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorobutanesulfonic acid (PFBS)	**0.51**	**J cn**	2.3	1.1	0.34	ng/L		10/22/23 23:59	1
Perfluoropentanesulfonic acid (PFPeS)	**1.6**	**J cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluorohexanesulfonic acid (PFHxS)	**38**	**cn**	2.3	1.3	0.65	ng/L		10/22/23 23:59	1

Client Sample ID: 31SB-23-07-50-51
Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanesulfonic acid (PFHpS)	**3.1**	**cn**	2.3	1.1	0.46	ng/L		10/22/23 23:59	1
Perfluorononanesulfonic acid (PFNS)	**2.5**	**cn**	2.3	1.1	0.46	ng/L		10/22/23 23:59	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U M cn	2.3	2.2	1.0	ng/L		10/22/23 23:59	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.2	4.4	1.9	ng/L		10/22/23 23:59	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**13**	**cn**	9.2	8.7	2.9	ng/L		10/22/23 23:59	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**330**	**cn**	9.2	8.8	3.0	ng/L		10/22/23 23:59	1
Perfluorooctanesulfonamide (FOSA)	**690**	**cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**2.9**	**M cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**6.9**	**I cn**	4.6	2.8	1.4	ng/L		10/22/23 23:59	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.6	U M cn	2.3	1.6	0.80	ng/L		10/22/23 23:59	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	23	11	5.7	ng/L		10/22/23 23:59	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	23	11	5.7	ng/L		10/22/23 23:59	1
HFPODA	4.6	U cn	9.2	4.6	2.3	ng/L		10/22/23 23:59	1
DONA	4.4	U cn	9.2	4.4	1.7	ng/L		10/22/23 23:59	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.6	2.3	1.1	ng/L		10/22/23 23:59	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.6	2.3	1.1	ng/L		10/22/23 23:59	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.2	4.4	1.1	ng/L		10/22/23 23:59	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.7	U cn	9.2	8.7	2.3	ng/L		10/22/23 23:59	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.6	2.1	0.57	ng/L		10/22/23 23:59	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.7	U cn	11	5.7	1.7	ng/L		10/22/23 23:59	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	57	29	11	ng/L		10/22/23 23:59	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	57	29	11	ng/L		10/22/23 23:59	1
Perfluorodecanesulfonic acid (PFDS)	**1.7**	**J cn**	2.3	1.1	0.57	ng/L		10/22/23 23:59	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.6	2.3	0.57	ng/L		10/22/23 23:59	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*83.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C4 PFBA	*85.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C5 PFPeA	*71.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C5 PFHxA	*91.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C4 PFHpA	*81.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C8 PFOA	*73.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C9 PFNA	*80.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C6 PFDA	*88.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C7 PFUnA	*85.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*
13C2 PFTeDA	*70.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/22/23 23:59*	*1*

Client Sample ID: 31SB-23-07-50-51

Lab Sample ID: 410-142725-3

Date Collected: 09/11/23 14:10

Matrix: Solid

Date Received: 09/14/23 10:10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFBS	89.5	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
13C3 PFHxS	80.0	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
13C8 PFOS	83.4	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
13C8 FOSA	79.1	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d3-NMeFOSAA	84.0	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d5-NEtFOSAA	74.1	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
M2-4:2 FTS	102	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
M2-6:2 FTS	102	^c cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
M2-8:2 FTS	114	^c cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
13C3 HFPO-DA	79.9	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d7-N-MeFOSE-M	46.7	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d9-N-EtFOSE-M	43.8	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d5-NEtPFOSA	57.9	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1
d3-NMePFOSA	62.5	cn	20 - 150	10/17/23 07:00	10/22/23 23:59	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**1800**	**D cn**	23	11	5.7	ng/L		10/24/23 16:32	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	83.3	cn	20 - 150	10/17/23 07:00	10/24/23 16:32	10

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**5.4**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-07-50-51

Lab Sample ID: 410-142725-3

Date Collected: 09/11/23 14:10

Matrix: Solid

Date Received: 09/14/23 10:10

Percent Solids: 94.6

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:36	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 00:36	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 00:36	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.49	U	0.99	0.49	0.25	ug/Kg	☼	10/14/23 00:36	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:36	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**1.2**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 00:36	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**11**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 00:36	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:36	1
DONA	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 00:36	1
HFPODA	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 00:36	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 00:36	1

Client Sample ID: 31SB-23-07-50-51
Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3
Matrix: Solid
Percent Solids: 94.6

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.099	U M	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 00:36	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 00:36	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:36	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:36	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:36	1
Perfluorobutanesulfonic acid (PFBS)	**0.060**	**J**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorodecanesulfonic acid (PFDS)	**0.067**	**J**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorodecanoic acid (PFDA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorododecanesulfonic acid (PFDoS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.21**	**M**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluoroheptanoic acid (PFHpA)	**0.083**	**J M**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorohexanesulfonic acid (PFHxS)	**1.5**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.058	ug/Kg	☼	10/14/23 00:36	1
Perfluorononanesulfonic acid (PFNS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorononanoic acid (PFNA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorooctanesulfonamide (FOSA)	**18**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorooctanesulfonic acid (PFOS)	**55**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:36	1
Perfluorooctanoic acid (PFOA)	**0.32**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 00:36	1
Perfluoropentanesulfonic acid (PFPeS)	**0.10**	**J**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluoropentanoic acid (PFPeA)	0.20	U M	0.40	0.20	0.099	ug/Kg	☼	10/14/23 00:36	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1
Perfluoroundecanoic acid (PFUnA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 00:36	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*43.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C2-PFDoDA	*76.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C3 HFPO-DA	*85.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C3 PFBS	*92.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C3 PFHxS	*83.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C4 PFHpA	*95.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C5 PFHxA	*101*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C5 PFPeA	*85.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C6 PFDA	*89.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C7 PFUnA	*88.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C8 FOSA	*85.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C8 PFOA	*91.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*
13C8 PFOS	*88.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 00:36*	*1*

Client Sample ID: 31SB-23-07-50-51

Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3

Matrix: Solid
Percent Solids: 94.6

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	91.3		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d3-NMeFOSAA	92.7		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d3-NMePFOSA	72.2		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d5-NEtFOSAA	96.6		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d5-NEtPFOSA	59.0		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d7-N-MeFOSE-M	71.6		20 - 150	09/19/23 08:46	10/14/23 00:36	1
d9-N-EtFOSE-M	68.5		20 - 150	09/19/23 08:46	10/14/23 00:36	1
M2-4:2 FTS	92.0		20 - 150	09/19/23 08:46	10/14/23 00:36	1
M2-6:2 FTS	78.9		20 - 150	09/19/23 08:46	10/14/23 00:36	1
M2-8:2 FTS	91.9		20 - 150	09/19/23 08:46	10/14/23 00:36	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RE

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	2.0	U B cn	4.1	2.0	0.51	ug/Kg	☼	10/24/23 23:31	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	107		20 - 150	10/23/23 07:32	10/24/23 23:31	1

Client Sample ID: 31SB-23-04-2-3

Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**8.0**	**J cn**	9.5	4.7	2.4	ng/L		10/31/23 09:02	1
Perfluoropentanoic acid (PFPeA)	**26**	**cn**	4.7	2.4	1.2	ng/L		10/31/23 09:02	1
Perfluorohexanoic acid (PFHxA)	**36**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluoroheptanoic acid (PFHpA)	**43**	**cn**	2.4	1.2	0.62	ng/L		10/31/23 09:02	1
Perfluorooctanoic acid (PFOA)	**97**	**cn**	2.4	1.5	0.76	ng/L		10/31/23 09:02	1
Perfluorononanoic acid (PFNA)	**30**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorodecanoic acid (PFDA)	**28**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluoroundecanoic acid (PFUnA)	**8.1**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorododecanoic acid (PFDoA)	**2.3**	**J cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorobutanesulfonic acid (PFBS)	**1.5**	**J cn**	2.4	1.2	0.36	ng/L		10/31/23 09:02	1
Perfluoropentanesulfonic acid (PFPeS)	**3.6**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluorohexanesulfonic acid (PFHxS)	**110**	**cn**	2.4	1.3	0.67	ng/L		10/31/23 09:02	1
Perfluoroheptanesulfonic acid (PFHpS)	**4.0**	**I cn**	2.4	1.2	0.47	ng/L		10/31/23 09:02	1
Perfluorononanesulfonic acid (PFNS)	**5.0**	**cn**	2.4	1.2	0.47	ng/L		10/31/23 09:02	1
Perfluorododecanesulfonic acid (PFDoS)	**1.2**	**J cn**	2.4	2.2	1.1	ng/L		10/31/23 09:02	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.5	U cn	9.5	4.5	2.0	ng/L		10/31/23 09:02	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**51**	**cn**	9.5	9.0	3.0	ng/L		10/31/23 09:02	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**17**	**M cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**8.5**	**I cn**	4.7	2.8	1.4	ng/L		10/31/23 09:02	1

Client Sample ID: 31SB-23-04-2-3

Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**2.6**	**cn**	2.4	1.7	0.83	ng/L		10/31/23 09:02	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	24	12	5.9	ng/L		10/31/23 09:02	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	24	12	5.9	ng/L		10/31/23 09:02	1
HFPODA	4.7	U cn	9.5	4.7	2.4	ng/L		10/31/23 09:02	1
DONA	4.5	U cn	9.5	4.5	1.8	ng/L		10/31/23 09:02	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.4	U cn	4.7	2.4	1.2	ng/L		10/31/23 09:02	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.4	U cn	4.7	2.4	1.2	ng/L		10/31/23 09:02	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.5	U cn	9.5	4.5	1.2	ng/L		10/31/23 09:02	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.0	U cn	9.5	9.0	2.4	ng/L		10/31/23 09:02	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.7	2.1	0.59	ng/L		10/31/23 09:02	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.9	U cn	12	5.9	1.8	ng/L		10/31/23 09:02	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	30	U cn	59	30	12	ng/L		10/31/23 09:02	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	**20**	**J cn**	59	30	12	ng/L		10/31/23 09:02	1
Perfluorodecanesulfonic acid (PFDS)	**10**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 09:02	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.4	U cn	4.7	2.4	0.59	ng/L		10/31/23 09:02	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*81.4*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C4 PFBA	*88.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C5 PFPeA	*89.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C5 PFHxA	*87.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C4 PFHpA	*90.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C8 PFOA	*108*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C9 PFNA	*86.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C6 PFDA	*84.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C7 PFUnA	*92.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C2 PFTeDA	*72.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C3 PFBS	*83.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C3 PFHxS	*88.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C8 PFOS	*92.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d3-NMeFOSAA	*90.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d5-NEtFOSAA	*82.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
M2-4:2 FTS	*91.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
M2-6:2 FTS	*80.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
13C3 HFPO-DA	*81.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d7-N-MeFOSE-M	*71.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d9-N-EtFOSE-M	*68.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d5-NEtPFOSA	*74.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*
d3-NMePFOSA	*77.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:02*	*1*

Client Sample ID: 31SB-23-04-2-3

Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**600**	**D cn**	24	12	5.9	ng/L		10/31/23 09:14	10
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**1200**	**D cn**	95	91	31	ng/L		10/31/23 09:14	10
Perfluorooctanesulfonamide (FOSA)	**1500**	**D cn**	24	12	5.9	ng/L		10/31/23 09:14	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*78.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:14*	*10*
13C8 FOSA	*79.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:14*	*10*
M2-8:2 FTS	*67.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:14*	*10*

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**3.0**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-04-2-3

Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4

Matrix: Solid
Percent Solids: 97.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:16	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 01:16	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 01:16	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	1.0	0.50	0.25	ug/Kg	☼	10/14/23 01:16	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:16	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**2.1**		1.0	0.80	0.35	ug/Kg	☼	10/14/23 01:16	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**33**		1.0	0.80	0.35	ug/Kg	☼	10/14/23 01:16	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:16	1
DONA	0.40	U cn	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:16	1
HFPODA	0.40	U	0.80	0.40	0.10	ug/Kg	☼	10/14/23 01:16	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg	☼	10/14/23 01:16	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.053**	**J M**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**0.61**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg	☼	10/14/23 01:16	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:16	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:16	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:16	1

Client Sample ID: 31SB-23-04-2-3
Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4
Matrix: Solid
Percent Solids: 97.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:16	1
Perfluorobutanesulfonic acid (PFBS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorodecanesulfonic acid (PFDS)	**0.53**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorodecanoic acid (PFDA)	**0.59**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorododecanesulfonic acid (PFDoS)	**0.77**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorododecanoic acid (PFDoA)	**0.11**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.11**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluoroheptanoic acid (PFHpA)	**0.72**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorohexanesulfonic acid (PFHxS)	**2.1**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorohexanoic acid (PFHxA)	**0.62**		0.20	0.12	0.059	ug/Kg	☼	10/14/23 01:16	1
Perfluorononanesulfonic acid (PFNS)	**0.12**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorononanoic acid (PFNA)	**0.52**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorooctanesulfonamide (FOSA)	**38**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorooctanesulfonic acid (PFOS)	**16**		0.20	0.10	0.051	ug/Kg	☼	10/14/23 01:16	1
Perfluorooctanoic acid (PFOA)	**1.5**		0.20	0.10	0.051	ug/Kg	☼	10/14/23 01:16	1
Perfluoropentanesulfonic acid (PFPeS)	**0.096**	**J I**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluoropentanoic acid (PFPeA)	**0.47**	**I M**	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:16	1
Perfluorotetradecanoic acid (PFTA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluorotridecanoic acid (PFTriA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1
Perfluoroundecanoic acid (PFUnA)	**0.24**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:16	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*62.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C2-PFDoDA	*95.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C3 HFPO-DA	*97.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C3 PFBS	*113*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C3 PFHxS	*102*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C4 PFHpA	*111*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C5 PFHxA	*99.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C5 PFPeA	*90.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C6 PFDA	*98.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C7 PFUnA	*105*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C8 FOSA	*93.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C8 PFOA	*93.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C8 PFOS	*103*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
13C9 PFNA	*109*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d3-NMeFOSAA	*83.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d3-NMePFOSA	*79.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d5-NEtFOSAA	*85.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d5-NEtPFOSA	*67.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d7-N-MeFOSE-M	*83.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
d9-N-EtFOSE-M	*80.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
M2-4:2 FTS	*101*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
M2-6:2 FTS	*125*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*
M2-8:2 FTS	*100*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:16*	*1*

Client Sample ID: 31SB-23-04-2-3

Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4

Matrix: Solid
Percent Solids: 97.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	1.0	ug/Kg	☼	10/17/23 06:20	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*20.9*	*M*	*20 - 150*	*09/19/23 08:46*	*10/17/23 06:20*	*10*

Client Sample ID: 31SB-23-06-19-20

Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	40	U cn	80	40	20	ng/L		10/31/23 09:26	1
Perfluoropentanoic acid (PFPeA)	20	U cn	40	20	10	ng/L		10/31/23 09:26	1
Perfluorohexanoic acid (PFHxA)	**22**	**cn**	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluoroheptanoic acid (PFHpA)	**9.8**	**J cn**	20	10	5.2	ng/L		10/31/23 09:26	1
Perfluorooctanoic acid (PFOA)	**110**	**cn**	20	13	6.4	ng/L		10/31/23 09:26	1
Perfluorononanoic acid (PFNA)	**36**	**cn**	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorodecanoic acid (PFDA)	**23**	**cn**	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorobutanesulfonic acid (PFBS)	10	U cn	20	10	3.0	ng/L		10/31/23 09:26	1
Perfluoropentanesulfonic acid (PFPeS)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluorohexanesulfonic acid (PFHxS)	**180**	**cn**	20	11	5.7	ng/L		10/31/23 09:26	1
Perfluoroheptanesulfonic acid (PFHpS)	**78**	**cn**	20	10	4.0	ng/L		10/31/23 09:26	1
Perfluorononanesulfonic acid (PFNS)	**14**	**J cn**	20	10	4.0	ng/L		10/31/23 09:26	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		10/31/23 09:26	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		10/31/23 09:26	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**39**	**J cn**	80	76	25	ng/L		10/31/23 09:26	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**4500**	**cn**	80	77	26	ng/L		10/31/23 09:26	1
Perfluorooctanesulfonamide (FOSA)	**2600**	**cn**	20	10	5.0	ng/L		10/31/23 09:26	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**9.3**	**J cn**	20	10	5.0	ng/L		10/31/23 09:26	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**49**	**I cn**	40	24	12	ng/L		10/31/23 09:26	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		10/31/23 09:26	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		10/31/23 09:26	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		10/31/23 09:26	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		10/31/23 09:26	1
HFPODA	40	U cn	80	40	20	ng/L		10/31/23 09:26	1
DONA	38	U cn	80	38	15	ng/L		10/31/23 09:26	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		10/31/23 09:26	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		10/31/23 09:26	1

Client Sample ID: 31SB-23-06-19-20

Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		10/31/23 09:26	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		10/31/23 09:26	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		10/31/23 09:26	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		10/31/23 09:26	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		10/31/23 09:26	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		10/31/23 09:26	1
Perfluorodecanesulfonic acid (PFDS)	**5.8**	**J cn**	20	10	5.0	ng/L		10/31/23 09:26	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		10/31/23 09:26	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*85.7*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C4 PFBA	*86.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C5 PFPeA	*89.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C5 PFHxA	*84.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C4 PFHpA	*88.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C8 PFOA	*79.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C9 PFNA	*84.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C6 PFDA	*81.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C7 PFUnA	*87.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C2 PFTeDA	*84.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C3 PFBS	*82.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C3 PFHxS	*81.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C8 PFOS	*94.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C8 FOSA	*91.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d3-NMeFOSAA	*92.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d5-NEtFOSAA	*59.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
M2-4:2 FTS	*90.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
M2-6:2 FTS	*77.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
M2-8:2 FTS	*78.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
13C3 HFPO-DA	*86.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d7-N-MeFOSE-M	*94.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d9-N-EtFOSE-M	*95.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d5-NEtPFOSA	*79.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*
d3-NMePFOSA	*77.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:26*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**61000**	**D cn**	2000	1000	500	ng/L		11/01/23 18:23	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*105*	*cn*	*20 - 150*	*10/17/23 07:00*	*11/01/23 18:23*	*100*

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**7.5**		1.0		1.0	%		09/18/23 09:12	1

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-06-19-20
Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5
Matrix: Solid
Percent Solids: 92.5

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:29	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 01:29	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 01:29	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	1.0	0.50	0.25	ug/Kg	☼	10/14/23 01:29	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:29	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**0.86**	**J**	1.0	0.80	0.35	ug/Kg	☼	10/14/23 01:29	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**110**		1.0	0.80	0.35	ug/Kg	☼	10/14/23 01:29	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:29	1
DONA	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 01:29	1
HFPODA	0.40	U	0.80	0.40	0.10	ug/Kg	☼	10/14/23 01:29	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U M	2.0	1.0	0.50	ug/Kg	☼	10/14/23 01:29	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.078**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg	☼	10/14/23 01:29	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**0.65**	**I**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluorobutanesulfonic acid (PFBS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.80	0.40	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluorodecanesulfonic acid (PFDS)	**0.18**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorodecanoic acid (PFDA)	**0.58**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorododecanoic acid (PFDoA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluoroheptanesulfonic acid (PFHpS)	**2.5**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluoroheptanoic acid (PFHpA)	**0.18**	**J**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorohexanesulfonic acid (PFHxS)	**3.3**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.059	ug/Kg	☼	10/14/23 01:29	1
Perfluorononanesulfonic acid (PFNS)	**0.44**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorononanoic acid (PFNA)	**0.85**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorooctanesulfonamide (FOSA)	**61**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorooctanoic acid (PFOA)	**1.7**		0.20	0.10	0.051	ug/Kg	☼	10/14/23 01:29	1
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1

Client Sample ID: 31SB-23-06-19-20

Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5

Matrix: Solid
Percent Solids: 92.5

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 01:29	1
Perfluorotetradecanoic acid (PFTA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluorotridecanoic acid (PFTriA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1
Perfluoroundecanoic acid (PFUnA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 01:29	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*43.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C2-PFDoDA	*62.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C3 HFPO-DA	*84.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C3 PFBS	*86.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C3 PFHxS	*81.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C4 PFBA	*32.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C4 PFHpA	*88.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C5 PFHxA	*83.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C5 PFPeA	*75.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C6 PFDA	*79.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C7 PFUnA	*73.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C8 FOSA	*117*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C8 PFOA	*100*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C8 PFOS	*88.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
13C9 PFNA	*79.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d3-NMeFOSAA	*122*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d3-NMePFOSA	*87.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d5-NEtFOSAA	*91.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d5-NEtPFOSA	*71.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d7-N-MeFOSE-M	*92.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
d9-N-EtFOSE-M	*87.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
M2-4:2 FTS	*101*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
M2-6:2 FTS	*86.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*
M2-8:2 FTS	*85.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 01:29*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**1900**	**D**	20	10	5.1	ug/Kg	☼	10/17/23 05:54	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*58.3*		*20 - 150*	*09/19/23 08:46*	*10/17/23 05:54*	*100*

Client Sample ID: 31SB-23-01-13-14

Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.6	U cn	9.2	4.6	2.3	ng/L		10/31/23 09:51	1
Perfluoropentanoic acid (PFPeA)	**2.1**	**J I cn**	4.6	2.3	1.2	ng/L		10/31/23 09:51	1
Perfluorohexanoic acid (PFHxA)	**8.2**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluoroheptanoic acid (PFHpA)	**7.5**	**cn**	2.3	1.2	0.60	ng/L		10/31/23 09:51	1
Perfluorooctanoic acid (PFOA)	**66**	**cn**	2.3	1.5	0.74	ng/L		10/31/23 09:51	1
Perfluorononanoic acid (PFNA)	**24**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluorodecanoic acid (PFDA)	**12**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1

Client Sample ID: 31SB-23-01-13-14
Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluorobutanesulfonic acid (PFBS)	1.2	U cn	2.3	1.2	0.35	ng/L		10/31/23 09:51	1
Perfluoropentanesulfonic acid (PFPeS)	**0.87**	**J cn**	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluorohexanesulfonic acid (PFHxS)	**72**	**cn**	2.3	1.3	0.66	ng/L		10/31/23 09:51	1
Perfluoroheptanesulfonic acid (PFHpS)	**35**	**cn**	2.3	1.2	0.46	ng/L		10/31/23 09:51	1
Perfluorononanesulfonic acid (PFNS)	**9.2**	**cn**	2.3	1.2	0.46	ng/L		10/31/23 09:51	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.3	2.2	1.0	ng/L		10/31/23 09:51	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.2	4.4	2.0	ng/L		10/31/23 09:51	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**41**	**cn**	9.2	8.8	2.9	ng/L		10/31/23 09:51	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**38**	**I cn**	4.6	2.8	1.4	ng/L		10/31/23 09:51	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	**5.6**	**cn**	2.3	1.6	0.81	ng/L		10/31/23 09:51	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 09:51	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 09:51	1
HFPODA	4.6	U cn	9.2	4.6	2.3	ng/L		10/31/23 09:51	1
DONA	4.4	U cn	9.2	4.4	1.7	ng/L		10/31/23 09:51	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.6	2.3	1.2	ng/L		10/31/23 09:51	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.6	2.3	1.2	ng/L		10/31/23 09:51	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.2	4.4	1.2	ng/L		10/31/23 09:51	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.8	U cn	9.2	8.8	2.3	ng/L		10/31/23 09:51	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.6	2.1	0.58	ng/L		10/31/23 09:51	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.8	U cn	12	5.8	1.7	ng/L		10/31/23 09:51	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 09:51	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 09:51	1
Perfluorodecanesulfonic acid (PFDS)	**10**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 09:51	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.6	2.3	0.58	ng/L		10/31/23 09:51	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*84.7*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:51*	*1*
13C4 PFBA	*84.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:51*	*1*
13C5 PFPeA	*90.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:51*	*1*
13C5 PFHxA	*90.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:51*	*1*
13C4 PFHpA	*89.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 09:51*	*1*

Client Sample ID: 31SB-23-01-13-14

Lab Sample ID: 410-142725-6

Date Collected: 09/12/23 14:15

Matrix: Solid

Date Received: 09/14/23 10:10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOA	105	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C9 PFNA	86.1	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C6 PFDA	82.7	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C7 PFUnA	87.0	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C2 PFTeDA	81.1	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C3 PFBS	86.3	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C3 PFHxS	82.1	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C8 PFOS	93.7	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d3-NMeFOSAA	97.6	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d5-NEtFOSAA	57.1	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
M2-4:2 FTS	95.4	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
M2-6:2 FTS	87.7	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
13C3 HFPO-DA	87.4	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d7-N-MeFOSE-M	81.2	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d9-N-EtFOSE-M	80.5	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d5-NEtPFOSA	77.4	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1
d3-NMePFOSA	77.0	cn	20 - 150	10/17/23 07:00	10/31/23 09:51	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1400	D	92	89	30	ng/L		10/31/23 10:03	10
Perfluorooctanesulfonamide (FOSA)	1400	D	23	12	5.8	ng/L		10/31/23 10:03	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	83.1		20 - 150	10/17/23 07:00	10/31/23 10:03	10
M2-8:2 FTS	88.5		20 - 150	10/17/23 07:00	10/31/23 10:03	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	7400	D cn	230	120	58	ng/L		11/01/23 18:35	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	117	cn	20 - 150	10/17/23 07:00	11/01/23 18:35	100

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	5.0		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-01-13-14

Lab Sample ID: 410-142725-6

Date Collected: 09/12/23 14:15

Matrix: Solid

Date Received: 09/14/23 10:10

Percent Solids: 95.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 02:47	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 02:47	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 02:47	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.49	U	0.99	0.49	0.25	ug/Kg	☼	10/14/23 02:47	1

Client Sample ID: 31SB-23-01-13-14
Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6
Matrix: Solid
Percent Solids: 95.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 02:47	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**0.81**	**J**	0.99	0.79	0.35	ug/Kg	☼	10/14/23 02:47	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**41**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 02:47	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 02:47	1
DONA	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 02:47	1
HFPODA	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 02:47	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 02:47	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.12**	**J M**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 02:47	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**0.51**	**I**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 02:47	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 02:47	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 02:47	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 02:47	1
Perfluorobutanesulfonic acid (PFBS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 02:47	1
Perfluorodecanesulfonic acid (PFDS)	**0.29**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorodecanoic acid (PFDA)	**0.22**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorododecanesulfonic acid (PFDoS)	**0.065**	**J I**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.85**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluoroheptanoic acid (PFHpA)	**0.11**	**J**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorohexanesulfonic acid (PFHxS)	**1.2**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorohexanoic acid (PFHxA)	**0.10**	**J M**	0.20	0.12	0.058	ug/Kg	☼	10/14/23 02:47	1
Perfluorononanesulfonic acid (PFNS)	**0.22**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorononanoic acid (PFNA)	**0.42**	**M**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorooctanesulfonamide (FOSA)	**39**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorooctanoic acid (PFOA)	**1.1**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 02:47	1
Perfluoropentanesulfonic acid (PFPeS)	0.099	U M	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 02:47	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1
Perfluoroundecanoic acid (PFUnA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 02:47	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*55.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 02:47*	*1*

Client Sample ID: 31SB-23-01-13-14

Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6

Matrix: Solid
Percent Solids: 95.0

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2-PFDoDA	78.4		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C3 HFPO-DA	83.4		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C3 PFBS	94.9		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C3 PFHxS	79.1		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C4 PFBA	86.1		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C4 PFHpA	94.9		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C5 PFHxA	89.5		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C5 PFPeA	80.5		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C6 PFDA	84.8		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C7 PFUnA	85.3		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C8 FOSA	89.2		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C8 PFOA	99.0		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C8 PFOS	92.1		20 - 150	09/19/23 08:46	10/14/23 02:47	1
13C9 PFNA	82.0		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d3-NMeFOSAA	97.2		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d3-NMePFOSA	70.5		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d5-NEtFOSAA	86.4		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d5-NEtPFOSA	63.6		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d7-N-MeFOSE-M	83.5		20 - 150	09/19/23 08:46	10/14/23 02:47	1
d9-N-EtFOSE-M	84.8		20 - 150	09/19/23 08:46	10/14/23 02:47	1
M2-4:2 FTS	91.0		20 - 150	09/19/23 08:46	10/14/23 02:47	1
M2-6:2 FTS	106		20 - 150	09/19/23 08:46	10/14/23 02:47	1
M2-8:2 FTS	76.7		20 - 150	09/19/23 08:46	10/14/23 02:47	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**190**	**D**	2.0	0.99	0.50	ug/Kg	☼	10/14/23 03:00	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	65.3		20 - 150	09/19/23 08:46	10/14/23 03:00	10

Client Sample ID: 31SB-23-03-33-34

Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.7	U cn	9.3	4.7	2.3	ng/L		10/31/23 10:15	1
Perfluoropentanoic acid (PFPeA)	2.3	U cn	4.7	2.3	1.2	ng/L		10/31/23 10:15	1
Perfluorohexanoic acid (PFHxA)	**6.0**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluoroheptanoic acid (PFHpA)	**6.4**	**cn**	2.3	1.2	0.61	ng/L		10/31/23 10:15	1
Perfluorooctanoic acid (PFOA)	**39**	**cn**	2.3	1.5	0.75	ng/L		10/31/23 10:15	1
Perfluorononanoic acid (PFNA)	**4.2**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluorodecanoic acid (PFDA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluorododecanoic acid (PFDoA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluorobutanesulfonic acid (PFBS)	1.2	U cn	2.3	1.2	0.35	ng/L		10/31/23 10:15	1
Perfluoropentanesulfonic acid (PFPeS)	**0.85**	**J cn**	2.3	1.2	0.58	ng/L		10/31/23 10:15	1

Client Sample ID: 31SB-23-03-33-34
Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**100**	**cn**	2.3	1.3	0.66	ng/L		10/31/23 10:15	1
Perfluoroheptanesulfonic acid (PFHpS)	**13**	**cn**	2.3	1.2	0.47	ng/L		10/31/23 10:15	1
Perfluorononanesulfonic acid (PFNS)	1.2	U cn	2.3	1.2	0.47	ng/L		10/31/23 10:15	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.3	2.2	1.0	ng/L		10/31/23 10:15	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.3	4.4	2.0	ng/L		10/31/23 10:15	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**24**	**cn**	9.3	8.9	2.9	ng/L		10/31/23 10:15	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**69**	**cn**	9.3	9.0	3.0	ng/L		10/31/23 10:15	1
Perfluorooctanesulfonamide (FOSA)	**10**	**M cn**	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.8	U cn	4.7	2.8	1.4	ng/L		10/31/23 10:15	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.6	U cn	2.3	1.6	0.82	ng/L		10/31/23 10:15	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 10:15	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 10:15	1
HFPODA	4.7	U cn	9.3	4.7	2.3	ng/L		10/31/23 10:15	1
DONA	4.4	U cn	9.3	4.4	1.7	ng/L		10/31/23 10:15	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.7	2.3	1.2	ng/L		10/31/23 10:15	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.7	2.3	1.2	ng/L		10/31/23 10:15	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.3	4.4	1.2	ng/L		10/31/23 10:15	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.9	U cn	9.3	8.9	2.3	ng/L		10/31/23 10:15	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.7	2.1	0.58	ng/L		10/31/23 10:15	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.8	U cn	12	5.8	1.7	ng/L		10/31/23 10:15	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 10:15	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 10:15	1
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 10:15	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.7	2.3	0.58	ng/L		10/31/23 10:15	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*93.3*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C4 PFBA	*89.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C5 PFPeA	*93.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C5 PFHxA	*89.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C4 PFHpA	*94.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C8 PFOA	*80.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C9 PFNA	*89.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*
13C6 PFDA	*91.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:15*	*1*

Client Sample ID: 31SB-23-03-33-34

Lab Sample ID: 410-142725-7

Date Collected: 09/13/23 08:45

Matrix: Solid

Date Received: 09/14/23 10:10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C7 PFUnA	93.2	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C2 PFTeDA	87.5	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C3 PFBS	81.5	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C3 PFHxS	85.3	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C8 PFOS	105	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C8 FOSA	91.5	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d3-NMeFOSAA	103	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d5-NEtFOSAA	73.7	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
M2-4:2 FTS	87.0	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
M2-6:2 FTS	94.3	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
M2-8:2 FTS	97.4	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
13C3 HFPO-DA	88.4	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d7-N-MeFOSE-M	88.3	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d9-N-EtFOSE-M	89.4	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d5-NEtPFOSA	82.0	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1
d3-NMePFOSA	80.2	cn	20 - 150	10/17/23 07:00	10/31/23 10:15	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**3500**	**D cn**	23	12	5.8	ng/L		10/31/23 10:27	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	86.3	cn	20 - 150	10/17/23 07:00	10/31/23 10:27	10

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**2.8**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-03-33-34

Lab Sample ID: 410-142725-7

Date Collected: 09/13/23 08:45

Matrix: Solid

Date Received: 09/14/23 10:10

Percent Solids: 97.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 03:13	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 03:13	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	4.9	2.5	0.99	ug/Kg	☼	10/14/23 03:13	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.49	U	0.99	0.49	0.25	ug/Kg	☼	10/14/23 03:13	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 03:13	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**0.63**	**J**	0.99	0.79	0.35	ug/Kg	☼	10/14/23 03:13	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**2.2**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 03:13	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 03:13	1
DONA	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 03:13	1
HFPODA	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 03:13	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1

Client Sample ID: 31SB-23-03-33-34
Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7
Matrix: Solid
Percent Solids: 97.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 03:13	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.49	ug/Kg	☼	10/14/23 03:13	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:13	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 03:13	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 03:13	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 03:13	1
Perfluorobutanesulfonic acid (PFBS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 03:13	1
Perfluorodecanesulfonic acid (PFDS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorodecanoic acid (PFDA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorododecanesulfonic acid (PFDoS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.41**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluoroheptanoic acid (PFHpA)	**0.10**	**J**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorohexanesulfonic acid (PFHxS)	**2.1**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.058	ug/Kg	☼	10/14/23 03:13	1
Perfluorononanesulfonic acid (PFNS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorononanoic acid (PFNA)	**0.14**	**J M**	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorooctanesulfonamide (FOSA)	**0.44**		0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorooctanoic acid (PFOA)	**0.62**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 03:13	1
Perfluoropentanesulfonic acid (PFPeS)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 03:13	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1
Perfluoroundecanoic acid (PFUnA)	0.099	U	0.20	0.099	0.049	ug/Kg	☼	10/14/23 03:13	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*51.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C2-PFDoDA	*74.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C3 HFPO-DA	*94.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C3 PFBS	*101*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C3 PFHxS	*89.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C4 PFBA	*94.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C4 PFHpA	*107*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C5 PFHxA	*114*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C5 PFPeA	*88.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C6 PFDA	*96.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C7 PFUnA	*83.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*
13C8 FOSA	*83.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:13*	*1*

Client Sample ID: 31SB-23-03-33-34

Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7

Matrix: Solid
Percent Solids: 97.2

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOA	106		20 - 150	09/19/23 08:46	10/14/23 03:13	1
13C8 PFOS	87.4		20 - 150	09/19/23 08:46	10/14/23 03:13	1
13C9 PFNA	95.0		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d3-NMeFOSAA	93.9		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d3-NMePFOSA	57.9		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d5-NEtFOSAA	82.5		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d5-NEtPFOSA	50.9		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d7-N-MeFOSE-M	76.2		20 - 150	09/19/23 08:46	10/14/23 03:13	1
d9-N-EtFOSE-M	74.4		20 - 150	09/19/23 08:46	10/14/23 03:13	1
M2-4:2 FTS	108		20 - 150	09/19/23 08:46	10/14/23 03:13	1
M2-6:2 FTS	105		20 - 150	09/19/23 08:46	10/14/23 03:13	1
M2-8:2 FTS	108		20 - 150	09/19/23 08:46	10/14/23 03:13	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**88**	**D**	2.0	0.99	0.50	ug/Kg	☼	10/14/23 03:27	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	68.4		20 - 150	09/19/23 08:46	10/14/23 03:27	10

Client Sample ID: 31SB-23-02-19-20

Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8

Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.7	U cn	9.4	4.7	2.4	ng/L		10/31/23 10:39	1
Perfluoropentanoic acid (PFPeA)	**4.9**	**cn**	4.7	2.4	1.2	ng/L		10/31/23 10:39	1
Perfluorohexanoic acid (PFHxA)	**22**	**FH cn**	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluoroheptanoic acid (PFHpA)	**13**	**cn**	2.4	1.2	0.61	ng/L		10/31/23 10:39	1
Perfluorooctanoic acid (PFOA)	**58**	**FH cn**	2.4	1.5	0.75	ng/L		10/31/23 10:39	1
Perfluorononanoic acid (PFNA)	**19**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorodecanoic acid (PFDA)	**4.3**	**FH cn**	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorododecanoic acid (PFDoA)	1.2	U FL cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorotridecanoic acid (PFTriA)	1.2	U F2 cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorobutanesulfonic acid (PFBS)	**0.72**	**J cn**	2.4	1.2	0.35	ng/L		10/31/23 10:39	1
Perfluoropentanesulfonic acid (PFPeS)	**2.5**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluorohexanesulfonic acid (PFHxS)	**160**	**cn**	2.4	1.3	0.67	ng/L		10/31/23 10:39	1
Perfluoroheptanesulfonic acid (PFHpS)	**65**	**cn**	2.4	1.2	0.47	ng/L		10/31/23 10:39	1
Perfluorononanesulfonic acid (PFNS)	**4.2**	**FH cn**	2.4	1.2	0.47	ng/L		10/31/23 10:39	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.4	2.2	1.1	ng/L		10/31/23 10:39	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.5	U cn	9.4	4.5	2.0	ng/L		10/31/23 10:39	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**55**	**cn**	9.4	9.0	2.9	ng/L		10/31/23 10:39	1
Perfluorooctanesulfonamide (FOSA)	**420**	**cn**	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-02-19-20
Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**8.0**	**I cn**	4.7	2.8	1.4	ng/L		10/31/23 10:39	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.7	U FH cn	2.4	1.7	0.83	ng/L		10/31/23 10:39	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	24	12	5.9	ng/L		10/31/23 10:39	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	24	12	5.9	ng/L		10/31/23 10:39	1
HFPODA	4.7	U cn	9.4	4.7	2.4	ng/L		10/31/23 10:39	1
DONA	4.5	U cn	9.4	4.5	1.8	ng/L		10/31/23 10:39	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.4	U cn	4.7	2.4	1.2	ng/L		10/31/23 10:39	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.4	U cn	4.7	2.4	1.2	ng/L		10/31/23 10:39	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.5	U cn	9.4	4.5	1.2	ng/L		10/31/23 10:39	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.0	U cn	9.4	9.0	2.4	ng/L		10/31/23 10:39	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.7	2.1	0.59	ng/L		10/31/23 10:39	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.9	U cn	12	5.9	1.8	ng/L		10/31/23 10:39	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	59	29	12	ng/L		10/31/23 10:39	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	59	29	12	ng/L		10/31/23 10:39	1
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	2.4	1.2	0.59	ng/L		10/31/23 10:39	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.4	U cn	4.7	2.4	0.59	ng/L		10/31/23 10:39	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*84.7*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C4 PFBA	*87.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C5 PFPeA	*90.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C5 PFHxA	*89.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C4 PFHpA	*88.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C8 PFOA	*89.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C9 PFNA	*87.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C6 PFDA	*89.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C7 PFUnA	*95.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C2 PFTeDA	*81.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C3 PFBS	*94.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C3 PFHxS	*78.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C8 PFOS	*87.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C8 FOSA	*113*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
d3-NMeFOSAA	*119*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
d5-NEtFOSAA	*57.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
M2-4:2 FTS	*88.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
M2-6:2 FTS	*88.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
13C3 HFPO-DA	*88.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
d7-N-MeFOSE-M	*104*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
d9-N-EtFOSE-M	*103*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*

Client Sample ID: 31SB-23-02-19-20

Lab Sample ID: 410-142725-8
Date Collected: 09/13/23 09:55
Matrix: Solid
Date Received: 09/14/23 10:10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
d5-NEtPFOSA	*97.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*
d3-NMePFOSA	*93.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 10:39*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**1200**	**D cn**	94	91	31	ng/L		10/31/23 11:15	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
M2-8:2 FTS	*99.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 11:15*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**21000**	**D cn**	240	120	59	ng/L		10/31/23 11:27	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*108*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 11:27*	*100*

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**8.2**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-23-02-19-20

Lab Sample ID: 410-142725-8
Date Collected: 09/13/23 09:55
Matrix: Solid
Date Received: 09/14/23 10:10
Percent Solids: 91.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 03:40	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 03:40	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg	☼	10/14/23 03:40	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	1.0	0.50	0.25	ug/Kg	☼	10/14/23 03:40	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 03:40	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**1.3**		1.0	0.80	0.35	ug/Kg	☼	10/14/23 03:40	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**39**		1.0	0.80	0.35	ug/Kg	☼	10/14/23 03:40	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 03:40	1
DONA	0.40	U	0.80	0.40	0.20	ug/Kg	☼	10/14/23 03:40	1
HFPODA	0.40	U	0.80	0.40	0.10	ug/Kg	☼	10/14/23 03:40	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg	☼	10/14/23 03:40	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg	☼	10/14/23 03:40	1

Client Sample ID: 31SB-23-02-19-20
Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8
Matrix: Solid
Percent Solids: 91.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**0.12**	**J I M**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluorobutanesulfonic acid (PFBS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.80	0.40	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluorodecanesulfonic acid (PFDS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorodecanoic acid (PFDA)	**0.11**	**J M**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorododecanoic acid (PFDoA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluoroheptanesulfonic acid (PFHpS)	**1.4**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluoroheptanoic acid (PFHpA)	**0.26**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorohexanesulfonic acid (PFHxS)	**2.9**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorohexanoic acid (PFHxA)	**0.24**	**M**	0.20	0.12	0.059	ug/Kg	☼	10/14/23 03:40	1
Perfluorononanesulfonic acid (PFNS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorononanoic acid (PFNA)	**0.50**		0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorooctanesulfonamide (FOSA)	**10**	**F2**	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorooctanoic acid (PFOA)	**1.4**		0.20	0.10	0.051	ug/Kg	☼	10/14/23 03:40	1
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.10	ug/Kg	☼	10/14/23 03:40	1
Perfluorotetradecanoic acid (PFTA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluorotridecanoic acid (PFTriA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1
Perfluoroundecanoic acid (PFUnA)	0.10	U	0.20	0.10	0.050	ug/Kg	☼	10/14/23 03:40	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*53.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C2-PFDoDA	*74.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C3 HFPO-DA	*94.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C3 PFBS	*98.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C3 PFHxS	*95.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C4 PFBA	*95.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C4 PFHpA	*104*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C5 PFHxA	*104*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C5 PFPeA	*87.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C6 PFDA	*87.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C7 PFUnA	*79.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C8 FOSA	*94.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C8 PFOA	*80.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C8 PFOS	*88.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
13C9 PFNA	*92.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
d3-NMeFOSAA	*101*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
d3-NMePFOSA	*73.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
d5-NEtFOSAA	*83.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*
d5-NEtPFOSA	*65.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 03:40*	*1*

Client Sample ID: 31SB-23-02-19-20

Lab Sample ID: 410-142725-8
Date Collected: 09/13/23 09:55
Matrix: Solid
Date Received: 09/14/23 10:10
Percent Solids: 91.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d7-N-MeFOSE-M	89.8		20 - 150	09/19/23 08:46	10/14/23 03:40	1
d9-N-EtFOSE-M	88.6		20 - 150	09/19/23 08:46	10/14/23 03:40	1
M2-4:2 FTS	103		20 - 150	09/19/23 08:46	10/14/23 03:40	1
M2-6:2 FTS	111		20 - 150	09/19/23 08:46	10/14/23 03:40	1
M2-8:2 FTS	93.5		20 - 150	09/19/23 08:46	10/14/23 03:40	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**560**	**D**	2.0	1.0	0.51	ug/Kg	☼	10/14/23 03:53	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	69.4		20 - 150	09/19/23 08:46	10/14/23 03:53	10

Client Sample ID: 31SB-DUP-23

Lab Sample ID: 410-142725-9
Date Collected: 09/11/23 00:00
Matrix: Solid
Date Received: 09/14/23 10:10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	4.6	U cn	9.3	4.6	2.3	ng/L		10/31/23 12:03	1
Perfluoropentanoic acid (PFPeA)	2.3	U cn	4.6	2.3	1.2	ng/L		10/31/23 12:03	1
Perfluorohexanoic acid (PFHxA)	**7.7**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluoroheptanoic acid (PFHpA)	**7.0**	**cn**	2.3	1.2	0.60	ng/L		10/31/23 12:03	1
Perfluorooctanoic acid (PFOA)	**48**	**cn**	2.3	1.5	0.74	ng/L		10/31/23 12:03	1
Perfluorononanoic acid (PFNA)	**8.4**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorodecanoic acid (PFDA)	**16**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluoroundecanoic acid (PFUnA)	**1.8**	**J cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorododecanoic acid (PFDoA)	**0.86**	**J cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorobutanesulfonic acid (PFBS)	**0.44**	**J I cn**	2.3	1.2	0.35	ng/L		10/31/23 12:03	1
Perfluoropentanesulfonic acid (PFPeS)	**0.83**	**J cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluorohexanesulfonic acid (PFHxS)	**110**	**cn**	2.3	1.3	0.66	ng/L		10/31/23 12:03	1
Perfluoroheptanesulfonic acid (PFHpS)	**7.3**	**cn**	2.3	1.2	0.46	ng/L		10/31/23 12:03	1
Perfluorononanesulfonic acid (PFNS)	**7.7**	**cn**	2.3	1.2	0.46	ng/L		10/31/23 12:03	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.3	2.2	1.0	ng/L		10/31/23 12:03	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.3	4.4	2.0	ng/L		10/31/23 12:03	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**9.4**	**cn**	9.3	8.8	2.9	ng/L		10/31/23 12:03	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**60**	**I cn**	4.6	2.8	1.4	ng/L		10/31/23 12:03	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	**2.8**	**M cn**	2.3	1.6	0.81	ng/L		10/31/23 12:03	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 12:03	1

Client Sample ID: 31SB-DUP-23
Date Collected: 09/11/23 00:00
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-9
Matrix: Solid

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	23	12	5.8	ng/L		10/31/23 12:03	1
HFPODA	4.6	U cn	9.3	4.6	2.3	ng/L		10/31/23 12:03	1
DONA	4.4	U cn	9.3	4.4	1.7	ng/L		10/31/23 12:03	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.6	2.3	1.2	ng/L		10/31/23 12:03	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.6	2.3	1.2	ng/L		10/31/23 12:03	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.3	4.4	1.2	ng/L		10/31/23 12:03	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.8	U cn	9.3	8.8	2.3	ng/L		10/31/23 12:03	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.6	2.1	0.58	ng/L		10/31/23 12:03	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.8	U cn	12	5.8	1.7	ng/L		10/31/23 12:03	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 12:03	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	58	29	12	ng/L		10/31/23 12:03	1
Perfluorodecanesulfonic acid (PFDS)	**15**	**cn**	2.3	1.2	0.58	ng/L		10/31/23 12:03	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.6	2.3	0.58	ng/L		10/31/23 12:03	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*86.1*	*M cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C4 PFBA	*86.0*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C5 PFPeA	*88.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C5 PFHxA	*87.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C4 PFHpA	*95.2*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C8 PFOA	*79.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C9 PFNA	*87.7*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C6 PFDA	*81.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C7 PFUnA	*86.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C2 PFTeDA	*87.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C3 PFBS	*84.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C3 PFHxS	*84.5*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C8 PFOS	*92.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d3-NMeFOSAA	*108*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d5-NEtFOSAA	*83.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
M2-4:2 FTS	*80.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
M2-6:2 FTS	*79.3*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
13C3 HFPO-DA	*88.6*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d7-N-MeFOSE-M	*83.1*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d9-N-EtFOSE-M	*77.4*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d5-NEtPFOSA	*80.9*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*
d3-NMePFOSA	*78.8*	*cn*	*20 - 150*	*10/17/23 07:00*	*10/31/23 12:03*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**850**	**D**	93	89	30	ng/L		10/31/23 12:15	10
Perfluorooctanesulfonamide (FOSA)	**3000**	**D**	23	12	5.8	ng/L		10/31/23 12:15	10

Client Sample ID: 31SB-DUP-23

Lab Sample ID: 410-142725-9

Date Collected: 09/11/23 00:00

Matrix: Solid

Date Received: 09/14/23 10:10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	81.6		20 - 150	10/17/23 07:00	10/31/23 12:15	10
M2-8:2 FTS	109		20 - 150	10/17/23 07:00	10/31/23 12:15	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - SPLP East - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**5600**	**D cn**	230	120	58	ng/L		11/01/23 18:47	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	98.7	cn	20 - 150	10/17/23 07:00	11/01/23 18:47	100

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Percent Moisture (EPA Moisture)	**4.2**		1.0		1.0	%		09/18/23 09:12	1

Client Sample ID: 31SB-DUP-23

Lab Sample ID: 410-142725-9

Date Collected: 09/11/23 00:00

Matrix: Solid

Date Received: 09/14/23 10:10

Percent Solids: 95.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 04:58	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/14/23 04:58	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	0.99	ug/Kg	☼	10/14/23 04:58	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	0.99	0.50	0.25	ug/Kg	☼	10/14/23 04:58	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 04:58	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.79	U M	0.99	0.79	0.35	ug/Kg	☼	10/14/23 04:58	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**33**		0.99	0.79	0.35	ug/Kg	☼	10/14/23 04:58	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 04:58	1
DONA	0.40	U	0.79	0.40	0.20	ug/Kg	☼	10/14/23 04:58	1
HFPODA	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 04:58	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/14/23 04:58	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.13**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**2.1**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.99	U	2.0	0.99	0.50	ug/Kg	☼	10/14/23 04:58	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**1.3**	**I M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	0.40	0.20	0.10	ug/Kg	☼	10/14/23 04:58	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 04:58	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 04:58	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 04:58	1

Client Sample ID: 31SB-DUP-23
Date Collected: 09/11/23 00:00
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-9
Matrix: Solid
Percent Solids: 95.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.79	0.40	0.099	ug/Kg	☼	10/14/23 04:58	1
Perfluorodecanesulfonic acid (PFDS)	**0.57**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorodecanoic acid (PFDA)	**0.31**	**M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorododecanesulfonic acid (PFDoS)	**0.23**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorododecanoic acid (PFDoA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.21**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluoroheptanoic acid (PFHpA)	**0.11**	**J**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorohexanesulfonic acid (PFHxS)	**1.9**		0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.059	ug/Kg	☼	10/14/23 04:58	1
Perfluorononanesulfonic acid (PFNS)	**0.19**	**J**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorononanoic acid (PFNA)	**0.13**	**J M**	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorooctanoic acid (PFOA)	**0.81**		0.20	0.099	0.051	ug/Kg	☼	10/14/23 04:58	1
Perfluoropentanesulfonic acid (PFPeS)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.099	ug/Kg	☼	10/14/23 04:58	1
Perfluorotetradecanoic acid (PFTA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluorotridecanoic acid (PFTriA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1
Perfluoroundecanoic acid (PFUnA)	0.099	U	0.20	0.099	0.050	ug/Kg	☼	10/14/23 04:58	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*53.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C2-PFDoDA	*77.6*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C3 HFPO-DA	*89.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C3 PFBS	*99.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C3 PFHxS	*87.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C4 PFBA	*94.1*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C4 PFHpA	*96.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C5 PFHxA	*91.7*	*^c cn*	*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C5 PFPeA	*84.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C6 PFDA	*86.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C7 PFUnA	*82.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C8 FOSA	*85.3*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C8 PFOA	*102*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C8 PFOS	*82.4*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
13C9 PFNA	*82.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d3-NMeFOSAA	*84.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d3-NMePFOSA	*63.8*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d5-NEtFOSAA	*73.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d5-NEtPFOSA	*57.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d7-N-MeFOSE-M	*78.9*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
d9-N-EtFOSE-M	*76.5*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
M2-4:2 FTS	*92.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
M2-6:2 FTS	*95.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*
M2-8:2 FTS	*96.7*		*20 - 150*	*09/19/23 08:46*	*10/14/23 04:58*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	**100**	**D**	2.0	0.99	0.50	ug/Kg	☼	10/14/23 05:11	10

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-DUP-23
Date Collected: 09/11/23 00:00
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-9
Matrix: Solid
Percent Solids: 95.8

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	150	D	2.0	0.99	0.51	ug/Kg	☼	10/14/23 05:11	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 FOSA	*61.0*		*20 - 150*	*09/19/23 08:46*	*10/14/23 05:11*	*10*
13C8 PFOS	*74.2*		*20 - 150*	*09/19/23 08:46*	*10/14/23 05:11*	*10*

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Solid

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFTDA (20-150)	PFDoDA (20-150)	HFPODA (20-150)	C3PFBS (20-150)	C3PFHS (20-150)	PFBA (20-150)	C4PFHA (20-150)	13C5PHA (20-150)
410-142725-1	31SB-23-08-11-12	59.6	79.7	88.9	89.1	84.1		98.8	95.9
410-142725-1 - DL	31SB-23-08-11-12								
410-142725-1 - RE	31SB-23-08-11-12						106		
410-142725-2	31SB-23-05-13-14	38.3	61.3	88.1	91.8	84.8	87.5	94.4	96.3
410-142725-2 - DL	31SB-23-05-13-14								
410-142725-3	31SB-23-07-50-51	43.2	76.1	85.2	92.8	83.5		95.9	101
410-142725-3 - RE	31SB-23-07-50-51						107		
410-142725-4	31SB-23-04-2-3	62.5	95.5	97.2	113	102		111	99.5
410-142725-4 - DL	31SB-23-04-2-3						20.9 M		
410-142725-5	31SB-23-06-19-20	43.6	62.4	84.1	86.7	81.4	32.0	88.3	83.5
410-142725-5 - DL	31SB-23-06-19-20								
410-142725-6	31SB-23-01-13-14	55.4	78.4	83.4	94.9	79.1	86.1	94.9	89.5
410-142725-6 - DL	31SB-23-01-13-14								
410-142725-7	31SB-23-03-33-34	51.7	74.1	94.0	101	89.2	94.5	107	114
410-142725-7 - DL	31SB-23-03-33-34								
410-142725-8	31SB-23-02-19-20	53.4	74.7	94.6	98.9	95.1	95.5	104	104
410-142725-8 - DL	31SB-23-02-19-20								
410-142725-8 MS	31SB-MS-23-02-19-20	53.8	72.8	85.4	94.5	86.3	92.1	93.5	93.8
410-142725-8 MSD	31SB-MSD-23-02-19-20	54.9	79.8	102	112	102	105	105	106
410-142725-9	31SB-DUP-23	53.5	77.6	89.7	99.8	87.0	94.1	96.5	91.7 ^c cn
410-142725-9 - DL	31SB-DUP-23								
LCS 410-420998/2-A	Lab Control Sample	55.3	72.0	98.3	101	91.4	38.5	98.3	96.0
LCS 410-431999/2-A	Lab Control Sample	79.0	88.0	81.3	72.1	83.9	85.9	95.0	94.3
LCS 410-434335/2-A	Lab Control Sample	71.3	81.0	102	162 *5+	98.8	106	114	114
LLCS 410-420998/3-A	Lab Control Sample	45.7	69.7	91.9	96.9	88.9	42.2	99.4	97.8
LLCS 410-431999/3-A	Lab Control Sample	73.3	88.2	79.4	79.3	79.2	82.6	90.7	87.1
LLCS 410-434335/3-A	Lab Control Sample	79.0	84.2	92.1	174 *5+	102	103	106	106
MB 410-420998/1-A	Method Blank	57.8	86.8	90.7	98.2	89.0	90.9	101	95.3
MB 410-431999/1-A	Method Blank	73.9	81.7	83.0	80.6	82.0	86.2	91.9	92.9
MB 410-434335/1-A	Method Blank	71.0	91.6	99.5	176 *5+	110	52.6	108	108

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOS (20-150)
410-142725-1	31SB-23-08-11-12	79.9	89.2	88.2	87.8	104	86.4	91.6	83.3
410-142725-1 - DL	31SB-23-08-11-12				60.5		71.9		
410-142725-1 - RE	31SB-23-08-11-12								
410-142725-2	31SB-23-05-13-14	85.0	89.0	78.2	94.3	102	85.0	86.9	90.3
410-142725-2 - DL	31SB-23-05-13-14						63.5		
410-142725-3	31SB-23-07-50-51	85.5	89.8	88.5	85.7	91.7	88.2	91.3	92.7
410-142725-3 - RE	31SB-23-07-50-51								
410-142725-4	31SB-23-04-2-3	90.3	98.3	105	93.0	93.6	103	109	83.5
410-142725-4 - DL	31SB-23-04-2-3								
410-142725-5	31SB-23-06-19-20	75.9	79.4	73.7	117	100	88.2	79.0	122
410-142725-5 - DL	31SB-23-06-19-20						58.3		
410-142725-6	31SB-23-01-13-14	80.5	84.8	85.3	89.2	99.0	92.1	82.0	97.2
410-142725-6 - DL	31SB-23-01-13-14						65.3		
410-142725-7	31SB-23-03-33-34	88.1	96.4	83.5	83.3	106	87.4	95.0	93.9
410-142725-7 - DL	31SB-23-03-33-34						68.4		

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-142725-1
Project/Site: AOC 31

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Solid
Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOS (20-150)
410-142725-8	31SB-23-02-19-20	87.5	87.4	79.1	94.6	80.4	88.7	92.0	101
410-142725-8 - DL	31SB-23-02-19-20						69.4		
410-142725-8 MS	31SB-MS-23-02-19-20	81.2	85.7	88.0	84.0	89.2	81.8	79.8	85.5
410-142725-8 MSD	31SB-MSD-23-02-19-20	95.8	89.8	83.5	103	124	87.1	101	108
410-142725-9	31SB-DUP-23	84.5	86.4	82.8	85.3	102	82.4	82.8	84.2
410-142725-9 - DL	31SB-DUP-23				61.0		74.2		
LCS 410-420998/2-A	Lab Control Sample	96.9	90.1	90.0	83.6	97.7	86.6	87.1	89.4
LCS 410-431999/2-A	Lab Control Sample	77.0	83.8	82.9	74.7	89.1	82.2	83.6	79.9
LCS 410-434335/2-A	Lab Control Sample	98.9	98.1	88.8	93.9	111	91.5	115	103
LLCS 410-420998/3-A	Lab Control Sample	79.6	82.6	84.5	80.4	91.9	86.2	111	88.3
LLCS 410-431999/3-A	Lab Control Sample	71.7	85.7	83.2	71.8	83.6	83.3	82.7	75.6
LLCS 410-434335/3-A	Lab Control Sample	94.1	100	94.8	89.8	97.0	93.4	101	102
MB 410-420998/1-A	Method Blank	87.5	98.9	88.4	79.8	103	84.3	101	87.5
MB 410-431999/1-A	Method Blank	64.0	84.0	84.3	72.3	76.9	80.9	80.4	76.9
MB 410-434335/1-A	Method Blank	108	101	95.3	93.7	106	97.0	111	110

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	d3NMFSA (20-150)	d5NEFOS (20-150)	d5NPFSA (20-150)	NMFM (20-150)	NEFM (20-150)	M242FTS (20-150)	M262FTS (20-150)	M282FTS (20-150)
410-142725-1	31SB-23-08-11-12	74.3	89.7	61.4	76.2	76.4	93.7	94.4	99.3
410-142725-1 - DL	31SB-23-08-11-12								
410-142725-1 - RE	31SB-23-08-11-12								
410-142725-2	31SB-23-05-13-14	62.7	93.7	52.4	67.4	61.1	95.8	89.9	92.3
410-142725-2 - DL	31SB-23-05-13-14								
410-142725-3	31SB-23-07-50-51	72.2	96.6	59.0	71.6	68.5	92.0	78.9	91.9
410-142725-3 - RE	31SB-23-07-50-51								
410-142725-4	31SB-23-04-2-3	79.6	85.1	67.3	83.5	80.3	101	125	100
410-142725-4 - DL	31SB-23-04-2-3								
410-142725-5	31SB-23-06-19-20	87.6	91.4	71.1	92.0	87.6	101	86.2	85.9
410-142725-5 - DL	31SB-23-06-19-20								
410-142725-6	31SB-23-01-13-14	70.5	86.4	63.6	83.5	84.8	91.0	106	76.7
410-142725-6 - DL	31SB-23-01-13-14								
410-142725-7	31SB-23-03-33-34	57.9	82.5	50.9	76.2	74.4	108	105	108
410-142725-7 - DL	31SB-23-03-33-34								
410-142725-8	31SB-23-02-19-20	73.3	83.6	65.4	89.8	88.6	103	111	93.5
410-142725-8 - DL	31SB-23-02-19-20								
410-142725-8 MS	31SB-MS-23-02-19-20	67.8	83.8	54.2	79.6	75.1	94.8	86.9	96.4
410-142725-8 MSD	31SB-MSD-23-02-19-20	79.8	98.1	71.0	91.2	91.7	110	109	126
410-142725-9	31SB-DUP-23	63.8	73.9	57.9	78.9	76.5	92.2	95.7	96.7
410-142725-9 - DL	31SB-DUP-23								
LCS 410-420998/2-A	Lab Control Sample	71.6	93.4	61.2	65.3	57.5	91.4	92.4	91.0
LCS 410-431999/2-A	Lab Control Sample	50.0	79.3	49.8	53.3	54.4	94.3	99.2	91.2
LCS 410-434335/2-A	Lab Control Sample	78.4	94.1	73.1	81.2	77.8	112	112	95.5
LLCS 410-420998/3-A	Lab Control Sample	54.9	85.9	51.5	71.4	69.0	98.6	100	93.7
LLCS 410-431999/3-A	Lab Control Sample	49.0	80.8	48.0	52.8	52.8	99.9	100	107
LLCS 410-434335/3-A	Lab Control Sample	73.3	94.1	71.7	85.2	83.7	111	119	117
MB 410-420998/1-A	Method Blank	58.6	80.9	51.9	67.5	66.7	90.0	97.6	102
MB 410-431999/1-A	Method Blank	51.2	76.9	49.2	52.3	54.0	99.6	101	98.5
MB 410-434335/1-A	Method Blank	86.7	103	83.2	88.8	86.4	128	128	200 *5+

Surrogate Legend

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-142725-1
Project/Site: AOC 31

PFTDA = 13C2 PFTeDA
PFDoDA = 13C2-PFDoDA
HFPODA = 13C3 HFPO-DA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
PFBA = 13C4 PFBA
C4PFHA = 13C4 PFHpA
13C5PHA = 13C5 PFHxA
PFPeA = 13C5 PFPeA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFOSA = 13C8 FOSA
C8PFOA = 13C8 PFOA
C8PFOS = 13C8 PFOS
C9PFNA = 13C9 PFNA
d3NMFOS = d3-NMeFOSAA
d3NMFSA = d3-NMePFOSA
d5NEFOS = d5-NEtFOSAA
d5NPFSA = d5-NEtPFOSA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Solid **Prep Type: SPLP East**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDoDA (20-150)	PFBA (20-150)	PFPeA (20-150)	13C5PHA (20-150)	C4PFHA (20-150)	C8PFOA (20-150)	C9PFNA (20-150)	C6PFDA (20-150)
410-142725-1	31SB-23-08-11-12	88.5 cn	83.8 cn	76.7 cn	93.1 cn	94.4 cn	74.0 cn	83.7 cn	85.0 cn
410-142725-1 - DL	31SB-23-08-11-12								
410-142725-2	31SB-23-05-13-14	81.7 cn	82.8 cn	73.3 cn	95.0 cn	88.1 cn	96.0 cn	76.8 cn	86.3 cn
410-142725-2 - DL	31SB-23-05-13-14								
410-142725-2 - DL2	31SB-23-05-13-14								
410-142725-3	31SB-23-07-50-51	83.2 cn	85.2 cn	71.1 cn	91.3 cn	81.2 cn	73.1 cn	80.9 cn	88.1 cn
410-142725-3 - DL	31SB-23-07-50-51								
410-142725-4	31SB-23-04-2-3	81.4 M cn	88.2 cn	89.1 cn	87.6 cn	90.9 cn	108 cn	86.2 cn	84.9 cn
410-142725-4 - DL	31SB-23-04-2-3								
410-142725-5	31SB-23-06-19-20	85.7 M cn	86.4 cn	89.3 cn	84.0 cn	88.8 cn	79.6 cn	84.9 cn	81.8 cn
410-142725-5 - DL2	31SB-23-06-19-20								
410-142725-6	31SB-23-01-13-14	84.7 M cn	84.8 cn	90.8 cn	90.2 cn	89.9 cn	105 cn	86.1 cn	82.7 cn
410-142725-6 - DL	31SB-23-01-13-14								
410-142725-6 - DL2	31SB-23-01-13-14								
410-142725-7	31SB-23-03-33-34	93.3 M cn	89.2 cn	93.7 cn	89.7 cn	94.2 cn	80.5 cn	89.7 cn	91.3 cn
410-142725-7 - DL	31SB-23-03-33-34								
410-142725-8	31SB-23-02-19-20	84.7 M cn	87.5 cn	90.8 cn	89.0 cn	88.4 cn	89.6 cn	87.8 cn	89.7 cn
410-142725-8 - DL	31SB-23-02-19-20								
410-142725-8 - DL2	31SB-23-02-19-20								
410-142725-8 MS	31SB-MS-23-02-19-20	73.3 M cn	91.0 cn	99.1 cn	93.4 cn	98.3 cn	95.2 cn	89.3 cn	86.3 cn
410-142725-8 MSD	31SB-MSD-23-02-19-20	83.1 M cn	92.3 cn	93.0 cn	92.0 cn	98.1 cn	98.4 cn	91.9 cn	87.8 cn
410-142725-9	31SB-DUP-23	86.1 M cn	86.0 cn	88.3 cn	87.6 cn	95.2 cn	79.6 cn	87.7 cn	81.1 cn
410-142725-9 - DL	31SB-DUP-23								
410-142725-9 - DL2	31SB-DUP-23								
LB 410-428846/1-C	Method Blank	88.7	83.5	71.3	89.2	87.4	82.5	81.9	85.9

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-142725-1
Project/Site: AOC 31

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Solid
Prep Type: SPLP East

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	13C7PUA (20-150)	PFTDA (20-150)	C3PFBS (20-150)	C3PFHS (20-150)	C8PFOS (20-150)	PFOSA (20-150)	d3NMFOS (20-150)	d5NEFOS (20-150)
410-142725-1	31SB-23-08-11-12	89.0 cn	67.6 cn	79.2 cn	81.5 cn	84.6 cn		84.2 cn	78.6 cn
410-142725-1 - DL	31SB-23-08-11-12					83.8 cn	80.2 cn		
410-142725-2	31SB-23-05-13-14	82.9 cn	58.7 cn	74.3 cn	85.8 cn	81.5 cn		77.8 cn	69.1 cn
410-142725-2 - DL	31SB-23-05-13-14						65.8 cn		
410-142725-2 - DL2	31SB-23-05-13-14					89.1 cn			
410-142725-3	31SB-23-07-50-51	85.3 cn	70.4 cn	89.5 cn	80.0 cn	83.4 cn	79.1 cn	84.0 cn	74.1 cn
410-142725-3 - DL	31SB-23-07-50-51					83.3 cn			
410-142725-4	31SB-23-04-2-3	92.1 cn	72.9 cn	83.1 cn	88.3 cn	92.8 cn		90.6 cn	82.3 cn
410-142725-4 - DL	31SB-23-04-2-3					78.6 cn	79.8 cn		
410-142725-5	31SB-23-06-19-20	87.4 cn	84.4 cn	82.8 cn	81.6 cn	94.5 cn	91.0 cn	92.1 cn	59.9 cn
410-142725-5 - DL2	31SB-23-06-19-20					105 cn			
410-142725-6	31SB-23-01-13-14	87.0 cn	81.1 cn	86.3 cn	82.1 cn	93.7 cn		97.6 cn	57.1 cn
410-142725-6 - DL	31SB-23-01-13-14						83.1		
410-142725-6 - DL2	31SB-23-01-13-14					117 cn			
410-142725-7	31SB-23-03-33-34	93.2 cn	87.5 cn	81.5 cn	85.3 cn	105 cn	91.5 cn	103 cn	73.7 cn
410-142725-7 - DL	31SB-23-03-33-34					86.3 cn			
410-142725-8	31SB-23-02-19-20	95.6 cn	81.2 cn	94.4 cn	78.7 cn	87.7 cn	113 cn	119 cn	57.4 cn
410-142725-8 - DL	31SB-23-02-19-20								
410-142725-8 - DL2	31SB-23-02-19-20					108 cn			
410-142725-8 MS	31SB-MS-23-02-19-20	86.8 cn	61.6 cn	87.9 cn	89.3 cn	94.9 cn	116 cn	113 cn	56.0 cn
410-142725-8 MSD	31SB-MSD-23-02-19-20	90.6 cn	90.1 cn	92.2 cn	87.8 cn	88.9 cn	114 cn	119 cn	57.2 cn
410-142725-9	31SB-DUP-23	86.5 cn	87.5 cn	84.6 cn	84.5 cn	92.9 cn		108 cn	83.4 cn
410-142725-9 - DL	31SB-DUP-23						81.6		
410-142725-9 - DL2	31SB-DUP-23					98.7 cn			
LB 410-428846/1-C	Method Blank	86.9	76.1	78.7	82.7	82.0	73.0	75.1	77.5

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (20-150)	M262FTS (20-150)	M282FTS (20-150)	HFPODA (20-150)	NMFM (20-150)	NEFM (20-150)	d5NPFSA (20-150)	d3NMFSA (20-150)
410-142725-1	31SB-23-08-11-12	88.2 cn	90.2 ^c cn	104 ^c cn	85.9 cn	56.1 cn	53.8 cn	66.8 cn	70.8 cn
410-142725-1 - DL	31SB-23-08-11-12								
410-142725-2	31SB-23-05-13-14	105 cn	92.9 ^c cn	110 ^c cn	83.7 cn	59.1 cn	57.3 cn	68.5 cn	71.2 cn
410-142725-2 - DL	31SB-23-05-13-14								
410-142725-2 - DL2	31SB-23-05-13-14								
410-142725-3	31SB-23-07-50-51	102 cn	102 ^c cn	114 ^c cn	79.9 cn	46.7 cn	43.8 cn	57.9 cn	62.5 cn
410-142725-3 - DL	31SB-23-07-50-51								
410-142725-4	31SB-23-04-2-3	91.9 cn	80.3 cn		81.6 cn	71.8 cn	68.6 cn	74.5 cn	77.8 cn
410-142725-4 - DL	31SB-23-04-2-3			67.2 cn					
410-142725-5	31SB-23-06-19-20	90.3 cn	77.2 cn	78.2 cn	86.1 cn	94.8 cn	95.4 cn	79.7 cn	77.7 cn
410-142725-5 - DL2	31SB-23-06-19-20								
410-142725-6	31SB-23-01-13-14	95.4 cn	87.7 cn		87.4 cn	81.2 cn	80.5 cn	77.4 cn	77.0 cn
410-142725-6 - DL	31SB-23-01-13-14			88.5					
410-142725-6 - DL2	31SB-23-01-13-14								
410-142725-7	31SB-23-03-33-34	87.0 cn	94.3 cn	97.4 cn	88.4 cn	88.3 cn	89.4 cn	82.0 cn	80.2 cn
410-142725-7 - DL	31SB-23-03-33-34								
410-142725-8	31SB-23-02-19-20	88.5 cn	88.2 cn		88.1 cn	104 cn	103 cn	97.6 cn	93.9 cn
410-142725-8 - DL	31SB-23-02-19-20			99.6 cn					
410-142725-8 - DL2	31SB-23-02-19-20								
410-142725-8 MS	31SB-MS-23-02-19-20	94.9 cn	102 cn	97.8 cn	92.8 cn	91.7 cn	82.0 cn	79.4 cn	82.8 cn

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-142725-1
Project/Site: AOC 31

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Solid
Prep Type: SPLP East

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (20-150)	M262FTS (20-150)	M282FTS (20-150)	HFPODA (20-150)	NMFM (20-150)	NEFM (20-150)	d5NPFSA (20-150)	d3NMFSA (20-150)
410-142725-8 MSD	31SB-MSD-23-02-19-20	97.7 cn	89.7 cn	93.1 cn	88.4 cn	103 cn	99.1 cn	89.2 cn	88.2 cn
410-142725-9	31SB-DUP-23	80.6 cn	79.3 cn		88.6 cn	83.1 cn	77.4 cn	80.9 cn	78.8 cn
410-142725-9 - DL	31SB-DUP-23			109					
410-142725-9 - DL2	31SB-DUP-23								
LB 410-428846/1-C	Method Blank	95.1	99.0	102	78.6	50.1	47.8	56.9	60.1

Surrogate Legend

PFDoDA = 13C2-PFDoDA
PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 FOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 410-420998/1-A
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420998

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg		10/13/23 22:52	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	0.80	U	1.0	0.80	0.35	ug/Kg		10/13/23 22:52	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	0.80	U	1.0	0.80	0.35	ug/Kg		10/13/23 22:52	1
DONA	0.40	U	0.80	0.40	0.20	ug/Kg		10/13/23 22:52	1
HFPODA	0.40	U	0.80	0.40	0.10	ug/Kg		10/13/23 22:52	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg		10/13/23 22:52	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg		10/13/23 22:52	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	1.0	0.50	0.25	ug/Kg		10/13/23 22:52	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg		10/13/23 22:52	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg		10/13/23 22:52	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg		10/13/23 22:52	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg		10/13/23 22:52	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/13/23 22:52	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/13/23 22:52	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/13/23 22:52	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/13/23 22:52	1
Perfluorobutanesulfonic acid (PFBS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorobutanoic acid (PFBA)	0.40	U	0.80	0.40	0.10	ug/Kg		10/13/23 22:52	1
Perfluorodecanesulfonic acid (PFDS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorodecanoic acid (PFDA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorododecanoic acid (PFDoA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluoroheptanesulfonic acid (PFHpS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluoroheptanoic acid (PFHpA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorohexanesulfonic acid (PFHxS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorohexanoic acid (PFHxA)	0.12	U	0.20	0.12	0.059	ug/Kg		10/13/23 22:52	1
Perfluorononanesulfonic acid (PFNS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorononanoic acid (PFNA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorooctanesulfonamide (FOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorooctanesulfonic acid (PFOS)	0.10	U	0.20	0.10	0.051	ug/Kg		10/13/23 22:52	1
Perfluorooctanoic acid (PFOA)	0.10	U	0.20	0.10	0.051	ug/Kg		10/13/23 22:52	1
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluoropentanoic acid (PFPeA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/13/23 22:52	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-420998/1-A
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420998

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorotetradecanoic acid (PFTA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluorotridecanoic acid (PFTriA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1
Perfluoroundecanoic acid (PFUnA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/13/23 22:52	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*86.8*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C4 PFBA	*90.9*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C5 PFPeA	*87.5*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C5 PFHxA	*95.3*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C4 PFHpA	*101*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C8 PFOA	*103*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C9 PFNA	*101*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C6 PFDA	*98.9*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C7 PFUnA	*88.4*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C2 PFTeDA	*57.8*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C3 PFBS	*98.2*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C3 PFHxS	*89.0*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C8 PFOS	*84.3*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C8 FOSA	*79.8*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d3-NMeFOSAA	*87.5*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d5-NEtFOSAA	*80.9*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
M2-4:2 FTS	*90.0*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
M2-6:2 FTS	*97.6*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
M2-8:2 FTS	*102*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
13C3 HFPO-DA	*90.7*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d7-N-MeFOSE-M	*67.5*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d9-N-EtFOSE-M	*66.7*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d5-NEtPFOSA	*51.9*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*
d3-NMePFOSA	*58.6*		*20 - 150*	*09/19/23 08:46*	*10/13/23 22:52*	*1*

Lab Sample ID: LCS 410-420998/2-A
Matrix: Solid
Analysis Batch: 431905

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	9.39	9.13		ug/Kg		97	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	9.52	8.47		ug/Kg		89	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	9.62	8.79		ug/Kg		91	40 - 150
DONA	9.45	9.54		ug/Kg		101	40 - 150
HFPODA	10.0	9.59		ug/Kg		96	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	9.35	8.50		ug/Kg		91	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.45	7.51		ug/Kg		79	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	2.50	3.28		ug/Kg		131	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	12.5	15.5		ug/Kg		124	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-420998/2-A
Matrix: Solid
Analysis Batch: 431905

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	25.0	31.2		ug/Kg		125	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	62.6	68.3		ug/Kg		109	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.50	2.28		ug/Kg		91	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	62.6	68.2		ug/Kg		109	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	2.50	3.34		ug/Kg		133	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	25.0	29.8		ug/Kg		119	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.50	2.47		ug/Kg		99	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	5.01	5.87		ug/Kg		117	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	4.46	4.66		ug/Kg		104	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	5.01	4.13		ug/Kg		83	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	5.01	4.81		ug/Kg		96	40 - 150
Perfluorobutanesulfonic acid (PFBS)	2.22	2.04		ug/Kg		92	40 - 150
Perfluorobutanoic acid (PFBA)	10.0	8.88		ug/Kg		89	40 - 150
Perfluorodecanesulfonic acid (PFDS)	2.42	1.96		ug/Kg		81	40 - 150
Perfluorodecanoic acid (PFDA)	2.50	2.26		ug/Kg		90	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	2.43	1.82		ug/Kg		75	40 - 150
Perfluorododecanoic acid (PFDoA)	2.50	2.30		ug/Kg		92	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	2.39	2.31		ug/Kg		97	40 - 150
Perfluoroheptanoic acid (PFHpA)	2.50	2.38		ug/Kg		95	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	2.29	2.20		ug/Kg		96	40 - 150
Perfluorohexanoic acid (PFHxA)	2.50	2.42		ug/Kg		97	40 - 150
Perfluorononanesulfonic acid (PFNS)	2.41	2.23		ug/Kg		93	40 - 150
Perfluorononanoic acid (PFNA)	2.50	2.40		ug/Kg		96	40 - 150
Perfluorooctanesulfonamide (FOSA)	2.50	2.51		ug/Kg		100	40 - 150
Perfluorooctanesulfonic acid (PFOS)	2.32	2.28		ug/Kg		98	40 - 150
Perfluorooctanoic acid (PFOA)	2.50	2.29		ug/Kg		92	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	2.36	2.39		ug/Kg		102	40 - 150
Perfluoropentanoic acid (PFPeA)	5.01	4.87	I	ug/Kg		97	40 - 150
Perfluorotetradecanoic acid (PFTA)	2.50	2.62		ug/Kg		105	40 - 150
Perfluorotridecanoic acid (PFTriA)	2.50	2.41		ug/Kg		96	40 - 150
Perfluoroundecanoic acid (PFUnA)	2.50	2.29		ug/Kg		91	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C2-PFDoDA	72.0		20 - 150
13C4 PFBA	38.5		20 - 150
13C5 PFPeA	96.9		20 - 150
13C5 PFHxA	96.0		20 - 150
13C4 PFHpA	98.3		20 - 150
13C8 PFOA	97.7		20 - 150
13C9 PFNA	87.1		20 - 150
13C6 PFDA	90.1		20 - 150
13C7 PFUnA	90.0		20 - 150
13C2 PFTeDA	55.3		20 - 150
13C3 PFBS	101		20 - 150
13C3 PFHxS	91.4		20 - 150
13C8 PFOS	86.6		20 - 150
13C8 FOSA	83.6		20 - 150
d3-NMeFOSAA	89.4		20 - 150
d5-NEtFOSAA	93.4		20 - 150
M2-4:2 FTS	91.4		20 - 150
M2-6:2 FTS	92.4		20 - 150
M2-8:2 FTS	91.0		20 - 150
13C3 HFPO-DA	98.3		20 - 150
d7-N-MeFOSE-M	65.3		20 - 150
d9-N-EtFOSE-M	57.5		20 - 150
d5-NEtPFOSA	61.2		20 - 150
d3-NMePFOSA	71.6		20 - 150

Lab Sample ID: LLCS 410-420998/3-A
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	1.50	1.33		ug/Kg		89	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.52	1.32		ug/Kg		87	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1.54	1.60		ug/Kg		104	40 - 150
DONA	1.51	1.44		ug/Kg		95	40 - 150
HFPODA	1.60	1.50		ug/Kg		94	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	1.50	1.33		ug/Kg		89	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	1.51	1.11		ug/Kg		73	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.400	0.370		ug/Kg		92	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	2.00	2.70		ug/Kg		135	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	4.00	3.84		ug/Kg		96	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	10.0	10.1		ug/Kg		101	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.400	0.389		ug/Kg		97	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	10.0	9.74		ug/Kg		97	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-420998/3-A
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.400	0.444		ug/Kg		111	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	4.00	4.06		ug/Kg		101	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.400	0.351		ug/Kg		88	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.800	0.660		ug/Kg		83	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.712	0.608		ug/Kg		85	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.800	0.811		ug/Kg		101	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.800	0.930		ug/Kg		116	40 - 150
Perfluorobutanesulfonic acid (PFBS)	0.355	0.322		ug/Kg		91	40 - 150
Perfluorobutanoic acid (PFBA)	1.60	1.35		ug/Kg		84	40 - 150
Perfluorodecanesulfonic acid (PFDS)	0.386	0.267		ug/Kg		69	40 - 150
Perfluorodecanoic acid (PFDA)	0.400	0.390		ug/Kg		97	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	0.388	0.220		ug/Kg		57	40 - 150
Perfluorododecanoic acid (PFDoA)	0.400	0.355		ug/Kg		89	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	0.381	0.381		ug/Kg		100	40 - 150
Perfluoroheptanoic acid (PFHpA)	0.400	0.346		ug/Kg		87	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	0.366	0.277		ug/Kg		76	40 - 150
Perfluorohexanoic acid (PFHxA)	0.400	0.344		ug/Kg		86	40 - 150
Perfluorononanesulfonic acid (PFNS)	0.385	0.315		ug/Kg		82	40 - 150
Perfluorononanoic acid (PFNA)	0.400	0.360		ug/Kg		90	40 - 150
Perfluorooctanesulfonamide (FOSA)	0.400	0.411		ug/Kg		103	40 - 150
Perfluorooctanesulfonic acid (PFOS)	0.371	0.348		ug/Kg		94	40 - 150
Perfluorooctanoic acid (PFOA)	0.400	0.430		ug/Kg		107	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	0.376	0.353		ug/Kg		94	40 - 150
Perfluoropentanoic acid (PFPeA)	0.800	0.936	I M	ug/Kg		117	40 - 150
Perfluorotetradecanoic acid (PFTA)	0.400	0.442		ug/Kg		110	40 - 150
Perfluorotridecanoic acid (PFTriA)	0.400	0.328		ug/Kg		82	40 - 150
Perfluoroundecanoic acid (PFUnA)	0.400	0.321		ug/Kg		80	40 - 150

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2-PFDoDA	*69.7*		*20 - 150*
13C4 PFBA	*42.2*		*20 - 150*
13C5 PFPeA	*79.6*		*20 - 150*
13C5 PFHxA	*97.8*		*20 - 150*
13C4 PFHpA	*99.4*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-420998/3-A
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420998

Isotope Dilution	LLCS %Recovery	LLCS Qualifier	Limits
13C8 PFOA	91.9		20 - 150
13C9 PFNA	111		20 - 150
13C6 PFDA	82.6		20 - 150
13C7 PFUnA	84.5		20 - 150
13C2 PFTeDA	45.7		20 - 150
13C3 PFBS	96.9		20 - 150
13C3 PFHxS	88.9		20 - 150
13C8 PFOS	86.2		20 - 150
13C8 FOSA	80.4		20 - 150
d3-NMeFOSAA	88.3		20 - 150
d5-NEtFOSAA	85.9		20 - 150
M2-4:2 FTS	98.6		20 - 150
M2-6:2 FTS	100		20 - 150
M2-8:2 FTS	93.7		20 - 150
13C3 HFPO-DA	91.9		20 - 150
d7-N-MeFOSE-M	71.4		20 - 150
d9-N-EtFOSE-M	69.0		20 - 150
d5-NEtPFOSA	51.5		20 - 150
d3-NMePFOSA	54.9		20 - 150

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	9.43	7.83		ug/Kg	☼	83	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	62.4	59.4		ug/Kg	☼	95	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	62.4	67.6		ug/Kg	☼	108	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	12.5	18.4		ug/Kg	☼	147	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	9.37	9.55		ug/Kg	☼	102	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.3		9.50	10.2		ug/Kg	☼	94	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39		9.60	34.4	4	ug/Kg	☼	-45	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	0.40	U	9.33	8.48		ug/Kg	☼	91	40 - 150
HFPODA	0.40	U	9.43	9.37		ug/Kg	☼	99	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	2.50	3.39		ug/Kg	☼	136	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U	25.0	30.8		ug/Kg	☼	123	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.10	U	2.50	2.19		ug/Kg	☼	87	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	2.50	3.15		ug/Kg	☼	126	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	25.0	31.9		ug/Kg	☼	128	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.12	J I M	2.50	2.69		ug/Kg	☼	103	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	5.00	4.26		ug/Kg	☼	85	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	4.45	3.98		ug/Kg	☼	90	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	5.00	6.02		ug/Kg	☼	120	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	5.00	5.88		ug/Kg	☼	118	40 - 150
Perfluorobutanesulfonic acid (PFBS)	0.10	U	2.22	2.13		ug/Kg	☼	96	40 - 150
Perfluorobutanoic acid (PFBA)	0.40	U	10.0	9.72		ug/Kg	☼	97	40 - 150
Perfluorodecanesulfonic acid (PFDS)	0.10	U	2.41	2.20		ug/Kg	☼	91	40 - 150
Perfluorodecanoic acid (PFDA)	0.11	J M	2.50	2.43		ug/Kg	☼	93	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	2.42	1.85		ug/Kg	☼	76	40 - 150
Perfluorododecanoic acid (PFDoA)	0.10	U	2.50	2.42		ug/Kg	☼	97	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	1.4		2.38	3.50		ug/Kg	☼	89	40 - 150
Perfluoroheptanoic acid (PFHpA)	0.26		2.50	2.51		ug/Kg	☼	90	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	2.9		2.28	4.37		ug/Kg	☼	63	40 - 150
Perfluorohexanoic acid (PFHxA)	0.24	M	2.50	2.32		ug/Kg	☼	83	40 - 150
Perfluorononanesulfonic acid (PFNS)	0.10	U	2.40	2.30		ug/Kg	☼	96	40 - 150
Perfluorononanoic acid (PFNA)	0.50		2.50	2.94		ug/Kg	☼	97	40 - 150
Perfluorooctanesulfonamide (FOSA)	10	F2	2.50	7.89	4	ug/Kg	☼	-97	40 - 150
Perfluorooctanesulfonic acid (PFOS)	520	E F2	2.32	369	E 4	ug/Kg	☼	-6555	40 - 150
Perfluorooctanoic acid (PFOA)	1.4		2.50	3.18		ug/Kg	☼	71	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	2.35	2.41		ug/Kg	☼	103	40 - 150
Perfluoropentanoic acid (PFPeA)	0.20	U	5.00	5.65		ug/Kg	☼	113	40 - 150
Perfluorotetradecanoic acid (PFTA)	0.10	U	2.50	2.69		ug/Kg	☼	108	40 - 150
Perfluorotridecanoic acid (PFTriA)	0.10	U	2.50	2.21		ug/Kg	☼	89	40 - 150
Perfluoroundecanoic acid (PFUnA)	0.10	U	2.50	2.15		ug/Kg	☼	86	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2 PFTeDA	*53.8*		*20 - 150*
13C2-PFDoDA	*72.8*		*20 - 150*
13C3 HFPO-DA	*85.4*		*20 - 150*
13C3 PFBS	*94.5*		*20 - 150*
13C3 PFHxS	*86.3*		*20 - 150*
13C4 PFBA	*92.1*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Isotope Dilution	MS %Recovery	MS Qualifier	Limits
13C4 PFHpA	93.5		20 - 150
13C5 PFHxA	93.8		20 - 150
13C5 PFPeA	81.2		20 - 150
13C6 PFDA	85.7		20 - 150
13C7 PFUnA	88.0		20 - 150
13C8 FOSA	84.0		20 - 150
13C8 PFOA	89.2		20 - 150
13C8 PFOS	81.8		20 - 150
13C9 PFNA	79.8		20 - 150
d3-NMeFOSAA	85.5		20 - 150
d3-NMePFOSA	67.8		20 - 150
d5-NEtFOSAA	83.8		20 - 150
d5-NEtPFOSA	54.2		20 - 150
d7-N-MeFOSE-M	79.6		20 - 150
d9-N-EtFOSE-M	75.1		20 - 150
M2-4:2 FTS	94.8		20 - 150
M2-6:2 FTS	86.9		20 - 150
M2-8:2 FTS	96.4		20 - 150

Lab Sample ID: 410-142725-8 MSD
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MSD-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	9.31	7.13		ug/Kg	☼	77	40 - 150	9	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	61.6	63.6		ug/Kg	☼	103	40 - 150	7	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	61.6	68.5		ug/Kg	☼	111	40 - 150	1	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	12.3	18.1		ug/Kg	☼	146	40 - 150	2	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	9.25	9.80		ug/Kg	☼	106	40 - 150	3	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.3		9.38	11.1		ug/Kg	☼	105	40 - 150	9	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39		9.47	43.9	4	ug/Kg	☼	55	40 - 150	24	30
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	0.40	U	9.21	7.52		ug/Kg	☼	82	40 - 150	12	30
HFPODA	0.40	U	9.31	9.47		ug/Kg	☼	102	40 - 150	1	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.40	U	9.85	9.61		ug/Kg	☼	98	40 - 150	4	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.10	U	2.47	3.03		ug/Kg	☼	123	40 - 150	11	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.0	U	24.7	30.7		ug/Kg	☼	124	40 - 150	0	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	2.47	2.17		ug/Kg	☼	88	40 - 150	1	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.10	U	2.47	3.23		ug/Kg	☼	131	40 - 150	2	30
	1.0	U	24.7	33.3		ug/Kg	☼	135	40 - 150	4	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MSD
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MSD-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.12	J I M	2.47	2.48		ug/Kg	☼	96	40 - 150	8	30
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U cn	4.93	5.02		ug/Kg	☼	102	40 - 150	16	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	4.39	3.92		ug/Kg	☼	89	40 - 150	1	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	4.93	5.74		ug/Kg	☼	116	40 - 150	5	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	4.93	5.68		ug/Kg	☼	115	40 - 150	3	30
Perfluorobutanesulfonic acid (PFBS)	0.10	U	2.19	2.04		ug/Kg	☼	93	40 - 150	4	30
Perfluorobutanoic acid (PFBA)	0.40	U	9.87	9.44		ug/Kg	☼	96	40 - 150	3	30
Perfluorodecanesulfonic acid (PFDS)	0.10	U	2.38	2.39		ug/Kg	☼	100	40 - 150	8	30
Perfluorodecanoic acid (PFDA)	0.11	J M	2.47	2.44		ug/Kg	☼	94	40 - 150	0	30
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	2.39	1.98		ug/Kg	☼	83	40 - 150	7	30
Perfluorododecanoic acid (PFDoA)	0.10	U	2.47	2.32		ug/Kg	☼	94	40 - 150	4	30
Perfluoroheptanesulfonic acid (PFHpS)	1.4		2.35	4.04		ug/Kg	☼	113	40 - 150	14	30
Perfluoroheptanoic acid (PFHpA)	0.26		2.47	2.76		ug/Kg	☼	101	40 - 150	10	30
Perfluorohexanesulfonic acid (PFHxS)	2.9		2.26	5.10		ug/Kg	☼	97	40 - 150	15	30
Perfluorohexanoic acid (PFHxA)	0.24	M	2.47	2.70		ug/Kg	☼	100	40 - 150	15	30
Perfluorononanesulfonic acid (PFNS)	0.10	U	2.37	2.48		ug/Kg	☼	104	40 - 150	7	30
Perfluorononanoic acid (PFNA)	0.50		2.47	2.68		ug/Kg	☼	88	40 - 150	9	30
Perfluorooctanesulfonamide (FOSA)	10	F2	2.47	14.5	4 F2	ug/Kg	☼	168	40 - 150	59	30
Perfluorooctanesulfonic acid (PFOS)	520	E F2	2.29	507	E 4 F2	ug/Kg	☼	-609	40 - 150	32	30
Perfluorooctanoic acid (PFOA)	1.4		2.47	3.72		ug/Kg	☼	94	40 - 150	16	30
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	2.32	2.40		ug/Kg	☼	103	40 - 150	0	30
Perfluoropentanoic acid (PFPeA)	0.20	U	4.93	5.57		ug/Kg	☼	113	40 - 150	2	30
Perfluorotetradecanoic acid (PFTA)	0.10	U	2.47	2.64		ug/Kg	☼	107	40 - 150	2	30
Perfluorotridecanoic acid (PFTriA)	0.10	U	2.47	2.40		ug/Kg	☼	97	40 - 150	8	30
Perfluoroundecanoic acid (PFUnA)	0.10	U	2.47	2.14		ug/Kg	☼	87	40 - 150	0	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2 PFTeDA	*54.9*		*20 - 150*
13C2-PFDoDA	*79.8*		*20 - 150*
13C3 HFPO-DA	*102*		*20 - 150*
13C3 PFBS	*112*		*20 - 150*
13C3 PFHxS	*102*		*20 - 150*
13C4 PFBA	*105*		*20 - 150*
13C4 PFHpA	*105*		*20 - 150*
13C5 PFHxA	*106*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MSD
Matrix: Solid
Analysis Batch: 430901

Client Sample ID: 31SB-MSD-23-02-19-20
Prep Type: Total/NA
Prep Batch: 420998

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C5 PFPeA	*95.8*		*20 - 150*
13C6 PFDA	*89.8*		*20 - 150*
13C7 PFUnA	*83.5*		*20 - 150*
13C8 FOSA	*103*		*20 - 150*
13C8 PFOA	*124*		*20 - 150*
13C8 PFOS	*87.1*		*20 - 150*
13C9 PFNA	*101*		*20 - 150*
d3-NMeFOSAA	*108*		*20 - 150*
d3-NMePFOSA	*79.8*		*20 - 150*
d5-NEtFOSAA	*98.1*		*20 - 150*
d5-NEtPFOSA	*71.0*		*20 - 150*
d7-N-MeFOSE-M	*91.2*		*20 - 150*
d9-N-EtFOSE-M	*91.7*		*20 - 150*
M2-4:2 FTS	*110*		*20 - 150*
M2-6:2 FTS	*109*		*20 - 150*
M2-8:2 FTS	*126*		*20 - 150*

Lab Sample ID: MB 410-431999/1-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 431999

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		10/22/23 22:47	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		10/22/23 22:47	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		10/22/23 22:47	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		10/22/23 22:47	1
HFPODA	4.0	U	8.0	4.0	2.0	ng/L		10/22/23 22:47	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		10/22/23 22:47	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		10/22/23 22:47	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		10/22/23 22:47	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		10/22/23 22:47	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		10/22/23 22:47	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		10/22/23 22:47	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		10/22/23 22:47	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		10/22/23 22:47	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		10/22/23 22:47	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		10/22/23 22:47	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-431999/1-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 431999

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		10/22/23 22:47	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		10/22/23 22:47	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		10/22/23 22:47	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		10/22/23 22:47	1
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	2.0	ng/L		10/22/23 22:47	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		10/22/23 22:47	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		10/22/23 22:47	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		10/22/23 22:47	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		10/22/23 22:47	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		10/22/23 22:47	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		10/22/23 22:47	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		10/22/23 22:47	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		10/22/23 22:47	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*81.7*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C4 PFBA	*86.2*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C5 PFPeA	*64.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C5 PFHxA	*92.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C4 PFHpA	*91.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C8 PFOA	*76.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C9 PFNA	*80.4*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C6 PFDA	*84.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C7 PFUnA	*84.3*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C2 PFTeDA	*73.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C3 PFBS	*80.6*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C3 PFHxS	*82.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C8 PFOS	*80.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C8 FOSA	*72.3*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
d3-NMeFOSAA	*76.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
d5-NEtFOSAA	*76.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
M2-4:2 FTS	*99.6*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
M2-6:2 FTS	*101*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
M2-8:2 FTS	*98.5*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
13C3 HFPO-DA	*83.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*
d7-N-MeFOSE-M	*52.3*		*20 - 150*	*10/17/23 07:00*	*10/22/23 22:47*	*1*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-431999/1-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 431999

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
d9-N-EtFOSE-M	54.0		20 - 150	10/17/23 07:00	10/22/23 22:47	1
d5-NEtPFOSA	49.2		20 - 150	10/17/23 07:00	10/22/23 22:47	1
d3-NMePFOSA	51.2		20 - 150	10/17/23 07:00	10/22/23 22:47	1

Lab Sample ID: LCS 410-431999/2-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431999

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.9	105		ng/L		112	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	95.2	106		ng/L		111	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	96.2	120		ng/L		125	40 - 150
DONA	94.5	111		ng/L		118	40 - 150
HFPODA	100	109		ng/L		109	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	93.5	110		ng/L		118	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.5	105		ng/L		111	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	25.0	26.9		ng/L		107	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	180		ng/L		144	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	250	267		ng/L		107	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	626	735		ng/L		118	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	25.0	27.4		ng/L		109	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	626	781		ng/L		125	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	29.4		ng/L		117	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	250	276		ng/L		110	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25.0	28.2		ng/L		112	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	50.1	62.3		ng/L		124	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	44.6	47.0		ng/L		106	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	50.1	63.6		ng/L		127	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	50.1	63.8		ng/L		127	40 - 150
Perfluorobutanesulfonic acid (PFBS)	22.2	28.2		ng/L		127	40 - 150
Perfluorobutanoic acid (PFBA)	100	111		ng/L		110	40 - 150
Perfluorodecanesulfonic acid (PFDS)	24.2	25.3		ng/L		105	40 - 150
Perfluorodecanoic acid (PFDA)	25.0	23.9		ng/L		95	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-431999/2-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431999

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorododecanesulfonic acid (PFDoS)	24.3	24.6		ng/L		101	40 - 150
Perfluorododecanoic acid (PFDoA)	25.0	25.5		ng/L		102	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	23.9	25.7		ng/L		108	40 - 150
Perfluoroheptanoic acid (PFHpA)	25.0	26.1		ng/L		104	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	22.9	24.6		ng/L		107	40 - 150
Perfluorohexanoic acid (PFHxA)	25.0	24.8		ng/L		99	40 - 150
Perfluorononanesulfonic acid (PFNS)	24.1	26.8		ng/L		111	40 - 150
Perfluorononanoic acid (PFNA)	25.0	27.0		ng/L		108	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	24.7		ng/L		99	40 - 150
Perfluorooctanesulfonic acid (PFOS)	23.2	24.2		ng/L		104	40 - 150
Perfluorooctanoic acid (PFOA)	25.0	24.9		ng/L		99	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	23.6	25.6		ng/L		109	40 - 150
Perfluoropentanoic acid (PFPeA)	50.1	61.9		ng/L		124	40 - 150
Perfluorotetradecanoic acid (PFTA)	25.0	30.8		ng/L		123	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	28.9		ng/L		115	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	26.8		ng/L		107	40 - 150

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2-PFDoDA	*88.0*		*20 - 150*
13C4 PFBA	*85.9*		*20 - 150*
13C5 PFPeA	*77.0*		*20 - 150*
13C5 PFHxA	*94.3*		*20 - 150*
13C4 PFHpA	*95.0*		*20 - 150*
13C8 PFOA	*89.1*		*20 - 150*
13C9 PFNA	*83.6*		*20 - 150*
13C6 PFDA	*83.8*		*20 - 150*
13C7 PFUnA	*82.9*		*20 - 150*
13C2 PFTeDA	*79.0*		*20 - 150*
13C3 PFBS	*72.1*		*20 - 150*
13C3 PFHxS	*83.9*		*20 - 150*
13C8 PFOS	*82.2*		*20 - 150*
13C8 FOSA	*74.7*		*20 - 150*
d3-NMeFOSAA	*79.9*		*20 - 150*
d5-NEtFOSAA	*79.3*		*20 - 150*
M2-4:2 FTS	*94.3*		*20 - 150*
M2-6:2 FTS	*99.2*		*20 - 150*
M2-8:2 FTS	*91.2*		*20 - 150*
13C3 HFPO-DA	*81.3*		*20 - 150*
d7-N-MeFOSE-M	*53.3*		*20 - 150*
d9-N-EtFOSE-M	*54.4*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-431999/2-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431999

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
d5-NEtPFOSA	*49.8*		*20 - 150*
d3-NMePFOSA	*50.0*		*20 - 150*

Lab Sample ID: LLCS 410-431999/3-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431999

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	15.0	16.8		ng/L		112	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	15.2	16.8		ng/L		110	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	15.4	15.4		ng/L		100	40 - 150
DONA	15.1	19.0		ng/L		126	40 - 150
HFPODA	16.0	18.0		ng/L		113	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	15.0	17.6		ng/L		118	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	15.1	18.4		ng/L		122	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	4.00	4.36		ng/L		109	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	20.0	30.1		ng/L		150	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	40.0	42.7		ng/L		107	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	100	122		ng/L		122	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4.00	4.42		ng/L		111	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	100	129		ng/L		128	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	4.81		ng/L		120	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	40.0	45.0		ng/L		112	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4.00	4.91		ng/L		123	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	8.00	8.43		ng/L		105	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	7.12	7.49		ng/L		105	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	8.00	10.4		ng/L		130	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	8.00	11.8		ng/L		147	40 - 150
Perfluorobutanesulfonic acid (PFBS)	3.55	4.68		ng/L		132	40 - 150
Perfluorobutanoic acid (PFBA)	16.0	16.3		ng/L		102	40 - 150
Perfluorodecanesulfonic acid (PFDS)	3.86	3.98		ng/L		103	40 - 150
Perfluorodecanoic acid (PFDA)	4.00	3.80		ng/L		95	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	3.88	3.86		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-431999/3-A
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 431999

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorododecanoic acid (PFDoA)	4.00	4.07		ng/L		102	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	3.81	3.84		ng/L		101	40 - 150
Perfluoroheptanoic acid (PFHpA)	4.00	4.60		ng/L		115	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	3.66	4.59		ng/L		126	40 - 150
Perfluorohexanoic acid (PFHxA)	4.00	4.15		ng/L		104	40 - 150
Perfluorononanesulfonic acid (PFNS)	3.85	4.21		ng/L		109	40 - 150
Perfluorononanoic acid (PFNA)	4.00	4.07		ng/L		102	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	3.94		ng/L		98	40 - 150
Perfluorooctanesulfonic acid (PFOS)	3.71	5.44		ng/L		147	40 - 150
Perfluorooctanoic acid (PFOA)	4.00	3.98		ng/L		100	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	3.76	4.65		ng/L		124	40 - 150
Perfluoropentanoic acid (PFPeA)	8.00	10.5		ng/L		131	40 - 150
Perfluorotetradecanoic acid (PFTA)	4.00	5.19		ng/L		130	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	4.52		ng/L		113	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	3.99		ng/L		100	40 - 150

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2-PFDoDA	*88.2*		*20 - 150*
13C4 PFBA	*82.6*		*20 - 150*
13C5 PFPeA	*71.7*		*20 - 150*
13C5 PFHxA	*87.1*		*20 - 150*
13C4 PFHpA	*90.7*		*20 - 150*
13C8 PFOA	*83.6*		*20 - 150*
13C9 PFNA	*82.7*		*20 - 150*
13C6 PFDA	*85.7*		*20 - 150*
13C7 PFUnA	*83.2*		*20 - 150*
13C2 PFTeDA	*73.3*		*20 - 150*
13C3 PFBS	*79.3*		*20 - 150*
13C3 PFHxS	*79.2*		*20 - 150*
13C8 PFOS	*83.3*		*20 - 150*
13C8 FOSA	*71.8*		*20 - 150*
d3-NMeFOSAA	*75.6*		*20 - 150*
d5-NEtFOSAA	*80.8*		*20 - 150*
M2-4:2 FTS	*99.9*		*20 - 150*
M2-6:2 FTS	*100*		*20 - 150*
M2-8:2 FTS	*107*		*20 - 150*
13C3 HFPO-DA	*79.4*		*20 - 150*
d7-N-MeFOSE-M	*52.8*		*20 - 150*
d9-N-EtFOSE-M	*52.8*		*20 - 150*
d5-NEtPFOSA	*48.0*		*20 - 150*
d3-NMePFOSA	*49.0*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-434335/1-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 434335

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.40	U	0.80	0.40	0.20	ug/Kg		10/24/23 22:43	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	85.8	B	1.0	0.80	0.35	ug/Kg		10/24/23 22:43	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	0.80	U	1.0	0.80	0.35	ug/Kg		10/24/23 22:43	1
DONA	0.40	U	0.80	0.40	0.20	ug/Kg		10/24/23 22:43	1
HFPODA	0.40	U	0.80	0.40	0.10	ug/Kg		10/24/23 22:43	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	0.40	U	0.80	0.40	0.20	ug/Kg		10/24/23 22:43	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	0.40	U	0.80	0.40	0.20	ug/Kg		10/24/23 22:43	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	0.50	U	1.0	0.50	0.25	ug/Kg		10/24/23 22:43	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg		10/24/23 22:43	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg		10/24/23 22:43	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	2.5	U	5.0	2.5	1.0	ug/Kg		10/24/23 22:43	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	1.0	U	2.0	1.0	0.50	ug/Kg		10/24/23 22:43	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/24/23 22:43	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/24/23 22:43	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/24/23 22:43	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.20	U	0.40	0.20	0.10	ug/Kg		10/24/23 22:43	1
Perfluorobutanesulfonic acid (PFBS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorobutanoic acid (PFBA)	0.837	B	0.80	0.40	0.10	ug/Kg		10/24/23 22:43	1
Perfluorodecanesulfonic acid (PFDS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorodecanoic acid (PFDA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorododecanesulfonic acid (PFDoS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorododecanoic acid (PFDoA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluoroheptanesulfonic acid (PFHpS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluoroheptanoic acid (PFHpA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorohexanesulfonic acid (PFHxS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorohexanoic acid (PFHxA)	1.35	B	0.20	0.12	0.059	ug/Kg		10/24/23 22:43	1
Perfluorononanesulfonic acid (PFNS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorononanoic acid (PFNA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorooctanesulfonamide (FOSA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorooctanesulfonic acid (PFOS)	0.10	U	0.20	0.10	0.051	ug/Kg		10/24/23 22:43	1
Perfluorooctanoic acid (PFOA)	0.10	U	0.20	0.10	0.051	ug/Kg		10/24/23 22:43	1
Perfluoropentanesulfonic acid (PFPeS)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluoropentanoic acid (PFPeA)	0.166	J I	0.40	0.20	0.10	ug/Kg		10/24/23 22:43	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-434335/1-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 434335

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorotetradecanoic acid (PFTA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluorotridecanoic acid (PFTriA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1
Perfluoroundecanoic acid (PFUnA)	0.10	U	0.20	0.10	0.050	ug/Kg		10/24/23 22:43	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*91.6*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C4 PFBA	*52.6*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C5 PFPeA	*108*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C5 PFHxA	*108*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C4 PFHpA	*108*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C8 PFOA	*106*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C9 PFNA	*111*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C6 PFDA	*101*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C7 PFUnA	*95.3*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C2 PFTeDA	*71.0*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C3 PFBS	*176*	*5+	*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C3 PFHxS	*110*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C8 PFOS	*97.0*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C8 FOSA	*93.7*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d3-NMeFOSAA	*110*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d5-NEtFOSAA	*103*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
M2-4:2 FTS	*128*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
M2-6:2 FTS	*128*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
M2-8:2 FTS	*200*	*5+	*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
13C3 HFPO-DA	*99.5*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d7-N-MeFOSE-M	*88.8*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d9-N-EtFOSE-M	*86.4*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d5-NEtPFOSA	*83.2*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*
d3-NMePFOSA	*86.7*		*20 - 150*	*10/23/23 07:32*	*10/24/23 22:43*	*1*

Lab Sample ID: LCS 410-434335/2-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 434335

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	9.39	8.78		ug/Kg		93	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	9.52	8.70		ug/Kg		91	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	9.62	9.80		ug/Kg		102	40 - 150
DONA	9.45	9.38		ug/Kg		99	40 - 150
HFPODA	10.0	8.83		ug/Kg		88	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	9.35	7.86		ug/Kg		84	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.45	7.35		ug/Kg		78	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	2.50	2.23		ug/Kg		89	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	12.5	13.5		ug/Kg		108	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-434335/2-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 434335

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	25.0	21.3		ug/Kg		85	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	62.6	57.3		ug/Kg		92	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.50	2.47		ug/Kg		98	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	62.6	49.3		ug/Kg		79	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	2.50	2.26		ug/Kg		90	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	25.0	22.3		ug/Kg		89	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.50	2.33		ug/Kg		93	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	5.01	3.89		ug/Kg		78	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	4.46	3.78		ug/Kg		85	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	5.01	4.58		ug/Kg		91	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	5.01	4.93		ug/Kg		98	40 - 150
Perfluorobutanesulfonic acid (PFBS)	2.22	1.24		ug/Kg		56	40 - 150
Perfluorobutanoic acid (PFBA)	10.0	9.38		ug/Kg		94	40 - 150
Perfluorodecanesulfonic acid (PFDS)	2.42	2.05		ug/Kg		85	40 - 150
Perfluorodecanoic acid (PFDA)	2.50	2.19		ug/Kg		87	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	2.43	1.93		ug/Kg		79	40 - 150
Perfluorododecanoic acid (PFDoA)	2.50	2.29		ug/Kg		92	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	2.39	2.33		ug/Kg		98	40 - 150
Perfluoroheptanoic acid (PFHpA)	2.50	2.03		ug/Kg		81	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	2.29	2.13		ug/Kg		93	40 - 150
Perfluorohexanoic acid (PFHxA)	2.50	2.13		ug/Kg		85	40 - 150
Perfluorononanesulfonic acid (PFNS)	2.41	2.20		ug/Kg		91	40 - 150
Perfluorononanoic acid (PFNA)	2.50	2.10		ug/Kg		84	40 - 150
Perfluorooctanesulfonamide (FOSA)	2.50	2.49		ug/Kg		99	40 - 150
Perfluorooctanesulfonic acid (PFOS)	2.32	2.11		ug/Kg		91	40 - 150
Perfluorooctanoic acid (PFOA)	2.50	1.94		ug/Kg		78	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	2.36	2.19		ug/Kg		93	40 - 150
Perfluoropentanoic acid (PFPeA)	5.01	4.71		ug/Kg		94	40 - 150
Perfluorotetradecanoic acid (PFTA)	2.50	2.41		ug/Kg		96	40 - 150
Perfluorotridecanoic acid (PFTriA)	2.50	2.50		ug/Kg		100	40 - 150
Perfluoroundecanoic acid (PFUnA)	2.50	2.27		ug/Kg		90	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C2-PFDoDA	81.0		20 - 150
13C4 PFBA	106		20 - 150
13C5 PFPeA	98.9		20 - 150
13C5 PFHxA	114		20 - 150
13C4 PFHpA	114		20 - 150
13C8 PFOA	111		20 - 150
13C9 PFNA	115		20 - 150
13C6 PFDA	98.1		20 - 150
13C7 PFUnA	88.8		20 - 150
13C2 PFTeDA	71.3		20 - 150
13C3 PFBS	162	*5+	20 - 150
13C3 PFHxS	98.8		20 - 150
13C8 PFOS	91.5		20 - 150
13C8 FOSA	93.9		20 - 150
d3-NMeFOSAA	103		20 - 150
d5-NEtFOSAA	94.1		20 - 150
M2-4:2 FTS	112		20 - 150
M2-6:2 FTS	112		20 - 150
M2-8:2 FTS	95.5		20 - 150
13C3 HFPO-DA	102		20 - 150
d7-N-MeFOSE-M	81.2		20 - 150
d9-N-EtFOSE-M	77.8		20 - 150
d5-NEtPFOSA	73.1		20 - 150
d3-NMePFOSA	78.4		20 - 150

Lab Sample ID: LLCS 410-434335/3-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 434335

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	1.50	1.50		ug/Kg		100	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1.52	1.25		ug/Kg		82	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1.54	1.28		ug/Kg		83	40 - 150
DONA	1.51	1.58		ug/Kg		105	40 - 150
HFPODA	1.60	1.58		ug/Kg		99	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	1.50	1.26		ug/Kg		84	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	1.51	1.39		ug/Kg		92	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.400	0.391		ug/Kg		98	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	2.00	2.18		ug/Kg		109	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	4.00	3.65		ug/Kg		91	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	10.0	8.85		ug/Kg		88	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.400	0.312		ug/Kg		78	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	10.0	8.10		ug/Kg		81	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-434335/3-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 434335

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.400	0.383		ug/Kg		96	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	4.00	3.86		ug/Kg		96	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.400	0.382		ug/Kg		95	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.800	0.724		ug/Kg		90	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.712	0.636		ug/Kg		89	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.800	0.727		ug/Kg		91	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.800	0.809		ug/Kg		101	40 - 150
Perfluorobutanesulfonic acid (PFBS)	0.355	0.194	J	ug/Kg		55	40 - 150
Perfluorobutanoic acid (PFBA)	1.60	1.52		ug/Kg		95	40 - 150
Perfluorodecanesulfonic acid (PFDS)	0.386	0.330		ug/Kg		85	40 - 150
Perfluorodecanoic acid (PFDA)	0.400	0.343		ug/Kg		86	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	0.388	0.301		ug/Kg		78	40 - 150
Perfluorododecanoic acid (PFDoA)	0.400	0.381		ug/Kg		95	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	0.381	0.381		ug/Kg		100	40 - 150
Perfluoroheptanoic acid (PFHpA)	0.400	0.347		ug/Kg		87	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	0.366	0.324		ug/Kg		89	40 - 150
Perfluorohexanoic acid (PFHxA)	0.400	0.318		ug/Kg		79	40 - 150
Perfluorononanesulfonic acid (PFNS)	0.385	0.339		ug/Kg		88	40 - 150
Perfluorononanoic acid (PFNA)	0.400	0.322		ug/Kg		81	40 - 150
Perfluorooctanesulfonamide (FOSA)	0.400	0.421		ug/Kg		105	40 - 150
Perfluorooctanesulfonic acid (PFOS)	0.371	0.377		ug/Kg		101	40 - 150
Perfluorooctanoic acid (PFOA)	0.400	0.339		ug/Kg		85	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	0.376	0.352		ug/Kg		94	40 - 150
Perfluoropentanoic acid (PFPeA)	0.800	0.752		ug/Kg		94	40 - 150
Perfluorotetradecanoic acid (PFTA)	0.400	0.381		ug/Kg		95	40 - 150
Perfluorotridecanoic acid (PFTriA)	0.400	0.387		ug/Kg		97	40 - 150
Perfluoroundecanoic acid (PFUnA)	0.400	0.337		ug/Kg		84	40 - 150

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2-PFDoDA	*84.2*		*20 - 150*
13C4 PFBA	*103*		*20 - 150*
13C5 PFPeA	*94.1*		*20 - 150*
13C5 PFHxA	*106*		*20 - 150*
13C4 PFHpA	*106*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-434335/3-A
Matrix: Solid
Analysis Batch: 434685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 434335

Isotope Dilution	LLCS %Recovery	LLCS Qualifier	Limits
13C8 PFOA	97.0		20 - 150
13C9 PFNA	101		20 - 150
13C6 PFDA	100		20 - 150
13C7 PFUnA	94.8		20 - 150
13C2 PFTeDA	79.0		20 - 150
13C3 PFBS	174	*5+	20 - 150
13C3 PFHxS	102		20 - 150
13C8 PFOS	93.4		20 - 150
13C8 FOSA	89.8		20 - 150
d3-NMeFOSAA	102		20 - 150
d5-NEtFOSAA	94.1		20 - 150
M2-4:2 FTS	111		20 - 150
M2-6:2 FTS	119		20 - 150
M2-8:2 FTS	117		20 - 150
13C3 HFPO-DA	92.1		20 - 150
d7-N-MeFOSE-M	85.2		20 - 150
d9-N-EtFOSE-M	83.7		20 - 150
d5-NEtPFOSA	71.7		20 - 150
d3-NMePFOSA	73.3		20 - 150

Lab Sample ID: LB 410-428846/1-C
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: SPLP East
Prep Batch: 431999

Analyte	LB Result	LB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.1	U	8.5	4.1	1.8	ng/L		10/22/23 23:23	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8.1	U	8.5	8.1	2.7	ng/L		10/22/23 23:23	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	8.2	U	8.5	8.2	2.8	ng/L		10/22/23 23:23	1
DONA	4.1	U	8.5	4.1	1.6	ng/L		10/22/23 23:23	1
HFPODA	4.3	U	8.5	4.3	2.1	ng/L		10/22/23 23:23	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.1	U	8.5	4.1	1.1	ng/L		10/22/23 23:23	1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.1	U	8.5	8.1	2.1	ng/L		10/22/23 23:23	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.3	U	11	5.3	1.6	ng/L		10/22/23 23:23	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U	21	11	5.3	ng/L		10/22/23 23:23	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	27	U	53	27	11	ng/L		10/22/23 23:23	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.5	U	2.1	1.5	0.75	ng/L		10/22/23 23:23	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	27	U	53	27	11	ng/L		10/22/23 23:23	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U	21	11	5.3	ng/L		10/22/23 23:23	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.6	U	4.3	2.6	1.3	ng/L		10/22/23 23:23	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LB 410-428846/1-C
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: SPLP East
Prep Batch: 431999

Analyte	LB Result	LB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U	4.3	2.1	1.1	ng/L		10/22/23 23:23	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U	4.3	1.9	0.53	ng/L		10/22/23 23:23	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U	4.3	2.1	0.53	ng/L		10/22/23 23:23	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U	4.3	2.1	1.1	ng/L		10/22/23 23:23	1
Perfluorobutanesulfonic acid (PFBS)	1.1	U	2.1	1.1	0.32	ng/L		10/22/23 23:23	1
Perfluorobutanoic acid (PFBA)	4.3	U	8.5	4.3	2.1	ng/L		10/22/23 23:23	1
Perfluorodecanesulfonic acid (PFDS)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorodecanoic acid (PFDA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U	2.1	2.0	0.96	ng/L		10/22/23 23:23	1
Perfluorododecanoic acid (PFDoA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluoroheptanesulfonic acid (PFHpS)	1.1	U	2.1	1.1	0.43	ng/L		10/22/23 23:23	1
Perfluoroheptanoic acid (PFHpA)	1.1	U	2.1	1.1	0.55	ng/L		10/22/23 23:23	1
Perfluorohexanesulfonic acid (PFHxS)	1.2	U	2.1	1.2	0.61	ng/L		10/22/23 23:23	1
Perfluorohexanoic acid (PFHxA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorononanesulfonic acid (PFNS)	1.1	U	2.1	1.1	0.43	ng/L		10/22/23 23:23	1
Perfluorononanoic acid (PFNA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorooctanesulfonamide (FOSA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorooctanesulfonic acid (PFOS)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorooctanoic acid (PFOA)	1.4	U	2.1	1.4	0.68	ng/L		10/22/23 23:23	1
Perfluoropentanesulfonic acid (PFPeS)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluoropentanoic acid (PFPeA)	2.1	U	4.3	2.1	1.1	ng/L		10/22/23 23:23	1
Perfluorotetradecanoic acid (PFTA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluorotridecanoic acid (PFTriA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1
Perfluoroundecanoic acid (PFUnA)	1.1	U	2.1	1.1	0.53	ng/L		10/22/23 23:23	1

Isotope Dilution	*LB %Recovery*	*LB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2-PFDoDA	*88.7*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C4 PFBA	*83.5*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C5 PFPeA	*71.3*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C5 PFHxA	*89.2*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C4 PFHpA	*87.4*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C8 PFOA	*82.5*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C9 PFNA	*81.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C6 PFDA	*85.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C7 PFUnA	*86.9*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C2 PFTeDA	*76.1*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C3 PFBS	*78.7*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C3 PFHxS	*82.7*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C8 PFOS	*82.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C8 FOSA	*73.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
d3-NMeFOSAA	*75.1*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
d5-NEtFOSAA	*77.5*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
M2-4:2 FTS	*95.1*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
M2-6:2 FTS	*99.0*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
M2-8:2 FTS	*102*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*
13C3 HFPO-DA	*78.6*		*20 - 150*	*10/17/23 07:00*	*10/22/23 23:23*	*1*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LB 410-428846/1-C
Matrix: Solid
Analysis Batch: 434262

Client Sample ID: Method Blank
Prep Type: SPLP East
Prep Batch: 431999

Isotope Dilution	LB %Recovery	LB Qualifier	Limits	Prepared	Analyzed	Dil Fac
d7-N-MeFOSE-M	50.1		20 - 150	10/17/23 07:00	10/22/23 23:23	1
d9-N-EtFOSE-M	47.8		20 - 150	10/17/23 07:00	10/22/23 23:23	1
d5-NEtPFOSA	56.9		20 - 150	10/17/23 07:00	10/22/23 23:23	1
d3-NMePFOSA	60.1		20 - 150	10/17/23 07:00	10/22/23 23:23	1

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 437441

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: SPLP East
Prep Batch: 431999

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	4.7	U cn	118	138	cn	ng/L		117	40 - 150
Perfluoropentanoic acid (PFPeA)	4.9	cn	58.8	71.3	cn	ng/L		113	40 - 150
Perfluorohexanoic acid (PFHxA)	22	FH cn	29.4	56.5	cn	ng/L		117	40 - 150
Perfluoroheptanoic acid (PFHpA)	13	cn	29.4	46.5	cn	ng/L		113	40 - 150
Perfluorooctanoic acid (PFOA)	58	FH cn	29.4	107	FH cn	ng/L		166	40 - 150
Perfluorononanoic acid (PFNA)	19	cn	29.4	58.2	cn	ng/L		134	40 - 150
Perfluorodecanoic acid (PFDA)	4.3	FH cn	29.4	47.4	cn	ng/L		147	40 - 150
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	29.4	36.0	cn	ng/L		122	40 - 150
Perfluorododecanoic acid (PFDoA)	1.2	U FL cn	29.4	36.2	cn	ng/L		123	40 - 150
Perfluorotridecanoic acid (PFTriA)	1.2	U F2 cn	29.4	39.0	cn	ng/L		133	40 - 150
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	29.4	41.3	cn	ng/L		141	40 - 150
Perfluorobutanesulfonic acid (PFBS)	0.72	J cn	26.1	32.6	cn	ng/L		122	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	2.5	cn	27.6	33.4	cn	ng/L		112	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	160	cn	26.8	165	4 cn	ng/L		34	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	65	cn	28.0	98.2	cn	ng/L		118	40 - 150
Perfluorooctanesulfonic acid (PFOS)	11000	E M cn	27.3	10100	E 4 M cn	ng/L		-3507	40 - 150
Perfluorononanesulfonic acid (PFNS)	4.2	FH cn	28.3	45.1	cn	ng/L		145	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	28.5	34.8	cn	ng/L		122	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.5	U cn	110	123	cn	ng/L		111	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	55	cn	112	149	cn	ng/L		84	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1300	E cn	113	1420	E 4 cn	ng/L		61	40 - 150
Perfluorooctanesulfonamide (FOSA)	420	cn	29.4	423	4 cn	ng/L		8	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	29.4	37.5	cn	ng/L		128	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	8.0	I cn	29.4	42.9	cn	ng/L		119	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	29.4	36.8	cn	ng/L		125	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 437441

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: SPLP East
Prep Batch: 431999

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.7	U FH cn	29.4	43.7	cn	ng/L		149	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	294	371	cn	ng/L		126	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	294	411	cn	ng/L		140	40 - 150
HFPODA	4.7	U cn	117	132	cn	ng/L		113	40 - 150
DONA	4.5	U cn	111	146	cn	ng/L		132	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.4	U cn	58.8	66.6	cn	ng/L		113	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.4	U cn	58.8	68.9	cn	ng/L		117	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.5	U cn	110	138	cn	ng/L		126	40 - 150
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.0	U cn	111	108	cn	ng/L		97	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	52.3	62.5	cn	ng/L		119	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.9	U cn	147	174	cn	ng/L		118	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	734	918	cn	ng/L		125	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	734	864	cn	ng/L		118	40 - 150
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	28.3	39.0	cn	ng/L		138	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.4	U cn	58.8	71.5	cn	ng/L		122	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2-PFDoDA	*73.3*	*M cn*	*20 - 150*
13C4 PFBA	*91.0*	*cn*	*20 - 150*
13C5 PFPeA	*99.1*	*cn*	*20 - 150*
13C5 PFHxA	*93.4*	*cn*	*20 - 150*
13C4 PFHpA	*98.3*	*cn*	*20 - 150*
13C8 PFOA	*95.2*	*cn*	*20 - 150*
13C9 PFNA	*89.3*	*cn*	*20 - 150*
13C6 PFDA	*86.3*	*cn*	*20 - 150*
13C7 PFUnA	*86.8*	*cn*	*20 - 150*
13C2 PFTeDA	*61.6*	*cn*	*20 - 150*
13C3 PFBS	*87.9*	*cn*	*20 - 150*
13C3 PFHxS	*89.3*	*cn*	*20 - 150*
13C8 PFOS	*94.9*	*cn*	*20 - 150*
13C8 FOSA	*116*	*cn*	*20 - 150*
d3-NMeFOSAA	*113*	*cn*	*20 - 150*
d5-NEtFOSAA	*56.0*	*cn*	*20 - 150*
M2-4:2 FTS	*94.9*	*cn*	*20 - 150*
M2-6:2 FTS	*102*	*cn*	*20 - 150*
M2-8:2 FTS	*97.8*	*cn*	*20 - 150*
13C3 HFPO-DA	*92.8*	*cn*	*20 - 150*
d7-N-MeFOSE-M	*91.7*	*cn*	*20 - 150*
d9-N-EtFOSE-M	*82.0*	*cn*	*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MS
Matrix: Solid
Analysis Batch: 437441

Client Sample ID: 31SB-MS-23-02-19-20
Prep Type: SPLP East
Prep Batch: 431999

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
d5-NEtPFOSA	*79.4*	*cn*	*20 - 150*
d3-NMePFOSA	*82.8*	*cn*	*20 - 150*

Lab Sample ID: 410-142725-8 MSD
Matrix: Solid
Analysis Batch: 437441

Client Sample ID: 31SB-MSD-23-02-19-20
Prep Type: SPLP East
Prep Batch: 431999

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	4.7	U cn	118	142	cn	ng/L		120	40 - 150	3	30
Perfluoropentanoic acid (PFPeA)	4.9	cn	59.0	75.6	cn	ng/L		120	40 - 150	6	30
Perfluorohexanoic acid (PFHxA)	22	FH cn	29.5	68.7	FH cn	ng/L		158	40 - 150	19	30
Perfluoroheptanoic acid (PFHpA)	13	cn	29.5	51.0	cn	ng/L		128	40 - 150	9	30
Perfluorooctanoic acid (PFOA)	58	FH cn	29.5	96.5	cn	ng/L		129	40 - 150	10	30
Perfluorononanoic acid (PFNA)	19	cn	29.5	51.5	cn	ng/L		111	40 - 150	12	30
Perfluorodecanoic acid (PFDA)	4.3	FH cn	29.5	49.3	FH cn	ng/L		153	40 - 150	4	30
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	29.5	38.7	cn	ng/L		131	40 - 150	7	30
Perfluorododecanoic acid (PFDoA)	1.2	U FL cn	29.5	36.0	cn	ng/L		122	40 - 150	0	30
Perfluorotridecanoic acid (PFTriA)	1.2	U F2 cn	29.5	36.1	cn	ng/L		123	40 - 150	8	30
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	29.5	36.5	cn	ng/L		124	40 - 150	12	30
Perfluorobutanesulfonic acid (PFBS)	0.72	J cn	26.1	27.8	cn	ng/L		103	40 - 150	16	30
Perfluoropentanesulfonic acid (PFPeS)	2.5	cn	27.7	34.0	cn	ng/L		114	40 - 150	2	30
Perfluorohexanesulfonic acid (PFHxS)	160	cn	26.9	184	4 cn	ng/L		106	40 - 150	11	30
Perfluoroheptanesulfonic acid (PFHpS)	65	cn	28.1	95.8	cn	ng/L		109	40 - 150	3	30
Perfluorooctanesulfonic acid (PFOS)	11000	E M cn	27.4	10900	E 4 M cn	ng/L		-636	40 - 150	7	30
Perfluorononanesulfonic acid (PFNS)	4.2	FH cn	28.4	48.8	FH cn	ng/L		157	40 - 150	8	30
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	28.6	42.8	cn	ng/L		150	40 - 150	20	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.5	U cn	111	112	cn	ng/L		102	40 - 150	9	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	55	cn	112	194	cn	ng/L		124	40 - 150	26	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1300	E cn	113	1730	E 4 cn	ng/L		335	40 - 150	20	30
Perfluorooctanesulfonamide (FOSA)	420	cn	29.5	557	4 cn	ng/L		465	40 - 150	27	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	29.5	37.2	cn	ng/L		126	40 - 150	1	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	8.0	I cn	29.5	42.6	cn	ng/L		118	40 - 150	1	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	29.5	34.1	cn	ng/L		116	40 - 150	8	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.7	U FH cn	29.5	47.7	FH cn	ng/L		162	40 - 150	9	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-142725-8 MSD
Matrix: Solid
Analysis Batch: 437441

Client Sample ID: 31SB-MSD-23-02-19-20
Prep Type: SPLP East
Prep Batch: 431999

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	295	360	cn	ng/L		122	40 - 150	3	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	295	386	cn	ng/L		131	40 - 150	6	30
HFPODA	4.7	U cn	118	129	cn	ng/L		110	40 - 150	2	30
DONA	4.5	U cn	111	145	cn	ng/L		131	40 - 150	1	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.4	U cn	59.0	67.8	cn	ng/L		115	40 - 150	2	30
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.4	U cn	59.0	70.5	cn	ng/L		120	40 - 150	2	30
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.5	U cn	110	142	cn	ng/L		129	40 - 150	3	30
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.0	U cn	111	118	cn	ng/L		106	40 - 150	9	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	52.5	65.8	cn	ng/L		125	40 - 150	5	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.9	U cn	147	177	cn	ng/L		120	40 - 150	2	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	737	905	cn	ng/L		123	40 - 150	1	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	737	859	cn	ng/L		117	40 - 150	1	30
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	28.4	41.7	cn	ng/L		147	40 - 150	7	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.4	U cn	59.0	72.7	cn	ng/L		123	40 - 150	2	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2-PFDoDA	*83.1*	*M cn*	*20 - 150*
13C4 PFBA	*92.3*	*cn*	*20 - 150*
13C5 PFPeA	*93.0*	*cn*	*20 - 150*
13C5 PFHxA	*92.0*	*cn*	*20 - 150*
13C4 PFHpA	*98.1*	*cn*	*20 - 150*
13C8 PFOA	*98.4*	*cn*	*20 - 150*
13C9 PFNA	*91.9*	*cn*	*20 - 150*
13C6 PFDA	*87.8*	*cn*	*20 - 150*
13C7 PFUnA	*90.6*	*cn*	*20 - 150*
13C2 PFTeDA	*90.1*	*cn*	*20 - 150*
13C3 PFBS	*92.2*	*cn*	*20 - 150*
13C3 PFHxS	*87.8*	*cn*	*20 - 150*
13C8 PFOS	*88.9*	*cn*	*20 - 150*
13C8 FOSA	*114*	*cn*	*20 - 150*
d3-NMeFOSAA	*119*	*cn*	*20 - 150*
d5-NEtFOSAA	*57.2*	*cn*	*20 - 150*
M2-4:2 FTS	*97.7*	*cn*	*20 - 150*
M2-6:2 FTS	*89.7*	*cn*	*20 - 150*
M2-8:2 FTS	*93.1*	*cn*	*20 - 150*
13C3 HFPO-DA	*88.4*	*cn*	*20 - 150*
d7-N-MeFOSE-M	*103*	*cn*	*20 - 150*
d9-N-EtFOSE-M	*99.1*	*cn*	*20 - 150*
d5-NEtPFOSA	*89.2*	*cn*	*20 - 150*
d3-NMePFOSA	*88.2*	*cn*	*20 - 150*

LCMS

Prep Batch: 420998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1 - DL	31SB-23-08-11-12	Total/NA	Solid	1633 Shake	
410-142725-1 - RA	31SB-23-08-11-12	Total/NA	Solid	1633 Shake	
410-142725-1	31SB-23-08-11-12	Total/NA	Solid	1633 Shake	
410-142725-2	31SB-23-05-13-14	Total/NA	Solid	1633 Shake	
410-142725-2 - DL	31SB-23-05-13-14	Total/NA	Solid	1633 Shake	
410-142725-3 - RA	31SB-23-07-50-51	Total/NA	Solid	1633 Shake	
410-142725-3	31SB-23-07-50-51	Total/NA	Solid	1633 Shake	
410-142725-3 - DL	31SB-23-07-50-51	Total/NA	Solid	1633 Shake	
410-142725-4 - DL	31SB-23-04-2-3	Total/NA	Solid	1633 Shake	
410-142725-4 - RA	31SB-23-04-2-3	Total/NA	Solid	1633 Shake	
410-142725-4	31SB-23-04-2-3	Total/NA	Solid	1633 Shake	
410-142725-5	31SB-23-06-19-20	Total/NA	Solid	1633 Shake	
410-142725-5 - RA	31SB-23-06-19-20	Total/NA	Solid	1633 Shake	
410-142725-5 - DL	31SB-23-06-19-20	Total/NA	Solid	1633 Shake	
410-142725-6 - DL	31SB-23-01-13-14	Total/NA	Solid	1633 Shake	
410-142725-6	31SB-23-01-13-14	Total/NA	Solid	1633 Shake	
410-142725-7 - DL	31SB-23-03-33-34	Total/NA	Solid	1633 Shake	
410-142725-7	31SB-23-03-33-34	Total/NA	Solid	1633 Shake	
410-142725-8	31SB-23-02-19-20	Total/NA	Solid	1633 Shake	
410-142725-8 - DL	31SB-23-02-19-20	Total/NA	Solid	1633 Shake	
410-142725-9	31SB-DUP-23	Total/NA	Solid	1633 Shake	
410-142725-9 - DL	31SB-DUP-23	Total/NA	Solid	1633 Shake	
MB 410-420998/1-A	Method Blank	Total/NA	Solid	1633 Shake	
LCS 410-420998/2-A	Lab Control Sample	Total/NA	Solid	1633 Shake	
LLCS 410-420998/3-A	Lab Control Sample	Total/NA	Solid	1633 Shake	
410-142725-8 MS	31SB-MS-23-02-19-20	Total/NA	Solid	1633 Shake	
410-142725-8 MSD	31SB-MSD-23-02-19-20	Total/NA	Solid	1633 Shake	

Leach Batch: 428846

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1 - DL	31SB-23-08-11-12	SPLP East	Solid	1312	
410-142725-1	31SB-23-08-11-12	SPLP East	Solid	1312	
410-142725-2	31SB-23-05-13-14	SPLP East	Solid	1312	
410-142725-2 - DL	31SB-23-05-13-14	SPLP East	Solid	1312	
410-142725-2 - DL2	31SB-23-05-13-14	SPLP East	Solid	1312	
410-142725-3	31SB-23-07-50-51	SPLP East	Solid	1312	
410-142725-3 - DL	31SB-23-07-50-51	SPLP East	Solid	1312	
410-142725-4	31SB-23-04-2-3	SPLP East	Solid	1312	
410-142725-4 - DL	31SB-23-04-2-3	SPLP East	Solid	1312	
410-142725-5	31SB-23-06-19-20	SPLP East	Solid	1312	
410-142725-5 - DL2	31SB-23-06-19-20	SPLP East	Solid	1312	
410-142725-5 - DL	31SB-23-06-19-20	SPLP East	Solid	1312	
410-142725-6	31SB-23-01-13-14	SPLP East	Solid	1312	
410-142725-6 - DL	31SB-23-01-13-14	SPLP East	Solid	1312	
410-142725-6 - DL2	31SB-23-01-13-14	SPLP East	Solid	1312	
410-142725-7	31SB-23-03-33-34	SPLP East	Solid	1312	
410-142725-7 - DL	31SB-23-03-33-34	SPLP East	Solid	1312	
410-142725-8	31SB-23-02-19-20	SPLP East	Solid	1312	
410-142725-8 - DL	31SB-23-02-19-20	SPLP East	Solid	1312	
410-142725-8 - DL2	31SB-23-02-19-20	SPLP East	Solid	1312	
410-142725-9 - DL2	31SB-DUP-23	SPLP East	Solid	1312	

LCMS (Continued)

Leach Batch: 428846 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-9	31SB-DUP-23	SPLP East	Solid	1312	
410-142725-9 - DL	31SB-DUP-23	SPLP East	Solid	1312	
LB 410-428846/1-C	Method Blank	SPLP East	Solid	1312	
410-142725-8 MS	31SB-MS-23-02-19-20	SPLP East	Solid	1312	
410-142725-8 MSD	31SB-MSD-23-02-19-20	SPLP East	Solid	1312	

Analysis Batch: 430901

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1	31SB-23-08-11-12	Total/NA	Solid	1633	420998
410-142725-1 - RA	31SB-23-08-11-12	Total/NA	Solid	1633	420998
410-142725-1 - DL	31SB-23-08-11-12	Total/NA	Solid	1633	420998
410-142725-2	31SB-23-05-13-14	Total/NA	Solid	1633	420998
410-142725-2 - DL	31SB-23-05-13-14	Total/NA	Solid	1633	420998
410-142725-3	31SB-23-07-50-51	Total/NA	Solid	1633	420998
410-142725-3 - RA	31SB-23-07-50-51	Total/NA	Solid	1633	420998
410-142725-3 - DL	31SB-23-07-50-51	Total/NA	Solid	1633	420998
410-142725-4	31SB-23-04-2-3	Total/NA	Solid	1633	420998
410-142725-5	31SB-23-06-19-20	Total/NA	Solid	1633	420998
410-142725-5 - RA	31SB-23-06-19-20	Total/NA	Solid	1633	420998
410-142725-6	31SB-23-01-13-14	Total/NA	Solid	1633	420998
410-142725-6 - DL	31SB-23-01-13-14	Total/NA	Solid	1633	420998
410-142725-7	31SB-23-03-33-34	Total/NA	Solid	1633	420998
410-142725-7 - DL	31SB-23-03-33-34	Total/NA	Solid	1633	420998
410-142725-8	31SB-23-02-19-20	Total/NA	Solid	1633	420998
410-142725-8 - DL	31SB-23-02-19-20	Total/NA	Solid	1633	420998
410-142725-9	31SB-DUP-23	Total/NA	Solid	1633	420998
410-142725-9 - DL	31SB-DUP-23	Total/NA	Solid	1633	420998
MB 410-420998/1-A	Method Blank	Total/NA	Solid	1633	420998
LLCS 410-420998/3-A	Lab Control Sample	Total/NA	Solid	1633	420998
410-142725-8 MS	31SB-MS-23-02-19-20	Total/NA	Solid	1633	420998
410-142725-8 MSD	31SB-MSD-23-02-19-20	Total/NA	Solid	1633	420998

Analysis Batch: 431905

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-4 - RA	31SB-23-04-2-3	Total/NA	Solid	1633	420998
410-142725-4 - DL	31SB-23-04-2-3	Total/NA	Solid	1633	420998
410-142725-5 - DL	31SB-23-06-19-20	Total/NA	Solid	1633	420998
LCS 410-420998/2-A	Lab Control Sample	Total/NA	Solid	1633	420998

Prep Batch: 431999

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1	31SB-23-08-11-12	SPLP East	Solid	1633	428846
410-142725-1 - DL	31SB-23-08-11-12	SPLP East	Solid	1633	428846
410-142725-2 - DL	31SB-23-05-13-14	SPLP East	Solid	1633	428846
410-142725-2 - DL2	31SB-23-05-13-14	SPLP East	Solid	1633	428846
410-142725-2	31SB-23-05-13-14	SPLP East	Solid	1633	428846
410-142725-3 - DL	31SB-23-07-50-51	SPLP East	Solid	1633	428846
410-142725-3	31SB-23-07-50-51	SPLP East	Solid	1633	428846
410-142725-4 - DL	31SB-23-04-2-3	SPLP East	Solid	1633	428846
410-142725-4	31SB-23-04-2-3	SPLP East	Solid	1633	428846
410-142725-5	31SB-23-06-19-20	SPLP East	Solid	1633	428846

LCMS (Continued)

Prep Batch: 431999 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-5 - DL2	31SB-23-06-19-20	SPLP East	Solid	1633	428846
410-142725-5 - DL	31SB-23-06-19-20	SPLP East	Solid	1633	428846
410-142725-6 - DL	31SB-23-01-13-14	SPLP East	Solid	1633	428846
410-142725-6	31SB-23-01-13-14	SPLP East	Solid	1633	428846
410-142725-6 - DL2	31SB-23-01-13-14	SPLP East	Solid	1633	428846
410-142725-7 - DL	31SB-23-03-33-34	SPLP East	Solid	1633	428846
410-142725-7	31SB-23-03-33-34	SPLP East	Solid	1633	428846
410-142725-8 - DL	31SB-23-02-19-20	SPLP East	Solid	1633	428846
410-142725-8	31SB-23-02-19-20	SPLP East	Solid	1633	428846
410-142725-8 - DL2	31SB-23-02-19-20	SPLP East	Solid	1633	428846
410-142725-9 - DL2	31SB-DUP-23	SPLP East	Solid	1633	428846
410-142725-9 - DL	31SB-DUP-23	SPLP East	Solid	1633	428846
410-142725-9	31SB-DUP-23	SPLP East	Solid	1633	428846
LB 410-428846/1-C	Method Blank	SPLP East	Solid	1633	428846
MB 410-431999/1-A	Method Blank	Total/NA	Solid	1633	
LCS 410-431999/2-A	Lab Control Sample	Total/NA	Solid	1633	
LLCS 410-431999/3-A	Lab Control Sample	Total/NA	Solid	1633	
410-142725-8 MS	31SB-MS-23-02-19-20	SPLP East	Solid	1633	428846
410-142725-8 MSD	31SB-MSD-23-02-19-20	SPLP East	Solid	1633	428846

Analysis Batch: 434262

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1	31SB-23-08-11-12	SPLP East	Solid	1633	431999
410-142725-2	31SB-23-05-13-14	SPLP East	Solid	1633	431999
410-142725-3	31SB-23-07-50-51	SPLP East	Solid	1633	431999
LB 410-428846/1-C	Method Blank	SPLP East	Solid	1633	431999
MB 410-431999/1-A	Method Blank	Total/NA	Solid	1633	431999
LCS 410-431999/2-A	Lab Control Sample	Total/NA	Solid	1633	431999
LLCS 410-431999/3-A	Lab Control Sample	Total/NA	Solid	1633	431999

Prep Batch: 434335

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1 - RE	31SB-23-08-11-12	Total/NA	Solid	1633 Shake	
410-142725-3 - RE	31SB-23-07-50-51	Total/NA	Solid	1633 Shake	
MB 410-434335/1-A	Method Blank	Total/NA	Solid	1633 Shake	
LCS 410-434335/2-A	Lab Control Sample	Total/NA	Solid	1633 Shake	
LLCS 410-434335/3-A	Lab Control Sample	Total/NA	Solid	1633 Shake	

Analysis Batch: 434685

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1 - DL	31SB-23-08-11-12	SPLP East	Solid	1633	431999
410-142725-1 - RE	31SB-23-08-11-12	Total/NA	Solid	1633	434335
410-142725-2 - DL	31SB-23-05-13-14	SPLP East	Solid	1633	431999
410-142725-2 - DL2	31SB-23-05-13-14	SPLP East	Solid	1633	431999
410-142725-3 - DL	31SB-23-07-50-51	SPLP East	Solid	1633	431999
410-142725-3 - RE	31SB-23-07-50-51	Total/NA	Solid	1633	434335
MB 410-434335/1-A	Method Blank	Total/NA	Solid	1633	434335
LCS 410-434335/2-A	Lab Control Sample	Total/NA	Solid	1633	434335
LLCS 410-434335/3-A	Lab Control Sample	Total/NA	Solid	1633	434335

QC Association Summary

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

LCMS

Analysis Batch: 437441

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-4	31SB-23-04-2-3	SPLP East	Solid	1633	431999
410-142725-4 - DL	31SB-23-04-2-3	SPLP East	Solid	1633	431999
410-142725-5	31SB-23-06-19-20	SPLP East	Solid	1633	431999
410-142725-5 - DL	31SB-23-06-19-20	SPLP East	Solid	1633	431999
410-142725-6	31SB-23-01-13-14	SPLP East	Solid	1633	431999
410-142725-6 - DL	31SB-23-01-13-14	SPLP East	Solid	1633	431999
410-142725-7	31SB-23-03-33-34	SPLP East	Solid	1633	431999
410-142725-7 - DL	31SB-23-03-33-34	SPLP East	Solid	1633	431999
410-142725-8	31SB-23-02-19-20	SPLP East	Solid	1633	431999
410-142725-8 - DL	31SB-23-02-19-20	SPLP East	Solid	1633	431999
410-142725-8 - DL2	31SB-23-02-19-20	SPLP East	Solid	1633	431999
410-142725-9	31SB-DUP-23	SPLP East	Solid	1633	431999
410-142725-9 - DL	31SB-DUP-23	SPLP East	Solid	1633	431999
410-142725-8 MS	31SB-MS-23-02-19-20	SPLP East	Solid	1633	431999
410-142725-8 MSD	31SB-MSD-23-02-19-20	SPLP East	Solid	1633	431999

Analysis Batch: 438043

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-5 - DL2	31SB-23-06-19-20	SPLP East	Solid	1633	431999
410-142725-6 - DL2	31SB-23-01-13-14	SPLP East	Solid	1633	431999
410-142725-9 - DL2	31SB-DUP-23	SPLP East	Solid	1633	431999

General Chemistry

Analysis Batch: 420500

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-142725-1	31SB-23-08-11-12	Total/NA	Solid	Moisture	
410-142725-2	31SB-23-05-13-14	Total/NA	Solid	Moisture	
410-142725-3	31SB-23-07-50-51	Total/NA	Solid	Moisture	
410-142725-4	31SB-23-04-2-3	Total/NA	Solid	Moisture	
410-142725-5	31SB-23-06-19-20	Total/NA	Solid	Moisture	
410-142725-6	31SB-23-01-13-14	Total/NA	Solid	Moisture	
410-142725-7	31SB-23-03-33-34	Total/NA	Solid	Moisture	
410-142725-8	31SB-23-02-19-20	Total/NA	Solid	Moisture	
410-142725-9	31SB-DUP-23	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-08-11-12
Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	434262	UCD3	ELLE	10/22/23 23:35
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	434685	UUV6	ELLE	10/24/23 16:08
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-08-11-12
Date Collected: 09/11/23 12:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-1
Matrix: Solid
Percent Solids: 95.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake	RE		434335	BX2W	ELLE	10/23/23 07:32
Total/NA	Analysis	1633	RE	1	434685	UUV6	ELLE	10/24/23 23:19
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/13/23 23:31
Total/NA	Prep	1633 Shake	RA		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	RA	1	430901	UCD3	ELLE	10/13/23 23:44
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/13/23 23:57

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	434262	UCD3	ELLE	10/22/23 23:47
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	434685	UUV6	ELLE	10/24/23 16:20
SPLP East	Leach	1312	DL2		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL2		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL2	100	434685	UUV6	ELLE	10/24/23 19:09
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid
Percent Solids: 96.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 00:10

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-05-13-14
Date Collected: 09/11/23 13:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-2
Matrix: Solid
Percent Solids: 96.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 00:23

Client Sample ID: 31SB-23-07-50-51
Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	434262	UCD3	ELLE	10/22/23 23:59
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	434685	UUV6	ELLE	10/24/23 16:32
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-07-50-51
Date Collected: 09/11/23 14:10
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-3
Matrix: Solid
Percent Solids: 94.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake	RE		434335	BX2W	ELLE	10/23/23 07:32
Total/NA	Analysis	1633	RE	1	434685	UUV6	ELLE	10/24/23 23:31
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 00:36
Total/NA	Prep	1633 Shake	RA		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	RA	1	430901	UCD3	ELLE	10/14/23 00:49
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 01:03

Client Sample ID: 31SB-23-04-2-3
Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 09:02
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 09:14
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-04-2-3
Date Collected: 09/11/23 15:05
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-4
Matrix: Solid
Percent Solids: 97.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 01:16
Total/NA	Prep	1633 Shake	RA		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	RA	1	431905	UUV6	ELLE	10/17/23 06:07
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	431905	UUV6	ELLE	10/17/23 06:20

Client Sample ID: 31SB-23-06-19-20
Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 09:26
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 09:38
SPLP East	Leach	1312	DL2		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL2		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL2	100	438043	UCD3	ELLE	11/01/23 18:23
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-06-19-20
Date Collected: 09/12/23 11:30
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-5
Matrix: Solid
Percent Solids: 92.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 01:29
Total/NA	Prep	1633 Shake	RA		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	RA	1	430901	UCD3	ELLE	10/14/23 02:08
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	100	431905	UUV6	ELLE	10/17/23 05:54

Client Sample ID: 31SB-23-01-13-14
Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 09:51
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 10:03

Client Sample ID: 31SB-23-01-13-14
Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312	DL2		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL2		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL2	100	438043	UCD3	ELLE	11/01/23 18:35
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-01-13-14
Date Collected: 09/12/23 14:15
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-6
Matrix: Solid
Percent Solids: 95.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 02:47
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 03:00

Client Sample ID: 31SB-23-03-33-34
Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 10:15
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 10:27
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-03-33-34
Date Collected: 09/13/23 08:45
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-7
Matrix: Solid
Percent Solids: 97.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 03:13
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 03:27

Client Sample ID: 31SB-23-02-19-20
Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 10:39

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Client Sample ID: 31SB-23-02-19-20
Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 11:15
SPLP East	Leach	1312	DL2		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL2		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL2	100	437441	UUV6	ELLE	10/31/23 11:27
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-23-02-19-20
Date Collected: 09/13/23 09:55
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-8
Matrix: Solid
Percent Solids: 91.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 03:40
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 03:53

Client Sample ID: 31SB-DUP-23
Date Collected: 09/11/23 00:00
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-9
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
SPLP East	Leach	1312			428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633			431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633		1	437441	UUV6	ELLE	10/31/23 12:03
SPLP East	Leach	1312	DL		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL	10	437441	UUV6	ELLE	10/31/23 12:15
SPLP East	Leach	1312	DL2		428846	UNWS	ELLE	10/09/23 12:00 - 10/10/23 06:00 [1]
SPLP East	Prep	1633	DL2		431999	BX2W	ELLE	10/17/23 07:00
SPLP East	Analysis	1633	DL2	100	438043	UCD3	ELLE	11/01/23 18:47
Total/NA	Analysis	Moisture		1	420500	UVJN	ELLE	09/18/23 09:12

Client Sample ID: 31SB-DUP-23
Date Collected: 09/11/23 00:00
Date Received: 09/14/23 10:10

Lab Sample ID: 410-142725-9
Matrix: Solid
Percent Solids: 95.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633 Shake			420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633		1	430901	UCD3	ELLE	10/14/23 04:58
Total/NA	Prep	1633 Shake	DL		420998	BX2W	ELLE	09/19/23 08:46
Total/NA	Analysis	1633	DL	10	430901	UCD3	ELLE	10/14/23 05:11

[1] This procedure uses a method stipulated length of time for the process. Both start and end times are displayed.

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Seres Engineering & Services LLC
Job ID: 410-142725-1
Project/Site: AOC 31

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
Moisture		Solid	Percent Moisture

Method Summary

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Method	Method Description	Protocol	Laboratory
1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	ELLE
Moisture	Percent Moisture	EPA	ELLE
1312	SPLP Extraction	SW846	ELLE
1633	Solid-Phase Extraction (SPE)	EPA	ELLE
1633 Shake	Shake Extraction with SPE	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Seres Engineering & Services LLC
Project/Site: AOC 31

Job ID: 410-142725-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-142725-1	31SB-23-08-11-12	Solid	09/11/23 12:15	09/14/23 10:10
410-142725-2	31SB-23-05-13-14	Solid	09/11/23 13:15	09/14/23 10:10
410-142725-3	31SB-23-07-50-51	Solid	09/11/23 14:10	09/14/23 10:10
410-142725-4	31SB-23-04-2-3	Solid	09/11/23 15:05	09/14/23 10:10
410-142725-5	31SB-23-06-19-20	Solid	09/12/23 11:30	09/14/23 10:10
410-142725-6	31SB-23-01-13-14	Solid	09/12/23 14:15	09/14/23 10:10
410-142725-7	31SB-23-03-33-34	Solid	09/13/23 08:45	09/14/23 10:10
410-142725-8	31SB-23-02-19-20	Solid	09/13/23 09:55	09/14/23 10:10
410-142725-9	31SB-DUP-23	Solid	09/11/23 00:00	09/14/23 10:10

Eurofins Lancaster Laboratories Environme
2425 New Holland Pike
Lancaster, PA 17601
Phone: 717-656-2300 Fax: 717-656-2681

Chain of C

410-142725 Chain of Custody

eurofins | Environment Testing

Client Information	Sampler: Spencer Gust		Carrier Tracking No(s):	COC No: 410-94491-26756.1
Client Contact: Heather Levesque	Phone: 616.834.8108	E-mail: Kerri Sachtleben@et.eurofinsus.com	State of Origin:	Page: Page 1 of 2
Company: Seres Engineering & Services LLC	PWSID:			Job #:
Address: 669 Marina Drive Suite B7	Due Date Requested:			
City: Charleston	TAT Requested (days): Standard			
State, Zip: SC, 29492	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 2019 - 00000002			
Email: halevesque@seres-es com	WO #:			
Project Name:	Project #: 41008470			
Site: AOC 31	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	SPLP 1312	1633_DOD5-List40 transfer 1633 method	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
31SB-23-08-11-12	09/11/2023	12:15	G	S			X	X	2	
31SB-23-05-13-14	09/11/2023	13:15	G	S			X	X	2	
31SB-23-07-50-51	09/11/2023	14:10	G	S			X	X	2	
31SB-23-04-2-3	09/11/2023	15:05	G	S			X	X	2	
31SB-23-06-19-20	09/12/2023	11:30	G	S			X	X	2	11:30 sample time
31SB-23-01-13-14	09/12/2023	14:15	G	S			X	X	2	
31SB-23-03-34-35	09/13/2023	08:45	G	S			X	X		
31SB-23-02-19-20	09/13/2023	09:55	G	S		X	X	X		
31SB-MS-23-02-19-20	09/13/2023	09:55	G	S		X	X	X		
31SB-MSD-23-02-19-20	09/13/2023	09:55	G	S		X	X	X		
31SB-DUP-23	09/11/2023		G	S			X	X		

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	Spencer Gust	09/13/2023 13:00	SERES	FedEx	09/13/2023 17:00	
2						
3					09/14/23 1010	

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: Raw 1.8 - COR 1.8

mB

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Seres Engineering & Services LLC

Job Number: 410-142725-1

Login Number: 142725
List Number: 1
Creator: Ballard, Megan

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable,where thermal pres is required(</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable,where thermal pres is required (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	False	No date or time on COC or containers.
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	False	No date or time on COC or sample containers.
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Heather Levesque
Seres Engineering & Services LLC
669 Marina Drive
Suite B7
Charleston, South Carolina 29492

Generated 12/21/2023 12:39:08 PM

JOB DESCRIPTION

Ft. Devens PFAS

JOB NUMBER

410-150085-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization



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12/21/2023 12:39:08 PM

Authorized for release by
Kerri Sachtleben, Client Services Group Leader
Kerri.Sachtleben@et.eurofinsus.com
(717)556-7376

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.
· QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
· Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
· Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied, except as otherwise agreed. We disclaim any other warranties, expressed or implied, including a warranty of fitness for particular purpose and warranty of merchantability. In no event shall Eurofins Lancaster Laboratories Environmental, LLC be liable for indirect, special, consequential, or incidental damages including, but not limited to, damages for loss of profit or goodwill regardless of (A) the negligence (either sole or concurrent) of Eurofins Lancaster Laboratories Environmental and (B) whether Eurofins Lancaster Laboratories Environmental has been informed of the possibility of such damages. We accept no legal responsibility for the purposes for which the client uses the test results. Except as otherwise agreed, no purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.



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Definitions/Glossary

Client: Seres Engineering & Services LLC
Job ID: 410-150085-1
Project/Site: Ft. Devens PFAS

Qualifiers

LCMS

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
cn	Refer to Case Narrative for further detail
D	The reported value is from a dilution.
E	Result exceeded calibration range.
F2	MS/MSD RPD exceeds control limits
FH	MS and/or MSD recovery above control limits.
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M	Manual integrated compound.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 410-150085-1 — Eurofins Lancaster Laboratories Environment

Job Narrative
410-150085-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Receipt
The samples were received on 11/6/2023 9:35 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.5°C

Receipt Exceptions
A revised COC was submitted by the client to correct the type of sample to grab instead of composite. The revised COC is attached to this report. 31LS-01-NOV23 (410-150085-1), 31LS-01-NOV23 (410-150085-1[MS]), 31LS-01-NOV23 (410-150085-1[MSD]), 31LS-02-NOV23 (410-150085-2), 31LS-03-NOV23 (410-150085-3), 31LS-04-NOV23 (410-150085-4), 31LS-05-NOV23 (410-150085-5), 31LS-06-NOV23 (410-150085-6), 31LS-07-NOV23 (410-150085-7), 31LS-08-NOV23 (410-150085-8), 31LS-08-NOV23 MS (410-150085-8[MS]), 31LS-08-NOV23 MSD (410-150085-8[MSD]) and 31LS-DUP-01-NOV23 (410-150085-9)

PFAS
Method 1633_DOD5: The recovery for target analyte DONA is outside the QC acceptance limits in the closing continuing calibration verification standard. Since the result is high and target DONA is not detected in the following sample: 31LS-DUP-01-NOV23 (410-150085-9), the data is reported.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-01-NOV23 (410-150085-1), 31LS-02-NOV23 (410-150085-2), 31LS-04-NOV23 (410-150085-4), 31LS-05-NOV23 (410-150085-5) and 31LS-07-NOV23 (410-150085-7) due to interference from the sample matrix.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-03-NOV23 (410-150085-3), 31LS-08-NOV23 (410-150085-8) and 31LS-DUP-01-NOV23 (410-150085-9) due to limited sample volume.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-01-NOV23 — Lab Sample ID: 410-150085-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	240	FH cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	76	FH cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	200	M cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	610	cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	730	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	28	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	290	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	180	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	840	cn	40	20	10	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS) - DL	7800	D cn	800	760	250	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	9600	D cn	200	110	57	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1700	D cn	200	100	50	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	8500	D cn	200	130	64	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	15000	D cn	2000	1000	500	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-02-NOV23 — Lab Sample ID: 410-150085-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	660	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	250	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	95	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	210	M cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	120	cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	780	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	36	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	66	M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	930	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	170	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	590	cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3500	D cn	200	110	57	ng/L	10		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-02-NOV23 (Continued)

Lab Sample ID: 410-150085-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanoic acid (PFHxA) - DL	1300	D cn	200	100	50	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	5700	D M cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-03-NOV23

Lab Sample ID: 410-150085-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	260	cn	8.6	8.2	2.7	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	28	cn	8.6	8.3	2.8	ng/L	1		1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.5	J cn	2.1	1.5	0.75	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	80	cn	2.1	1.1	0.32	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	140	cn	8.6	4.3	2.1	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	57	cn	2.1	1.1	0.43	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	8.6	cn	2.1	1.1	0.54	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	17	cn	2.1	1.1	0.54	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	400	D cn	21	11	5.6	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1100	D cn	21	11	5.4	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	490	D cn	21	14	6.9	ng/L	10		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS) - DL	130	D cn	21	11	5.4	ng/L	10		1633	Total/NA
Perfluoropentanoic acid (PFPeA) - DL	350	D cn	43	21	11	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	2100	D cn	210	120	61	ng/L	100		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	2600	D M cn	210	110	54	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-04-NOV23

Lab Sample ID: 410-150085-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	25	J cn	80	38	17	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	390	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	4700	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	67	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	280	M cn	80	40	20	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	26	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	13	J cn	20	10	4.0	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-04-NOV23 (Continued)

Lab Sample ID: 410-150085-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	720	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	980	cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	67	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	670	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	91	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	970	cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1400	D cn	200	100	50	ng/L	10		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	3300	D cn	200	100	50	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	5800	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-05-NOV23

Lab Sample ID: 410-150085-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	270	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1300	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	51	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	110	M cn	80	40	20	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	5.3	J cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	40	cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	470	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	630	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	29	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	800	M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	860	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	62	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	340	cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2400	D cn	200	110	57	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	6200	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-06-NOV23

Lab Sample ID: 410-150085-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	130		7.8	7.4	2.4	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-06-NOV23 (Continued)

Lab Sample ID: 410-150085-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	89		7.8	7.5	2.5	ng/L	1		1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.83	J	1.9	1.4	0.68	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	210		7.8	3.9	1.9	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	0.72	J	1.9	0.97	0.49	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	28		1.9	0.97	0.39	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	13		1.9	0.97	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	53		1.9	0.97	0.49	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS) - DL	140	D	19	9.7	2.9	ng/L	10		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	460	D	19	9.7	5.1	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	500	D	19	13	6.2	ng/L	10		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS) - DL	220	D	19	9.7	4.9	ng/L	10		1633	Total/NA
Perfluoropentanoic acid (PFPeA) - DL	500	D	39	19	9.7	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	3900	D	190	110	56	ng/L	100		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL2	1400	D	190	97	49	ng/L	100		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	2400	D	190	97	49	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-07-NOV23

Lab Sample ID: 410-150085-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	570	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	41	J cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	69	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	220	M cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	16	J cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	640	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	5.0	J M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	61	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	400	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	830	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	190	cn	20	10	5.0	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-07-NOV23 (Continued)

Lab Sample ID: 410-150085-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanoic acid (PFPeA)	750	cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2600	D cn	200	110	57	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	3800	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-08-NOV23

Lab Sample ID: 410-150085-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	130	F2 FH cn	8.5	8.1	2.6	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	260	FH cn	8.5	8.2	2.8	ng/L	1		1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	J cn	2.1	1.5	0.74	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	32	FH cn	2.1	1.1	0.32	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	46	FH M cn	8.5	4.2	2.1	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.5	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	10	FH cn	2.1	1.1	0.42	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	9.8	FH cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	66	FH cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	130	FH cn	4.2	2.1	1.1	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	240	D cn	21	11	5.5	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	290	D cn	21	11	5.3	ng/L	10		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	490	D cn	21	11	5.3	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1200	D cn	21	11	5.3	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	770	D cn	21	14	6.8	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	2200	D cn	210	120	60	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-DUP-01-NOV23

Lab Sample ID: 410-150085-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	140	cn	9.5	9.1	3.0	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	240	cn	9.5	9.2	3.1	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	31	cn	2.4	1.2	0.36	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	42	M cn	9.5	4.8	2.4	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	2.2	J M cn	2.4	1.2	0.60	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-DUP-01-NOV23 (Continued)

Lab Sample ID: 410-150085-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanesulfonic acid (PFHpS)	13	cn	2.4	1.2	0.48	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	8.6	M cn	2.4	1.2	0.60	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	61	M cn	2.4	1.2	0.60	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	120	M cn	4.8	2.4	1.2	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	250	D cn	24	12	6.2	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	260	D cn	24	12	6.0	ng/L	10		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	510	D cn	24	12	6.0	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	880	D cn	24	12	6.0	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	810	D cn	24	15	7.6	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	2200	D cn	240	130	68	ng/L	100		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-01-NOV23
Date Collected: 11/03/23 10:00
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-1
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		12/07/23 02:07	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:07	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:07	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		12/07/23 02:07	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		12/07/23 02:07	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**240**	**FH cn**	80	77	26	ng/L		12/07/23 02:07	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		12/07/23 02:07	1
DONA	38	U cn	80	38	15	ng/L		12/07/23 02:07	1
HFPODA	40	U cn	80	40	20	ng/L		12/07/23 02:07	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:07	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		12/07/23 02:07	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:07	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		12/07/23 02:07	1
Perfluorobutanesulfonic acid (PFBS)	**76**	**FH cn**	20	10	3.0	ng/L		12/07/23 02:07	1
Perfluorobutanoic acid (PFBA)	**200**	**M cn**	80	40	20	ng/L		12/07/23 02:07	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluorodecanoic acid (PFDA)	10	U M cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		12/07/23 02:07	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluoroheptanesulfonic acid (PFHpS)	**610**	**cn**	20	10	4.0	ng/L		12/07/23 02:07	1
Perfluoroheptanoic acid (PFHpA)	**730**	**cn**	20	10	5.2	ng/L		12/07/23 02:07	1
Perfluorononanesulfonic acid (PFNS)	10	U M FH cn	20	10	4.0	ng/L		12/07/23 02:07	1
Perfluorononanoic acid (PFNA)	**28**	**cn**	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluorooctanesulfonamide (FOSA)	**290**	**cn**	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluoropentanesulfonic acid (PFPeS)	**180**	**cn**	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluoropentanoic acid (PFPeA)	**840**	**cn**	40	20	10	ng/L		12/07/23 02:07	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:07	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		12/07/23 02:07	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		12/07/23 02:07	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		12/07/23 02:07	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		12/07/23 02:07	1

Client Sample ID: 31LS-01-NOV23

Date Collected: 11/03/23 10:00
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-1

Matrix: Water

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2 PFTeDA	78.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C2-PFDoDA	74.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C3 HFPO-DA	75.5	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C3 PFBS	81.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C3 PFHxS	75.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C4 PFBA	77.1	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C4 PFHpA	67.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C5 PFHxA	74.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C5 PFPeA	67.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C6 PFDA	84.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C7 PFUnA	81.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C8 FOSA	83.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C8 PFOS	78.1	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
13C9 PFNA	86.5	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d3-NMeFOSAA	90.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d3-NMePFOSA	73.5	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d5-NEtFOSAA	72.9	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d5-NEtPFOSA	73.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d7-N-MeFOSE-M	79.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
d9-N-EtFOSE-M	75.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
M2-4:2 FTS	90.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1
M2-8:2 FTS	79.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:07	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7800	D cn	800	760	250	ng/L		12/08/23 15:40	10
Perfluorohexanesulfonic acid (PFHxS)	9600	D cn	200	110	57	ng/L		12/08/23 15:40	10
Perfluorohexanoic acid (PFHxA)	1700	D cn	200	100	50	ng/L		12/08/23 15:40	10
Perfluorooctanoic acid (PFOA)	8500	D cn	200	130	64	ng/L		12/08/23 15:40	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	71.9	cn	20 - 150	11/26/23 12:23	12/08/23 15:40	10
13C5 PFHxA	72.9	cn	20 - 150	11/26/23 12:23	12/08/23 15:40	10
13C8 PFOA	66.6	cn	20 - 150	11/26/23 12:23	12/08/23 15:40	10
M2-6:2 FTS	73.1	cn	20 - 150	11/26/23 12:23	12/08/23 15:40	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	15000	D cn	2000	1000	500	ng/L		12/08/23 15:53	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	78.7	cn	20 - 150	11/26/23 12:23	12/08/23 15:53	100

Client Sample ID: 31LS-02-NOV23

Date Collected: 11/03/23 10:10
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-2

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		12/07/23 02:20	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-02-NOV23
Date Collected: 11/03/23 10:10
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-2
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:20	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:20	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		12/07/23 02:20	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		12/07/23 02:20	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**660**	**cn**	80	76	25	ng/L		12/07/23 02:20	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**250**	**cn**	80	77	26	ng/L		12/07/23 02:20	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		12/07/23 02:20	1
DONA	38	U cn	80	38	15	ng/L		12/07/23 02:20	1
HFPODA	40	U cn	80	40	20	ng/L		12/07/23 02:20	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:20	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		12/07/23 02:20	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:20	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		12/07/23 02:20	1
Perfluorobutanesulfonic acid (PFBS)	**95**	**cn**	20	10	3.0	ng/L		12/07/23 02:20	1
Perfluorobutanoic acid (PFBA)	**210**	**M cn**	80	40	20	ng/L		12/07/23 02:20	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluorodecanoic acid (PFDA)	10	U M cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		12/07/23 02:20	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluoroheptanesulfonic acid (PFHpS)	**120**	**cn**	20	10	4.0	ng/L		12/07/23 02:20	1
Perfluoroheptanoic acid (PFHpA)	**780**	**cn**	20	10	5.2	ng/L		12/07/23 02:20	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		12/07/23 02:20	1
Perfluorononanoic acid (PFNA)	**36**	**cn**	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluorooctanesulfonamide (FOSA)	**66**	**M cn**	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluorooctanoic acid (PFOA)	**930**	**cn**	20	13	6.4	ng/L		12/07/23 02:20	1
Perfluoropentanesulfonic acid (PFPeS)	**170**	**cn**	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluoropentanoic acid (PFPeA)	**590**	**cn**	40	20	10	ng/L		12/07/23 02:20	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:20	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		12/07/23 02:20	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		12/07/23 02:20	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		12/07/23 02:20	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		12/07/23 02:20	1

Client Sample ID: 31LS-02-NOV23

Lab Sample ID: 410-150085-2

Date Collected: 11/03/23 10:10

Matrix: Water

Date Received: 11/06/23 09:35

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*81.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C2-PFDoDA	*84.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C3 HFPO-DA	*80.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C3 PFBS	*86.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C3 PFHxS	*80.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C4 PFBA	*74.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C4 PFHpA	*74.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C5 PFHxA	*77.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C5 PFPeA	*79.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C6 PFDA	*87.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C7 PFUnA	*84.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C8 FOSA	*73.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C8 PFOA	*82.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C8 PFOS	*76.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
13C9 PFNA	*80.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d3-NMeFOSAA	*72.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d3-NMePFOSA	*62.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d5-NEtFOSAA	*67.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d5-NEtPFOSA	*63.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d7-N-MeFOSE-M	*71.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
d9-N-EtFOSE-M	*65.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
M2-4:2 FTS	*110*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
M2-6:2 FTS	*79.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*
M2-8:2 FTS	*83.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:20*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**3500**	**D cn**	200	110	57	ng/L		12/08/23 16:06	10
Perfluorohexanoic acid (PFHxA)	**1300**	**D cn**	200	100	50	ng/L		12/08/23 16:06	10
Perfluorooctanesulfonic acid (PFOS)	**5700**	**D M cn**	200	100	50	ng/L		12/08/23 16:06	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*70.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 16:06*	*10*
13C5 PFHxA	*80.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 16:06*	*10*
13C8 PFOS	*75.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 16:06*	*10*

Client Sample ID: 31LS-03-NOV23

Lab Sample ID: 410-150085-3

Date Collected: 11/03/23 10:15

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.2	U cn	8.6	8.2	2.1	ng/L		12/07/23 02:33	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	27	U cn	54	27	11	ng/L		12/07/23 02:33	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	27	U M cn	54	27	11	ng/L		12/07/23 02:33	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.4	U cn	11	5.4	1.6	ng/L		12/07/23 02:33	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.1	U cn	8.6	4.1	1.8	ng/L		12/07/23 02:33	1

Client Sample ID: 31LS-03-NOV23
Date Collected: 11/03/23 10:15
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-3
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**260**	**cn**	8.6	8.2	2.7	ng/L		12/07/23 02:33	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**28**	**cn**	8.6	8.3	2.8	ng/L		12/07/23 02:33	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.1	U cn	8.6	4.1	1.1	ng/L		12/07/23 02:33	1
DONA	4.1	U cn	8.6	4.1	1.6	ng/L		12/07/23 02:33	1
HFPODA	4.3	U cn	8.6	4.3	2.1	ng/L		12/07/23 02:33	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	21	11	5.4	ng/L		12/07/23 02:33	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**1.5**	**J cn**	2.1	1.5	0.75	ng/L		12/07/23 02:33	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	21	11	5.4	ng/L		12/07/23 02:33	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.6	U cn	4.3	2.6	1.3	ng/L		12/07/23 02:33	1
Perfluorobutanesulfonic acid (PFBS)	**80**	**cn**	2.1	1.1	0.32	ng/L		12/07/23 02:33	1
Perfluorobutanoic acid (PFBA)	**140**	**cn**	8.6	4.3	2.1	ng/L		12/07/23 02:33	1
Perfluorodecanesulfonic acid (PFDS)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluorodecanoic acid (PFDA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U cn	2.1	2.0	0.97	ng/L		12/07/23 02:33	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluoroheptanesulfonic acid (PFHpS)	**57**	**cn**	2.1	1.1	0.43	ng/L		12/07/23 02:33	1
Perfluorononanesulfonic acid (PFNS)	1.1	U cn	2.1	1.1	0.43	ng/L		12/07/23 02:33	1
Perfluorononanoic acid (PFNA)	**8.6**	**cn**	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluorooctanesulfonamide (FOSA)	**17**	**cn**	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.1	1.1	0.54	ng/L		12/07/23 02:33	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U cn	4.3	1.9	0.54	ng/L		12/07/23 02:33	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U cn	4.3	2.1	1.1	ng/L		12/07/23 02:33	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U cn	4.3	2.1	1.1	ng/L		12/07/23 02:33	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U cn	4.3	2.1	0.54	ng/L		12/07/23 02:33	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*59.6*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C2-PFDoDA	*47.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C3 HFPO-DA	*87.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C3 PFBS	*87.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C4 PFBA	*69.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C5 PFHxA	*75.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C5 PFPeA	*84.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C6 PFDA	*57.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C7 PFUnA	*49.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*
13C8 FOSA	*64.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:33*	*1*

Client Sample ID: 31LS-03-NOV23

Lab Sample ID: 410-150085-3

Date Collected: 11/03/23 10:15
Matrix: Water
Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	48.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
13C9 PFNA	68.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d3-NMeFOSAA	54.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d3-NMePFOSA	53.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d5-NEtFOSAA	43.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d5-NEtPFOSA	50.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d7-N-MeFOSE-M	54.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
d9-N-EtFOSE-M	44.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
M2-4:2 FTS	149	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
M2-6:2 FTS	87.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1
M2-8:2 FTS	70.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:33	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**400**	**D cn**	21	11	5.6	ng/L		12/08/23 16:19	10
Perfluorohexanoic acid (PFHxA)	**1100**	**D cn**	21	11	5.4	ng/L		12/08/23 16:19	10
Perfluorooctanoic acid (PFOA)	**490**	**D cn**	21	14	6.9	ng/L		12/08/23 16:19	10
Perfluoropentanesulfonic acid (PFPeS)	**130**	**D cn**	21	11	5.4	ng/L		12/08/23 16:19	10
Perfluoropentanoic acid (PFPeA)	**350**	**D cn**	43	21	11	ng/L		12/08/23 16:19	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	76.6	cn	20 - 150	11/26/23 12:23	12/08/23 16:19	10
13C4 PFHpA	85.4	cn	20 - 150	11/26/23 12:23	12/08/23 16:19	10
13C5 PFHxA	80.4	cn	20 - 150	11/26/23 12:23	12/08/23 16:19	10
13C5 PFPeA	78.7	cn	20 - 150	11/26/23 12:23	12/08/23 16:19	10
13C8 PFOA	79.4	cn	20 - 150	11/26/23 12:23	12/08/23 16:19	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2100**	**D cn**	210	120	61	ng/L		12/08/23 16:32	100
Perfluorooctanesulfonic acid (PFOS)	**2600**	**D M cn**	210	110	54	ng/L		12/08/23 16:32	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	80.8	cn	20 - 150	11/26/23 12:23	12/08/23 16:32	100
13C8 PFOS	44.0	cn	20 - 150	11/26/23 12:23	12/08/23 16:32	100

Client Sample ID: 31LS-04-NOV23

Lab Sample ID: 410-150085-4

Date Collected: 11/03/23 10:20
Matrix: Water
Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		12/07/23 02:46	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:46	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U M cn	500	250	100	ng/L		12/07/23 02:46	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		12/07/23 02:46	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	**25**	**J cn**	80	38	17	ng/L		12/07/23 02:46	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-04-NOV23
Date Collected: 11/03/23 10:20
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-4
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**390**	**cn**	80	76	25	ng/L		12/07/23 02:46	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**4700**	**cn**	80	77	26	ng/L		12/07/23 02:46	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		12/07/23 02:46	1
DONA	38	U cn	80	38	15	ng/L		12/07/23 02:46	1
HFPODA	40	U cn	80	40	20	ng/L		12/07/23 02:46	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:46	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		12/07/23 02:46	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:46	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U M cn	40	24	12	ng/L		12/07/23 02:46	1
Perfluorobutanesulfonic acid (PFBS)	**67**	**cn**	20	10	3.0	ng/L		12/07/23 02:46	1
Perfluorobutanoic acid (PFBA)	**280**	**M cn**	80	40	20	ng/L		12/07/23 02:46	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluorodecanoic acid (PFDA)	**26**	**cn**	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		12/07/23 02:46	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluoroheptanesulfonic acid (PFHpS)	**13**	**J cn**	20	10	4.0	ng/L		12/07/23 02:46	1
Perfluoroheptanoic acid (PFHpA)	**720**	**cn**	20	10	5.2	ng/L		12/07/23 02:46	1
Perfluorohexanesulfonic acid (PFHxS)	**980**	**cn**	20	11	5.7	ng/L		12/07/23 02:46	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		12/07/23 02:46	1
Perfluorononanoic acid (PFNA)	**67**	**cn**	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluorooctanoic acid (PFOA)	**670**	**cn**	20	13	6.4	ng/L		12/07/23 02:46	1
Perfluoropentanesulfonic acid (PFPeS)	**91**	**cn**	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluoropentanoic acid (PFPeA)	**970**	**cn**	40	20	10	ng/L		12/07/23 02:46	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:46	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		12/07/23 02:46	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		12/07/23 02:46	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		12/07/23 02:46	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		12/07/23 02:46	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*76.2*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:46*	*1*
13C2-PFDoDA	*75.7*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:46*	*1*
13C3 HFPO-DA	*84.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:46*	*1*
13C3 PFBS	*81.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:46*	*1*

Client Sample ID: 31LS-04-NOV23

Lab Sample ID: 410-150085-4

Date Collected: 11/03/23 10:20

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	81.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C4 PFBA	81.1	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C4 PFHpA	83.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C5 PFHxA	84.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C5 PFPeA	78.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C6 PFDA	79.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C7 PFUnA	79.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C8 PFOA	83.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C8 PFOS	78.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
13C9 PFNA	86.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d3-NMeFOSAA	82.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d3-NMePFOSA	71.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d5-NEtFOSAA	74.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d5-NEtPFOSA	72.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d7-N-MeFOSE-M	73.1	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
d9-N-EtFOSE-M	67.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
M2-4:2 FTS	90.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
M2-6:2 FTS	71.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1
M2-8:2 FTS	78.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:46	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanoic acid (PFHxA)	**1400**	**D cn**	200	100	50	ng/L		12/08/23 16:45	10
Perfluorooctanesulfonamide (FOSA)	**3300**	**D cn**	200	100	50	ng/L		12/08/23 16:45	10
Perfluorooctanesulfonic acid (PFOS)	**5800**	**D cn**	200	100	50	ng/L		12/08/23 16:45	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFHxA	79.5	cn	20 - 150	11/26/23 12:23	12/08/23 16:45	10
13C8 FOSA	78.2	cn	20 - 150	11/26/23 12:23	12/08/23 16:45	10
13C8 PFOS	77.9	cn	20 - 150	11/26/23 12:23	12/08/23 16:45	10

Client Sample ID: 31LS-05-NOV23

Lab Sample ID: 410-150085-5

Date Collected: 11/03/23 10:30

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		12/07/23 02:59	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:59	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 02:59	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		12/07/23 02:59	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		12/07/23 02:59	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**270**	**cn**	80	76	25	ng/L		12/07/23 02:59	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**1300**	**cn**	80	77	26	ng/L		12/07/23 02:59	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		12/07/23 02:59	1
DONA	38	U cn	80	38	15	ng/L		12/07/23 02:59	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-05-NOV23
Date Collected: 11/03/23 10:30
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-5
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
HFPODA	40	U cn	80	40	20	ng/L		12/07/23 02:59	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:59	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		12/07/23 02:59	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		12/07/23 02:59	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		12/07/23 02:59	1
Perfluorobutanesulfonic acid (PFBS)	**51**	**cn**	20	10	3.0	ng/L		12/07/23 02:59	1
Perfluorobutanoic acid (PFBA)	**110**	**M cn**	80	40	20	ng/L		12/07/23 02:59	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorodecanoic acid (PFDA)	**5.3**	**J cn**	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		12/07/23 02:59	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluoroheptanesulfonic acid (PFHpS)	**40**	**cn**	20	10	4.0	ng/L		12/07/23 02:59	1
Perfluoroheptanoic acid (PFHpA)	**470**	**cn**	20	10	5.2	ng/L		12/07/23 02:59	1
Perfluorohexanoic acid (PFHxA)	**630**	**cn**	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		12/07/23 02:59	1
Perfluorononanoic acid (PFNA)	**29**	**cn**	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorooctanesulfonamide (FOSA)	**800**	**M cn**	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorooctanoic acid (PFOA)	**860**	**cn**	20	13	6.4	ng/L		12/07/23 02:59	1
Perfluoropentanesulfonic acid (PFPeS)	**62**	**cn**	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluoropentanoic acid (PFPeA)	**340**	**cn**	40	20	10	ng/L		12/07/23 02:59	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		12/07/23 02:59	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		12/07/23 02:59	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		12/07/23 02:59	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		12/07/23 02:59	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		12/07/23 02:59	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*80.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C2-PFDoDA	*81.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C3 HFPO-DA	*81.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C3 PFBS	*76.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C3 PFHxS	*73.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C4 PFBA	*77.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C4 PFHpA	*82.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C5 PFHxA	*80.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C5 PFPeA	*72.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*
13C6 PFDA	*84.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 02:59*	*1*

Client Sample ID: 31LS-05-NOV23

Lab Sample ID: 410-150085-5

Date Collected: 11/03/23 10:30

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C7 PFUnA	82.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
13C8 FOSA	77.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
13C8 PFOA	82.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
13C8 PFOS	80.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
13C9 PFNA	83.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d3-NMeFOSAA	78.0	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d3-NMePFOSA	67.3	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d5-NEtFOSAA	70.7	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d5-NEtPFOSA	65.4	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d7-N-MeFOSE-M	70.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
d9-N-EtFOSE-M	66.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
M2-4:2 FTS	87.6	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
M2-6:2 FTS	70.8	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1
M2-8:2 FTS	73.2	cn	20 - 150	11/26/23 12:23	12/07/23 02:59	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2400**	**D cn**	200	110	57	ng/L		12/08/23 17:24	10
Perfluorooctanesulfonic acid (PFOS)	**6200**	**D cn**	200	100	50	ng/L		12/08/23 17:24	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	73.1	cn	20 - 150	11/26/23 12:23	12/08/23 17:24	10
13C8 PFOS	82.7	cn	20 - 150	11/26/23 12:23	12/08/23 17:24	10

Client Sample ID: 31LS-06-NOV23

Lab Sample ID: 410-150085-6

Date Collected: 11/03/23 10:35

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.4	U	7.8	7.4	1.9	ng/L		12/07/23 03:12	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	49	24	9.7	ng/L		12/07/23 03:12	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	24	U M	49	24	9.7	ng/L		12/07/23 03:12	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	9.7	4.9	1.5	ng/L		12/07/23 03:12	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	7.8	3.7	1.7	ng/L		12/07/23 03:12	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**130**		7.8	7.4	2.4	ng/L		12/07/23 03:12	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**89**		7.8	7.5	2.5	ng/L		12/07/23 03:12	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.8	3.7	0.97	ng/L		12/07/23 03:12	1
DONA	3.7	U	7.8	3.7	1.5	ng/L		12/07/23 03:12	1
HFPODA	3.9	U	7.8	3.9	1.9	ng/L		12/07/23 03:12	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.7	U	19	9.7	4.9	ng/L		12/07/23 03:12	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.83**	**J**	1.9	1.4	0.68	ng/L		12/07/23 03:12	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-06-NOV23
Date Collected: 11/03/23 10:35
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-6
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.7	U	19	9.7	4.9	ng/L		12/07/23 03:12	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	3.9	2.3	1.2	ng/L		12/07/23 03:12	1
Perfluorobutanoic acid (PFBA)	**210**		7.8	3.9	1.9	ng/L		12/07/23 03:12	1
Perfluorodecanesulfonic acid (PFDS)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluorodecanoic acid (PFDA)	**0.72**	**J**	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	1.9	1.9	0.88	ng/L		12/07/23 03:12	1
Perfluorododecanoic acid (PFDoA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluoroheptanesulfonic acid (PFHpS)	**28**		1.9	0.97	0.39	ng/L		12/07/23 03:12	1
Perfluorononanesulfonic acid (PFNS)	0.97	U	1.9	0.97	0.39	ng/L		12/07/23 03:12	1
Perfluorononanoic acid (PFNA)	**13**		1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluorooctanesulfonamide (FOSA)	**53**		1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluorotetradecanoic acid (PFTA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluorotridecanoic acid (PFTriA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluoroundecanoic acid (PFUnA)	0.97	U	1.9	0.97	0.49	ng/L		12/07/23 03:12	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	3.9	1.8	0.49	ng/L		12/07/23 03:12	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.9	1.9	0.97	ng/L		12/07/23 03:12	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.9	1.9	0.97	ng/L		12/07/23 03:12	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.9	1.9	0.49	ng/L		12/07/23 03:12	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*46.4*	*M*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C2-PFDoDA	*51.3*	*M*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C3 HFPO-DA	*81.0*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C4 PFBA	*58.0*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C5 PFHxA	*74.2*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C5 PFPeA	*75.3*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C6 PFDA	*50.1*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C7 PFUnA	*50.1*	*M*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C8 FOSA	*52.2*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C8 PFOS	*44.1*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
13C9 PFNA	*63.8*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d3-NMeFOSAA	*50.7*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d3-NMePFOSA	*54.8*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d5-NEtFOSAA	*42.5*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d5-NEtPFOSA	*56.0*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d7-N-MeFOSE-M	*63.5*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
d9-N-EtFOSE-M	*54.6*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
M2-4:2 FTS	*133*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
M2-6:2 FTS	*86.5*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*
M2-8:2 FTS	*63.1*		*20 - 150*	*11/26/23 12:23*	*12/07/23 03:12*	*1*

Client Sample ID: 31LS-06-NOV23

Lab Sample ID: 410-150085-6

Date Collected: 11/03/23 10:35

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	140	D	19	9.7	2.9	ng/L		12/08/23 17:37	10
Perfluoroheptanoic acid (PFHpA)	460	D	19	9.7	5.1	ng/L		12/08/23 17:37	10
Perfluorooctanoic acid (PFOA)	500	D	19	13	6.2	ng/L		12/08/23 17:37	10
Perfluoropentanesulfonic acid (PFPeS)	220	D	19	9.7	4.9	ng/L		12/08/23 17:37	10
Perfluoropentanoic acid (PFPeA)	500	D	39	19	9.7	ng/L		12/08/23 17:37	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFBS	*85.7*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:37*	*10*
13C3 PFHxS	*68.9*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:37*	*10*
13C4 PFHpA	*82.8*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:37*	*10*
13C5 PFPeA	*83.8*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:37*	*10*
13C8 PFOA	*73.5*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:37*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	3900	D	190	110	56	ng/L		12/08/23 17:50	100
Perfluorohexanoic acid (PFHxA)	1400	D	190	97	49	ng/L		12/08/23 17:50	100
Perfluorooctanesulfonic acid (PFOS)	2400	D	190	97	49	ng/L		12/08/23 17:50	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*67.9*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:50*	*100*
13C5 PFHxA	*84.2*		*20 - 150*	*11/26/23 12:23*	*12/08/23 17:50*	*100*
13C8 PFOS	*55.1*	*M*	*20 - 150*	*11/26/23 12:23*	*12/08/23 17:50*	*100*

Client Sample ID: 31LS-07-NOV23

Lab Sample ID: 410-150085-7

Date Collected: 11/03/23 10:40

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		12/07/23 03:25	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 03:25	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		12/07/23 03:25	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		12/07/23 03:25	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		12/07/23 03:25	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	570	cn	80	76	25	ng/L		12/07/23 03:25	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	41	J cn	80	77	26	ng/L		12/07/23 03:25	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		12/07/23 03:25	1
DONA	38	U cn	80	38	15	ng/L		12/07/23 03:25	1
HFPODA	40	U cn	80	40	20	ng/L		12/07/23 03:25	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		12/07/23 03:25	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		12/07/23 03:25	1

Client Sample ID: 31LS-07-NOV23
Date Collected: 11/03/23 10:40
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-7
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		12/07/23 03:25	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		12/07/23 03:25	1
Perfluorobutanesulfonic acid (PFBS)	**69**	**cn**	20	10	3.0	ng/L		12/07/23 03:25	1
Perfluorobutanoic acid (PFBA)	**220**	**M cn**	80	40	20	ng/L		12/07/23 03:25	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorodecanoic acid (PFDA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		12/07/23 03:25	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluoroheptanesulfonic acid (PFHpS)	**16**	**J cn**	20	10	4.0	ng/L		12/07/23 03:25	1
Perfluoroheptanoic acid (PFHpA)	**640**	**cn**	20	10	5.2	ng/L		12/07/23 03:25	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		12/07/23 03:25	1
Perfluorononanoic acid (PFNA)	**5.0**	**J M cn**	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorooctanesulfonamide (FOSA)	**61**	**cn**	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorooctanesulfonic acid (PFOS)	**400**	**cn**	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorooctanoic acid (PFOA)	**830**	**cn**	20	13	6.4	ng/L		12/07/23 03:25	1
Perfluoropentanesulfonic acid (PFPeS)	**190**	**cn**	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluoropentanoic acid (PFPeA)	**750**	**cn**	40	20	10	ng/L		12/07/23 03:25	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		12/07/23 03:25	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		12/07/23 03:25	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		12/07/23 03:25	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		12/07/23 03:25	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		12/07/23 03:25	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*54.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C2-PFDoDA	*62.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C3 HFPO-DA	*78.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C3 PFBS	*85.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C3 PFHxS	*80.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C4 PFBA	*79.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C4 PFHpA	*68.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C5 PFHxA	*74.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C5 PFPeA	*73.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C6 PFDA	*70.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C7 PFUnA	*71.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C8 FOSA	*69.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C8 PFOA	*81.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C8 PFOS	*66.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
13C9 PFNA	*82.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*
d3-NMeFOSAA	*73.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:25*	*1*

Client Sample ID: 31LS-07-NOV23

Lab Sample ID: 410-150085-7

Date Collected: 11/03/23 10:40

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d3-NMePFOSA	64.9	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
d5-NEtFOSAA	63.2	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
d5-NEtPFOSA	64.7	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
d7-N-MeFOSE-M	69.9	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
d9-N-EtFOSE-M	66.9	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
M2-4:2 FTS	89.4	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
M2-6:2 FTS	70.7	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1
M2-8:2 FTS	74.3	cn	20 - 150	11/26/23 12:23	12/07/23 03:25	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2600**	**D cn**	200	110	57	ng/L		12/08/23 18:03	10
Perfluorohexanoic acid (PFHxA)	**3800**	**D cn**	200	100	50	ng/L		12/08/23 18:03	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	75.8	cn	20 - 150	11/26/23 12:23	12/08/23 18:03	10
13C5 PFHxA	71.9	cn	20 - 150	11/26/23 12:23	12/08/23 18:03	10

Client Sample ID: 31LS-08-NOV23

Lab Sample ID: 410-150085-8

Date Collected: 11/03/23 10:45

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.1	U cn	8.5	8.1	2.1	ng/L		12/07/23 03:38	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	26	U cn	53	26	11	ng/L		12/07/23 03:38	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	26	U M cn	53	26	11	ng/L		12/07/23 03:38	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.3	U cn	11	5.3	1.6	ng/L		12/07/23 03:38	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.0	U cn	8.5	4.0	1.8	ng/L		12/07/23 03:38	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**130**	**F2 FH cn**	8.5	8.1	2.6	ng/L		12/07/23 03:38	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**260**	**FH cn**	8.5	8.2	2.8	ng/L		12/07/23 03:38	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.0	U cn	8.5	4.0	1.1	ng/L		12/07/23 03:38	1
DONA	4.0	U cn	8.5	4.0	1.6	ng/L		12/07/23 03:38	1
HFPODA	4.2	U cn	8.5	4.2	2.1	ng/L		12/07/23 03:38	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	21	11	5.3	ng/L		12/07/23 03:38	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**1.3**	**J cn**	2.1	1.5	0.74	ng/L		12/07/23 03:38	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	21	11	5.3	ng/L		12/07/23 03:38	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.5	U cn	4.2	2.5	1.3	ng/L		12/07/23 03:38	1

Client Sample ID: 31LS-08-NOV23
Date Collected: 11/03/23 10:45
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-8
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	**32**	**FH cn**	2.1	1.1	0.32	ng/L		12/07/23 03:38	1
Perfluorobutanoic acid (PFBA)	**46**	**FH M cn**	8.5	4.2	2.1	ng/L		12/07/23 03:38	1
Perfluorodecanesulfonic acid (PFDS)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluorodecanoic acid (PFDA)	**3.5**	**cn**	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U cn	2.1	2.0	0.95	ng/L		12/07/23 03:38	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluoroheptanesulfonic acid (PFHpS)	**10**	**FH cn**	2.1	1.1	0.42	ng/L		12/07/23 03:38	1
Perfluorononanesulfonic acid (PFNS)	1.1	U FH cn	2.1	1.1	0.42	ng/L		12/07/23 03:38	1
Perfluorononanoic acid (PFNA)	**9.8**	**FH cn**	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluoropentanesulfonic acid (PFPeS)	**66**	**FH cn**	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluoropentanoic acid (PFPeA)	**130**	**FH cn**	4.2	2.1	1.1	ng/L		12/07/23 03:38	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.1	1.1	0.53	ng/L		12/07/23 03:38	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U cn	4.2	1.9	0.53	ng/L		12/07/23 03:38	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U cn	4.2	2.1	1.1	ng/L		12/07/23 03:38	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U cn	4.2	2.1	1.1	ng/L		12/07/23 03:38	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U cn	4.2	2.1	0.53	ng/L		12/07/23 03:38	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*61.8*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C2-PFDoDA	*50.9*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C3 HFPO-DA	*78.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C3 PFBS	*88.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C3 PFHxS	*65.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C4 PFBA	*62.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C5 PFHxA	*75.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C5 PFPeA	*74.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C6 PFDA	*47.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C7 PFUnA	*43.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C8 PFOS	*43.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
13C9 PFNA	*58.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d3-NMeFOSAA	*46.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d3-NMePFOSA	*48.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d5-NEtFOSAA	*41.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d5-NEtPFOSA	*47.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d7-N-MeFOSE-M	*59.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
d9-N-EtFOSE-M	*49.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
M2-4:2 FTS	*143*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
M2-6:2 FTS	*83.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*
M2-8:2 FTS	*55.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 03:38*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**240**	**D cn**	21	11	5.5	ng/L		12/08/23 18:16	10
Perfluorohexanoic acid (PFHxA)	**290**	**D cn**	21	11	5.3	ng/L		12/08/23 18:16	10

Client Sample ID: 31LS-08-NOV23

Lab Sample ID: 410-150085-8

Date Collected: 11/03/23 10:45

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	**490**	**D cn**	21	11	5.3	ng/L		12/08/23 18:16	10
Perfluorooctanesulfonic acid (PFOS)	**1200**	**D cn**	21	11	5.3	ng/L		12/08/23 18:16	10
Perfluorooctanoic acid (PFOA)	**770**	**D cn**	21	14	6.8	ng/L		12/08/23 18:16	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFHpA	*76.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:16*	*10*
13C5 PFHxA	*79.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:16*	*10*
13C8 FOSA	*55.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:16*	*10*
13C8 PFOA	*71.8*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:16*	*10*
13C8 PFOS	*43.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:16*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2200**	**D cn**	210	120	60	ng/L		12/08/23 18:29	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*73.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:29*	*100*

Client Sample ID: 31LS-DUP-01-NOV23

Lab Sample ID: 410-150085-9

Date Collected: 11/03/23 00:00

Matrix: Water

Date Received: 11/06/23 09:35

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	9.1	U cn	9.5	9.1	2.4	ng/L		12/07/23 04:43	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	30	U cn	60	30	12	ng/L		12/07/23 04:43	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	30	U M cn	60	30	12	ng/L		12/07/23 04:43	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	6.0	U cn	12	6.0	1.8	ng/L		12/07/23 04:43	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.5	U M cn	9.5	4.5	2.0	ng/L		12/07/23 04:43	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**140**	**cn**	9.5	9.1	3.0	ng/L		12/07/23 04:43	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**240**	**cn**	9.5	9.2	3.1	ng/L		12/07/23 04:43	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.5	U cn	9.5	4.5	1.2	ng/L		12/07/23 04:43	1
DONA	4.5	U ^c cn	9.5	4.5	1.8	ng/L		12/07/23 04:43	1
HFPODA	4.8	U cn	9.5	4.8	2.4	ng/L		12/07/23 04:43	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U M cn	24	12	6.0	ng/L		12/07/23 04:43	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.7	U M cn	2.4	1.7	0.83	ng/L		12/07/23 04:43	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U M cn	24	12	6.0	ng/L		12/07/23 04:43	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.9	U M cn	4.8	2.9	1.4	ng/L		12/07/23 04:43	1
Perfluorobutanesulfonic acid (PFBS)	**31**	**cn**	2.4	1.2	0.36	ng/L		12/07/23 04:43	1

Client Sample ID: 31LS-DUP-01-NOV23
Date Collected: 11/03/23 00:00
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**42**	**M cn**	9.5	4.8	2.4	ng/L		12/07/23 04:43	1
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluorodecanoic acid (PFDA)	**2.2**	**J M cn**	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluorododecanesulfonic acid (PFDoS)	2.3	U cn	2.4	2.3	1.1	ng/L		12/07/23 04:43	1
Perfluorododecanoic acid (PFDoA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluoroheptanesulfonic acid (PFHpS)	**13**	**cn**	2.4	1.2	0.48	ng/L		12/07/23 04:43	1
Perfluorononanesulfonic acid (PFNS)	1.2	U M cn	2.4	1.2	0.48	ng/L		12/07/23 04:43	1
Perfluorononanoic acid (PFNA)	**8.6**	**M cn**	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluoropentanesulfonic acid (PFPeS)	**61**	**M cn**	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluoropentanoic acid (PFPeA)	**120**	**M cn**	4.8	2.4	1.2	ng/L		12/07/23 04:43	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	2.4	1.2	0.60	ng/L		12/07/23 04:43	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.8	2.1	0.60	ng/L		12/07/23 04:43	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.4	U cn	4.8	2.4	1.2	ng/L		12/07/23 04:43	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.4	U cn	4.8	2.4	1.2	ng/L		12/07/23 04:43	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.4	U cn	4.8	2.4	0.60	ng/L		12/07/23 04:43	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*52.4*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C2-PFDoDA	*44.0*	*M cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C3 HFPO-DA	*81.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C3 PFBS	*90.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C3 PFHxS	*72.5*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C4 PFBA	*78.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C5 PFHxA	*76.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C5 PFPeA	*77.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C6 PFDA	*46.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C7 PFUnA	*44.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C8 PFOS	*44.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
13C9 PFNA	*65.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d3-NMeFOSAA	*47.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d3-NMePFOSA	*49.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d5-NEtFOSAA	*39.9*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d5-NEtPFOSA	*48.1*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d7-N-MeFOSE-M	*49.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
d9-N-EtFOSE-M	*42.6*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
M2-4:2 FTS	*99.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
M2-6:2 FTS	*78.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*
M2-8:2 FTS	*50.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/07/23 04:43*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**250**	**D cn**	24	12	6.2	ng/L		12/08/23 18:42	10
Perfluorohexanoic acid (PFHxA)	**260**	**D cn**	24	12	6.0	ng/L		12/08/23 18:42	10
Perfluorooctanesulfonamide (FOSA)	**510**	**D cn**	24	12	6.0	ng/L		12/08/23 18:42	10

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-DUP-01-NOV23
Date Collected: 11/03/23 00:00
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	880	D cn	24	12	6.0	ng/L		12/08/23 18:42	10
Perfluorooctanoic acid (PFOA)	810	D cn	24	15	7.6	ng/L		12/08/23 18:42	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFHpA	*79.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:42*	*10*
13C5 PFHxA	*80.0*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:42*	*10*
13C8 FOSA	*56.2*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:42*	*10*
13C8 PFOA	*75.4*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:42*	*10*
13C8 PFOS	*46.7*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:42*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	2200	D cn	240	130	68	ng/L		12/08/23 18:55	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*82.3*	*cn*	*20 - 150*	*11/26/23 12:23*	*12/08/23 18:55*	*100*

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFTDA	PFDoDA	HFPODA	C3PFBS	C3PFHS	PFBA	C4PFHA	13C5PHA
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-150085-1	31LS-01-NOV23	78.8 cn	74.2 cn	75.5 cn	81.4 cn	75.4 cn	77.1 cn	67.4 cn	74.3 cn
410-150085-1 - DL	31LS-01-NOV23					71.9 cn			72.9 cn
410-150085-1 - DL2	31LS-01-NOV23								
410-150085-1 MS	31LS-01-NOV23	56.7 M	51.2 M	78.9	109	76.2	41.7	77.8	76.6
410-150085-1 MSD	31LS-01-NOV23	60.6 M	56.0 M	83.7	103	73.7	22.9	78.0	73.1
410-150085-2	31LS-02-NOV23	81.9 cn	84.8 cn	80.7 cn	86.4 cn	80.2 cn	74.7 cn	74.9 cn	77.2 cn
410-150085-2 - DL	31LS-02-NOV23					70.7 cn			80.7 cn
410-150085-3	31LS-03-NOV23	59.6 M cn	47.8 cn	87.8 cn	87.6 cn		69.9 cn		75.9 cn
410-150085-3 - DL	31LS-03-NOV23					76.6 cn		85.4 cn	80.4 cn
410-150085-3 - DL2	31LS-03-NOV23					80.8 cn			
410-150085-4	31LS-04-NOV23	76.2 M cn	75.7 M cn	84.1 cn	81.1 cn	81.8 cn	81.1 cn	83.3 cn	84.0 cn
410-150085-4 - DL	31LS-04-NOV23								79.5 cn
410-150085-5	31LS-05-NOV23	80.6 cn	81.0 cn	81.4 cn	76.2 cn	73.8 cn	77.0 cn	82.8 cn	80.7 cn
410-150085-5 - DL	31LS-05-NOV23					73.1 cn			
410-150085-6	31LS-06-NOV23	46.4 M	51.3 M	81.0			58.0		74.2
410-150085-6 - DL	31LS-06-NOV23				85.7	68.9		82.8	
410-150085-6 - DL2	31LS-06-NOV23					67.9			84.2
410-150085-7	31LS-07-NOV23	54.0 cn	62.5 cn	78.1 cn	85.6 cn	80.0 cn	79.2 cn	68.9 cn	74.0 cn
410-150085-7 - DL	31LS-07-NOV23					75.8 cn			71.9 cn
410-150085-8	31LS-08-NOV23	61.8 M cn	50.9 M cn	78.5 cn	88.5 cn	65.9 cn	62.9 cn		75.3 cn
410-150085-8 - DL	31LS-08-NOV23							76.5 cn	79.4 cn
410-150085-8 - DL2	31LS-08-NOV23					73.5 cn			
410-150085-9	31LS-DUP-01-NOV23	52.4 M cn	44.0 M cn	81.7 cn	90.0 cn	72.5 cn	78.0 cn		76.3 cn
410-150085-9 - DL	31LS-DUP-01-NOV23							79.7 cn	80.0 cn
410-150085-9 - DL2	31LS-DUP-01-NOV23					82.3 cn			
LCS 410-446773/2-A	Lab Control Sample	83.1	82.7	81.3	78.5	81.1	76.3	79.2	81.0
LLCS 410-446773/3-A	Lab Control Sample	78.9	82.1	75.1	83.3	76.2	77.7	68.2	72.9
MB 410-446773/1-A	Method Blank	77.7 M	80.6	69.8	77.1	76.6	75.1	66.7	71.8

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFPeA	C6PFDA	13C7PUA	PFOSA	C8PFOA	C8PFOS	C9PFNA	d3NMFOS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-150085-1	31LS-01-NOV23	67.7 cn	84.3 cn	81.6 cn	83.8 cn		78.1 cn	86.5 cn	90.2 cn
410-150085-1 - DL	31LS-01-NOV23					66.6 cn			
410-150085-1 - DL2	31LS-01-NOV23						78.7 cn		
410-150085-1 MS	31LS-01-NOV23	77.9	67.6	59.9	86.1	71.2	68.6	75.5	68.8
410-150085-1 MSD	31LS-01-NOV23	74.6	72.0	65.6	87.3	77.9	69.7	79.8	73.2
410-150085-2	31LS-02-NOV23	79.0 cn	87.6 cn	84.1 cn	73.8 cn	82.1 cn	76.5 cn	80.1 cn	72.9 cn
410-150085-2 - DL	31LS-02-NOV23						75.9 cn		
410-150085-3	31LS-03-NOV23	84.5 cn	57.7 cn	49.6 cn	64.8 cn		48.7 cn	68.8 cn	54.8 cn
410-150085-3 - DL	31LS-03-NOV23	78.7 cn				79.4 cn			
410-150085-3 - DL2	31LS-03-NOV23						44.0 cn		
410-150085-4	31LS-04-NOV23	78.6 cn	79.3 cn	79.2 cn		83.4 cn	78.7 cn	86.0 cn	82.2 cn
410-150085-4 - DL	31LS-04-NOV23				78.2 cn		77.9 cn		
410-150085-5	31LS-05-NOV23	72.7 cn	84.5 cn	82.4 cn	77.4 cn	82.2 cn	80.3 cn	83.3 cn	78.0 cn
410-150085-5 - DL	31LS-05-NOV23						82.7 cn		
410-150085-6	31LS-06-NOV23	75.3	50.1	50.1 M	52.2		44.1	63.8	50.7
410-150085-6 - DL	31LS-06-NOV23	83.8				73.5			
410-150085-6 - DL2	31LS-06-NOV23						55.1 M		
410-150085-7	31LS-07-NOV23	73.1 cn	70.5 cn	71.5 cn	69.8 cn	81.1 cn	66.1 cn	82.7 cn	73.0 cn

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFPeA	C6PFDA	13C7PUA	PFOSA	C8PFOA	C8PFOS	C9PFNA	d3NMFOS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-150085-7 - DL	31LS-07-NOV23								
410-150085-8	31LS-08-NOV23	74.0 cn	47.8 cn	43.6 cn			43.7 cn	58.7 cn	46.1 cn
410-150085-8 - DL	31LS-08-NOV23				55.1 cn	71.8 cn	43.3 cn		
410-150085-8 - DL2	31LS-08-NOV23								
410-150085-9	31LS-DUP-01-NOV23	77.0 cn	46.7 cn	44.1 cn			44.1 cn	65.2 cn	47.7 cn
410-150085-9 - DL	31LS-DUP-01-NOV23				56.2 cn	75.4 cn	46.7 cn		
410-150085-9 - DL2	31LS-DUP-01-NOV23								
LCS 410-446773/2-A	Lab Control Sample	74.7	85.0	83.0	76.0	74.5	79.2	84.9	80.5
LLCS 410-446773/3-A	Lab Control Sample	70.3	87.4	82.5	72.9	73.2	82.2	76.6	78.8
MB 410-446773/1-A	Method Blank	66.3	74.5	77.4	73.2	77.3	76.4	68.9	77.7

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		d3NMFSA	d5NEFOS	d5NPFSA	NMFM	NEFM	M242FTS	M262FTS	M282FTS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-150085-1	31LS-01-NOV23	73.5 cn	72.9 cn	73.4 cn	79.2 cn	75.6 cn	90.0 cn		79.4 cn
410-150085-1 - DL	31LS-01-NOV23							73.1 cn	
410-150085-1 - DL2	31LS-01-NOV23								
410-150085-1 MS	31LS-01-NOV23	67.7	46.9	63.9	62.7	56.0	128	86.6	99.6
410-150085-1 MSD	31LS-01-NOV23	65.8	47.4	61.6	64.1	58.6	120	92.7	84.8
410-150085-2	31LS-02-NOV23	62.5 cn	67.2 cn	63.8 cn	71.3 cn	65.7 cn	110 cn	79.0 cn	83.4 cn
410-150085-2 - DL	31LS-02-NOV23								
410-150085-3	31LS-03-NOV23	53.6 cn	43.6 cn	50.0 cn	54.2 cn	44.8 cn	149 cn	87.6 cn	70.4 cn
410-150085-3 - DL	31LS-03-NOV23								
410-150085-3 - DL2	31LS-03-NOV23								
410-150085-4	31LS-04-NOV23	71.2 cn	74.2 cn	72.6 cn	73.1 cn	67.7 cn	90.0 cn	71.7 cn	78.8 cn
410-150085-4 - DL	31LS-04-NOV23								
410-150085-5	31LS-05-NOV23	67.3 cn	70.7 cn	65.4 cn	70.8 cn	66.6 cn	87.6 cn	70.8 cn	73.2 cn
410-150085-5 - DL	31LS-05-NOV23								
410-150085-6	31LS-06-NOV23	54.8	42.5	56.0	63.5	54.6	133	86.5	63.1
410-150085-6 - DL	31LS-06-NOV23								
410-150085-6 - DL2	31LS-06-NOV23								
410-150085-7	31LS-07-NOV23	64.9 cn	63.2 cn	64.7 cn	69.9 cn	66.9 cn	89.4 cn	70.7 cn	74.3 cn
410-150085-7 - DL	31LS-07-NOV23								
410-150085-8	31LS-08-NOV23	48.9 cn	41.9 cn	47.7 cn	59.9 cn	49.8 cn	143 cn	83.0 cn	55.3 cn
410-150085-8 - DL	31LS-08-NOV23								
410-150085-8 - DL2	31LS-08-NOV23								
410-150085-9	31LS-DUP-01-NOV23	49.9 cn	39.9 cn	48.1 cn	49.7 cn	42.6 cn	99.2 cn	78.7 cn	50.4 cn
410-150085-9 - DL	31LS-DUP-01-NOV23								
410-150085-9 - DL2	31LS-DUP-01-NOV23								
LCS 410-446773/2-A	Lab Control Sample	68.3	74.4	69.8	75.2	70.9	81.7	80.1	81.9
LLCS 410-446773/3-A	Lab Control Sample	67.7	69.4	69.8	72.2	68.1	86.9	69.9	78.2
MB 410-446773/1-A	Method Blank	65.3	70.7	68.8	72.6	68.4	85.2	68.2	83.0

Surrogate Legend

PFTDA = 13C2 PFTeDA
PFDoDA = 13C2-PFDoDA
HFPODA = 13C3 HFPO-DA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
PFBA = 13C4 PFBA
C4PFHA = 13C4 PFHpA

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-150085-1
Project/Site: Ft. Devens PFAS

13C5PHA = 13C5 PFHxA
PFPeA = 13C5 PFPeA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFOSA = 13C8 FOSA
C8PFOA = 13C8 PFOA
C8PFOS = 13C8 PFOS
C9PFNA = 13C9 PFNA
d3NMFOS = d3-NMeFOSAA
d3NMFSA = d3-NMePFOSA
d5NEFOS = d5-NEtFOSAA
d5NPFSA = d5-NEtPFOSA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 410-446773/1-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 446773

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		12/07/23 01:02	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		12/07/23 01:02	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		12/07/23 01:02	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		12/07/23 01:02	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		12/07/23 01:02	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		12/07/23 01:02	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		12/07/23 01:02	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		12/07/23 01:02	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		12/07/23 01:02	1
HFPODA	4.0	U	8.0	4.0	2.0	ng/L		12/07/23 01:02	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		12/07/23 01:02	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		12/07/23 01:02	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		12/07/23 01:02	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		12/07/23 01:02	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		12/07/23 01:02	1
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	2.0	ng/L		12/07/23 01:02	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		12/07/23 01:02	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		12/07/23 01:02	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		12/07/23 01:02	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		12/07/23 01:02	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		12/07/23 01:02	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		12/07/23 01:02	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		12/07/23 01:02	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		12/07/23 01:02	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		12/07/23 01:02	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		12/07/23 01:02	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-446773/1-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 446773

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		12/07/23 01:02	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		12/07/23 01:02	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*77.7*	*M*	*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C2-PFDoDA	*80.6*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C3 HFPO-DA	*69.8*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C3 PFBS	*77.1*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C3 PFHxS	*76.6*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C4 PFBA	*75.1*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C4 PFHpA	*66.7*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C5 PFHxA	*71.8*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C5 PFPeA	*66.3*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C6 PFDA	*74.5*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C7 PFUnA	*77.4*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C8 FOSA	*73.2*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C8 PFOA	*77.3*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C8 PFOS	*76.4*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
13C9 PFNA	*68.9*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d3-NMeFOSAA	*77.7*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d3-NMePFOSA	*65.3*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d5-NEtFOSAA	*70.7*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d5-NEtPFOSA	*68.8*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d7-N-MeFOSE-M	*72.6*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
d9-N-EtFOSE-M	*68.4*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
M2-4:2 FTS	*85.2*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
M2-6:2 FTS	*68.2*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*
M2-8:2 FTS	*83.0*		*20 - 150*	*11/26/23 12:23*	*12/07/23 01:02*	*1*

Lab Sample ID: LCS 410-446773/2-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.2	85.5	M	ng/L		91	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	626	553		ng/L		88	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	626	568		ng/L		91	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	123		ng/L		98	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.9	101		ng/L		107	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	95.2	89.9		ng/L		95	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	96.2	99.6		ng/L		104	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-446773/2-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	93.2	87.1	M	ng/L		93	40 - 150
DONA	94.2	109	I	ng/L		115	40 - 150
HFPODA	100	93.8		ng/L		94	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	25.0	24.7		ng/L		99	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	250	274		ng/L		109	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	25.0	28.4		ng/L		114	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	25.0		ng/L		100	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	250	270		ng/L		108	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25.0	26.0		ng/L		104	40 - 150
Perfluorobutanesulfonic acid (PFBS)	22.2	24.1		ng/L		108	40 - 150
Perfluorobutanoic acid (PFBA)	100	104		ng/L		104	40 - 150
Perfluorodecanesulfonic acid (PFDS)	24.2	23.6		ng/L		98	40 - 150
Perfluorodecanoic acid (PFDA)	25.0	25.8		ng/L		103	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	24.3	21.5	M	ng/L		88	40 - 150
Perfluorododecanoic acid (PFDoA)	25.0	27.5		ng/L		110	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	23.9	23.8		ng/L		100	40 - 150
Perfluoroheptanoic acid (PFHpA)	25.0	24.4		ng/L		98	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	22.9	23.6		ng/L		103	40 - 150
Perfluorohexanoic acid (PFHxA)	25.0	25.8		ng/L		103	40 - 150
Perfluorononanesulfonic acid (PFNS)	24.1	25.4	M	ng/L		105	40 - 150
Perfluorononanoic acid (PFNA)	25.0	30.5		ng/L		122	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	23.6		ng/L		94	40 - 150
Perfluorooctanesulfonic acid (PFOS)	23.2	23.6		ng/L		101	40 - 150
Perfluorooctanoic acid (PFOA)	25.0	32.4		ng/L		130	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	23.6	24.2		ng/L		103	40 - 150
Perfluoropentanoic acid (PFPeA)	50.1	53.6		ng/L		107	40 - 150
Perfluorotetradecanoic acid (PFTA)	25.0	27.7		ng/L		111	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	25.6		ng/L		102	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	25.8		ng/L		103	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	44.6	44.0		ng/L		99	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	50.1	53.6		ng/L		107	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-446773/2-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			50.1	46.4		ng/L		93	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			50.1	49.6		ng/L		99	40 - 150		

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFTeDA	*83.1*		*20 - 150*
13C2-PFDoDA	*82.7*		*20 - 150*
13C3 HFPO-DA	*81.3*		*20 - 150*
13C3 PFBS	*78.5*		*20 - 150*
13C3 PFHxS	*81.1*		*20 - 150*
13C4 PFBA	*76.3*		*20 - 150*
13C4 PFHpA	*79.2*		*20 - 150*
13C5 PFHxA	*81.0*		*20 - 150*
13C5 PFPeA	*74.7*		*20 - 150*
13C6 PFDA	*85.0*		*20 - 150*
13C7 PFUnA	*83.0*		*20 - 150*
13C8 FOSA	*76.0*		*20 - 150*
13C8 PFOA	*74.5*		*20 - 150*
13C8 PFOS	*79.2*		*20 - 150*
13C9 PFNA	*84.9*		*20 - 150*
d3-NMeFOSAA	*80.5*		*20 - 150*
d3-NMePFOSA	*68.3*		*20 - 150*
d5-NEtFOSAA	*74.4*		*20 - 150*
d5-NEtPFOSA	*69.8*		*20 - 150*
d7-N-MeFOSE-M	*75.2*		*20 - 150*
d9-N-EtFOSE-M	*70.9*		*20 - 150*
M2-4:2 FTS	*81.7*		*20 - 150*
M2-6:2 FTS	*80.1*		*20 - 150*
M2-8:2 FTS	*81.9*		*20 - 150*

Lab Sample ID: LLCS 410-446773/3-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF			15.1	15.0		ng/L		100	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)			100	86.1		ng/L		86	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)			100	89.2		ng/L		89	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)			20.0	18.4		ng/L		92	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)			15.0	12.8		ng/L		86	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)			15.2	16.4		ng/L		108	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)			15.4	15.6		ng/L		101	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-446773/3-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	14.9	14.7		ng/L		99	40 - 150
DONA	15.1	19.8	I	ng/L		132	40 - 150
HFPODA	16.0	15.6		ng/L		98	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	4.00	3.77		ng/L		94	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	40.0	42.1		ng/L		105	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4.00	4.66		ng/L		117	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	3.78		ng/L		94	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	40.0	41.5		ng/L		104	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4.00	4.15		ng/L		104	40 - 150
Perfluorobutanesulfonic acid (PFBS)	3.55	3.56		ng/L		100	40 - 150
Perfluorobutanoic acid (PFBA)	16.0	15.3	M	ng/L		96	40 - 150
Perfluorodecanesulfonic acid (PFDS)	3.86	3.47		ng/L		90	40 - 150
Perfluorodecanoic acid (PFDA)	4.00	4.16		ng/L		104	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	3.88	3.08	M	ng/L		79	40 - 150
Perfluorododecanoic acid (PFDoA)	4.00	4.13		ng/L		103	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	3.81	3.43		ng/L		90	40 - 150
Perfluoroheptanoic acid (PFHpA)	4.00	4.26		ng/L		106	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	3.66	4.00		ng/L		109	40 - 150
Perfluorohexanoic acid (PFHxA)	4.00	3.78		ng/L		94	40 - 150
Perfluorononanesulfonic acid (PFNS)	3.85	3.74	M	ng/L		97	40 - 150
Perfluorononanoic acid (PFNA)	4.00	4.78		ng/L		120	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	3.76		ng/L		94	40 - 150
Perfluorooctanesulfonic acid (PFOS)	3.71	3.85		ng/L		104	40 - 150
Perfluorooctanoic acid (PFOA)	4.00	5.70		ng/L		143	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	3.76	3.83		ng/L		102	40 - 150
Perfluoropentanoic acid (PFPeA)	8.00	8.84		ng/L		110	40 - 150
Perfluorotetradecanoic acid (PFTA)	4.00	4.36		ng/L		109	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	4.14		ng/L		104	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	4.16		ng/L		104	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	7.12	6.90		ng/L		97	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	8.00	7.69		ng/L		96	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-446773/3-A
Matrix: Water
Analysis Batch: 450681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 446773

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			8.00	7.64		ng/L		95	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			8.00	7.00		ng/L		87	40 - 150		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2 PFTeDA	*78.9*		*20 - 150*
13C2-PFDoDA	*82.1*		*20 - 150*
13C3 HFPO-DA	*75.1*		*20 - 150*
13C3 PFBS	*83.3*		*20 - 150*
13C3 PFHxS	*76.2*		*20 - 150*
13C4 PFBA	*77.7*		*20 - 150*
13C4 PFHpA	*68.2*		*20 - 150*
13C5 PFHxA	*72.9*		*20 - 150*
13C5 PFPeA	*70.3*		*20 - 150*
13C6 PFDA	*87.4*		*20 - 150*
13C7 PFUnA	*82.5*		*20 - 150*
13C8 FOSA	*72.9*		*20 - 150*
13C8 PFOA	*73.2*		*20 - 150*
13C8 PFOS	*82.2*		*20 - 150*
13C9 PFNA	*76.6*		*20 - 150*
d3-NMeFOSAA	*78.8*		*20 - 150*
d3-NMePFOSA	*67.7*		*20 - 150*
d5-NEtFOSAA	*69.4*		*20 - 150*
d5-NEtPFOSA	*69.8*		*20 - 150*
d7-N-MeFOSE-M	*72.2*		*20 - 150*
d9-N-EtFOSE-M	*68.1*		*20 - 150*
M2-4:2 FTS	*86.9*		*20 - 150*
M2-6:2 FTS	*69.9*		*20 - 150*
M2-8:2 FTS	*78.2*		*20 - 150*

Lab Sample ID: 410-150085-1 MS
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	94.3	65.8	M	ng/L		70	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	626	502		ng/L		80	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	626	613		ng/L		98	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	125	130		ng/L		103	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	94.0	97.7		ng/L		104	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8600	E F2 cn	95.3	1990	E 4	ng/L		-6912	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	240	FH cn	96.3	615	E FH	ng/L		385	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-150085-1 MS
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn	93.3	71.8	M	ng/L		77	40 - 150
HFPODA	38	U cn	94.3	72.2		ng/L		77	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40	U cn	100	96.8		ng/L		97	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	25.1	26.6		ng/L		106	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	U cn	251	306		ng/L		122	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	14	U cn	25.1	33.4		ng/L		133	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	25.1	26.1		ng/L		104	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	U cn	251	294		ng/L		117	40 - 150
Perfluorobutanesulfonic acid (PFBS)	24	U cn	25.1	32.1		ng/L		128	40 - 150
Perfluorobutanoic acid (PFBA)	76	FH cn	22.2	117	E FH	ng/L		185	40 - 150
Perfluorodecanesulfonic acid (PFDS)	200	M cn	100	336		ng/L		133	40 - 150
Perfluorodecanoic acid (PFDA)	10	U cn	24.2	24.4	M	ng/L		101	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	10	U M cn	25.1	30.5		ng/L		122	40 - 150
Perfluorododecanoic acid (PFDoA)	19	U cn	24.3	23.1	M	ng/L		95	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	10	U cn	25.1	31.3	M	ng/L		125	40 - 150
Perfluoroheptanoic acid (PFHpA)	610	cn	23.9	261	E 4	ng/L		-1468	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	730	cn	25.1	534	E 4	ng/L		-767	40 - 150
Perfluorohexanoic acid (PFHxA)	9800	E cn	22.9	3840	E 4	ng/L		-25809	40 - 150
Perfluorononanesulfonic acid (PFNS)	1500	E cn	25.1	970	E 4	ng/L		-2125	40 - 150
Perfluorononanoic acid (PFNA)	10	U M FH cn	24.1	34.7	M	ng/L		144	40 - 150
Perfluorooctanesulfonamide (FOSA)	28	cn	25.1	54.6		ng/L		105	40 - 150
Perfluorooctanesulfonic acid (PFOS)	290	cn	25.1	502	M E 4	ng/L		848	40 - 150
Perfluorooctanoic acid (PFOA)	15000	E cn	23.3	6010	E 4	ng/L		-37823	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	6500	E cn	25.1	1430	E 4	ng/L		-20164	40 - 150
Perfluoropentanoic acid (PFPeA)	180	cn	23.6	255	E 4	ng/L		335	40 - 150
Perfluorotetradecanoic acid (PFTA)	840	cn	50.2	558	E 4	ng/L		-570	40 - 150
Perfluorotridecanoic acid (PFTriA)	10	U cn	25.1	29.1	M	ng/L		116	40 - 150
Perfluoroundecanoic acid (PFUnA)	10	U cn	25.1	28.8		ng/L		115	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	10	U cn	25.1	27.4		ng/L		109	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	18	U cn	44.6	44.2		ng/L		99	40 - 150
	20	U cn	50.2	51.6		ng/L		103	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-150085-1 MS
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	50.2	47.9		ng/L		95	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	50.2	50.2		ng/L		100	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2 PFTeDA	*56.7*	*M*	*20 - 150*
13C2-PFDoDA	*51.2*	*M*	*20 - 150*
13C3 HFPO-DA	*78.9*		*20 - 150*
13C3 PFBS	*109*		*20 - 150*
13C3 PFHxS	*76.2*		*20 - 150*
13C4 PFBA	*41.7*		*20 - 150*
13C4 PFHpA	*77.8*		*20 - 150*
13C5 PFHxA	*76.6*		*20 - 150*
13C5 PFPeA	*77.9*		*20 - 150*
13C6 PFDA	*67.6*		*20 - 150*
13C7 PFUnA	*59.9*		*20 - 150*
13C8 FOSA	*86.1*		*20 - 150*
13C8 PFOA	*71.2*		*20 - 150*
13C8 PFOS	*68.6*		*20 - 150*
13C9 PFNA	*75.5*		*20 - 150*
d3-NMeFOSAA	*68.8*		*20 - 150*
d3-NMePFOSA	*67.7*		*20 - 150*
d5-NEtFOSAA	*46.9*		*20 - 150*
d5-NEtPFOSA	*63.9*		*20 - 150*
d7-N-MeFOSE-M	*62.7*		*20 - 150*
d9-N-EtFOSE-M	*56.0*		*20 - 150*
M2-4:2 FTS	*128*		*20 - 150*
M2-6:2 FTS	*86.6*		*20 - 150*
M2-8:2 FTS	*99.6*		*20 - 150*

Lab Sample ID: 410-150085-1 MSD
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	93.8	64.7	M	ng/L		69	40 - 150	2	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	623	559		ng/L		90	40 - 150	11	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	623	678		ng/L		109	40 - 150	10	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	125	134		ng/L		107	40 - 150	3	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	93.5	99.0		ng/L		106	40 - 150	1	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8600	E F2 cn	94.7	1430	E 4 F2	ng/L		-7546	40 - 150	33	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	240	FH cn	95.7	825	E FH	ng/L		607	40 - 150	29	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-150085-1 MSD
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn	92.8	77.5	M	ng/L		84	40 - 150	8	30
HFPODA	38	U cn	93.8	76.4		ng/L		81	40 - 150	6	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40	U cn	99.5	94.6		ng/L		95	40 - 150	2	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	24.9	27.6		ng/L		111	40 - 150	4	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	U cn	249	308		ng/L		124	40 - 150	1	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	14	U cn	24.9	34.4		ng/L		138	40 - 150	3	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	24.9	28.8		ng/L		115	40 - 150	10	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	U cn	249	298		ng/L		120	40 - 150	1	30
Perfluorobutanesulfonic acid (PFBS)	24	U cn	24.9	29.8		ng/L		120	40 - 150	7	30
Perfluorobutanoic acid (PFBA)	76	FH cn	22.1	111	E FH	ng/L		160	40 - 150	5	30
Perfluorodecanesulfonic acid (PFDS)	200	M cn	99.7	330		ng/L		127	40 - 150	2	30
Perfluorodecanoic acid (PFDA)	10	U cn	24.1	24.4	M	ng/L		101	40 - 150	0	30
Perfluorododecanesulfonic acid (PFDoS)	10	U M cn	24.9	30.4		ng/L		122	40 - 150	1	30
Perfluorododecanoic acid (PFDoA)	19	U cn	24.2	21.2	M	ng/L		88	40 - 150	9	30
Perfluoroheptanesulfonic acid (PFHpS)	10	U cn	24.9	31.9	M	ng/L		128	40 - 150	2	30
Perfluoroheptanoic acid (PFHpA)	610	cn	23.8	232	E 4	ng/L		-1598	40 - 150	12	30
Perfluorohexanesulfonic acid (PFHxS)	730	cn	24.9	573	E 4	ng/L		-613	40 - 150	7	30
Perfluorohexanoic acid (PFHxA)	9800	E cn	22.8	3580	E 4	ng/L		-27098	40 - 150	7	30
Perfluorononanesulfonic acid (PFNS)	1500	E cn	24.9	1060	E 4	ng/L		-1765	40 - 150	9	30
Perfluorononanoic acid (PFNA)	10	U M FH cn	24.0	36.3	M FH	ng/L		151	40 - 150	4	30
Perfluorooctanesulfonamide (FOSA)	28	cn	24.9	53.2		ng/L		100	40 - 150	3	30
Perfluorooctanesulfonic acid (PFOS)	290	cn	24.9	559	E 4	ng/L		1080	40 - 150	11	30
Perfluorooctanoic acid (PFOA)	15000	E cn	23.1	6150	E 4	ng/L		-37414	40 - 150	2	30
Perfluoropentanesulfonic acid (PFPeS)	6500	E cn	24.9	1260	E 4	ng/L		-20960	40 - 150	12	30
Perfluoropentanoic acid (PFPeA)	180	cn	23.5	225	E 4	ng/L		212	40 - 150	12	30
Perfluorotetradecanoic acid (PFTA)	840	cn	49.9	599	E 4	ng/L		-493	40 - 150	7	30
Perfluorotridecanoic acid (PFTriA)	10	U cn	24.9	28.9	M	ng/L		116	40 - 150	1	30
Perfluoroundecanoic acid (PFUnA)	10	U cn	24.9	29.0	M	ng/L		116	40 - 150	1	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	10	U cn	24.9	28.1		ng/L		113	40 - 150	3	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	18	U cn	44.4	52.6		ng/L		119	40 - 150	17	30
	20	U cn	49.9	52.9		ng/L		106	40 - 150	3	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-150085-1 MSD
Matrix: Water
Analysis Batch: 450681

Client Sample ID: 31LS-01-NOV23
Prep Type: Total/NA
Prep Batch: 446773

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	49.9	55.3		ng/L		111	40 - 150	14	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	49.9	43.3		ng/L		87	40 - 150	15	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2 PFTeDA	*60.6*	*M*	*20 - 150*
13C2-PFDoDA	*56.0*	*M*	*20 - 150*
13C3 HFPO-DA	*83.7*		*20 - 150*
13C3 PFBS	*103*		*20 - 150*
13C3 PFHxS	*73.7*		*20 - 150*
13C4 PFBA	*22.9*		*20 - 150*
13C4 PFHpA	*78.0*		*20 - 150*
13C5 PFHxA	*73.1*		*20 - 150*
13C5 PFPeA	*74.6*		*20 - 150*
13C6 PFDA	*72.0*		*20 - 150*
13C7 PFUnA	*65.6*		*20 - 150*
13C8 FOSA	*87.3*		*20 - 150*
13C8 PFOA	*77.9*		*20 - 150*
13C8 PFOS	*69.7*		*20 - 150*
13C9 PFNA	*79.8*		*20 - 150*
d3-NMeFOSAA	*73.2*		*20 - 150*
d3-NMePFOSA	*65.8*		*20 - 150*
d5-NEtFOSAA	*47.4*		*20 - 150*
d5-NEtPFOSA	*61.6*		*20 - 150*
d7-N-MeFOSE-M	*64.1*		*20 - 150*
d9-N-EtFOSE-M	*58.6*		*20 - 150*
M2-4:2 FTS	*120*		*20 - 150*
M2-6:2 FTS	*92.7*		*20 - 150*
M2-8:2 FTS	*84.8*		*20 - 150*

LCMS

Prep Batch: 446773

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-150085-1	31LS-01-NOV23	Total/NA	Water	1633	
410-150085-1 - DL	31LS-01-NOV23	Total/NA	Water	1633	
410-150085-1 - DL2	31LS-01-NOV23	Total/NA	Water	1633	
410-150085-2	31LS-02-NOV23	Total/NA	Water	1633	
410-150085-2 - DL	31LS-02-NOV23	Total/NA	Water	1633	
410-150085-3	31LS-03-NOV23	Total/NA	Water	1633	
410-150085-3 - DL	31LS-03-NOV23	Total/NA	Water	1633	
410-150085-3 - DL2	31LS-03-NOV23	Total/NA	Water	1633	
410-150085-4	31LS-04-NOV23	Total/NA	Water	1633	
410-150085-4 - DL	31LS-04-NOV23	Total/NA	Water	1633	
410-150085-5	31LS-05-NOV23	Total/NA	Water	1633	
410-150085-5 - DL	31LS-05-NOV23	Total/NA	Water	1633	
410-150085-6	31LS-06-NOV23	Total/NA	Water	1633	
410-150085-6 - DL	31LS-06-NOV23	Total/NA	Water	1633	
410-150085-6 - DL2	31LS-06-NOV23	Total/NA	Water	1633	
410-150085-7	31LS-07-NOV23	Total/NA	Water	1633	
410-150085-7 - DL	31LS-07-NOV23	Total/NA	Water	1633	
410-150085-8 - DL2	31LS-08-NOV23	Total/NA	Water	1633	
410-150085-8	31LS-08-NOV23	Total/NA	Water	1633	
410-150085-8 - DL	31LS-08-NOV23	Total/NA	Water	1633	
410-150085-9	31LS-DUP-01-NOV23	Total/NA	Water	1633	
410-150085-9 - DL	31LS-DUP-01-NOV23	Total/NA	Water	1633	
410-150085-9 - DL2	31LS-DUP-01-NOV23	Total/NA	Water	1633	
MB 410-446773/1-A	Method Blank	Total/NA	Water	1633	
LCS 410-446773/2-A	Lab Control Sample	Total/NA	Water	1633	
LLCS 410-446773/3-A	Lab Control Sample	Total/NA	Water	1633	
410-150085-1 MS	31LS-01-NOV23	Total/NA	Water	1633	
410-150085-1 MSD	31LS-01-NOV23	Total/NA	Water	1633	

Analysis Batch: 450681

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-150085-1	31LS-01-NOV23	Total/NA	Water	1633	446773
410-150085-2	31LS-02-NOV23	Total/NA	Water	1633	446773
410-150085-3	31LS-03-NOV23	Total/NA	Water	1633	446773
410-150085-4	31LS-04-NOV23	Total/NA	Water	1633	446773
410-150085-5	31LS-05-NOV23	Total/NA	Water	1633	446773
410-150085-6	31LS-06-NOV23	Total/NA	Water	1633	446773
410-150085-7	31LS-07-NOV23	Total/NA	Water	1633	446773
410-150085-8	31LS-08-NOV23	Total/NA	Water	1633	446773
410-150085-9	31LS-DUP-01-NOV23	Total/NA	Water	1633	446773
MB 410-446773/1-A	Method Blank	Total/NA	Water	1633	446773
LCS 410-446773/2-A	Lab Control Sample	Total/NA	Water	1633	446773
LLCS 410-446773/3-A	Lab Control Sample	Total/NA	Water	1633	446773
410-150085-1 MS	31LS-01-NOV23	Total/NA	Water	1633	446773
410-150085-1 MSD	31LS-01-NOV23	Total/NA	Water	1633	446773

Analysis Batch: 451581

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-150085-1 - DL	31LS-01-NOV23	Total/NA	Water	1633	446773
410-150085-1 - DL2	31LS-01-NOV23	Total/NA	Water	1633	446773
410-150085-2 - DL	31LS-02-NOV23	Total/NA	Water	1633	446773

LCMS (Continued)

Analysis Batch: 451581 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-150085-3 - DL	31LS-03-NOV23	Total/NA	Water	1633	446773
410-150085-3 - DL2	31LS-03-NOV23	Total/NA	Water	1633	446773
410-150085-4 - DL	31LS-04-NOV23	Total/NA	Water	1633	446773
410-150085-5 - DL	31LS-05-NOV23	Total/NA	Water	1633	446773
410-150085-6 - DL	31LS-06-NOV23	Total/NA	Water	1633	446773
410-150085-6 - DL2	31LS-06-NOV23	Total/NA	Water	1633	446773
410-150085-7 - DL	31LS-07-NOV23	Total/NA	Water	1633	446773
410-150085-8 - DL	31LS-08-NOV23	Total/NA	Water	1633	446773
410-150085-8 - DL2	31LS-08-NOV23	Total/NA	Water	1633	446773
410-150085-9 - DL	31LS-DUP-01-NOV23	Total/NA	Water	1633	446773
410-150085-9 - DL2	31LS-DUP-01-NOV23	Total/NA	Water	1633	446773

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-01-NOV23

Lab Sample ID: 410-150085-1

Date Collected: 11/03/23 10:00
Matrix: Water
Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 02:07
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 15:40
Total/NA	Prep	1633	DL2		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL2	100	451581	JVK6	ELLE	12/08/23 15:53

Client Sample ID: 31LS-02-NOV23

Lab Sample ID: 410-150085-2

Date Collected: 11/03/23 10:10
Matrix: Water
Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 02:20
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 16:06

Client Sample ID: 31LS-03-NOV23

Lab Sample ID: 410-150085-3

Date Collected: 11/03/23 10:15
Matrix: Water
Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 02:33
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 16:19
Total/NA	Prep	1633	DL2		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL2	100	451581	JVK6	ELLE	12/08/23 16:32

Client Sample ID: 31LS-04-NOV23

Lab Sample ID: 410-150085-4

Date Collected: 11/03/23 10:20
Matrix: Water
Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 02:46
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 16:45

Client Sample ID: 31LS-05-NOV23

Lab Sample ID: 410-150085-5

Date Collected: 11/03/23 10:30
Matrix: Water
Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 02:59

Client Sample ID: 31LS-05-NOV23

Lab Sample ID: 410-150085-5

Date Collected: 11/03/23 10:30

Matrix: Water

Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 17:24

Client Sample ID: 31LS-06-NOV23

Lab Sample ID: 410-150085-6

Date Collected: 11/03/23 10:35

Matrix: Water

Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 03:12
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 17:37
Total/NA	Prep	1633	DL2		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL2	100	451581	JVK6	ELLE	12/08/23 17:50

Client Sample ID: 31LS-07-NOV23

Lab Sample ID: 410-150085-7

Date Collected: 11/03/23 10:40

Matrix: Water

Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 03:25
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 18:03

Client Sample ID: 31LS-08-NOV23

Lab Sample ID: 410-150085-8

Date Collected: 11/03/23 10:45

Matrix: Water

Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 03:38
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 18:16
Total/NA	Prep	1633	DL2		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL2	100	451581	JVK6	ELLE	12/08/23 18:29

Client Sample ID: 31LS-DUP-01-NOV23

Lab Sample ID: 410-150085-9

Date Collected: 11/03/23 00:00

Matrix: Water

Date Received: 11/06/23 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633		1	450681	JVK6	ELLE	12/07/23 04:43
Total/NA	Prep	1633	DL		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL	10	451581	JVK6	ELLE	12/08/23 18:42

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Client Sample ID: 31LS-DUP-01-NOV23

Date Collected: 11/03/23 00:00
Date Received: 11/06/23 09:35

Lab Sample ID: 410-150085-9

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633	DL2		446773	DX7G	ELLE	11/26/23 12:23
Total/NA	Analysis	1633	DL2	100	451581	JVK6	ELLE	12/08/23 18:55

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Seres Engineering & Services LLC
Job ID: 410-150085-1
Project/Site: Ft. Devens PFAS

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24

Method Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Method	Method Description	Protocol	Laboratory
1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	ELLE
1633	Solid-Phase Extraction (SPE)	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-150085-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-150085-1	31LS-01-NOV23	Water	11/03/23 10:00	11/06/23 09:35
410-150085-2	31LS-02-NOV23	Water	11/03/23 10:10	11/06/23 09:35
410-150085-3	31LS-03-NOV23	Water	11/03/23 10:15	11/06/23 09:35
410-150085-4	31LS-04-NOV23	Water	11/03/23 10:20	11/06/23 09:35
410-150085-5	31LS-05-NOV23	Water	11/03/23 10:30	11/06/23 09:35
410-150085-6	31LS-06-NOV23	Water	11/03/23 10:35	11/06/23 09:35
410-150085-7	31LS-07-NOV23	Water	11/03/23 10:40	11/06/23 09:35
410-150085-8	31LS-08-NOV23	Water	11/03/23 10:45	11/06/23 09:35
410-150085-9	31LS-DUP-01-NOV23	Water	11/03/23 00:00	11/06/23 09:35

410-150085 Chain of Custody

s Environme

Chain of Custody Record

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Client Information	Sampler: Spencer Gust	Lab PM: Sachtleben, Kerri S	Carrier Tracking No(s):	COC No: 410-101216-28883 1
Client Contact: Heather Levesque	Phone: 616-834-8108	E-Mail: Kerri Sachtleben@et eurofinsus com	State of Origin:	Page: Page 1 of 2
Company: Seres Engineering & Services LLC	PWSID:			Job #:
Address: 669 Marina Drive Suite B7	Due Date Requested:			
City: Charleston	TAT Requested (days):			
State, Zip: SC, 29492	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 2019 - 00000002			
Email: halevesque@seres-es com	WO #:			
Project Name: Ft. Devens PFAS	Project #: 41008470			
Site: AOC 31	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Tnzma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	E1633DR(B)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
31LS-Ø1-NOV23	11/03/2023	10:00	C	W			1		
31LS-Ø2-NOV23	11/03/2023	10:10	C	W			1		
31LS-Ø3-NOV23	11/03/2023	10:15	C	W			1		
31LS-Ø4-NOV23	11/03/2023	10:20	C	W			1		
31LS-Ø5-NOV23	11/03/2023	10:30	C	W			1		
31LS-Ø6-NOV23	11/03/2023	10:35	C	W			1		
31LS-Ø7-NOV23	11/03/2023	10:40	C	W			1		
31LS-Ø8-NOV23	11/03/2023	10:45	C	W			1		
31LS-DUP-Ø1-NOV23	11/03/2023	—	C	W			1		
MS	—	—	C	W			1		Composite MS
MSD	—	—	C	W			1		Composite MSD

Possible Hazard Identification

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Spencer P Gust	11/03/2023 16:00		FedEx	11/03/2023 16:00	fedex
Relinquished by: /	Date/Time: /	Company: /	Received by:	Date/Time:	Company:
Relinquished by: /	Date/Time: /	Company: /	Received by: Holly Amo	Date/Time: 11/6/23 0935	Company: FLEET

Custody Seals Intact: Yes Δ No | Custody Seal No.: 185251, 185250

Cooler Temperature(s) °C and Other Remarks: R: 0.5 C: 0.5

IHA GJH

Ver: 06/08/2021

410-150085 Chain of Custody

s Environme

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: Spencer Gust	Lab PM: Sachtleben, Kerri S	Carrier Tracking No(s):	COC No: 410-101216-28883 1
Client Contact: Heather Levesque	Phone: 616-834-8108	E-Mail: Kerri Sachtleben@et eurofinsus com	State of Origin:	Page: Page 1 of 2
Company: Seres Engineering & Services LLC	PWSID:			Job #:
Address: 669 Marina Drive Suite B7	Due Date Requested:			
City: Charleston	TAT Requested (days):			
State, Zip: SC, 29492	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 2019 - 00000002			
Email: halevesque@seres-es com	WO #:			
Project Name: Ft. Devens PFAS	Project #: 41008470			
Site: AOC 31	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Tnzma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	E1633DR(B)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
31LS-01-NOV23	11/03/2023	10:00	C	W			1		
31LS-02-NOV23	11/03/2023	10:10	C	W			1		
31LS-03-NOV23	11/03/2023	10:15	C	W			1		
31LS-04-NOV23	11/03/2023	10:20	C	W			1		
31LS-05-NOV23	11/03/2023	10:30	C	W			1		
31LS-06-NOV23	11/03/2023	10:35	C	W			1		
31LS-07-NOV23	11/03/2023	10:40	C	W			1		
31LS-08-NOV23	11/03/2023	10:45	C	W			1		
31LS-DUP-01-NOV23	11/03/2023	—	C	W			1		
MS	—	—	C	W			1		Composite MS
MSD	—	—	C	W			1		Composite MSD

Possible Hazard Identification

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	Spencer Gust	11/03/2023 16:00		FedEx	11/03/2023 16:00	fedex
2						
3				Holly Amo	11/6/23 0935	FLEET

Custody Seals Intact: ☑ Yes Δ No | Custody Seal No.: 185251, 185250

Cooler Temperature(s) °C and Other Remarks: R: 0.5 C: 0.5

IHA GJH

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Seres Engineering & Services LLC

Job Number: 410-150085-1

Login Number: 150085

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Arroyo, Haley

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable,where thermal pres is required(</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable,where thermal pres is required (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Heather Levesque
Seres Engineering & Services LLC
669 Marina Drive
Suite B7
Charleston, South Carolina 29492

Generated 1/19/2024 6:48:49 AM

JOB DESCRIPTION

Ft. Devens PFAS

JOB NUMBER

410-155546-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization



Generated
1/19/2024 6:48:49 AM

Authorized for release by
Kerri Sachtleben, Client Services Group Leader
Kerri.Sachtleben@et.eurofinsus.com
(717)556-7376

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.
· QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
· Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
· Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied, except as otherwise agreed. We disclaim any other warranties, expressed or implied, including a warranty of fitness for particular purpose and warranty of merchantability. In no event shall Eurofins Lancaster Laboratories Environmental, LLC be liable for indirect, special, consequential, or incidental damages including, but not limited to, damages for loss of profit or goodwill regardless of (A) the negligence (either sole or concurrent) of Eurofins Lancaster Laboratories Environmental and (B) whether Eurofins Lancaster Laboratories Environmental has been informed of the possibility of such damages. We accept no legal responsibility for the purposes for which the client uses the test results. Except as otherwise agreed, no purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.



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Qualifiers

LCMS

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
cn	Refer to Case Narrative for further detail
D	The reported value is from a dilution.
E	Result exceeded calibration range.
F2	MS/MSD RPD exceeds control limits
FH	MS and/or MSD recovery above control limits.
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M	Manual integrated compound.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 410-155546-1 Eurofins Lancaster Laboratories Environment

Job Narrative
410-155546-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Receipt
The samples were received on 12/21/2023 11:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.5°C

Receipt Exceptions
The Field Sampler was not listed on the Chain of Custody. The client was contacted and the field sampler identified as Spencer Gust.

The container count for the following samples did not match what was listed on the Chain-of-Custody (COC): 31LS-01-DEC23 (410-155546-1), 31LS-01-DEC23 (410-155546-1[MS]), 31LS-01-DEC23 (410-155546-1[MSD]), 31LS-02-DEC23 (410-155546-2), 31LS-03-DEC23 (410-155546-3), 31LS-04-DEC23 (410-155546-4), 31LS-05-DEC23 (410-155546-5), 31LS-06-DEC23 (410-155546-6), 31LS-07-DEC23 (410-155546-7), 31LS-08-DEC23 (410-155546-8) and 31LS-08-DEC23 (410-155546-9). The laboratory received 1 total containers per sample, while the COC lists 2 total containers per sample.

PFAS
Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-01-DEC23 (410-155546-1) and 31LS-02-DEC23 (410-155546-2) due to interference from the sample matrix.

Method 1633_DOD5: Reporting limits were raised for the following sample: 31LS-03-DEC23 (410-155546-3) due to limited sample volume.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-04-DEC23 (410-155546-4), 31LS-07-DEC23 (410-155546-7) and (410-155546-A-7-C DU) due to interference from the sample matrix.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-05-DEC23 (410-155546-5) and 31LS-06-DEC23 (410-155546-6) due to limited sample volume.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-01-DEC23 — Lab Sample ID: 410-155546-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2400	FH F2 cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	580	F2 cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	96	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	170	cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	210	FH F2 cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	690	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	5500	F2 cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	1500	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	36	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	330	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	2800	F2 cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	200	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	530	FH cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	5900	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-02-DEC23 — Lab Sample ID: 410-155546-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	560	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	270	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	130	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	210	cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	180	cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	750	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	4600	cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	1600	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	52	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	72	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	1200	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	250	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	650	cn	40	20	10	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-02-DEC23 (Continued)

Lab Sample ID: 410-155546-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanesulfonic acid (PFOS) - DL	11000	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-03-DEC23

Lab Sample ID: 410-155546-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	280	cn	8.5	8.0	2.6	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	32	cn	8.5	8.1	2.7	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	74	cn	2.1	1.1	0.32	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	140	cn	8.5	4.2	2.1	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	71	cn	2.1	1.1	0.42	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	460	cn	2.1	1.1	0.55	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	11	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	17	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	550	cn	2.1	1.4	0.68	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	160	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	420	cn	4.2	2.1	1.1	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2400	D cn	21	12	6.0	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1100	D cn	21	11	5.3	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	2800	D cn	21	11	5.3	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-04-DEC23

Lab Sample ID: 410-155546-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	900	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	3200	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	49	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	310	cn	80	40	20	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	21	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	12	J M cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	1200	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	2300	cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	1500	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	73	M cn	20	10	5.0	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-04-DEC23 (Continued)

Lab Sample ID: 410-155546-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanesulfonamide (FOSA)	1900	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	2800	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	1800	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	120	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	1000	cn	40	20	10	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-05-DEC23

Lab Sample ID: 410-155546-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	210	cn	8.0	7.6	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1100	cn	8.0	7.7	2.6	ng/L	1		1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.1	J M cn	2.0	1.4	0.70	ng/L	1		1633	Total/NA
N-methylperfluorooctanesulfonamide (NMeFOSA)	0.82	J M cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	3.9	J I M cn	4.0	2.4	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	49	cn	2.0	1.0	0.30	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	98	cn	8.0	4.0	2.0	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	4.7	M cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	56	cn	2.0	1.0	0.40	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	430	cn	2.0	1.0	0.52	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	560	cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	1.3	J M cn	2.0	1.0	0.40	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	34	M cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	67	cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	240	cn	4.0	2.0	1.0	ng/L	1		1633	Total/NA
Perfluoroundecanoic acid (PFUnA)	0.68	J cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3000	D	20	11	5.7	ng/L	10		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	640	D M	20	10	5.0	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	1000	D	20	13	6.4	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	7900	D cn	200	100	50	ng/L	100		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-06-DEC23 — Lab Sample ID: 410-155546-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	93	cn	8.1	7.7	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	50	cn	8.1	7.8	2.6	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	190	cn	2.0	1.0	0.31	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	210	cn	8.1	4.1	2.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	21	cn	2.0	1.0	0.41	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	520	cn	2.0	1.0	0.53	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	9.3	M cn	2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	30	cn	2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	360	cn	2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	460	cn	4.1	2.0	1.0	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1500	D	20	10	5.1	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1200	D	20	10	5.1	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	620	D M	20	13	6.5	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	4800	D cn	200	110	58	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-07-DEC23 — Lab Sample ID: 410-155546-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	510	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	68	J cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	72	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	210	cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	27	cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	680	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	4000	cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	3200	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	7.5	J M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	65	M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	820	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	820	M cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	220	cn	20	10	5.0	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-07-DEC23 (Continued) — Lab Sample ID: 410-155546-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanoic acid (PFPeA)	600	cn	40	20	10	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-08-DEC23 — Lab Sample ID: 410-155546-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	100		7.6	7.3	2.4	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	220		7.6	7.4	2.5	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	1.4	J I M	3.8	2.3	1.1	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	29		1.9	0.96	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	29		7.6	3.8	1.9	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	2.7		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	14		1.9	0.96	0.38	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	190		1.9	0.96	0.50	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	190		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	12	M	1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	420		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	45		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	79		3.8	1.9	0.96	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	1900	D	19	11	5.4	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	750	D	19	9.6	4.8	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	710	D	19	12	6.1	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-08-DEC23 — Lab Sample ID: 410-155546-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	130		7.8	7.5	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	310		7.8	7.5	2.5	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	1.6	J I M	3.9	2.4	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	24		2.0	0.98	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	25		7.8	3.9	2.0	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.4	M	2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	21		2.0	0.98	0.39	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-08-DEC23 (Continued)

Lab Sample ID: 410-155546-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoroheptanoic acid (PFHpA)	150		2.0	0.98	0.51	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	170		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	15	M	2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	560		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	52		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	65	M	3.9	2.0	0.98	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	1400	D	20	11	5.6	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	980	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	680	D	20	13	6.3	ng/L	10		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-01-DEC23
Date Collected: 12/20/23 12:20
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-1
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		01/10/24 12:28	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		01/10/24 12:28	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		01/10/24 12:28	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		01/10/24 12:28	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		01/10/24 12:28	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**2400**	**FH F2 cn**	80	76	25	ng/L		01/10/24 12:28	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**580**	**F2 cn**	80	77	26	ng/L		01/10/24 12:28	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		01/10/24 12:28	1
DONA	38	U cn	80	38	15	ng/L		01/10/24 12:28	1
HFPODA	40	U cn	80	40	20	ng/L		01/10/24 12:28	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		01/10/24 12:28	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		01/10/24 12:28	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		01/10/24 12:28	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		01/10/24 12:28	1
Perfluorobutanesulfonic acid (PFBS)	**96**	**cn**	20	10	3.0	ng/L		01/10/24 12:28	1
Perfluorobutanoic acid (PFBA)	**170**	**cn**	80	40	20	ng/L		01/10/24 12:28	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorodecanoic acid (PFDA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		01/10/24 12:28	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluoroheptanesulfonic acid (PFHpS)	**210**	**FH F2 cn**	20	10	4.0	ng/L		01/10/24 12:28	1
Perfluoroheptanoic acid (PFHpA)	**690**	**cn**	20	10	5.2	ng/L		01/10/24 12:28	1
Perfluorohexanesulfonic acid (PFHxS)	**5500**	**F2 cn**	20	11	5.7	ng/L		01/10/24 12:28	1
Perfluorohexanoic acid (PFHxA)	**1500**	**cn**	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		01/10/24 12:28	1
Perfluorononanoic acid (PFNA)	**36**	**cn**	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorooctanesulfonamide (FOSA)	**330**	**cn**	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorooctanoic acid (PFOA)	**2800**	**F2 cn**	20	13	6.4	ng/L		01/10/24 12:28	1
Perfluoropentanesulfonic acid (PFPeS)	**200**	**cn**	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluoropentanoic acid (PFPeA)	**530**	**FH cn**	40	20	10	ng/L		01/10/24 12:28	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		01/10/24 12:28	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		01/10/24 12:28	1

Client Sample ID: 31LS-01-DEC23

Lab Sample ID: 410-155546-1

Date Collected: 12/20/23 12:20

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		01/10/24 12:28	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		01/10/24 12:28	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		01/10/24 12:28	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*86.5*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C2-PFDoDA	*87.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C3 HFPO-DA	*78.7*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C3 PFBS	*87.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C3 PFHxS	*79.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C4 PFBA	*80.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C4 PFHpA	*77.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C5 PFHxA	*79.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C5 PFPeA	*71.2*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C6 PFDA	*85.7*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C7 PFUnA	*80.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C8 FOSA	*82.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C8 PFOA	*74.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C8 PFOS	*84.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
13C9 PFNA	*84.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d3-NMeFOSAA	*92.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d3-NMePFOSA	*72.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d5-NEtFOSAA	*84.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d5-NEtPFOSA	*73.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d7-N-MeFOSE-M	*84.5*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
d9-N-EtFOSE-M	*78.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
M2-4:2 FTS	*86.7*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
M2-6:2 FTS	*100*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*
M2-8:2 FTS	*81.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 12:28*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**5900**	**D cn**	200	100	50	ng/L		01/11/24 10:36	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*74.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/11/24 10:36*	*10*

Client Sample ID: 31LS-02-DEC23

Lab Sample ID: 410-155546-2

Date Collected: 12/20/23 12:25

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		01/10/24 13:07	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		01/10/24 13:07	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		01/10/24 13:07	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-02-DEC23
Date Collected: 12/20/23 12:25
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-2
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		01/10/24 13:07	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		01/10/24 13:07	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**560**	**cn**	80	76	25	ng/L		01/10/24 13:07	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**270**	**cn**	80	77	26	ng/L		01/10/24 13:07	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		01/10/24 13:07	1
DONA	38	U cn	80	38	15	ng/L		01/10/24 13:07	1
HFPODA	40	U cn	80	40	20	ng/L		01/10/24 13:07	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		01/10/24 13:07	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		01/10/24 13:07	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		01/10/24 13:07	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		01/10/24 13:07	1
Perfluorobutanesulfonic acid (PFBS)	**130**	**cn**	20	10	3.0	ng/L		01/10/24 13:07	1
Perfluorobutanoic acid (PFBA)	**210**	**cn**	80	40	20	ng/L		01/10/24 13:07	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorodecanoic acid (PFDA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		01/10/24 13:07	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluoroheptanesulfonic acid (PFHpS)	**180**	**cn**	20	10	4.0	ng/L		01/10/24 13:07	1
Perfluoroheptanoic acid (PFHpA)	**750**	**cn**	20	10	5.2	ng/L		01/10/24 13:07	1
Perfluorohexanesulfonic acid (PFHxS)	**4600**	**cn**	20	11	5.7	ng/L		01/10/24 13:07	1
Perfluorohexanoic acid (PFHxA)	**1600**	**cn**	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		01/10/24 13:07	1
Perfluorononanoic acid (PFNA)	**52**	**cn**	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorooctanesulfonamide (FOSA)	**72**	**cn**	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorooctanoic acid (PFOA)	**1200**	**cn**	20	13	6.4	ng/L		01/10/24 13:07	1
Perfluoropentanesulfonic acid (PFPeS)	**250**	**cn**	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluoropentanoic acid (PFPeA)	**650**	**cn**	40	20	10	ng/L		01/10/24 13:07	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		01/10/24 13:07	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		01/10/24 13:07	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		01/10/24 13:07	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		01/10/24 13:07	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		01/10/24 13:07	1

Client Sample ID: 31LS-02-DEC23

Lab Sample ID: 410-155546-2

Date Collected: 12/20/23 12:25

Matrix: Water

Date Received: 12/21/23 11:00

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*72.5*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C2-PFDoDA	*76.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C3 HFPO-DA	*76.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C3 PFBS	*93.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C3 PFHxS	*77.8*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C4 PFBA	*78.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C4 PFHpA	*75.8*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C5 PFHxA	*79.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C5 PFPeA	*82.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C6 PFDA	*76.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C7 PFUnA	*70.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C8 FOSA	*87.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C8 PFOA	*70.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C8 PFOS	*92.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
13C9 PFNA	*79.9*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d3-NMeFOSAA	*93.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d3-NMePFOSA	*73.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d5-NEtFOSAA	*85.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d5-NEtPFOSA	*73.2*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d7-N-MeFOSE-M	*86.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
d9-N-EtFOSE-M	*81.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
M2-4:2 FTS	*80.8*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
M2-6:2 FTS	*86.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*
M2-8:2 FTS	*86.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:07*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**11000**	**D cn**	200	100	50	ng/L		01/11/24 10:49	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*63.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/11/24 10:49*	*10*

Client Sample ID: 31LS-03-DEC23

Lab Sample ID: 410-155546-3

Date Collected: 12/20/23 12:30

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.0	U cn	8.5	8.0	2.1	ng/L		01/10/24 13:33	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	26	U cn	53	26	11	ng/L		01/10/24 13:33	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	26	U cn	53	26	11	ng/L		01/10/24 13:33	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.3	U cn	11	5.3	1.6	ng/L		01/10/24 13:33	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.0	U cn	8.5	4.0	1.8	ng/L		01/10/24 13:33	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**280**	**cn**	8.5	8.0	2.6	ng/L		01/10/24 13:33	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**32**	**cn**	8.5	8.1	2.7	ng/L		01/10/24 13:33	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.0	U cn	8.5	4.0	1.1	ng/L		01/10/24 13:33	1
DONA	4.0	U cn	8.5	4.0	1.6	ng/L		01/10/24 13:33	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-03-DEC23
Date Collected: 12/20/23 12:30
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-3
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
HFPODA	4.2	U cn	8.5	4.2	2.1	ng/L		01/10/24 13:33	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	21	11	5.3	ng/L		01/10/24 13:33	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.5	U cn	2.1	1.5	0.74	ng/L		01/10/24 13:33	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	21	11	5.3	ng/L		01/10/24 13:33	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.5	U cn	4.2	2.5	1.3	ng/L		01/10/24 13:33	1
Perfluorobutanesulfonic acid (PFBS)	**74**	**cn**	2.1	1.1	0.32	ng/L		01/10/24 13:33	1
Perfluorobutanoic acid (PFBA)	**140**	**cn**	8.5	4.2	2.1	ng/L		01/10/24 13:33	1
Perfluorodecanesulfonic acid (PFDS)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluorodecanoic acid (PFDA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U cn	2.1	2.0	0.95	ng/L		01/10/24 13:33	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluoroheptanesulfonic acid (PFHpS)	**71**	**cn**	2.1	1.1	0.42	ng/L		01/10/24 13:33	1
Perfluoroheptanoic acid (PFHpA)	**460**	**cn**	2.1	1.1	0.55	ng/L		01/10/24 13:33	1
Perfluorononanesulfonic acid (PFNS)	1.1	U cn	2.1	1.1	0.42	ng/L		01/10/24 13:33	1
Perfluorononanoic acid (PFNA)	**11**	**cn**	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluorooctanesulfonamide (FOSA)	**17**	**cn**	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluorooctanoic acid (PFOA)	**550**	**cn**	2.1	1.4	0.68	ng/L		01/10/24 13:33	1
Perfluoropentanesulfonic acid (PFPeS)	**160**	**cn**	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluoropentanoic acid (PFPeA)	**420**	**cn**	4.2	2.1	1.1	ng/L		01/10/24 13:33	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.1	1.1	0.53	ng/L		01/10/24 13:33	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U cn	4.2	1.9	0.53	ng/L		01/10/24 13:33	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U cn	4.2	2.1	1.1	ng/L		01/10/24 13:33	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U cn	4.2	2.1	1.1	ng/L		01/10/24 13:33	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U cn	4.2	2.1	0.53	ng/L		01/10/24 13:33	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*60.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C2-PFDoDA	*52.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C3 HFPO-DA	*76.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C3 PFBS	*101*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C3 PFHxS	*70.7*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C4 PFBA	*45.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C4 PFHpA	*74.3*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C5 PFHxA	*70.1*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C5 PFPeA	*64.4*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C6 PFDA	*74.0*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*
13C7 PFUnA	*59.6*	*cn*	*20 - 150*	*01/08/24 06:47*	*01/10/24 13:33*	*1*

Client Sample ID: 31LS-03-DEC23

Lab Sample ID: 410-155546-3

Date Collected: 12/20/23 12:30

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	80.5	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
13C8 PFOA	81.8	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
13C8 PFOS	76.8	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
13C9 PFNA	80.7	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d3-NMeFOSAA	74.9	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d3-NMePFOSA	75.1	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d5-NEtFOSAA	65.6	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d5-NEtPFOSA	57.0	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d7-N-MeFOSE-M	70.3	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
d9-N-EtFOSE-M	62.9	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
M2-4:2 FTS	109	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
M2-6:2 FTS	98.3	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1
M2-8:2 FTS	82.2	cn	20 - 150	01/08/24 06:47	01/10/24 13:33	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2400**	**D cn**	21	12	6.0	ng/L		01/11/24 11:02	10
Perfluorohexanoic acid (PFHxA)	**1100**	**D cn**	21	11	5.3	ng/L		01/11/24 11:02	10
Perfluorooctanesulfonic acid (PFOS)	**2800**	**D cn**	21	11	5.3	ng/L		01/11/24 11:02	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	54.9	cn	20 - 150	01/08/24 06:47	01/11/24 11:02	10
13C5 PFHxA	61.3	cn	20 - 150	01/08/24 06:47	01/11/24 11:02	10
13C8 PFOS	61.3	cn	20 - 150	01/08/24 06:47	01/11/24 11:02	10

Client Sample ID: 31LS-04-DEC23

Lab Sample ID: 410-155546-4

Date Collected: 12/20/23 12:35

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		01/11/24 15:30	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		01/11/24 15:30	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		01/11/24 15:30	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		01/11/24 15:30	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		01/11/24 15:30	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**900**	**cn**	80	76	25	ng/L		01/11/24 15:30	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**3200**	**cn**	80	77	26	ng/L		01/11/24 15:30	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		01/11/24 15:30	1
DONA	38	U cn	80	38	15	ng/L		01/11/24 15:30	1
HFPODA	40	U cn	80	40	20	ng/L		01/11/24 15:30	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		01/11/24 15:30	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-04-DEC23
Date Collected: 12/20/23 12:35
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-4
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		01/11/24 15:30	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		01/11/24 15:30	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U M cn	40	24	12	ng/L		01/11/24 15:30	1
Perfluorobutanesulfonic acid (PFBS)	**49**	**cn**	20	10	3.0	ng/L		01/11/24 15:30	1
Perfluorobutanoic acid (PFBA)	**310**	**cn**	80	40	20	ng/L		01/11/24 15:30	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorodecanoic acid (PFDA)	**21**	**cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		01/11/24 15:30	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluoroheptanesulfonic acid (PFHpS)	**12**	**J M cn**	20	10	4.0	ng/L		01/11/24 15:30	1
Perfluoroheptanoic acid (PFHpA)	**1200**	**cn**	20	10	5.2	ng/L		01/11/24 15:30	1
Perfluorohexanesulfonic acid (PFHxS)	**2300**	**cn**	20	11	5.7	ng/L		01/11/24 15:30	1
Perfluorohexanoic acid (PFHxA)	**1500**	**cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		01/11/24 15:30	1
Perfluorononanoic acid (PFNA)	**73**	**M cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorooctanesulfonamide (FOSA)	**1900**	**cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorooctanesulfonic acid (PFOS)	**2800**	**cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorooctanoic acid (PFOA)	**1800**	**cn**	20	13	6.4	ng/L		01/11/24 15:30	1
Perfluoropentanesulfonic acid (PFPeS)	**120**	**cn**	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluoropentanoic acid (PFPeA)	**1000**	**cn**	40	20	10	ng/L		01/11/24 15:30	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		01/11/24 15:30	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		01/11/24 15:30	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		01/11/24 15:30	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		01/11/24 15:30	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		01/11/24 15:30	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*84.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C2-PFDoDA	*76.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C3 HFPO-DA	*71.8*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C3 PFBS	*73.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C3 PFHxS	*60.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C4 PFBA	*71.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C4 PFHpA	*66.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C5 PFHxA	*72.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C5 PFPeA	*77.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C6 PFDA	*75.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C7 PFUnA	*72.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*
13C8 FOSA	*93.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:30*	*1*

Client Sample ID: 31LS-04-DEC23

Lab Sample ID: 410-155546-4

Date Collected: 12/20/23 12:35

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOA	59.6	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
13C8 PFOS	79.9	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
13C9 PFNA	76.2	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d3-NMeFOSAA	92.3	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d3-NMePFOSA	73.3	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d5-NEtFOSAA	94.5	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d5-NEtPFOSA	74.8	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d7-N-MeFOSE-M	57.2	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
d9-N-EtFOSE-M	58.9	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
M2-4:2 FTS	79.2	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
M2-6:2 FTS	80.3	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1
M2-8:2 FTS	85.5	cn	20 - 150	01/08/24 07:25	01/11/24 15:30	1

Client Sample ID: 31LS-05-DEC23

Lab Sample ID: 410-155546-5

Date Collected: 12/20/23 12:40

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U cn	8.0	7.6	2.0	ng/L		01/11/24 15:42	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U cn	50	25	10	ng/L		01/11/24 15:42	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U cn	50	25	10	ng/L		01/11/24 15:42	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U cn	10	5.0	1.5	ng/L		01/11/24 15:42	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U cn	8.0	3.8	1.7	ng/L		01/11/24 15:42	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**210**	**cn**	8.0	7.6	2.5	ng/L		01/11/24 15:42	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**1100**	**cn**	8.0	7.7	2.6	ng/L		01/11/24 15:42	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U cn	8.0	3.8	1.0	ng/L		01/11/24 15:42	1
DONA	3.8	U cn	8.0	3.8	1.5	ng/L		01/11/24 15:42	1
HFPODA	4.0	U cn	8.0	4.0	2.0	ng/L		01/11/24 15:42	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U cn	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	20	10	5.0	ng/L		01/11/24 15:42	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**1.1**	**J M cn**	2.0	1.4	0.70	ng/L		01/11/24 15:42	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**0.82**	**J M cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	20	10	5.0	ng/L		01/11/24 15:42	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**3.9**	**J I M cn**	4.0	2.4	1.2	ng/L		01/11/24 15:42	1
Perfluorobutanesulfonic acid (PFBS)	**49**	**cn**	2.0	1.0	0.30	ng/L		01/11/24 15:42	1
Perfluorobutanoic acid (PFBA)	**98**	**cn**	8.0	4.0	2.0	ng/L		01/11/24 15:42	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U cn	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluorodecanoic acid (PFDA)	**4.7**	**M cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U cn	2.0	1.9	0.90	ng/L		01/11/24 15:42	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-05-DEC23
Date Collected: 12/20/23 12:40
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-5
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	1.0	U cn	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluoroheptanesulfonic acid (PFHpS)	**56**	**cn**	2.0	1.0	0.40	ng/L		01/11/24 15:42	1
Perfluoroheptanoic acid (PFHpA)	**430**	**cn**	2.0	1.0	0.52	ng/L		01/11/24 15:42	1
Perfluorohexanoic acid (PFHxA)	**560**	**cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluorononanesulfonic acid (PFNS)	**1.3**	**J M cn**	2.0	1.0	0.40	ng/L		01/11/24 15:42	1
Perfluorononanoic acid (PFNA)	**34**	**M cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluoropentanesulfonic acid (PFPeS)	**67**	**cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluoropentanoic acid (PFPeA)	**240**	**cn**	4.0	2.0	1.0	ng/L		01/11/24 15:42	1
Perfluorotetradecanoic acid (PFTA)	1.0	U cn	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluorotridecanoic acid (PFTriA)	1.0	U cn	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluoroundecanoic acid (PFUnA)	**0.68**	**J cn**	2.0	1.0	0.50	ng/L		01/11/24 15:42	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U cn	4.0	1.8	0.50	ng/L		01/11/24 15:42	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U cn	4.0	2.0	1.0	ng/L		01/11/24 15:42	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U cn	4.0	2.0	1.0	ng/L		01/11/24 15:42	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U cn	4.0	2.0	0.50	ng/L		01/11/24 15:42	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*55.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C2-PFDoDA	*53.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C3 HFPO-DA	*78.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C3 PFBS	*77.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C3 PFHxS	*60.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C4 PFBA	*71.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C4 PFHpA	*73.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C5 PFHxA	*75.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C5 PFPeA	*77.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C6 PFDA	*65.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C7 PFUnA	*61.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C8 FOSA	*112*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C8 PFOA	*74.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C8 PFOS	*76.3*	*M cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
13C9 PFNA	*73.8*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d3-NMeFOSAA	*102*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d3-NMePFOSA	*82.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d5-NEtFOSAA	*78.8*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d5-NEtPFOSA	*75.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d7-N-MeFOSE-M	*56.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
d9-N-EtFOSE-M	*55.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
M2-4:2 FTS	*81.8*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
M2-6:2 FTS	*92.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*
M2-8:2 FTS	*92.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:42*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**3000**	**D**	20	11	5.7	ng/L		01/12/24 04:12	10

Client Sample ID: 31LS-05-DEC23

Lab Sample ID: 410-155546-5

Date Collected: 12/20/23 12:40

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	**640**	**D M**	20	10	5.0	ng/L		01/12/24 04:12	10
Perfluorooctanoic acid (PFOA)	**1000**	**D**	20	13	6.4	ng/L		01/12/24 04:12	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*55.1*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:12*	*10*
13C8 FOSA	*94.3*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:12*	*10*
13C8 PFOA	*60.0*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:12*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**7900**	**D cn**	200	100	50	ng/L		01/13/24 08:13	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*78.7*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/13/24 08:13*	*100*

Client Sample ID: 31LS-06-DEC23

Lab Sample ID: 410-155546-6

Date Collected: 12/20/23 12:45

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.7	U cn	8.1	7.7	2.0	ng/L		01/11/24 15:55	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U cn	51	25	10	ng/L		01/11/24 15:55	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U cn	51	25	10	ng/L		01/11/24 15:55	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.1	U cn	10	5.1	1.5	ng/L		01/11/24 15:55	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.9	U cn	8.1	3.9	1.7	ng/L		01/11/24 15:55	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**93**	**cn**	8.1	7.7	2.5	ng/L		01/11/24 15:55	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**50**	**cn**	8.1	7.8	2.6	ng/L		01/11/24 15:55	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.9	U cn	8.1	3.9	1.0	ng/L		01/11/24 15:55	1
DONA	3.9	U cn	8.1	3.9	1.5	ng/L		01/11/24 15:55	1
HFPODA	4.1	U cn	8.1	4.1	2.0	ng/L		01/11/24 15:55	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	20	10	5.1	ng/L		01/11/24 15:55	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U cn	2.0	1.4	0.71	ng/L		01/11/24 15:55	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	20	10	5.1	ng/L		01/11/24 15:55	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.4	U cn	4.1	2.4	1.2	ng/L		01/11/24 15:55	1
Perfluorobutanesulfonic acid (PFBS)	**190**	**cn**	2.0	1.0	0.31	ng/L		01/11/24 15:55	1
Perfluorobutanoic acid (PFBA)	**210**	**cn**	8.1	4.1	2.0	ng/L		01/11/24 15:55	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluorodecanoic acid (PFDA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U cn	2.0	1.9	0.92	ng/L		01/11/24 15:55	1

Client Sample ID: 31LS-06-DEC23
Date Collected: 12/20/23 12:45
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-6
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluoroheptanesulfonic acid (PFHpS)	**21**	**cn**	2.0	1.0	0.41	ng/L		01/11/24 15:55	1
Perfluoroheptanoic acid (PFHpA)	**520**	**cn**	2.0	1.0	0.53	ng/L		01/11/24 15:55	1
Perfluorononanesulfonic acid (PFNS)	1.0	U cn	2.0	1.0	0.41	ng/L		01/11/24 15:55	1
Perfluorononanoic acid (PFNA)	**9.3**	**M cn**	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluorooctanesulfonamide (FOSA)	**30**	**cn**	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluoropentanesulfonic acid (PFPeS)	**360**	**cn**	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluoropentanoic acid (PFPeA)	**460**	**cn**	4.1	2.0	1.0	ng/L		01/11/24 15:55	1
Perfluorotetradecanoic acid (PFTA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluorotridecanoic acid (PFTriA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluoroundecanoic acid (PFUnA)	1.0	U cn	2.0	1.0	0.51	ng/L		01/11/24 15:55	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U cn	4.1	1.8	0.51	ng/L		01/11/24 15:55	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U cn	4.1	2.0	1.0	ng/L		01/11/24 15:55	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U cn	4.1	2.0	1.0	ng/L		01/11/24 15:55	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U cn	4.1	2.0	0.51	ng/L		01/11/24 15:55	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*30.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C2-PFDoDA	*32.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C3 HFPO-DA	*82.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C3 PFBS	*91.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C3 PFHxS	*60.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C4 PFBA	*75.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C4 PFHpA	*77.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C5 PFHxA	*74.7*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C5 PFPeA	*86.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C6 PFDA	*49.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C7 PFUnA	*35.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C8 FOSA	*75.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C8 PFOA	*70.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C8 PFOS	*46.8*	*M cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
13C9 PFNA	*66.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d3-NMeFOSAA	*62.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d3-NMePFOSA	*59.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d5-NEtFOSAA	*50.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d5-NEtPFOSA	*56.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d7-N-MeFOSE-M	*51.8*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
d9-N-EtFOSE-M	*47.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
M2-4:2 FTS	*102*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
M2-6:2 FTS	*87.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*
M2-8:2 FTS	*73.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 15:55*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanoic acid (PFHxA)	**1500**	**D**	20	10	5.1	ng/L		01/12/24 04:24	10
Perfluorooctanesulfonic acid (PFOS)	**1200**	**D**	20	10	5.1	ng/L		01/12/24 04:24	10

Client Sample ID: 31LS-06-DEC23

Lab Sample ID: 410-155546-6

Date Collected: 12/20/23 12:45

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanoic acid (PFOA)	**620**	**D M**	20	13	6.5	ng/L		01/12/24 04:24	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C5 PFHxA	*73.4*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:24*	*10*
13C8 PFOA	*77.9*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:24*	*10*
13C8 PFOS	*41.9*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:24*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**4800**	**D cn**	200	110	58	ng/L		01/13/24 08:25	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*78.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/13/24 08:25*	*100*

Client Sample ID: 31LS-07-DEC23

Lab Sample ID: 410-155546-7

Date Collected: 12/20/23 12:50

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		01/11/24 16:07	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		01/11/24 16:07	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		01/11/24 16:07	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		01/11/24 16:07	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		01/11/24 16:07	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**510**	**cn**	80	76	25	ng/L		01/11/24 16:07	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**68**	**J cn**	80	77	26	ng/L		01/11/24 16:07	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		01/11/24 16:07	1
DONA	38	U cn	80	38	15	ng/L		01/11/24 16:07	1
HFPODA	40	U cn	80	40	20	ng/L		01/11/24 16:07	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		01/11/24 16:07	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		01/11/24 16:07	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		01/11/24 16:07	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		01/11/24 16:07	1
Perfluorobutanesulfonic acid (PFBS)	**72**	**cn**	20	10	3.0	ng/L		01/11/24 16:07	1
Perfluorobutanoic acid (PFBA)	**210**	**cn**	80	40	20	ng/L		01/11/24 16:07	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorodecanoic acid (PFDA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		01/11/24 16:07	1

Client Sample ID: 31LS-07-DEC23
Date Collected: 12/20/23 12:50
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-7
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluoroheptanesulfonic acid (PFHpS)	**27**	**cn**	20	10	4.0	ng/L		01/11/24 16:07	1
Perfluoroheptanoic acid (PFHpA)	**680**	**cn**	20	10	5.2	ng/L		01/11/24 16:07	1
Perfluorohexanesulfonic acid (PFHxS)	**4000**	**cn**	20	11	5.7	ng/L		01/11/24 16:07	1
Perfluorohexanoic acid (PFHxA)	**3200**	**cn**	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		01/11/24 16:07	1
Perfluorononanoic acid (PFNA)	**7.5**	**J M cn**	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorooctanesulfonamide (FOSA)	**65**	**M cn**	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorooctanesulfonic acid (PFOS)	**820**	**cn**	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorooctanoic acid (PFOA)	**820**	**M cn**	20	13	6.4	ng/L		01/11/24 16:07	1
Perfluoropentanesulfonic acid (PFPeS)	**220**	**cn**	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluoropentanoic acid (PFPeA)	**600**	**cn**	40	20	10	ng/L		01/11/24 16:07	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		01/11/24 16:07	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		01/11/24 16:07	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		01/11/24 16:07	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		01/11/24 16:07	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		01/11/24 16:07	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*82.1*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C2-PFDoDA	*74.7*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C3 HFPO-DA	*82.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C3 PFBS	*77.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C3 PFHxS	*64.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C4 PFBA	*77.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C4 PFHpA	*83.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C5 PFHxA	*79.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C5 PFPeA	*88.7*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C6 PFDA	*77.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C7 PFUnA	*74.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C8 FOSA	*96.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C8 PFOA	*75.2*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C8 PFOS	*79.3*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
13C9 PFNA	*76.6*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d3-NMeFOSAA	*93.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d3-NMePFOSA	*71.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d5-NEtFOSAA	*87.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d5-NEtPFOSA	*71.0*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d7-N-MeFOSE-M	*56.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
d9-N-EtFOSE-M	*58.5*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
M2-4:2 FTS	*86.4*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
M2-6:2 FTS	*81.7*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*
M2-8:2 FTS	*82.9*	*cn*	*20 - 150*	*01/08/24 07:25*	*01/11/24 16:07*	*1*

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-08-DEC23
Date Collected: 12/20/23 12:55
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-8
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.3	U	7.6	7.3	1.9	ng/L		01/11/24 16:31	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	48	24	9.6	ng/L		01/11/24 16:31	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	24	U	48	24	9.6	ng/L		01/11/24 16:31	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.8	U	9.6	4.8	1.4	ng/L		01/11/24 16:31	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	7.6	3.6	1.6	ng/L		01/11/24 16:31	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**100**		7.6	7.3	2.4	ng/L		01/11/24 16:31	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**220**		7.6	7.4	2.5	ng/L		01/11/24 16:31	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.6	U	7.6	3.6	0.96	ng/L		01/11/24 16:31	1
DONA	3.6	U	7.6	3.6	1.4	ng/L		01/11/24 16:31	1
HFPODA	3.8	U	7.6	3.8	1.9	ng/L		01/11/24 16:31	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.6	U	19	9.6	4.8	ng/L		01/11/24 16:31	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U M	1.9	1.3	0.67	ng/L		01/11/24 16:31	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.6	U	19	9.6	4.8	ng/L		01/11/24 16:31	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**1.4**	**J I M**	3.8	2.3	1.1	ng/L		01/11/24 16:31	1
Perfluorobutanesulfonic acid (PFBS)	**29**		1.9	0.96	0.29	ng/L		01/11/24 16:31	1
Perfluorobutanoic acid (PFBA)	**29**		7.6	3.8	1.9	ng/L		01/11/24 16:31	1
Perfluorodecanesulfonic acid (PFDS)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluorodecanoic acid (PFDA)	**2.7**		1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.86	ng/L		01/11/24 16:31	1
Perfluorododecanoic acid (PFDoA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluoroheptanesulfonic acid (PFHpS)	**14**		1.9	0.96	0.38	ng/L		01/11/24 16:31	1
Perfluoroheptanoic acid (PFHpA)	**190**		1.9	0.96	0.50	ng/L		01/11/24 16:31	1
Perfluorohexanoic acid (PFHxA)	**190**		1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluorononanesulfonic acid (PFNS)	0.96	U	1.9	0.96	0.38	ng/L		01/11/24 16:31	1
Perfluorononanoic acid (PFNA)	**12**	**M**	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluorooctanesulfonamide (FOSA)	**420**		1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluoropentanesulfonic acid (PFPeS)	**45**		1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluoropentanoic acid (PFPeA)	**79**		3.8	1.9	0.96	ng/L		01/11/24 16:31	1
Perfluorotetradecanoic acid (PFTA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluorotridecanoic acid (PFTriA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluoroundecanoic acid (PFUnA)	0.96	U	1.9	0.96	0.48	ng/L		01/11/24 16:31	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.8	1.7	0.48	ng/L		01/11/24 16:31	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.8	1.9	0.96	ng/L		01/11/24 16:31	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.8	1.9	0.96	ng/L		01/11/24 16:31	1

Client Sample ID: 31LS-08-DEC23

Lab Sample ID: 410-155546-8

Date Collected: 12/20/23 12:55

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.8	1.9	0.48	ng/L		01/11/24 16:31	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*62.0*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C2-PFDoDA	*51.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C3 HFPO-DA	*86.4*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C3 PFBS	*86.5*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C3 PFHxS	*72.7*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C4 PFBA	*85.0*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C4 PFHpA	*83.8*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C5 PFHxA	*88.4*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C5 PFPeA	*95.7*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C6 PFDA	*69.0*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C7 PFUnA	*54.4*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C8 FOSA	*93.0*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C8 PFOA	*79.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C8 PFOS	*69.5*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
13C9 PFNA	*78.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d3-NMeFOSAA	*75.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d3-NMePFOSA	*65.4*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d5-NEtFOSAA	*68.1*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d5-NEtPFOSA	*60.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d7-N-MeFOSE-M	*48.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
d9-N-EtFOSE-M	*46.8*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
M2-4:2 FTS	*98.9*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
M2-6:2 FTS	*94.9*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*
M2-8:2 FTS	*91.1*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:31*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**1900**	**D**	19	11	5.4	ng/L		01/12/24 04:36	10
Perfluorooctanesulfonic acid (PFOS)	**750**	**D**	19	9.6	4.8	ng/L		01/12/24 04:36	10
Perfluorooctanoic acid (PFOA)	**710**	**D**	19	12	6.1	ng/L		01/12/24 04:36	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*52.9*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:36*	*10*
13C8 PFOA	*77.8*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:36*	*10*
13C8 PFOS	*61.1*		*20 - 150*	*01/08/24 07:25*	*01/12/24 04:36*	*10*

Client Sample ID: 31LS-08-DEC23

Lab Sample ID: 410-155546-9

Date Collected: 12/20/23 12:55

Matrix: Water

Date Received: 12/21/23 11:00

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	7.8	7.5	2.0	ng/L		01/11/24 16:43	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	49	25	9.8	ng/L		01/11/24 16:43	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	49	25	9.8	ng/L		01/11/24 16:43	1

Client Sample ID: 31LS-08-DEC23
Date Collected: 12/20/23 12:55
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	9.8	4.9	1.5	ng/L		01/11/24 16:43	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	7.8	3.7	1.7	ng/L		01/11/24 16:43	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**130**		7.8	7.5	2.5	ng/L		01/11/24 16:43	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**310**		7.8	7.5	2.5	ng/L		01/11/24 16:43	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.8	3.7	0.98	ng/L		01/11/24 16:43	1
DONA	3.7	U	7.8	3.7	1.5	ng/L		01/11/24 16:43	1
HFPODA	3.9	U	7.8	3.9	2.0	ng/L		01/11/24 16:43	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.8	U	20	9.8	4.9	ng/L		01/11/24 16:43	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.69	ng/L		01/11/24 16:43	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.8	U	20	9.8	4.9	ng/L		01/11/24 16:43	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**1.6**	**J I M**	3.9	2.4	1.2	ng/L		01/11/24 16:43	1
Perfluorobutanesulfonic acid (PFBS)	**24**		2.0	0.98	0.29	ng/L		01/11/24 16:43	1
Perfluorobutanoic acid (PFBA)	**25**		7.8	3.9	2.0	ng/L		01/11/24 16:43	1
Perfluorodecanesulfonic acid (PFDS)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluorodecanoic acid (PFDA)	**3.4**	**M**	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.88	ng/L		01/11/24 16:43	1
Perfluorododecanoic acid (PFDoA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluoroheptanesulfonic acid (PFHpS)	**21**		2.0	0.98	0.39	ng/L		01/11/24 16:43	1
Perfluoroheptanoic acid (PFHpA)	**150**		2.0	0.98	0.51	ng/L		01/11/24 16:43	1
Perfluorohexanoic acid (PFHxA)	**170**		2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluorononanesulfonic acid (PFNS)	0.98	U	2.0	0.98	0.39	ng/L		01/11/24 16:43	1
Perfluorononanoic acid (PFNA)	**15**	**M**	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluorooctanesulfonamide (FOSA)	**560**		2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluoropentanesulfonic acid (PFPeS)	**52**		2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluoropentanoic acid (PFPeA)	**65**	**M**	3.9	2.0	0.98	ng/L		01/11/24 16:43	1
Perfluorotetradecanoic acid (PFTA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluorotridecanoic acid (PFTriA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluoroundecanoic acid (PFUnA)	0.98	U	2.0	0.98	0.49	ng/L		01/11/24 16:43	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	3.9	1.8	0.49	ng/L		01/11/24 16:43	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	3.9	2.0	0.98	ng/L		01/11/24 16:43	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	3.9	2.0	0.98	ng/L		01/11/24 16:43	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	3.9	2.0	0.49	ng/L		01/11/24 16:43	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*55.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:43*	*1*
13C2-PFDoDA	*44.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 16:43*	*1*

Client Sample ID: 31LS-08-DEC23
Date Collected: 12/20/23 12:55
Date Received: 12/21/23 11:00

Lab Sample ID: 410-155546-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	79.4		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C3 PFBS	73.9		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C3 PFHxS	60.1		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C4 PFBA	69.7		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C4 PFHpA	72.6		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C5 PFHxA	83.4		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C5 PFPeA	88.1		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C6 PFDA	51.5		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C7 PFUnA	43.7		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C8 FOSA	75.4		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C8 PFOA	71.9		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C8 PFOS	54.4		20 - 150	01/08/24 07:25	01/11/24 16:43	1
13C9 PFNA	64.7		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d3-NMeFOSAA	59.2		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d3-NMePFOSA	56.6		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d5-NEtFOSAA	56.3		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d5-NEtPFOSA	51.6		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d7-N-MeFOSE-M	40.9		20 - 150	01/08/24 07:25	01/11/24 16:43	1
d9-N-EtFOSE-M	39.9		20 - 150	01/08/24 07:25	01/11/24 16:43	1
M2-4:2 FTS	84.0		20 - 150	01/08/24 07:25	01/11/24 16:43	1
M2-6:2 FTS	74.3		20 - 150	01/08/24 07:25	01/11/24 16:43	1
M2-8:2 FTS	63.3		20 - 150	01/08/24 07:25	01/11/24 16:43	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	1400	D	20	11	5.6	ng/L		01/12/24 04:48	10
Perfluorooctanesulfonic acid (PFOS)	980	D	20	9.8	4.9	ng/L		01/12/24 04:48	10
Perfluorooctanoic acid (PFOA)	680	D	20	13	6.3	ng/L		01/12/24 04:48	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	58.6		20 - 150	01/08/24 07:25	01/12/24 04:48	10
13C8 PFOA	59.4		20 - 150	01/08/24 07:25	01/12/24 04:48	10
13C8 PFOS	55.9		20 - 150	01/08/24 07:25	01/12/24 04:48	10

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFTDA	PFDoDA	HFPODA	C3PFBS	C3PFHS	PFBA	C4PFHA	13C5PHA
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-155546-1	31LS-01-DEC23	86.5 cn	87.3 cn	78.7 cn	87.3 cn	79.1 cn	80.6 cn	77.1 cn	79.1 cn
410-155546-1 - DL	31LS-01-DEC23								
410-155546-1 MS	31LS-01-DEC23	72.4	74.8	87.0	94.9	77.2	66.1	88.2	80.4
410-155546-1 MSD	31LS-01-DEC23	75.8	75.0	78.5	89.9	74.7	81.1	74.6	78.1
410-155546-2	31LS-02-DEC23	72.5 cn	76.4 cn	76.4 cn	93.3 cn	77.8 cn	78.0 cn	75.8 cn	79.4 cn
410-155546-2 - DL	31LS-02-DEC23								
410-155546-2 DU	31LS-02-DEC23	74.5	71.6	88.2	92.3	80.7	77.4	90.3	82.3
410-155546-3	31LS-03-DEC23	60.6 cn	52.1 cn	76.4 cn	101 cn	70.7 cn	45.3 cn	74.3 cn	70.1 cn
410-155546-3 - DL	31LS-03-DEC23					54.9 cn			61.3 cn
410-155546-4	31LS-04-DEC23	84.0 cn	76.1 cn	71.8 cn	73.9 cn	60.0 cn	71.6 cn	66.1 cn	72.5 cn
410-155546-5	31LS-05-DEC23	55.9 cn	53.5 cn	78.3 cn	77.4 cn	60.6 cn	71.2 cn	73.4 cn	75.0 cn
410-155546-5 - DL	31LS-05-DEC23					55.1			
410-155546-5 - DL2	31LS-05-DEC23								
410-155546-6	31LS-06-DEC23	30.3 cn	32.5 cn	82.9 cn	91.1 cn	60.6 cn	75.0 cn	77.2 cn	74.7 cn
410-155546-6 - DL	31LS-06-DEC23								73.4
410-155546-6 - DL2	31LS-06-DEC23					78.2 cn			
410-155546-7	31LS-07-DEC23	82.1 cn	74.7 cn	82.0 cn	77.4 cn	64.9 cn	77.0 cn	83.2 cn	79.2 cn
410-155546-7 DU	31LS-07-DEC23	77.4 cn	65.4 cn	82.1 cn	72.3 cn	62.6 cn	74.1 cn	70.4 cn	78.2 cn
410-155546-8	31LS-08-DEC23	62.0	51.3	86.4	86.5	72.7	85.0	83.8	88.4
410-155546-8 - DL	31LS-08-DEC23					52.9			
410-155546-9	31LS-08-DEC23	55.6	44.6	79.4	73.9	60.1	69.7	72.6	83.4
410-155546-9 - DL	31LS-08-DEC23					58.6			
LCS 410-461060/2-A	Lab Control Sample	70.2	70.0	72.8	74.5	67.9	59.4	74.1	73.1
LCS 410-461070/2-A	Lab Control Sample	80.6	74.8	82.4	78.6	64.5	79.1	76.1	79.5
LLCS 410-461060/3-A	Lab Control Sample	70.6	68.3	72.2	74.6	70.8	76.0	71.3	68.3
LLCS 410-461070/3-A	Lab Control Sample	86.4	71.6	82.1	79.8	63.6	78.9	77.4	79.9
MB 410-461060/1-A	Method Blank	68.8	66.5	67.1	76.7	69.5	74.8	71.5	69.5
MB 410-461070/1-A	Method Blank	84.7	71.6	80.9	73.7	67.8	78.4	82.3	84.3

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFPeA	C6PFDA	13C7PUA	PFOSA	C8PFOA	C8PFOS	C9PFNA	d3NMFOS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-155546-1	31LS-01-DEC23	71.2 cn	85.7 cn	80.0 cn	82.4 cn	74.9 cn	84.3 cn	84.3 cn	92.9 cn
410-155546-1 - DL	31LS-01-DEC23						74.9 cn		
410-155546-1 MS	31LS-01-DEC23	78.9	76.5	78.3	87.8	103	88.1	87.2	95.7
410-155546-1 MSD	31LS-01-DEC23	82.8	78.2	79.4	83.0	83.3	85.0	81.8	85.0
410-155546-2	31LS-02-DEC23	82.1 cn	76.6 cn	70.4 cn	87.6 cn	70.9 cn	92.9 cn	79.9 cn	93.6 cn
410-155546-2 - DL	31LS-02-DEC23						63.4 cn		
410-155546-2 DU	31LS-02-DEC23	81.8	84.6	75.9	86.4	83.0	91.1	83.5	88.2
410-155546-3	31LS-03-DEC23	64.4 cn	74.0 cn	59.6 cn	80.5 cn	81.8 cn	76.8 cn	80.7 cn	74.9 cn
410-155546-3 - DL	31LS-03-DEC23						61.3 cn		
410-155546-4	31LS-04-DEC23	77.1 cn	75.1 cn	72.1 cn	93.3 cn	59.6 cn	79.9 cn	76.2 cn	92.3 cn
410-155546-5	31LS-05-DEC23	77.9 cn	65.9 cn	61.1 cn	112 cn	74.1 cn	76.3 M cn	73.8 cn	102 cn
410-155546-5 - DL	31LS-05-DEC23				94.3	60.0			
410-155546-5 - DL2	31LS-05-DEC23						78.7 cn		
410-155546-6	31LS-06-DEC23	86.4 cn	49.1 cn	35.9 cn	75.4 cn	70.0 cn	46.8 M cn	66.9 cn	62.0 cn
410-155546-6 - DL	31LS-06-DEC23					77.9	41.9		
410-155546-6 - DL2	31LS-06-DEC23								
410-155546-7	31LS-07-DEC23	88.7 cn	77.5 cn	74.5 cn	96.3 cn	75.2 cn	79.3 cn	76.6 cn	93.9 cn
410-155546-7 DU	31LS-07-DEC23	81.7 cn	67.7 cn	70.7 cn	92.6 cn	72.1 cn	78.4 cn	72.3 cn	88.4 cn

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-155546-1
Project/Site: Ft. Devens PFAS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOS (20-150)
410-155546-8	31LS-08-DEC23	95.7	69.0	54.4	93.0	79.6	69.5	78.3	75.6
410-155546-8 - DL	31LS-08-DEC23					77.8	61.1		
410-155546-9	31LS-08-DEC23	88.1	51.5	43.7	75.4	71.9	54.4	64.7	59.2
410-155546-9 - DL	31LS-08-DEC23					59.4	55.9		
LCS 410-461060/2-A	Lab Control Sample	73.1	72.5	71.7	75.3	74.1	81.1	73.0	80.7
LCS 410-461070/2-A	Lab Control Sample	81.7	79.8	74.0	96.9	71.1	84.2	79.6	98.8
LLCS 410-461060/3-A	Lab Control Sample	66.8	76.0	70.4	72.1	82.3	75.2	71.0	72.6
LLCS 410-461070/3-A	Lab Control Sample	82.3	75.9	74.4	94.3	74.3	81.2	79.2	91.2
MB 410-461060/1-A	Method Blank	64.1	69.6	68.9	65.4	71.2	72.4	74.0	78.0
MB 410-461070/1-A	Method Blank	81.7	78.3	75.2	93.8	74.0	79.9	79.7	94.1

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	d3NMFSA (20-150)	d5NEFOS (20-150)	d5NPFSA (20-150)	NMFM (20-150)	NEFM (20-150)	M242FTS (20-150)	M262FTS (20-150)	M282FTS (20-150)
410-155546-1	31LS-01-DEC23	72.4 cn	84.4 cn	73.1 cn	84.5 cn	78.0 cn	86.7 cn	100 cn	81.0 cn
410-155546-1 - DL	31LS-01-DEC23								
410-155546-1 MS	31LS-01-DEC23	74.2	86.1	74.7	89.6	83.6	97.2	105	99.3
410-155546-1 MSD	31LS-01-DEC23	62.4	85.1	64.8	84.6	80.6	83.4	93.4	83.4
410-155546-2	31LS-02-DEC23	73.1 cn	85.0 cn	73.2 cn	86.4 cn	81.6 cn	80.8 cn	86.3 cn	86.4 cn
410-155546-2 - DL	31LS-02-DEC23								
410-155546-2 DU	31LS-02-DEC23	72.3	81.8	73.6	84.0	81.2	88.1	95.0	82.4
410-155546-3	31LS-03-DEC23	75.1 cn	65.6 cn	57.0 cn	70.3 cn	62.9 cn	109 cn	98.3 cn	82.2 cn
410-155546-3 - DL	31LS-03-DEC23								
410-155546-4	31LS-04-DEC23	73.3 cn	94.5 cn	74.8 cn	57.2 cn	58.9 cn	79.2 cn	80.3 cn	85.5 cn
410-155546-5	31LS-05-DEC23	82.3 cn	78.8 cn	75.6 cn	56.9 cn	55.6 cn	81.8 cn	92.1 cn	92.2 cn
410-155546-5 - DL	31LS-05-DEC23								
410-155546-5 - DL2	31LS-05-DEC23								
410-155546-6	31LS-06-DEC23	59.5 cn	50.6 cn	56.2 cn	51.8 cn	47.0 cn	102 cn	87.1 cn	73.6 cn
410-155546-6 - DL	31LS-06-DEC23								
410-155546-6 - DL2	31LS-06-DEC23								
410-155546-7	31LS-07-DEC23	71.0 cn	87.0 cn	71.0 cn	56.9 cn	58.5 cn	86.4 cn	81.7 cn	82.9 cn
410-155546-7 DU	31LS-07-DEC23	66.8 cn	92.6 cn	67.3 cn	55.9 cn	56.1 cn	76.3 cn	73.6 cn	80.9 cn
410-155546-8	31LS-08-DEC23	65.4	68.1	60.6	48.3	46.8	98.9	94.9	91.1
410-155546-8 - DL	31LS-08-DEC23								
410-155546-9	31LS-08-DEC23	56.6	56.3	51.6	40.9	39.9	84.0	74.3	63.3
410-155546-9 - DL	31LS-08-DEC23								
LCS 410-461060/2-A	Lab Control Sample	61.5	87.9	62.6	78.6	75.2	78.6	67.5	80.0
LCS 410-461070/2-A	Lab Control Sample	73.4	90.5	72.9	60.1	62.0	90.0	75.9	91.1
LLCS 410-461060/3-A	Lab Control Sample	55.5	72.3	58.7	72.7	68.8	78.7	84.8	73.5
LLCS 410-461070/3-A	Lab Control Sample	73.1	95.1	72.6	57.9	58.8	87.1	75.0	87.1
MB 410-461060/1-A	Method Blank	52.4	62.9	54.1	68.6	65.6	60.8	69.0	66.7
MB 410-461070/1-A	Method Blank	69.3	90.5	72.3	57.8	60.2	84.4	90.3	98.1

Surrogate Legend

PFTDA = 13C2 PFTeDA
PFDoDA = 13C2-PFDoDA
HFPODA = 13C3 HFPO-DA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
PFBA = 13C4 PFBA
C4PFHA = 13C4 PFHpA

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-155546-1
Project/Site: Ft. Devens PFAS

13C5PHA = 13C5 PFHxA
PFPeA = 13C5 PFPeA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFOSA = 13C8 FOSA
C8PFOA = 13C8 PFOA
C8PFOS = 13C8 PFOS
C9PFNA = 13C9 PFNA
d3NMFOS = d3-NMeFOSAA
d3NMFSA = d3-NMePFOSA
d5NEFOS = d5-NEtFOSAA
d5NPFSA = d5-NEtPFOSA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 410-461060/1-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 461060

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		01/10/24 09:11	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		01/10/24 09:11	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		01/10/24 09:11	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		01/10/24 09:11	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		01/10/24 09:11	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		01/10/24 09:11	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		01/10/24 09:11	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		01/10/24 09:11	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		01/10/24 09:11	1
HFPODA	4.0	U	8.0	4.0	2.0	ng/L		01/10/24 09:11	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		01/10/24 09:11	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		01/10/24 09:11	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		01/10/24 09:11	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		01/10/24 09:11	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		01/10/24 09:11	1
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	2.0	ng/L		01/10/24 09:11	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		01/10/24 09:11	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		01/10/24 09:11	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		01/10/24 09:11	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		01/10/24 09:11	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		01/10/24 09:11	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		01/10/24 09:11	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		01/10/24 09:11	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		01/10/24 09:11	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		01/10/24 09:11	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		01/10/24 09:11	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-461060/1-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 461060

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		01/10/24 09:11	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		01/10/24 09:11	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*68.8*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C2-PFDoDA	*66.5*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C3 HFPO-DA	*67.1*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C3 PFBS	*76.7*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C3 PFHxS	*69.5*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C4 PFBA	*74.8*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C4 PFHpA	*71.5*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C5 PFHxA	*69.5*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C5 PFPeA	*64.1*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C6 PFDA	*69.6*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C7 PFUnA	*68.9*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C8 FOSA	*65.4*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C8 PFOA	*71.2*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C8 PFOS	*72.4*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
13C9 PFNA	*74.0*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d3-NMeFOSAA	*78.0*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d3-NMePFOSA	*52.4*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d5-NEtFOSAA	*62.9*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d5-NEtPFOSA	*54.1*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d7-N-MeFOSE-M	*68.6*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
d9-N-EtFOSE-M	*65.6*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
M2-4:2 FTS	*60.8*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
M2-6:2 FTS	*69.0*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*
M2-8:2 FTS	*66.7*		*20 - 150*	*01/08/24 06:47*	*01/10/24 09:11*	*1*

Lab Sample ID: LCS 410-461060/2-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.2	89.7		ng/L		95	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	625	553		ng/L		89	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	625	590		ng/L		94	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	127		ng/L		101	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.9	85.4		ng/L		91	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	95.2	98.5		ng/L		104	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	96.2	83.2		ng/L		87	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-461060/2-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	93.2	91.6		ng/L		98	40 - 150
HFPODA	94.2	93.6		ng/L		99	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	100	97.5		ng/L		98	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	25.0	25.9		ng/L		103	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	250	250		ng/L		100	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	24.7		ng/L		99	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	25.0	25.2		ng/L		101	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	250	261		ng/L		104	40 - 150
Perfluorobutanesulfonic acid (PFBS)	25.0	25.5		ng/L		102	40 - 150
Perfluorobutanoic acid (PFBA)	22.2	23.1		ng/L		104	40 - 150
Perfluorodecanesulfonic acid (PFDS)	100	99.3		ng/L		99	40 - 150
Perfluorodecanoic acid (PFDA)	24.2	23.8		ng/L		98	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	25.0	25.4		ng/L		101	40 - 150
Perfluorododecanoic acid (PFDoA)	24.3	23.3		ng/L		96	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	25.0	26.5		ng/L		106	40 - 150
Perfluoroheptanoic acid (PFHpA)	23.9	22.8		ng/L		95	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	25.0	24.5		ng/L		98	40 - 150
Perfluorohexanoic acid (PFHxA)	22.9	23.7		ng/L		104	40 - 150
Perfluorononanesulfonic acid (PFNS)	25.0	24.4		ng/L		97	40 - 150
Perfluorononanoic acid (PFNA)	24.1	25.4		ng/L		105	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	33.0		ng/L		132	40 - 150
Perfluorooctanesulfonic acid (PFOS)	25.0	24.8		ng/L		99	40 - 150
Perfluorooctanoic acid (PFOA)	23.2	23.3		ng/L		100	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	25.0	28.7		ng/L		115	40 - 150
Perfluoropentanoic acid (PFPeA)	23.6	26.2		ng/L		111	40 - 150
Perfluorotetradecanoic acid (PFTA)	50.1	51.7		ng/L		103	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	26.1		ng/L		104	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	25.3		ng/L		101	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	25.0	25.2		ng/L		101	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	44.6	42.4		ng/L		95	40 - 150
	50.1	50.2		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-461060/2-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			50.1	50.1		ng/L		100	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			50.1	41.3		ng/L		82	40 - 150		

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFTeDA	*70.2*		*20 - 150*
13C2-PFDoDA	*70.0*		*20 - 150*
13C3 HFPO-DA	*72.8*		*20 - 150*
13C3 PFBS	*74.5*		*20 - 150*
13C3 PFHxS	*67.9*		*20 - 150*
13C4 PFBA	*59.4*		*20 - 150*
13C4 PFHpA	*74.1*		*20 - 150*
13C5 PFHxA	*73.1*		*20 - 150*
13C5 PFPeA	*73.1*		*20 - 150*
13C6 PFDA	*72.5*		*20 - 150*
13C7 PFUnA	*71.7*		*20 - 150*
13C8 FOSA	*75.3*		*20 - 150*
13C8 PFOA	*74.1*		*20 - 150*
13C8 PFOS	*81.1*		*20 - 150*
13C9 PFNA	*73.0*		*20 - 150*
d3-NMeFOSAA	*80.7*		*20 - 150*
d3-NMePFOSA	*61.5*		*20 - 150*
d5-NEtFOSAA	*87.9*		*20 - 150*
d5-NEtPFOSA	*62.6*		*20 - 150*
d7-N-MeFOSE-M	*78.6*		*20 - 150*
d9-N-EtFOSE-M	*75.2*		*20 - 150*
M2-4:2 FTS	*78.6*		*20 - 150*
M2-6:2 FTS	*67.5*		*20 - 150*
M2-8:2 FTS	*80.0*		*20 - 150*

Lab Sample ID: LLCS 410-461060/3-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF			15.1	14.4		ng/L		96	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)			100	98.6		ng/L		98	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)			100	106		ng/L		106	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)			20.0	22.2		ng/L		111	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)			15.0	13.5		ng/L		90	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)			15.2	14.9		ng/L		98	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)			15.4	15.2		ng/L		99	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-461060/3-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	14.9	14.9		ng/L		100	40 - 150
HFPODA	15.1	16.5		ng/L		109	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	16.0	16.4		ng/L		103	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	4.00	4.15		ng/L		104	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	40.0	40.9		ng/L		102	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	4.57		ng/L		114	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	4.00	4.30		ng/L		107	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	40.0	42.9		ng/L		107	40 - 150
Perfluorobutanesulfonic acid (PFBS)	4.00	4.70		ng/L		117	40 - 150
Perfluorobutanoic acid (PFBA)	3.55	3.59		ng/L		101	40 - 150
Perfluorodecanesulfonic acid (PFDS)	16.0	15.9		ng/L		99	40 - 150
Perfluorodecanoic acid (PFDA)	3.86	3.94		ng/L		102	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	4.00	4.00		ng/L		100	40 - 150
Perfluorododecanoic acid (PFDoA)	3.88	3.68		ng/L		95	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	4.00	4.36		ng/L		109	40 - 150
Perfluoroheptanoic acid (PFHpA)	3.81	3.79		ng/L		99	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	4.00	3.88		ng/L		97	40 - 150
Perfluorohexanoic acid (PFHxA)	3.66	3.67		ng/L		100	40 - 150
Perfluorononanesulfonic acid (PFNS)	4.00	4.60		ng/L		115	40 - 150
Perfluorononanoic acid (PFNA)	3.85	4.18		ng/L		109	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	4.71		ng/L		118	40 - 150
Perfluorooctanesulfonic acid (PFOS)	4.00	3.94		ng/L		98	40 - 150
Perfluorooctanoic acid (PFOA)	3.71	4.04		ng/L		109	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	4.00	4.81		ng/L		120	40 - 150
Perfluoropentanoic acid (PFPeA)	3.76	4.13		ng/L		110	40 - 150
Perfluorotetradecanoic acid (PFTA)	8.00	8.16		ng/L		102	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	4.09		ng/L		102	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	4.07		ng/L		102	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	4.00	4.14		ng/L		103	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	7.12	7.42		ng/L		104	40 - 150
	8.00	8.68		ng/L		108	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-461060/3-A
Matrix: Water
Analysis Batch: 461868

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461060

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			8.00	8.60		ng/L		107	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			8.00	8.99		ng/L		112	40 - 150		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2 PFTeDA	*70.6*		*20 - 150*
13C2-PFDoDA	*68.3*		*20 - 150*
13C3 HFPO-DA	*72.2*		*20 - 150*
13C3 PFBS	*74.6*		*20 - 150*
13C3 PFHxS	*70.8*		*20 - 150*
13C4 PFBA	*76.0*		*20 - 150*
13C4 PFHpA	*71.3*		*20 - 150*
13C5 PFHxA	*68.3*		*20 - 150*
13C5 PFPeA	*66.8*		*20 - 150*
13C6 PFDA	*76.0*		*20 - 150*
13C7 PFUnA	*70.4*		*20 - 150*
13C8 FOSA	*72.1*		*20 - 150*
13C8 PFOA	*82.3*		*20 - 150*
13C8 PFOS	*75.2*		*20 - 150*
13C9 PFNA	*71.0*		*20 - 150*
d3-NMeFOSAA	*72.6*		*20 - 150*
d3-NMePFOSA	*55.5*		*20 - 150*
d5-NEtFOSAA	*72.3*		*20 - 150*
d5-NEtPFOSA	*58.7*		*20 - 150*
d7-N-MeFOSE-M	*72.7*		*20 - 150*
d9-N-EtFOSE-M	*68.8*		*20 - 150*
M2-4:2 FTS	*78.7*		*20 - 150*
M2-6:2 FTS	*84.8*		*20 - 150*
M2-8:2 FTS	*73.5*		*20 - 150*

Lab Sample ID: 410-155546-1 MS
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	942	884		ng/L		94	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	6250	6350		ng/L		102	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	6250	6800		ng/L		109	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	1250	1370		ng/L		110	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	939	876		ng/L		93	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2400	FH F2 cn	952	7880	FH	ng/L		572	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	580	F2 cn	962	1110		ng/L		55	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-1 MS
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn	932	881		ng/L		94	40 - 150
HFPODA	38	U cn	942	883		ng/L		94	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40	U cn	1000	999		ng/L		100	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	250	266		ng/L		106	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	U cn	2500	2640		ng/L		105	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	14	U cn	250	276		ng/L		110	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	250	257		ng/L		103	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	U cn	2500	2570		ng/L		103	40 - 150
Perfluorobutanesulfonic acid (PFBS)	24	U cn	250	253		ng/L		101	40 - 150
Perfluorobutanoic acid (PFBA)	96	cn	222	292		ng/L		88	40 - 150
Perfluorodecanesulfonic acid (PFDS)	170	cn	1000	1190		ng/L		102	40 - 150
Perfluorodecanoic acid (PFDA)	10	U cn	242	247		ng/L		102	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	10	U cn	250	271		ng/L		108	40 - 150
Perfluorododecanoic acid (PFDoA)	19	U cn	243	232		ng/L		96	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	10	U cn	250	255		ng/L		102	40 - 150
Perfluoroheptanoic acid (PFHpA)	210	FH F2 cn	239	1160	FH	ng/L		395	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	690	cn	250	960		ng/L		108	40 - 150
Perfluorohexanoic acid (PFHxA)	5500	F2 cn	229	8850	E 4	ng/L		1469	40 - 150
Perfluorononanesulfonic acid (PFNS)	1500	cn	250	1890	4	ng/L		149	40 - 150
Perfluorononanoic acid (PFNA)	10	U cn	241	264		ng/L		110	40 - 150
Perfluorooctanesulfonamide (FOSA)	36	cn	250	348		ng/L		125	40 - 150
Perfluorooctanesulfonic acid (PFOS)	330	cn	250	531		ng/L		80	40 - 150
Perfluorooctanoic acid (PFOA)	6300	E F2 cn	232	16700	E 4	ng/L		4476	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	2800	F2 cn	250	7580	E 4	ng/L		1902	40 - 150
Perfluoropentanoic acid (PFPeA)	200	cn	236	472		ng/L		117	40 - 150
Perfluorotetradecanoic acid (PFTA)	530	FH cn	501	1340	FH	ng/L		162	40 - 150
Perfluorotridecanoic acid (PFTriA)	10	U cn	250	268		ng/L		107	40 - 150
Perfluoroundecanoic acid (PFUnA)	10	U cn	250	271		ng/L		108	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	10	U cn	250	235		ng/L		94	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	18	U cn	446	432		ng/L		97	40 - 150
	20	U cn	501	543		ng/L		108	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-1 MS
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	501	531		ng/L		106	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	501	530		ng/L		106	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2 PFTeDA	*72.4*		*20 - 150*
13C2-PFDoDA	*74.8*		*20 - 150*
13C3 HFPO-DA	*87.0*		*20 - 150*
13C3 PFBS	*94.9*		*20 - 150*
13C3 PFHxS	*77.2*		*20 - 150*
13C4 PFBA	*66.1*		*20 - 150*
13C4 PFHpA	*88.2*		*20 - 150*
13C5 PFHxA	*80.4*		*20 - 150*
13C5 PFPeA	*78.9*		*20 - 150*
13C6 PFDA	*76.5*		*20 - 150*
13C7 PFUnA	*78.3*		*20 - 150*
13C8 FOSA	*87.8*		*20 - 150*
13C8 PFOA	*103*		*20 - 150*
13C8 PFOS	*88.1*		*20 - 150*
13C9 PFNA	*87.2*		*20 - 150*
d3-NMeFOSAA	*95.7*		*20 - 150*
d3-NMePFOSA	*74.2*		*20 - 150*
d5-NEtFOSAA	*86.1*		*20 - 150*
d5-NEtPFOSA	*74.7*		*20 - 150*
d7-N-MeFOSE-M	*89.6*		*20 - 150*
d9-N-EtFOSE-M	*83.6*		*20 - 150*
M2-4:2 FTS	*97.2*		*20 - 150*
M2-6:2 FTS	*105*		*20 - 150*
M2-8:2 FTS	*99.3*		*20 - 150*

Lab Sample ID: 410-155546-1 MSD
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	942	871		ng/L		92	40 - 150	2	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	6250	5720		ng/L		91	40 - 150	10	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	6250	5840		ng/L		93	40 - 150	15	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	1250	1200		ng/L		96	40 - 150	13	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	939	959		ng/L		102	40 - 150	9	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2400	FH F2 cn	952	2960	F2	ng/L		54	40 - 150	91	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	580	F2 cn	962	1650	F2	ng/L		111	40 - 150	39	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-1 MSD
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn	932	846		ng/L		91	40 - 150	4	30
HFPODA	38	U cn	942	899		ng/L		95	40 - 150	2	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40	U cn	1000	951		ng/L		95	40 - 150	5	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	250	259		ng/L		103	40 - 150	3	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	U cn	2500	2560		ng/L		102	40 - 150	3	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	14	U cn	250	282		ng/L		113	40 - 150	2	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	250	264		ng/L		105	40 - 150	3	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	U cn	2500	2560		ng/L		102	40 - 150	0	30
Perfluorobutanesulfonic acid (PFBS)	24	U cn	250	268		ng/L		107	40 - 150	6	30
Perfluorobutanoic acid (PFBA)	96	cn	222	311		ng/L		97	40 - 150	6	30
Perfluorodecanesulfonic acid (PFDS)	170	cn	1000	1120		ng/L		94	40 - 150	7	30
Perfluorodecanoic acid (PFDA)	10	U cn	242	243		ng/L		101	40 - 150	2	30
Perfluorododecanesulfonic acid (PFDoS)	10	U cn	250	274		ng/L		109	40 - 150	1	30
Perfluorododecanoic acid (PFDoA)	19	U cn	243	232		ng/L		95	40 - 150	0	30
Perfluoroheptanesulfonic acid (PFHpS)	10	U cn	250	264		ng/L		106	40 - 150	3	30
Perfluoroheptanoic acid (PFHpA)	210	FH F2 cn	239	509	F2	ng/L		124	40 - 150	78	30
Perfluorohexanesulfonic acid (PFHxS)	690	cn	250	924		ng/L		93	40 - 150	4	30
Perfluorohexanoic acid (PFHxA)	5500	F2 cn	229	5220	4 F2	ng/L		-116	40 - 150	52	30
Perfluorononanesulfonic acid (PFNS)	1500	cn	250	1760	4	ng/L		97	40 - 150	7	30
Perfluorononanoic acid (PFNA)	10	U cn	241	255		ng/L		106	40 - 150	3	30
Perfluorooctanesulfonamide (FOSA)	36	cn	250	361		ng/L		130	40 - 150	3	30
Perfluorooctanesulfonic acid (PFOS)	330	cn	250	565		ng/L		93	40 - 150	6	30
Perfluorooctanoic acid (PFOA)	6300	E F2 cn	232	7360	E 4 F2	ng/L		444	40 - 150	78	30
Perfluoropentanesulfonic acid (PFPeS)	2800	F2 cn	250	2780	4 F2	ng/L		-15	40 - 150	93	30
Perfluoropentanoic acid (PFPeA)	200	cn	236	491		ng/L		125	40 - 150	4	30
Perfluorotetradecanoic acid (PFTA)	530	FH cn	501	1030		ng/L		101	40 - 150	26	30
Perfluorotridecanoic acid (PFTriA)	10	U cn	250	255		ng/L		102	40 - 150	5	30
Perfluoroundecanoic acid (PFUnA)	10	U cn	250	278		ng/L		111	40 - 150	3	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	10	U cn	250	251		ng/L		100	40 - 150	6	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	18	U cn	446	406		ng/L		91	40 - 150	6	30
	20	U cn	501	466		ng/L		93	40 - 150	15	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-1 MSD
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-01-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	501	512		ng/L		102	40 - 150	4	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	501	448		ng/L		90	40 - 150	17	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2 PFTeDA	*75.8*		*20 - 150*
13C2-PFDoDA	*75.0*		*20 - 150*
13C3 HFPO-DA	*78.5*		*20 - 150*
13C3 PFBS	*89.9*		*20 - 150*
13C3 PFHxS	*74.7*		*20 - 150*
13C4 PFBA	*81.1*		*20 - 150*
13C4 PFHpA	*74.6*		*20 - 150*
13C5 PFHxA	*78.1*		*20 - 150*
13C5 PFPeA	*82.8*		*20 - 150*
13C6 PFDA	*78.2*		*20 - 150*
13C7 PFUnA	*79.4*		*20 - 150*
13C8 FOSA	*83.0*		*20 - 150*
13C8 PFOA	*83.3*		*20 - 150*
13C8 PFOS	*85.0*		*20 - 150*
13C9 PFNA	*81.8*		*20 - 150*
d3-NMeFOSAA	*85.0*		*20 - 150*
d3-NMePFOSA	*62.4*		*20 - 150*
d5-NEtFOSAA	*85.1*		*20 - 150*
d5-NEtPFOSA	*64.8*		*20 - 150*
d7-N-MeFOSE-M	*84.6*		*20 - 150*
d9-N-EtFOSE-M	*80.6*		*20 - 150*
M2-4:2 FTS	*83.4*		*20 - 150*
M2-6:2 FTS	*93.4*		*20 - 150*
M2-8:2 FTS	*83.4*		*20 - 150*

Lab Sample ID: 410-155546-2 DU
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-02-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	76	U	ng/L		NC	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	250	U	ng/L		NC	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	250	U	ng/L		NC	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	50	U	ng/L		NC	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	38	U	ng/L		NC	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	560	cn	581		ng/L		3	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	270	cn	263		ng/L		4	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-2 DU
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-02-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn	38	U	ng/L		NC	30
HFPODA	38	U cn	38	U	ng/L		NC	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	40	U cn	40	U	ng/L		NC	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	10	U	ng/L		NC	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	U cn	100	U	ng/L		NC	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	14	U cn	14	U	ng/L		NC	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	10	U	ng/L		NC	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	U cn	100	U	ng/L		NC	30
Perfluorobutanesulfonic acid (PFBS)	24	U cn	24	U	ng/L		NC	30
Perfluorobutanoic acid (PFBA)	130	cn	135		ng/L		1	30
Perfluorodecanesulfonic acid (PFDS)	210	cn	221		ng/L		4	30
Perfluorodecanoic acid (PFDA)	10	U cn	10	U	ng/L		NC	30
Perfluorododecanesulfonic acid (PFDoS)	10	U cn	10	U	ng/L		NC	30
Perfluorododecanoic acid (PFDoA)	19	U cn	19	U	ng/L		NC	30
Perfluoroheptanesulfonic acid (PFHpS)	10	U cn	10	U	ng/L		NC	30
Perfluoroheptanoic acid (PFHpA)	180	cn	182		ng/L		1	30
Perfluorohexanesulfonic acid (PFHxS)	750	cn	704		ng/L		6	30
Perfluorohexanoic acid (PFHxA)	4600	cn	4560		ng/L		1	30
Perfluorononanesulfonic acid (PFNS)	1600	cn	1490		ng/L		5	30
Perfluorononanoic acid (PFNA)	10	U cn	10	U	ng/L		NC	30
Perfluorooctanesulfonamide (FOSA)	52	cn	54.2		ng/L		4	30
Perfluorooctanoic acid (PFOA)	72	cn	64.6	M	ng/L		11	30
Perfluoropentanesulfonic acid (PFPeS)	1200	cn	1220		ng/L		0.6	30
Perfluoropentanoic acid (PFPeA)	250	cn	237		ng/L		6	30
Perfluorotetradecanoic acid (PFTA)	650	cn	635		ng/L		2	30
Perfluorotridecanoic acid (PFTriA)	10	U cn	10	U	ng/L		NC	30
Perfluoroundecanoic acid (PFUnA)	10	U cn	10	U	ng/L		NC	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	10	U cn	10	U	ng/L		NC	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	18	U cn	18	U	ng/L		NC	30
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	20	U	ng/L		NC	30
	20	U cn	20	U	ng/L		NC	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-2 DU
Matrix: Water
Analysis Batch: 461868

Client Sample ID: 31LS-02-DEC23
Prep Type: Total/NA
Prep Batch: 461060

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn		20	U	ng/L				NC	30

Isotope Dilution	*DU %Recovery*	*DU Qualifier*	*Limits*
13C2 PFTeDA	*74.5*		*20 - 150*
13C2-PFDoDA	*71.6*		*20 - 150*
13C3 HFPO-DA	*88.2*		*20 - 150*
13C3 PFBS	*92.3*		*20 - 150*
13C3 PFHxS	*80.7*		*20 - 150*
13C4 PFBA	*77.4*		*20 - 150*
13C4 PFHpA	*90.3*		*20 - 150*
13C5 PFHxA	*82.3*		*20 - 150*
13C5 PFPeA	*81.8*		*20 - 150*
13C6 PFDA	*84.6*		*20 - 150*
13C7 PFUnA	*75.9*		*20 - 150*
13C8 FOSA	*86.4*		*20 - 150*
13C8 PFOA	*83.0*		*20 - 150*
13C8 PFOS	*91.1*		*20 - 150*
13C9 PFNA	*83.5*		*20 - 150*
d3-NMeFOSAA	*88.2*		*20 - 150*
d3-NMePFOSA	*72.3*		*20 - 150*
d5-NEtFOSAA	*81.8*		*20 - 150*
d5-NEtPFOSA	*73.6*		*20 - 150*
d7-N-MeFOSE-M	*84.0*		*20 - 150*
d9-N-EtFOSE-M	*81.2*		*20 - 150*
M2-4:2 FTS	*88.1*		*20 - 150*
M2-6:2 FTS	*95.0*		*20 - 150*
M2-8:2 FTS	*82.4*		*20 - 150*

Lab Sample ID: MB 410-461070/1-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 461070

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		01/11/24 14:53	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		01/11/24 14:53	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		01/11/24 14:53	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		01/11/24 14:53	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		01/11/24 14:53	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		01/11/24 14:53	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		01/11/24 14:53	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		01/11/24 14:53	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		01/11/24 14:53	1
HFPODA	4.0	U	8.0	4.0	2.0	ng/L		01/11/24 14:53	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-461070/1-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 461070

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		01/11/24 14:53	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		01/11/24 14:53	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		01/11/24 14:53	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		01/11/24 14:53	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		01/11/24 14:53	1
Perfluorobutanoic acid (PFBA)	4.0	U M	8.0	4.0	2.0	ng/L		01/11/24 14:53	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		01/11/24 14:53	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		01/11/24 14:53	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		01/11/24 14:53	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		01/11/24 14:53	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		01/11/24 14:53	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		01/11/24 14:53	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		01/11/24 14:53	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		01/11/24 14:53	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		01/11/24 14:53	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		01/11/24 14:53	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		01/11/24 14:53	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		01/11/24 14:53	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*84.7*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C2-PFDoDA	*71.6*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C3 HFPO-DA	*80.9*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C3 PFBS	*73.7*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C3 PFHxS	*67.8*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C4 PFBA	*78.4*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C4 PFHpA	*82.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C5 PFHxA	*84.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C5 PFPeA	*81.7*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C6 PFDA	*78.3*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*
13C7 PFUnA	*75.2*		*20 - 150*	*01/08/24 07:25*	*01/11/24 14:53*	*1*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-461070/1-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 461070

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	93.8		20 - 150	01/08/24 07:25	01/11/24 14:53	1
13C8 PFOA	74.0		20 - 150	01/08/24 07:25	01/11/24 14:53	1
13C8 PFOS	79.9		20 - 150	01/08/24 07:25	01/11/24 14:53	1
13C9 PFNA	79.7		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d3-NMeFOSAA	94.1		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d3-NMePFOSA	69.3		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d5-NEtFOSAA	90.5		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d5-NEtPFOSA	72.3		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d7-N-MeFOSE-M	57.8		20 - 150	01/08/24 07:25	01/11/24 14:53	1
d9-N-EtFOSE-M	60.2		20 - 150	01/08/24 07:25	01/11/24 14:53	1
M2-4:2 FTS	84.4		20 - 150	01/08/24 07:25	01/11/24 14:53	1
M2-6:2 FTS	90.3		20 - 150	01/08/24 07:25	01/11/24 14:53	1
M2-8:2 FTS	98.1		20 - 150	01/08/24 07:25	01/11/24 14:53	1

Lab Sample ID: LCS 410-461070/2-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.2	99.1		ng/L		105	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	625	683		ng/L		109	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	625	672		ng/L		108	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	122		ng/L		98	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.9	84.9		ng/L		90	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	95.2	97.8		ng/L		103	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	96.2	96.1		ng/L		100	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	93.2	89.6		ng/L		96	40 - 150
DONA	94.2	79.9		ng/L		85	40 - 150
HFPODA	100	96.6		ng/L		97	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	25.0	22.4		ng/L		89	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	250	250		ng/L		100	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	25.0	27.4	M	ng/L		109	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	23.9		ng/L		96	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	250	265		ng/L		106	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25.0	23.6		ng/L		94	40 - 150
Perfluorobutanesulfonic acid (PFBS)	22.2	22.3		ng/L		100	40 - 150
Perfluorobutanoic acid (PFBA)	100	100		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-461070/2-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorodecanesulfonic acid (PFDS)	24.2	23.1		ng/L		96	40 - 150
Perfluorodecanoic acid (PFDA)	25.0	24.2		ng/L		97	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	24.3	21.5		ng/L		89	40 - 150
Perfluorododecanoic acid (PFDoA)	25.0	24.9		ng/L		99	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	23.9	20.1		ng/L		84	40 - 150
Perfluoroheptanoic acid (PFHpA)	25.0	26.3		ng/L		105	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	22.9	30.9		ng/L		135	40 - 150
Perfluorohexanoic acid (PFHxA)	25.0	25.1		ng/L		100	40 - 150
Perfluorononanesulfonic acid (PFNS)	24.1	21.9		ng/L		91	40 - 150
Perfluorononanoic acid (PFNA)	25.0	25.3		ng/L		101	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	25.3		ng/L		101	40 - 150
Perfluorooctanesulfonic acid (PFOS)	23.2	21.2		ng/L		91	40 - 150
Perfluorooctanoic acid (PFOA)	25.0	30.4		ng/L		121	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	23.6	26.7		ng/L		113	40 - 150
Perfluoropentanoic acid (PFPeA)	50.1	50.0		ng/L		100	40 - 150
Perfluorotetradecanoic acid (PFTA)	25.0	25.8		ng/L		103	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	23.8		ng/L		95	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	24.5		ng/L		98	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	44.6	44.3		ng/L		99	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	50.1	47.9		ng/L		96	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	50.1	43.5		ng/L		87	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	50.1	48.8		ng/L		97	40 - 150

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFTeDA	*80.6*		*20 - 150*
13C2-PFDoDA	*74.8*		*20 - 150*
13C3 HFPO-DA	*82.4*		*20 - 150*
13C3 PFBS	*78.6*		*20 - 150*
13C3 PFHxS	*64.5*		*20 - 150*
13C4 PFBA	*79.1*		*20 - 150*
13C4 PFHpA	*76.1*		*20 - 150*
13C5 PFHxA	*79.5*		*20 - 150*
13C5 PFPeA	*81.7*		*20 - 150*
13C6 PFDA	*79.8*		*20 - 150*
13C7 PFUnA	*74.0*		*20 - 150*
13C8 FOSA	*96.9*		*20 - 150*
13C8 PFOA	*71.1*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-461070/2-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C8 PFOS	84.2		20 - 150
13C9 PFNA	79.6		20 - 150
d3-NMeFOSAA	98.8		20 - 150
d3-NMePFOSA	73.4		20 - 150
d5-NEtFOSAA	90.5		20 - 150
d5-NEtPFOSA	72.9		20 - 150
d7-N-MeFOSE-M	60.1		20 - 150
d9-N-EtFOSE-M	62.0		20 - 150
M2-4:2 FTS	90.0		20 - 150
M2-6:2 FTS	75.9		20 - 150
M2-8:2 FTS	91.1		20 - 150

Lab Sample ID: LLCS 410-461070/3-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	15.1	16.5		ng/L		110	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	100	105		ng/L		105	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	100	103		ng/L		103	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	20.0	18.4		ng/L		92	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	15.0	13.8	M	ng/L		92	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	15.2	14.0		ng/L		92	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	15.4	16.4		ng/L		107	40 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	14.9	15.4		ng/L		103	40 - 150
HFPODA	15.1	14.3		ng/L		95	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	16.0	16.3		ng/L		102	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	4.00	3.61		ng/L		90	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	40.0	40.8		ng/L		102	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	4.12	M	ng/L		103	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	4.00	3.98		ng/L		100	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	40.0	41.7		ng/L		104	40 - 150
Perfluorobutanesulfonic acid (PFBS)	4.00	3.71	J	ng/L		93	40 - 150
Perfluorobutanoic acid (PFBA)	3.55	3.46		ng/L		98	40 - 150
Perfluorodecanesulfonic acid (PFDS)	16.0	15.0		ng/L		94	40 - 150
Perfluorodecanoic acid (PFDA)	3.86	3.70		ng/L		96	40 - 150
	4.00	4.38	M	ng/L		110	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-461070/3-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorododecanesulfonic acid (PFDoS)	3.88	3.49		ng/L		90	40 - 150
Perfluorododecanoic acid (PFDoA)	4.00	4.04		ng/L		101	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	3.81	3.42		ng/L		90	40 - 150
Perfluoroheptanoic acid (PFHpA)	4.00	3.84		ng/L		96	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	3.66	5.05		ng/L		138	40 - 150
Perfluorohexanoic acid (PFHxA)	4.00	3.99	M	ng/L		100	40 - 150
Perfluorononanesulfonic acid (PFNS)	3.85	3.61		ng/L		94	40 - 150
Perfluorononanoic acid (PFNA)	4.00	4.35	M	ng/L		109	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	4.00		ng/L		100	40 - 150
Perfluorooctanesulfonic acid (PFOS)	3.71	3.97	M	ng/L		107	40 - 150
Perfluorooctanoic acid (PFOA)	4.00	4.89	M	ng/L		122	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	3.76	4.18		ng/L		111	40 - 150
Perfluoropentanoic acid (PFPeA)	8.00	7.32	M	ng/L		91	40 - 150
Perfluorotetradecanoic acid (PFTA)	4.00	4.20		ng/L		105	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	3.84		ng/L		96	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	3.70		ng/L		92	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	7.12	7.32		ng/L		103	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	8.00	8.19		ng/L		102	40 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	8.00	6.93	I	ng/L		87	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	8.00	7.66		ng/L		96	40 - 150

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2 PFTeDA	*86.4*		*20 - 150*
13C2-PFDoDA	*71.6*		*20 - 150*
13C3 HFPO-DA	*82.1*		*20 - 150*
13C3 PFBS	*79.8*		*20 - 150*
13C3 PFHxS	*63.6*		*20 - 150*
13C4 PFBA	*78.9*		*20 - 150*
13C4 PFHpA	*77.4*		*20 - 150*
13C5 PFHxA	*79.9*		*20 - 150*
13C5 PFPeA	*82.3*		*20 - 150*
13C6 PFDA	*75.9*		*20 - 150*
13C7 PFUnA	*74.4*		*20 - 150*
13C8 FOSA	*94.3*		*20 - 150*
13C8 PFOA	*74.3*		*20 - 150*
13C8 PFOS	*81.2*		*20 - 150*
13C9 PFNA	*79.2*		*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-461070/3-A
Matrix: Water
Analysis Batch: 462474

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 461070

Isotope Dilution	LLCS %Recovery	LLCS Qualifier	Limits
d3-NMeFOSAA	91.2		20 - 150
d3-NMePFOSA	73.1		20 - 150
d5-NEtFOSAA	95.1		20 - 150
d5-NEtPFOSA	72.6		20 - 150
d7-N-MeFOSE-M	57.9		20 - 150
d9-N-EtFOSE-M	58.8		20 - 150
M2-4:2 FTS	87.1		20 - 150
M2-6:2 FTS	75.0		20 - 150
M2-8:2 FTS	87.1		20 - 150

Lab Sample ID: 410-155546-7 DU
Matrix: Water
Analysis Batch: 462474

Client Sample ID: 31LS-07-DEC23
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn		76	U cn	ng/L				NC	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn		250	U cn	ng/L				NC	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn		250	U cn	ng/L				NC	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn		50	U cn	ng/L				NC	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn		38	U cn	ng/L				NC	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	510	cn		504	cn	ng/L				1	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	68	J cn		63.4	J cn	ng/L				7	30
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	38	U cn		38	U cn	ng/L				NC	30
	38	U cn		38	U cn	ng/L				NC	30
HFPODA	40	U cn		40	U cn	ng/L				NC	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn		10	U cn	ng/L				NC	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn		100	U cn	ng/L				NC	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn		14	U cn	ng/L				NC	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn		10	U cn	ng/L				NC	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn		100	U cn	ng/L				NC	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn		24	U cn	ng/L				NC	30
Perfluorobutanesulfonic acid (PFBS)	72	cn		73.6	cn	ng/L				3	30
Perfluorobutanoic acid (PFBA)	210	cn		218	cn	ng/L				3	30
Perfluorodecanesulfonic acid (PFDS)	10	U cn		10	U cn	ng/L				NC	30
Perfluorodecanoic acid (PFDA)	10	U cn		10	U cn	ng/L				NC	30
Perfluorododecanesulfonic acid (PFDoS)	19	U cn		19	U cn	ng/L				NC	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-7 DU
Matrix: Water
Analysis Batch: 462474

Client Sample ID: 31LS-07-DEC23
Prep Type: Total/NA
Prep Batch: 461070

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluorododecanoic acid (PFDoA)	10	U cn		10	U cn	ng/L				NC	30
Perfluoroheptanesulfonic acid (PFHpS)	27	cn		29.2	cn	ng/L				8	30
Perfluoroheptanoic acid (PFHpA)	680	cn		726	cn	ng/L				7	30
Perfluorohexanesulfonic acid (PFHxS)	4000	cn		4060	cn	ng/L				0.3	30
Perfluorohexanoic acid (PFHxA)	3200	cn		3150	cn	ng/L				2	30
Perfluorononanesulfonic acid (PFNS)	10	U cn		10	U cn	ng/L				NC	30
Perfluorononanoic acid (PFNA)	7.5	J M cn		7.27	J M cn	ng/L				3	30
Perfluorooctanesulfonamide (FOSA)	65	M cn		66.8	M cn	ng/L				3	30
Perfluorooctanesulfonic acid (PFOS)	820	cn		829	cn	ng/L				0.7	30
Perfluorooctanoic acid (PFOA)	820	M cn		805	cn	ng/L				2	30
Perfluoropentanesulfonic acid (PFPeS)	220	cn		222	cn	ng/L				3	30
Perfluoropentanoic acid (PFPeA)	600	cn		623	cn	ng/L				4	30
Perfluorotetradecanoic acid (PFTA)	10	U cn		10	U cn	ng/L				NC	30
Perfluorotridecanoic acid (PFTriA)	10	U cn		10	U cn	ng/L				NC	30
Perfluoroundecanoic acid (PFUnA)	10	U cn		10	U cn	ng/L				NC	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn		18	U cn	ng/L				NC	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn		20	U cn	ng/L				NC	30
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn		20	U cn	ng/L				NC	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn		20	U cn	ng/L				NC	30

Isotope Dilution	*DU %Recovery*	*DU Qualifier*	*Limits*
13C2 PFTeDA	*77.4*	*cn*	*20 - 150*
13C2-PFDoDA	*65.4*	*cn*	*20 - 150*
13C3 HFPO-DA	*82.1*	*cn*	*20 - 150*
13C3 PFBS	*72.3*	*cn*	*20 - 150*
13C3 PFHxS	*62.6*	*cn*	*20 - 150*
13C4 PFBA	*74.1*	*cn*	*20 - 150*
13C4 PFHpA	*70.4*	*cn*	*20 - 150*
13C5 PFHxA	*78.2*	*cn*	*20 - 150*
13C5 PFPeA	*81.7*	*cn*	*20 - 150*
13C6 PFDA	*67.7*	*cn*	*20 - 150*
13C7 PFUnA	*70.7*	*cn*	*20 - 150*
13C8 FOSA	*92.6*	*cn*	*20 - 150*
13C8 PFOA	*72.1*	*cn*	*20 - 150*
13C8 PFOS	*78.4*	*cn*	*20 - 150*
13C9 PFNA	*72.3*	*cn*	*20 - 150*
d3-NMeFOSAA	*88.4*	*cn*	*20 - 150*
d3-NMePFOSA	*66.8*	*cn*	*20 - 150*

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-155546-7 DU
Matrix: Water
Analysis Batch: 462474

Client Sample ID: 31LS-07-DEC23
Prep Type: Total/NA
Prep Batch: 461070

Isotope Dilution	DU %Recovery	DU Qualifier	Limits
d5-NEtFOSAA	92.6	cn	20 - 150
d5-NEtPFOSA	67.3	cn	20 - 150
d7-N-MeFOSE-M	55.9	cn	20 - 150
d9-N-EtFOSE-M	56.1	cn	20 - 150
M2-4:2 FTS	76.3	cn	20 - 150
M2-6:2 FTS	73.6	cn	20 - 150
M2-8:2 FTS	80.9	cn	20 - 150

LCMS

Prep Batch: 461060

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-1	31LS-01-DEC23	Total/NA	Water	1633	
410-155546-1 - DL	31LS-01-DEC23	Total/NA	Water	1633	
410-155546-2	31LS-02-DEC23	Total/NA	Water	1633	
410-155546-2 - DL	31LS-02-DEC23	Total/NA	Water	1633	
410-155546-3	31LS-03-DEC23	Total/NA	Water	1633	
410-155546-3 - DL	31LS-03-DEC23	Total/NA	Water	1633	
MB 410-461060/1-A	Method Blank	Total/NA	Water	1633	
LCS 410-461060/2-A	Lab Control Sample	Total/NA	Water	1633	
LLCS 410-461060/3-A	Lab Control Sample	Total/NA	Water	1633	
410-155546-1 MS	31LS-01-DEC23	Total/NA	Water	1633	
410-155546-1 MSD	31LS-01-DEC23	Total/NA	Water	1633	
410-155546-2 DU	31LS-02-DEC23	Total/NA	Water	1633	

Prep Batch: 461070

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-4	31LS-04-DEC23	Total/NA	Water	1633	
410-155546-5	31LS-05-DEC23	Total/NA	Water	1633	
410-155546-5 - DL	31LS-05-DEC23	Total/NA	Water	1633	
410-155546-5 - DL2	31LS-05-DEC23	Total/NA	Water	1633	
410-155546-6 - DL2	31LS-06-DEC23	Total/NA	Water	1633	
410-155546-6 - DL	31LS-06-DEC23	Total/NA	Water	1633	
410-155546-6	31LS-06-DEC23	Total/NA	Water	1633	
410-155546-7	31LS-07-DEC23	Total/NA	Water	1633	
410-155546-8	31LS-08-DEC23	Total/NA	Water	1633	
410-155546-8 - DL	31LS-08-DEC23	Total/NA	Water	1633	
410-155546-9	31LS-08-DEC23	Total/NA	Water	1633	
410-155546-9 - DL	31LS-08-DEC23	Total/NA	Water	1633	
MB 410-461070/1-A	Method Blank	Total/NA	Water	1633	
LCS 410-461070/2-A	Lab Control Sample	Total/NA	Water	1633	
LLCS 410-461070/3-A	Lab Control Sample	Total/NA	Water	1633	
410-155546-7 DU	31LS-07-DEC23	Total/NA	Water	1633	

Analysis Batch: 461868

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-1	31LS-01-DEC23	Total/NA	Water	1633	461060
410-155546-2	31LS-02-DEC23	Total/NA	Water	1633	461060
410-155546-3	31LS-03-DEC23	Total/NA	Water	1633	461060
MB 410-461060/1-A	Method Blank	Total/NA	Water	1633	461060
LCS 410-461060/2-A	Lab Control Sample	Total/NA	Water	1633	461060
LLCS 410-461060/3-A	Lab Control Sample	Total/NA	Water	1633	461060
410-155546-1 MS	31LS-01-DEC23	Total/NA	Water	1633	461060
410-155546-1 MSD	31LS-01-DEC23	Total/NA	Water	1633	461060
410-155546-2 DU	31LS-02-DEC23	Total/NA	Water	1633	461060

Analysis Batch: 462362

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-1 - DL	31LS-01-DEC23	Total/NA	Water	1633	461060
410-155546-2 - DL	31LS-02-DEC23	Total/NA	Water	1633	461060
410-155546-3 - DL	31LS-03-DEC23	Total/NA	Water	1633	461060

LCMS

Analysis Batch: 462474

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-4	31LS-04-DEC23	Total/NA	Water	1633	461070
410-155546-5	31LS-05-DEC23	Total/NA	Water	1633	461070
410-155546-5 - DL	31LS-05-DEC23	Total/NA	Water	1633	461070
410-155546-6	31LS-06-DEC23	Total/NA	Water	1633	461070
410-155546-6 - DL	31LS-06-DEC23	Total/NA	Water	1633	461070
410-155546-7	31LS-07-DEC23	Total/NA	Water	1633	461070
410-155546-8	31LS-08-DEC23	Total/NA	Water	1633	461070
410-155546-8 - DL	31LS-08-DEC23	Total/NA	Water	1633	461070
410-155546-9	31LS-08-DEC23	Total/NA	Water	1633	461070
410-155546-9 - DL	31LS-08-DEC23	Total/NA	Water	1633	461070
MB 410-461070/1-A	Method Blank	Total/NA	Water	1633	461070
LCS 410-461070/2-A	Lab Control Sample	Total/NA	Water	1633	461070
LLCS 410-461070/3-A	Lab Control Sample	Total/NA	Water	1633	461070
410-155546-7 DU	31LS-07-DEC23	Total/NA	Water	1633	461070

Analysis Batch: 463103

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-155546-5 - DL2	31LS-05-DEC23	Total/NA	Water	1633	461070
410-155546-6 - DL2	31LS-06-DEC23	Total/NA	Water	1633	461070

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-01-DEC23

Lab Sample ID: 410-155546-1

Date Collected: 12/20/23 12:20

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633		1	461868	UUV6	ELLE	01/10/24 12:28
Total/NA	Prep	1633	DL		461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633	DL	10	462362	VK3G	ELLE	01/11/24 10:36

Client Sample ID: 31LS-02-DEC23

Lab Sample ID: 410-155546-2

Date Collected: 12/20/23 12:25

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633		1	461868	UUV6	ELLE	01/10/24 13:07
Total/NA	Prep	1633	DL		461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633	DL	10	462362	VK3G	ELLE	01/11/24 10:49

Client Sample ID: 31LS-03-DEC23

Lab Sample ID: 410-155546-3

Date Collected: 12/20/23 12:30

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633		1	461868	UUV6	ELLE	01/10/24 13:33
Total/NA	Prep	1633	DL		461060	M4QQ	ELLE	01/08/24 06:47
Total/NA	Analysis	1633	DL	10	462362	VK3G	ELLE	01/11/24 11:02

Client Sample ID: 31LS-04-DEC23

Lab Sample ID: 410-155546-4

Date Collected: 12/20/23 12:35

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 15:30

Client Sample ID: 31LS-05-DEC23

Lab Sample ID: 410-155546-5

Date Collected: 12/20/23 12:40

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 15:42
Total/NA	Prep	1633	DL		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL	10	462474	UUV6	ELLE	01/12/24 04:12
Total/NA	Prep	1633	DL2		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL2	100	463103	UUV6	ELLE	01/13/24 08:13

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Client Sample ID: 31LS-06-DEC23

Lab Sample ID: 410-155546-6

Date Collected: 12/20/23 12:45

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 15:55
Total/NA	Prep	1633	DL		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL	10	462474	UUV6	ELLE	01/12/24 04:24
Total/NA	Prep	1633	DL2		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL2	100	463103	UUV6	ELLE	01/13/24 08:25

Client Sample ID: 31LS-07-DEC23

Lab Sample ID: 410-155546-7

Date Collected: 12/20/23 12:50

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 16:07

Client Sample ID: 31LS-08-DEC23

Lab Sample ID: 410-155546-8

Date Collected: 12/20/23 12:55

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 16:31
Total/NA	Prep	1633	DL		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL	10	462474	UUV6	ELLE	01/12/24 04:36

Client Sample ID: 31LS-08-DEC23

Lab Sample ID: 410-155546-9

Date Collected: 12/20/23 12:55

Matrix: Water

Date Received: 12/21/23 11:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633		1	462474	UUV6	ELLE	01/11/24 16:43
Total/NA	Prep	1633	DL		461070	RC3V	ELLE	01/08/24 07:25
Total/NA	Analysis	1633	DL	10	462474	UUV6	ELLE	01/12/24 04:48

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Seres Engineering & Services LLC
Job ID: 410-155546-1
Project/Site: Ft. Devens PFAS

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24

Method Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Method	Method Description	Protocol	Laboratory
1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	ELLE
1633	Solid-Phase Extraction (SPE)	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-155546-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-155546-1	31LS-01-DEC23	Water	12/20/23 12:20	12/21/23 11:00
410-155546-2	31LS-02-DEC23	Water	12/20/23 12:25	12/21/23 11:00
410-155546-3	31LS-03-DEC23	Water	12/20/23 12:30	12/21/23 11:00
410-155546-4	31LS-04-DEC23	Water	12/20/23 12:35	12/21/23 11:00
410-155546-5	31LS-05-DEC23	Water	12/20/23 12:40	12/21/23 11:00
410-155546-6	31LS-06-DEC23	Water	12/20/23 12:45	12/21/23 11:00
410-155546-7	31LS-07-DEC23	Water	12/20/23 12:50	12/21/23 11:00
410-155546-8	31LS-08-DEC23	Water	12/20/23 12:55	12/21/23 11:00
410-155546-9	31LS-08-DEC23	Water	12/20/23 12:55	12/21/23 11:00

CHAIN-OF-CUSTODY RECORD

ARVC
Heather Levesque
669 Marina Drive, Suite B7, Charleston, SC 29492
619-370-0374

COC #: 31LS-DEC23

US Army Corps of Engineers

Project Name: Former Fort Devens, PFAS Remedial Investigation	Laboratory: Eurofins Lancaster Laboratories Environmental, LLC, Lancaster, PA	Event: Seres-Arcadis JV, PFAS RI Phase II, AOC 31 Lysimeter Sampling, Dec 2023
Project Number: DEVNS-PFAS RI	POC:	
WBS Code:	Ship to:	

Comments:
E1633DR (B) = PFAS Short HoldTime 28 days

Equipment:

Code	Matrix
WG	Ground Water

Code	Container/Preservative
50	2x 500ml HDPE Bottle, Cool 0° to 6°C; protected from light

410-155546 Chain of Custody

Event: Seres-Arcadis JV, PFAS RI Phase II, AOC 31 Lysimeter Sampling, Dec 2023

	Sample ID	Matrix	Date	Time	Samp Init	Analytical Test Method: E1633DR (B)	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom	Cooler	Comments
						50						
1	31LS-01-DEC23	WG	12/20/2023	12:20		X	31LS-01	N1	0.00	0.00	1	
2	31LS-02-DEC23	WG	12/20/2023	12:25		X	31LS-02	N1	0.00	0.00	1	
3	31LS-03-DEC23	WG	12/20/2023	12:30		X	31LS-03	N1	0.00	0.00	1	
4	31LS-04-DEC23	WG	12/20/2023	12:35		X	31LS-04	N1	0.00	0.00	1	
5	31LS-05-DEC23	WG	12/20/2023	12:40		X	31LS-05	N1	0.00	0.00	1	
6	31LS-06-DEC23	WG	12/20/2023	12:45		X	31LS-06	N1	0.00	0.00	1	
7	31LS-07-DEC23	WG	12/20/2023	12:50		X	31LS-07	N1	0.00	0.00	1	
8	31LS-08-DEC23	WG	12/20/2023	12:55		X	31LS-08	FD1	0.00	0.00	1	
9	31LS-08-DEC23	WG	12/20/2023	12:55		X	31LS-08	N1	0.00	0.00	1	
10	31LS-01-DEC23	WG	12/20/2023	12:20		X	31LS-01	MS1	0.00	0.00	1	
11	31LS-01-DEC23	WG	12/20/2023	12:20		X	31LS-01	SD1	0.00	0.00	1	
12												
13												
14												
15												
16												

Turnaround Time: NA

Raw 0.6- QDR 0.5

Relinquished by: (Signature) Spencer P Gist
Date 12/20/2023
Time 16.00
Received by: (Signature)
eCOC 12/4/23 11:00

Date
Time
Shipping Date: 12/20/2023
Received by Laboratory: (Signature, Date, Time) & conditio

1/19/2024

Login Sample Receipt Checklist

Client: Seres Engineering & Services LLC

Job Number: 410-155546-1

Login Number: 155546

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Ballard, Megan

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable,where thermal pres is required(</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable,where thermal pres is required (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	False	Refer to Job Narrative for details.
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Heather Levesque
Seres Engineering & Services LLC
669 Marina Drive
Suite B7
Charleston, South Carolina 29492

Generated 3/4/2024 9:35:09 AM

JOB DESCRIPTION

Ft. Devens PFAS

JOB NUMBER

410-160459-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization



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3/4/2024 9:35:09 AM

Authorized for release by
Kerri Sachtleben, Client Services Group Leader
Kerri.Sachtleben@et.eurofinsus.com
(717)556-7376

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.
· QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
· Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
· Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

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Definitions/Glossary

Client: Seres Engineering & Services LLC
Job ID: 410-160459-1
Project/Site: Ft. Devens PFAS

Qualifiers

LCMS

Qualifier	Qualifier Description
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
cn	Refer to Case Narrative for further detail
D	The reported value is from a dilution.
E	Result exceeded calibration range.
F2	MS/MSD RPD exceeds control limits
FH	MS and/or MSD recovery above control limits.
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M	Manual integrated compound.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 410-160459-1 Eurofins Lancaster Laboratories Environment

Job Narrative
410-160459-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Receipt
The samples were received on 2/10/2024 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 1.4°C.

Receipt Exceptions
The Field Sampler was not listed on the Chain of Custody.

PFAS
Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-02-FEB24 (410-160459-2) and 31LS-04-FEB24 (410-160459-4) due to interference from the sample matrix.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-01-FEB24 — Lab Sample ID: 410-160459-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
3-Perfluoropentylpropanoic acid (5:3 FTCA)	10	J	49	25	9.8	ng/L	1		1633	Total/NA
3-Perfluoropropylpropanoic acid (3:3 FTCA)	2.7	J M	9.8	4.9	1.5	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	1800	F2	7.9	7.5	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	570	F2	7.9	7.6	2.6	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	1.8	J I	3.9	2.4	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	66		2.0	0.98	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	160		7.9	3.9	2.0	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.3		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	140	F2	2.0	0.98	0.39	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	600		2.0	0.98	0.51	ng/L	1		1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	0.44	J F2 M	2.0	0.98	0.39	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	29	F2 FH	2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	340		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	150		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	530	F2	3.9	2.0	0.98	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	4800	D	20	11	5.6	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1300	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	5500	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	2400	D	20	13	6.3	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-02-FEB24 — Lab Sample ID: 410-160459-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	770	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	350	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	130	cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	240	cn	80	40	20	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	220	I cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	900	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	5400	cn	20	11	5.7	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-02-FEB24 (Continued)

Lab Sample ID: 410-160459-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanoic acid (PFHxA)	1500	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	66	M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	80	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	1300	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	210	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	770	cn	40	20	10	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	12000	D cn	200	100	50	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-03-FEB24

Lab Sample ID: 410-160459-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	280		7.6	7.2	2.4	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	36		7.6	7.3	2.5	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	89		1.9	0.95	0.28	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	150		7.6	3.8	1.9	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	58		1.9	0.95	0.38	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	420		1.9	0.95	0.49	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	8.5	M	1.9	0.95	0.47	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	12	M	1.9	0.95	0.47	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	450		1.9	1.2	0.61	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	140		1.9	0.95	0.47	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	430		3.8	1.9	0.95	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2200	D	19	10	5.4	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1100	D	19	9.5	4.7	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	2400	D	19	9.5	4.7	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-04-FEB24

Lab Sample ID: 410-160459-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	330	cn	80	76	25	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	4000	cn	80	77	26	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	18	J cn	20	10	3.0	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	110	cn	80	40	20	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-04-FEB24 (Continued)

Lab Sample ID: 410-160459-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorodecanoic acid (PFDA)	24	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	8.2	J cn	20	10	4.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	500	cn	20	10	5.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	670	cn	20	11	5.7	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	530	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	41	M cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	1900	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	2700	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	720	cn	20	13	6.4	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	37	cn	20	10	5.0	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	410	M cn	40	20	10	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-05-FEB24

Lab Sample ID: 410-160459-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	190		7.9	7.5	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	1100		7.9	7.6	2.6	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	3.9	J I	4.0	2.4	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	30		2.0	0.99	0.30	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	83		7.9	4.0	2.0	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.8	M	2.0	0.99	0.49	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	47		2.0	0.99	0.40	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	360		2.0	0.99	0.51	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	470		2.0	0.99	0.49	ng/L	1		1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	1.1	J	2.0	0.99	0.40	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	30		2.0	0.99	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	550		2.0	0.99	0.49	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	51		2.0	0.99	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	250		4.0	2.0	0.99	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2000	D	20	11	5.6	ng/L	10		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-05-FEB24 (Continued)

Lab Sample ID: 410-160459-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanoic acid (PFOA) - DL	780	D	20	13	6.3	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	8200	D	200	99	49	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-06-FEB24

Lab Sample ID: 410-160459-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	130		8.1	7.7	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	47		8.1	7.8	2.6	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	72		2.0	1.0	0.30	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	100		8.1	4.1	2.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	21		2.0	1.0	0.41	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	510		2.0	1.0	0.53	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	16	M	2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	22	M	2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	590		2.0	1.3	0.65	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	170		2.0	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	280		4.1	2.0	1.0	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	4200	D	20	11	5.8	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	840	D	20	10	5.1	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1600	D	20	10	5.1	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-07-FEB24

Lab Sample ID: 410-160459-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
3-Perfluoropentylpropanoic acid (5:3 FTCA)	11	J	49	24	9.7	ng/L	1		1633	Total/NA
3-Perfluoropropylpropanoic acid (3:3 FTCA)	3.8	J M	9.7	4.9	1.5	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	470		7.8	7.4	2.4	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	85		7.8	7.5	2.5	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	69		1.9	0.97	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	240		7.8	3.9	1.9	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	39		1.9	0.97	0.39	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	7.2	M	1.9	0.97	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	75		1.9	0.97	0.49	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-07-FEB24 (Continued)

Lab Sample ID: 410-160459-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanesulfonic acid (PFPeS)	250		1.9	0.97	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	670		3.9	1.9	0.97	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	670	D	19	9.7	5.0	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3400	D	19	11	5.5	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	2800	D	19	9.7	4.9	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1100	D	19	9.7	4.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	840	D	19	13	6.2	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-DUP-01-FEB24

Lab Sample ID: 410-160459-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	68		7.0	6.7	2.2	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	260		7.0	6.8	2.3	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2.8	J I	3.5	2.1	1.1	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	10		1.8	0.88	0.26	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	29		7.0	3.5	1.8	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.3	M	1.8	0.88	0.44	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	14		1.8	0.88	0.35	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	170		1.8	0.88	0.46	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	180		1.8	0.88	0.44	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	15		1.8	0.88	0.44	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	430		1.8	1.1	0.56	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	30		1.8	0.88	0.44	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	90		3.5	1.8	0.88	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	1200	D	18	9.7	5.0	ng/L	10		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	570	D	18	8.8	4.4	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	770	D	18	8.8	4.4	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-08-FEB24

Lab Sample ID: 410-160459-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	70		7.6	7.3	2.4	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-08-FEB24 (Continued)

Lab Sample ID: 410-160459-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	220		7.6	7.4	2.5	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2.3	J I M	3.8	2.3	1.1	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	11		1.9	0.96	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	30		7.6	3.8	1.9	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.6		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	14		1.9	0.96	0.38	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	170		1.9	0.96	0.50	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	170		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	17		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	480		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	470		1.9	1.2	0.61	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	29		1.9	0.96	0.48	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	92		3.8	1.9	0.96	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	1100	D	19	11	5.4	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	810	D	19	9.6	4.8	ng/L	10		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-01-FEB24
Date Collected: 02/08/24 08:50
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-1
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	7.9	7.5	2.0	ng/L		02/21/24 19:52	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	49	25	9.8	ng/L		02/21/24 19:52	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	**10**	**J**	49	25	9.8	ng/L		02/21/24 19:52	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	**2.7**	**J M**	9.8	4.9	1.5	ng/L		02/21/24 19:52	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	7.9	3.7	1.7	ng/L		02/21/24 19:52	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**1800**	**F2**	7.9	7.5	2.5	ng/L		02/21/24 19:52	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**570**	**F2**	7.9	7.6	2.6	ng/L		02/21/24 19:52	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.9	3.7	0.98	ng/L		02/21/24 19:52	1
DONA	3.7	U	7.9	3.7	1.5	ng/L		02/21/24 19:52	1
HFPODA	3.9	U	7.9	3.9	2.0	ng/L		02/21/24 19:52	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.8	U	20	9.8	4.9	ng/L		02/21/24 19:52	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.69	ng/L		02/21/24 19:52	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.8	U	20	9.8	4.9	ng/L		02/21/24 19:52	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**1.8**	**J I**	3.9	2.4	1.2	ng/L		02/21/24 19:52	1
Perfluorobutanesulfonic acid (PFBS)	**66**		2.0	0.98	0.29	ng/L		02/21/24 19:52	1
Perfluorobutanoic acid (PFBA)	**160**		7.9	3.9	2.0	ng/L		02/21/24 19:52	1
Perfluorodecanesulfonic acid (PFDS)	0.98	U F2	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluorodecanoic acid (PFDA)	**3.3**		2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.88	ng/L		02/21/24 19:52	1
Perfluorododecanoic acid (PFDoA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluoroheptanesulfonic acid (PFHpS)	**140**	**F2**	2.0	0.98	0.39	ng/L		02/21/24 19:52	1
Perfluoroheptanoic acid (PFHpA)	**600**		2.0	0.98	0.51	ng/L		02/21/24 19:52	1
Perfluorononanesulfonic acid (PFNS)	**0.44**	**J F2 M**	2.0	0.98	0.39	ng/L		02/21/24 19:52	1
Perfluorononanoic acid (PFNA)	**29**	**F2 FH**	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluorooctanesulfonamide (FOSA)	**340**		2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluoropentanesulfonic acid (PFPeS)	**150**		2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluoropentanoic acid (PFPeA)	**530**	**F2**	3.9	2.0	0.98	ng/L		02/21/24 19:52	1
Perfluorotetradecanoic acid (PFTA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluorotridecanoic acid (PFTriA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluoroundecanoic acid (PFUnA)	0.98	U	2.0	0.98	0.49	ng/L		02/21/24 19:52	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	3.9	1.8	0.49	ng/L		02/21/24 19:52	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	3.9	2.0	0.98	ng/L		02/21/24 19:52	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	3.9	2.0	0.98	ng/L		02/21/24 19:52	1

Client Sample ID: 31LS-01-FEB24

Lab Sample ID: 410-160459-1

Date Collected: 02/08/24 08:50

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	3.9	2.0	0.49	ng/L		02/21/24 19:52	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*55.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C2-PFDoDA	*66.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C3 HFPO-DA	*77.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C3 PFBS	*90.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C3 PFHxS	*75.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C4 PFBA	*61.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C4 PFHpA	*77.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C5 PFHxA	*74.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C5 PFPeA	*75.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C6 PFDA	*76.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C7 PFUnA	*73.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C8 FOSA	*76.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C8 PFOS	*85.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
13C9 PFNA	*73.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d3-NMeFOSAA	*79.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d3-NMePFOSA	*58.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d5-NEtFOSAA	*64.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d5-NEtPFOSA	*54.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d7-N-MeFOSE-M	*54.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
d9-N-EtFOSE-M	*48.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
M2-4:2 FTS	*120*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
M2-6:2 FTS	*107*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*
M2-8:2 FTS	*85.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:52*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**4800**	**D**	20	11	5.6	ng/L		02/22/24 13:47	10
Perfluorohexanoic acid (PFHxA)	**1300**	**D**	20	9.8	4.9	ng/L		02/22/24 13:47	10
Perfluorooctanesulfonic acid (PFOS)	**5500**	**D**	20	9.8	4.9	ng/L		02/22/24 13:47	10
Perfluorooctanoic acid (PFOA)	**2400**	**D**	20	13	6.3	ng/L		02/22/24 13:47	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*83.1*		*20 - 150*	*02/16/24 06:37*	*02/22/24 13:47*	*10*
13C5 PFHxA	*94.1*		*20 - 150*	*02/16/24 06:37*	*02/22/24 13:47*	*10*
13C8 PFOA	*81.8*		*20 - 150*	*02/16/24 06:37*	*02/22/24 13:47*	*10*
13C8 PFOS	*106*		*20 - 150*	*02/16/24 06:37*	*02/22/24 13:47*	*10*

Client Sample ID: 31LS-02-FEB24

Lab Sample ID: 410-160459-2

Date Collected: 02/08/24 09:00

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		02/21/24 20:34	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		02/21/24 20:34	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-02-FEB24
Date Collected: 02/08/24 09:00
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-2
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		02/21/24 20:34	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		02/21/24 20:34	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		02/21/24 20:34	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**770**	**cn**	80	76	25	ng/L		02/21/24 20:34	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**350**	**cn**	80	77	26	ng/L		02/21/24 20:34	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		02/21/24 20:34	1
DONA	38	U cn	80	38	15	ng/L		02/21/24 20:34	1
HFPODA	40	U cn	80	40	20	ng/L		02/21/24 20:34	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		02/21/24 20:34	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		02/21/24 20:34	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		02/21/24 20:34	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		02/21/24 20:34	1
Perfluorobutanesulfonic acid (PFBS)	**130**	**cn**	20	10	3.0	ng/L		02/21/24 20:34	1
Perfluorobutanoic acid (PFBA)	**240**	**cn**	80	40	20	ng/L		02/21/24 20:34	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorodecanoic acid (PFDA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		02/21/24 20:34	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluoroheptanesulfonic acid (PFHpS)	**220**	**I cn**	20	10	4.0	ng/L		02/21/24 20:34	1
Perfluoroheptanoic acid (PFHpA)	**900**	**cn**	20	10	5.2	ng/L		02/21/24 20:34	1
Perfluorohexanesulfonic acid (PFHxS)	**5400**	**cn**	20	11	5.7	ng/L		02/21/24 20:34	1
Perfluorohexanoic acid (PFHxA)	**1500**	**cn**	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		02/21/24 20:34	1
Perfluorononanoic acid (PFNA)	**66**	**M cn**	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorooctanesulfonamide (FOSA)	**80**	**cn**	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorooctanoic acid (PFOA)	**1300**	**cn**	20	13	6.4	ng/L		02/21/24 20:34	1
Perfluoropentanesulfonic acid (PFPeS)	**210**	**cn**	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluoropentanoic acid (PFPeA)	**770**	**cn**	40	20	10	ng/L		02/21/24 20:34	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		02/21/24 20:34	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		02/21/24 20:34	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		02/21/24 20:34	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		02/21/24 20:34	1

Client Sample ID: 31LS-02-FEB24

Date Collected: 02/08/24 09:00
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-2

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		02/21/24 20:34	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*48.7*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C2-PFDoDA	*62.7*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C3 HFPO-DA	*77.5*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C3 PFBS	*75.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C3 PFHxS	*72.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C4 PFBA	*74.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C4 PFHpA	*75.8*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C5 PFHxA	*81.7*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C5 PFPeA	*76.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C6 PFDA	*74.1*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C7 PFUnA	*70.0*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C8 FOSA	*65.8*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C8 PFOA	*70.7*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C8 PFOS	*73.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
13C9 PFNA	*75.8*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d3-NMeFOSAA	*75.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d3-NMePFOSA	*50.1*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d5-NEtFOSAA	*72.9*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d5-NEtPFOSA	*49.8*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d7-N-MeFOSE-M	*54.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
d9-N-EtFOSE-M	*51.1*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
M2-4:2 FTS	*90.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
M2-6:2 FTS	*77.1*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*
M2-8:2 FTS	*69.8*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 20:34*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**12000**	**D cn**	200	100	50	ng/L		02/22/24 14:01	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*113*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/22/24 14:01*	*10*

Client Sample ID: 31LS-03-FEB24

Date Collected: 02/08/24 09:05
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-3

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.2	U	7.6	7.2	1.9	ng/L		02/21/24 20:48	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	47	24	9.5	ng/L		02/21/24 20:48	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	24	U	47	24	9.5	ng/L		02/21/24 20:48	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.7	U	9.5	4.7	1.4	ng/L		02/21/24 20:48	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	7.6	3.6	1.6	ng/L		02/21/24 20:48	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**280**		7.6	7.2	2.4	ng/L		02/21/24 20:48	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-03-FEB24
Date Collected: 02/08/24 09:05
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-3
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**36**		7.6	7.3	2.5	ng/L		02/21/24 20:48	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.6	U	7.6	3.6	0.95	ng/L		02/21/24 20:48	1
DONA	3.6	U	7.6	3.6	1.4	ng/L		02/21/24 20:48	1
HFPODA	3.8	U	7.6	3.8	1.9	ng/L		02/21/24 20:48	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.5	U	19	9.5	4.7	ng/L		02/21/24 20:48	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	1.9	1.3	0.66	ng/L		02/21/24 20:48	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.5	U	19	9.5	4.7	ng/L		02/21/24 20:48	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	3.8	2.3	1.1	ng/L		02/21/24 20:48	1
Perfluorobutanesulfonic acid (PFBS)	**89**		1.9	0.95	0.28	ng/L		02/21/24 20:48	1
Perfluorobutanoic acid (PFBA)	**150**		7.6	3.8	1.9	ng/L		02/21/24 20:48	1
Perfluorodecanesulfonic acid (PFDS)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluorodecanoic acid (PFDA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.85	ng/L		02/21/24 20:48	1
Perfluorododecanoic acid (PFDoA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluoroheptanesulfonic acid (PFHpS)	**58**		1.9	0.95	0.38	ng/L		02/21/24 20:48	1
Perfluoroheptanoic acid (PFHpA)	**420**		1.9	0.95	0.49	ng/L		02/21/24 20:48	1
Perfluorononanesulfonic acid (PFNS)	0.95	U	1.9	0.95	0.38	ng/L		02/21/24 20:48	1
Perfluorononanoic acid (PFNA)	**8.5**	**M**	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluorooctanesulfonamide (FOSA)	**12**	**M**	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluorooctanoic acid (PFOA)	**450**		1.9	1.2	0.61	ng/L		02/21/24 20:48	1
Perfluoropentanesulfonic acid (PFPeS)	**140**		1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluoropentanoic acid (PFPeA)	**430**		3.8	1.9	0.95	ng/L		02/21/24 20:48	1
Perfluorotetradecanoic acid (PFTA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluorotridecanoic acid (PFTriA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluoroundecanoic acid (PFUnA)	0.95	U	1.9	0.95	0.47	ng/L		02/21/24 20:48	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.8	1.7	0.47	ng/L		02/21/24 20:48	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.8	1.9	0.95	ng/L		02/21/24 20:48	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.8	1.9	0.95	ng/L		02/21/24 20:48	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.8	1.9	0.47	ng/L		02/21/24 20:48	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*62.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C2-PFDoDA	*62.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C3 HFPO-DA	*76.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C3 PFBS	*83.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C3 PFHxS	*76.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C4 PFBA	*75.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*
13C4 PFHpA	*78.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 20:48*	*1*

Client Sample ID: 31LS-03-FEB24

Lab Sample ID: 410-160459-3

Date Collected: 02/08/24 09:05
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFHxA	79.2		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C5 PFPeA	76.2		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C6 PFDA	73.3		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C7 PFUnA	62.2		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C8 FOSA	62.5		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C8 PFOA	67.0		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C8 PFOS	66.9		20 - 150	02/16/24 06:37	02/21/24 20:48	1
13C9 PFNA	71.4		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d3-NMeFOSAA	64.6		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d3-NMePFOSA	53.2		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d5-NEtFOSAA	60.1		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d5-NEtPFOSA	47.4		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d7-N-MeFOSE-M	48.1		20 - 150	02/16/24 06:37	02/21/24 20:48	1
d9-N-EtFOSE-M	41.5		20 - 150	02/16/24 06:37	02/21/24 20:48	1
M2-4:2 FTS	110		20 - 150	02/16/24 06:37	02/21/24 20:48	1
M2-6:2 FTS	95.3		20 - 150	02/16/24 06:37	02/21/24 20:48	1
M2-8:2 FTS	66.1		20 - 150	02/16/24 06:37	02/21/24 20:48	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2200**	**D**	19	10	5.4	ng/L		02/22/24 14:15	10
Perfluorohexanoic acid (PFHxA)	**1100**	**D**	19	9.5	4.7	ng/L		02/22/24 14:15	10
Perfluorooctanesulfonic acid (PFOS)	**2400**	**D**	19	9.5	4.7	ng/L		02/22/24 14:15	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	79.6		20 - 150	02/16/24 06:37	02/22/24 14:15	10
13C5 PFHxA	89.4		20 - 150	02/16/24 06:37	02/22/24 14:15	10
13C8 PFOS	78.0		20 - 150	02/16/24 06:37	02/22/24 14:15	10

Client Sample ID: 31LS-04-FEB24

Lab Sample ID: 410-160459-4

Date Collected: 02/08/24 09:10
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	80	76	20	ng/L		02/21/24 21:02	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	500	250	100	ng/L		02/21/24 21:02	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	500	250	100	ng/L		02/21/24 21:02	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	100	50	15	ng/L		02/21/24 21:02	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	80	38	17	ng/L		02/21/24 21:02	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**330**	**cn**	80	76	25	ng/L		02/21/24 21:02	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**4000**	**cn**	80	77	26	ng/L		02/21/24 21:02	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	38	U cn	80	38	10	ng/L		02/21/24 21:02	1
DONA	38	U cn	80	38	15	ng/L		02/21/24 21:02	1
HFPODA	40	U cn	80	40	20	ng/L		02/21/24 21:02	1

Client Sample ID: 31LS-04-FEB24
Date Collected: 02/08/24 09:10
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-4
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	200	100	50	ng/L		02/21/24 21:02	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	20	14	7.0	ng/L		02/21/24 21:02	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	200	100	50	ng/L		02/21/24 21:02	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	24	U cn	40	24	12	ng/L		02/21/24 21:02	1
Perfluorobutanesulfonic acid (PFBS)	**18**	**J cn**	20	10	3.0	ng/L		02/21/24 21:02	1
Perfluorobutanoic acid (PFBA)	**110**	**cn**	80	40	20	ng/L		02/21/24 21:02	1
Perfluorodecanesulfonic acid (PFDS)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorodecanoic acid (PFDA)	**24**	**cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	20	19	9.0	ng/L		02/21/24 21:02	1
Perfluorododecanoic acid (PFDoA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluoroheptanesulfonic acid (PFHpS)	**8.2**	**J cn**	20	10	4.0	ng/L		02/21/24 21:02	1
Perfluoroheptanoic acid (PFHpA)	**500**	**cn**	20	10	5.2	ng/L		02/21/24 21:02	1
Perfluorohexanesulfonic acid (PFHxS)	**670**	**cn**	20	11	5.7	ng/L		02/21/24 21:02	1
Perfluorohexanoic acid (PFHxA)	**530**	**cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorononanesulfonic acid (PFNS)	10	U cn	20	10	4.0	ng/L		02/21/24 21:02	1
Perfluorononanoic acid (PFNA)	**41**	**M cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorooctanesulfonamide (FOSA)	**1900**	**cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorooctanesulfonic acid (PFOS)	**2700**	**cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorooctanoic acid (PFOA)	**720**	**cn**	20	13	6.4	ng/L		02/21/24 21:02	1
Perfluoropentanesulfonic acid (PFPeS)	**37**	**cn**	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluoropentanoic acid (PFPeA)	**410**	**M cn**	40	20	10	ng/L		02/21/24 21:02	1
Perfluorotetradecanoic acid (PFTA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluorotridecanoic acid (PFTriA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluoroundecanoic acid (PFUnA)	10	U cn	20	10	5.0	ng/L		02/21/24 21:02	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	40	18	5.0	ng/L		02/21/24 21:02	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	40	20	10	ng/L		02/21/24 21:02	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn	40	20	10	ng/L		02/21/24 21:02	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn	40	20	5.0	ng/L		02/21/24 21:02	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*55.4*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C2-PFDoDA	*73.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C3 HFPO-DA	*79.3*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C3 PFBS	*74.0*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C3 PFHxS	*67.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C4 PFBA	*72.2*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C4 PFHpA	*75.9*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*
13C5 PFHxA	*82.6*	*cn*	*20 - 150*	*02/16/24 06:37*	*02/21/24 21:02*	*1*

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-04-FEB24

Lab Sample ID: 410-160459-4

Date Collected: 02/08/24 09:10
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFPeA	81.7	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C6 PFDA	79.6	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C7 PFUnA	71.0	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C8 FOSA	66.6	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C8 PFOA	70.4	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C8 PFOS	75.9	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
13C9 PFNA	69.3	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d3-NMeFOSAA	78.6	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d3-NMePFOSA	56.4	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d5-NEtFOSAA	77.6	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d5-NEtPFOSA	55.3	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d7-N-MeFOSE-M	56.8	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
d9-N-EtFOSE-M	52.3	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
M2-4:2 FTS	83.9	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
M2-6:2 FTS	88.8	M cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1
M2-8:2 FTS	69.0	cn	20 - 150	02/16/24 06:37	02/21/24 21:02	1

Client Sample ID: 31LS-05-FEB24

Lab Sample ID: 410-160459-5

Date Collected: 02/08/24 09:15
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	7.9	7.5	2.0	ng/L		02/21/24 21:31	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	49	25	9.9	ng/L		02/21/24 21:31	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	49	25	9.9	ng/L		02/21/24 21:31	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	9.9	4.9	1.5	ng/L		02/21/24 21:31	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	7.9	3.8	1.7	ng/L		02/21/24 21:31	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**190**		7.9	7.5	2.5	ng/L		02/21/24 21:31	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**1100**		7.9	7.6	2.6	ng/L		02/21/24 21:31	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	7.9	3.8	0.99	ng/L		02/21/24 21:31	1
DONA	3.8	U	7.9	3.8	1.5	ng/L		02/21/24 21:31	1
HFPODA	4.0	U	7.9	4.0	2.0	ng/L		02/21/24 21:31	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.9	U	20	9.9	4.9	ng/L		02/21/24 21:31	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U M	2.0	1.4	0.69	ng/L		02/21/24 21:31	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.9	U	20	9.9	4.9	ng/L		02/21/24 21:31	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**3.9**	**J I**	4.0	2.4	1.2	ng/L		02/21/24 21:31	1
Perfluorobutanesulfonic acid (PFBS)	**30**		2.0	0.99	0.30	ng/L		02/21/24 21:31	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-05-FEB24
Date Collected: 02/08/24 09:15
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-5
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**83**		7.9	4.0	2.0	ng/L		02/21/24 21:31	1
Perfluorodecanesulfonic acid (PFDS)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluorodecanoic acid (PFDA)	**3.8**	**M**	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.89	ng/L		02/21/24 21:31	1
Perfluorododecanoic acid (PFDoA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluoroheptanesulfonic acid (PFHpS)	**47**		2.0	0.99	0.40	ng/L		02/21/24 21:31	1
Perfluoroheptanoic acid (PFHpA)	**360**		2.0	0.99	0.51	ng/L		02/21/24 21:31	1
Perfluorohexanoic acid (PFHxA)	**470**		2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluorononanesulfonic acid (PFNS)	**1.1**	**J**	2.0	0.99	0.40	ng/L		02/21/24 21:31	1
Perfluorononanoic acid (PFNA)	**30**		2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluorooctanesulfonamide (FOSA)	**550**		2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluoropentanesulfonic acid (PFPeS)	**51**		2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluoropentanoic acid (PFPeA)	**250**		4.0	2.0	0.99	ng/L		02/21/24 21:31	1
Perfluorotetradecanoic acid (PFTA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluorotridecanoic acid (PFTriA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluoroundecanoic acid (PFUnA)	0.99	U	2.0	0.99	0.49	ng/L		02/21/24 21:31	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.49	ng/L		02/21/24 21:31	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	0.99	ng/L		02/21/24 21:31	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	0.99	ng/L		02/21/24 21:31	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.49	ng/L		02/21/24 21:31	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*54.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C2-PFDoDA	*63.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C3 HFPO-DA	*77.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C3 PFBS	*86.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C3 PFHxS	*75.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C4 PFBA	*30.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C4 PFHpA	*80.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C5 PFHxA	*83.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C5 PFPeA	*77.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C6 PFDA	*78.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C7 PFUnA	*69.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C8 FOSA	*93.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C8 PFOA	*67.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C8 PFOS	*87.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
13C9 PFNA	*72.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d3-NMeFOSAA	*97.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d3-NMePFOSA	*70.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d5-NEtFOSAA	*82.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d5-NEtPFOSA	*64.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d7-N-MeFOSE-M	*60.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
d9-N-EtFOSE-M	*51.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
M2-4:2 FTS	*104*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
M2-6:2 FTS	*98.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*
M2-8:2 FTS	*84.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:31*	*1*

Client Sample ID: 31LS-05-FEB24

Lab Sample ID: 410-160459-5

Date Collected: 02/08/24 09:15

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2000**	**D**	20	11	5.6	ng/L		02/22/24 14:57	10
Perfluorooctanoic acid (PFOA)	**780**	**D**	20	13	6.3	ng/L		02/22/24 14:57	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*81.7*		*20 - 150*	*02/16/24 06:37*	*02/22/24 14:57*	*10*
13C8 PFOA	*86.3*		*20 - 150*	*02/16/24 06:37*	*02/22/24 14:57*	*10*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**8200**	**D**	200	99	49	ng/L		02/23/24 07:13	100

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*90.5*		*20 - 150*	*02/16/24 06:37*	*02/23/24 07:13*	*100*

Client Sample ID: 31LS-06-FEB24

Lab Sample ID: 410-160459-6

Date Collected: 02/08/24 09:20

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.7	U	8.1	7.7	2.0	ng/L		02/21/24 21:46	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	51	25	10	ng/L		02/21/24 21:46	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	51	25	10	ng/L		02/21/24 21:46	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.1	U	10	5.1	1.5	ng/L		02/21/24 21:46	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.1	3.8	1.7	ng/L		02/21/24 21:46	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**130**		8.1	7.7	2.5	ng/L		02/21/24 21:46	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**47**		8.1	7.8	2.6	ng/L		02/21/24 21:46	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.1	3.8	1.0	ng/L		02/21/24 21:46	1
DONA	3.8	U	8.1	3.8	1.5	ng/L		02/21/24 21:46	1
HFPODA	4.1	U	8.1	4.1	2.0	ng/L		02/21/24 21:46	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.1	ng/L		02/21/24 21:46	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.71	ng/L		02/21/24 21:46	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.1	ng/L		02/21/24 21:46	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.4	U	4.1	2.4	1.2	ng/L		02/21/24 21:46	1
Perfluorobutanesulfonic acid (PFBS)	**72**		2.0	1.0	0.30	ng/L		02/21/24 21:46	1
Perfluorobutanoic acid (PFBA)	**100**		8.1	4.1	2.0	ng/L		02/21/24 21:46	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluorodecanoic acid (PFDA)	1.0	U M	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.91	ng/L		02/21/24 21:46	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-06-FEB24
Date Collected: 02/08/24 09:20
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-6
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluoroheptanesulfonic acid (PFHpS)	**21**		2.0	1.0	0.41	ng/L		02/21/24 21:46	1
Perfluoroheptanoic acid (PFHpA)	**510**		2.0	1.0	0.53	ng/L		02/21/24 21:46	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.41	ng/L		02/21/24 21:46	1
Perfluorononanoic acid (PFNA)	**16**	**M**	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluorooctanesulfonamide (FOSA)	**22**	**M**	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluorooctanoic acid (PFOA)	**590**		2.0	1.3	0.65	ng/L		02/21/24 21:46	1
Perfluoropentanesulfonic acid (PFPeS)	**170**		2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluoropentanoic acid (PFPeA)	**280**		4.1	2.0	1.0	ng/L		02/21/24 21:46	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.51	ng/L		02/21/24 21:46	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.1	1.8	0.51	ng/L		02/21/24 21:46	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.1	2.0	1.0	ng/L		02/21/24 21:46	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.1	2.0	1.0	ng/L		02/21/24 21:46	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.1	2.0	0.51	ng/L		02/21/24 21:46	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*65.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C2-PFDoDA	*68.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C3 HFPO-DA	*75.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C3 PFBS	*90.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C3 PFHxS	*76.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C4 PFBA	*72.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C4 PFHpA	*76.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C5 PFHxA	*76.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C5 PFPeA	*76.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C6 PFDA	*69.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C7 PFUnA	*64.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C8 FOSA	*61.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C8 PFOA	*75.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C8 PFOS	*70.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
13C9 PFNA	*66.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d3-NMeFOSAA	*69.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d3-NMePFOSA	*54.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d5-NEtFOSAA	*69.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d5-NEtPFOSA	*53.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d7-N-MeFOSE-M	*44.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
d9-N-EtFOSE-M	*33.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
M2-4:2 FTS	*111*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
M2-6:2 FTS	*95.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*
M2-8:2 FTS	*89.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 21:46*	*1*

Client Sample ID: 31LS-06-FEB24

Lab Sample ID: 410-160459-6

Date Collected: 02/08/24 09:20

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**4200**	**D**	20	11	5.8	ng/L		02/22/24 15:39	10
Perfluorohexanoic acid (PFHxA)	**840**	**D**	20	10	5.1	ng/L		02/22/24 15:39	10
Perfluorooctanesulfonic acid (PFOS)	**1600**	**D**	20	10	5.1	ng/L		02/22/24 15:39	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*88.8*		*20 - 150*	*02/16/24 06:37*	*02/22/24 15:39*	*10*
13C5 PFHxA	*93.2*		*20 - 150*	*02/16/24 06:37*	*02/22/24 15:39*	*10*
13C8 PFOS	*87.9*		*20 - 150*	*02/16/24 06:37*	*02/22/24 15:39*	*10*

Client Sample ID: 31LS-07-FEB24

Lab Sample ID: 410-160459-7

Date Collected: 02/08/24 09:25

Matrix: Water

Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.4	U	7.8	7.4	1.9	ng/L		02/21/24 22:00	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	49	24	9.7	ng/L		02/21/24 22:00	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	**11**	**J**	49	24	9.7	ng/L		02/21/24 22:00	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	**3.8**	**J M**	9.7	4.9	1.5	ng/L		02/21/24 22:00	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	7.8	3.7	1.6	ng/L		02/21/24 22:00	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**470**		7.8	7.4	2.4	ng/L		02/21/24 22:00	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**85**		7.8	7.5	2.5	ng/L		02/21/24 22:00	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.8	3.7	0.97	ng/L		02/21/24 22:00	1
DONA	3.7	U	7.8	3.7	1.5	ng/L		02/21/24 22:00	1
HFPODA	3.9	U	7.8	3.9	1.9	ng/L		02/21/24 22:00	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.7	U	19	9.7	4.9	ng/L		02/21/24 22:00	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	1.9	1.4	0.68	ng/L		02/21/24 22:00	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.7	U	19	9.7	4.9	ng/L		02/21/24 22:00	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	3.9	2.3	1.2	ng/L		02/21/24 22:00	1
Perfluorobutanesulfonic acid (PFBS)	**69**		1.9	0.97	0.29	ng/L		02/21/24 22:00	1
Perfluorobutanoic acid (PFBA)	**240**		7.8	3.9	1.9	ng/L		02/21/24 22:00	1
Perfluorodecanesulfonic acid (PFDS)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluorodecanoic acid (PFDA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.87	ng/L		02/21/24 22:00	1
Perfluorododecanoic acid (PFDoA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluoroheptanesulfonic acid (PFHpS)	**39**		1.9	0.97	0.39	ng/L		02/21/24 22:00	1
Perfluorononanesulfonic acid (PFNS)	0.97	U	1.9	0.97	0.39	ng/L		02/21/24 22:00	1

Client Sample ID: 31LS-07-FEB24
Date Collected: 02/08/24 09:25
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-7
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorononanoic acid (PFNA)	**7.2**	**M**	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluorooctanesulfonamide (FOSA)	**75**		1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluoropentanesulfonic acid (PFPeS)	**250**		1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluoropentanoic acid (PFPeA)	**670**		3.9	1.9	0.97	ng/L		02/21/24 22:00	1
Perfluorotetradecanoic acid (PFTA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluorotridecanoic acid (PFTriA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluoroundecanoic acid (PFUnA)	0.97	U	1.9	0.97	0.49	ng/L		02/21/24 22:00	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.9	1.7	0.49	ng/L		02/21/24 22:00	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.9	1.9	0.97	ng/L		02/21/24 22:00	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.9	1.9	0.97	ng/L		02/21/24 22:00	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.9	1.9	0.49	ng/L		02/21/24 22:00	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*69.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C2-PFDoDA	*66.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C3 HFPO-DA	*78.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C3 PFBS	*91.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C3 PFHxS	*78.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C4 PFBA	*73.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C5 PFHxA	*72.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C5 PFPeA	*78.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C6 PFDA	*64.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C7 PFUnA	*66.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C8 FOSA	*61.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C8 PFOS	*63.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
13C9 PFNA	*69.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d3-NMeFOSAA	*69.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d3-NMePFOSA	*55.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d5-NEtFOSAA	*67.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d5-NEtPFOSA	*51.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d7-N-MeFOSE-M	*48.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
d9-N-EtFOSE-M	*41.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
M2-4:2 FTS	*119*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
M2-6:2 FTS	*107*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*
M2-8:2 FTS	*81.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:00*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**670**	**D**	19	9.7	5.0	ng/L		02/22/24 15:54	10
Perfluorohexanesulfonic acid (PFHxS)	**3400**	**D**	19	11	5.5	ng/L		02/22/24 15:54	10
Perfluorohexanoic acid (PFHxA)	**2800**	**D**	19	9.7	4.9	ng/L		02/22/24 15:54	10
Perfluorooctanesulfonic acid (PFOS)	**1100**	**D**	19	9.7	4.9	ng/L		02/22/24 15:54	10
Perfluorooctanoic acid (PFOA)	**840**	**D**	19	13	6.2	ng/L		02/22/24 15:54	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*89.2*		*20 - 150*	*02/16/24 06:37*	*02/22/24 15:54*	*10*
13C4 PFHpA	*90.9*		*20 - 150*	*02/16/24 06:37*	*02/22/24 15:54*	*10*

Client Sample ID: 31LS-07-FEB24

Lab Sample ID: 410-160459-7

Date Collected: 02/08/24 09:25
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFHxA	92.9		20 - 150	02/16/24 06:37	02/22/24 15:54	10
13C8 PFOA	81.9		20 - 150	02/16/24 06:37	02/22/24 15:54	10
13C8 PFOS	76.6		20 - 150	02/16/24 06:37	02/22/24 15:54	10

Client Sample ID: 31LS-DUP-01-FEB24

Lab Sample ID: 410-160459-8

Date Collected: 02/08/24 00:00
Matrix: Water
Date Received: 02/10/24 09:30

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	6.7	U	7.0	6.7	1.8	ng/L		02/21/24 22:14	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	22	U	44	22	8.8	ng/L		02/21/24 22:14	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	22	U	44	22	8.8	ng/L		02/21/24 22:14	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.4	U	8.8	4.4	1.3	ng/L		02/21/24 22:14	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.3	U	7.0	3.3	1.5	ng/L		02/21/24 22:14	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**68**		7.0	6.7	2.2	ng/L		02/21/24 22:14	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**260**		7.0	6.8	2.3	ng/L		02/21/24 22:14	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.3	U	7.0	3.3	0.88	ng/L		02/21/24 22:14	1
DONA	3.3	U	7.0	3.3	1.3	ng/L		02/21/24 22:14	1
HFPODA	3.5	U	7.0	3.5	1.8	ng/L		02/21/24 22:14	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	8.8	U	18	8.8	4.4	ng/L		02/21/24 22:14	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.2	U	1.8	1.2	0.62	ng/L		02/21/24 22:14	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	8.8	U	18	8.8	4.4	ng/L		02/21/24 22:14	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**2.8**	**J I**	3.5	2.1	1.1	ng/L		02/21/24 22:14	1
Perfluorobutanesulfonic acid (PFBS)	**10**		1.8	0.88	0.26	ng/L		02/21/24 22:14	1
Perfluorobutanoic acid (PFBA)	**29**		7.0	3.5	1.8	ng/L		02/21/24 22:14	1
Perfluorodecanesulfonic acid (PFDS)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluorodecanoic acid (PFDA)	**3.3**	**M**	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluorododecanesulfonic acid (PFDoS)	1.7	U	1.8	1.7	0.79	ng/L		02/21/24 22:14	1
Perfluorododecanoic acid (PFDoA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluoroheptanesulfonic acid (PFHpS)	**14**		1.8	0.88	0.35	ng/L		02/21/24 22:14	1
Perfluoroheptanoic acid (PFHpA)	**170**		1.8	0.88	0.46	ng/L		02/21/24 22:14	1
Perfluorohexanoic acid (PFHxA)	**180**		1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluorononanesulfonic acid (PFNS)	0.88	U	1.8	0.88	0.35	ng/L		02/21/24 22:14	1
Perfluorononanoic acid (PFNA)	**15**		1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluorooctanoic acid (PFOA)	**430**		1.8	1.1	0.56	ng/L		02/21/24 22:14	1
Perfluoropentanesulfonic acid (PFPeS)	**30**		1.8	0.88	0.44	ng/L		02/21/24 22:14	1

Client Sample ID: 31LS-DUP-01-FEB24
Date Collected: 02/08/24 00:00
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-8
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoropentanoic acid (PFPeA)	**90**		3.5	1.8	0.88	ng/L		02/21/24 22:14	1
Perfluorotetradecanoic acid (PFTA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluorotridecanoic acid (PFTriA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluoroundecanoic acid (PFUnA)	0.88	U	1.8	0.88	0.44	ng/L		02/21/24 22:14	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.6	U	3.5	1.6	0.44	ng/L		02/21/24 22:14	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.8	U	3.5	1.8	0.88	ng/L		02/21/24 22:14	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.8	U	3.5	1.8	0.88	ng/L		02/21/24 22:14	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.8	U	3.5	1.8	0.44	ng/L		02/21/24 22:14	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*56.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C2-PFDoDA	*57.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C3 HFPO-DA	*74.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C3 PFBS	*76.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C3 PFHxS	*68.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C4 PFBA	*72.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C4 PFHpA	*74.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C5 PFHxA	*75.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C5 PFPeA	*74.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C6 PFDA	*73.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C7 PFUnA	*62.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C8 PFOA	*69.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C8 PFOS	*64.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
13C9 PFNA	*73.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d3-NMeFOSAA	*71.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d3-NMePFOSA	*51.0*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d5-NEtFOSAA	*69.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d5-NEtPFOSA	*46.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d7-N-MeFOSE-M	*46.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
d9-N-EtFOSE-M	*41.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
M2-4:2 FTS	*92.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
M2-6:2 FTS	*91.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*
M2-8:2 FTS	*65.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:14*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**1200**	**D**	18	9.7	5.0	ng/L		02/22/24 16:08	10
Perfluorooctanesulfonamide (FOSA)	**570**	**D**	18	8.8	4.4	ng/L		02/22/24 16:08	10
Perfluorooctanesulfonic acid (PFOS)	**770**	**D**	18	8.8	4.4	ng/L		02/22/24 16:08	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*84.0*		*20 - 150*	*02/16/24 06:37*	*02/22/24 16:08*	*10*
13C8 FOSA	*82.1*		*20 - 150*	*02/16/24 06:37*	*02/22/24 16:08*	*10*
13C8 PFOS	*84.6*		*20 - 150*	*02/16/24 06:37*	*02/22/24 16:08*	*10*

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-08-FEB24
Date Collected: 02/08/24 09:35
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.3	U	7.6	7.3	1.9	ng/L		02/21/24 22:28	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	48	24	9.6	ng/L		02/21/24 22:28	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	24	U	48	24	9.6	ng/L		02/21/24 22:28	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.8	U	9.6	4.8	1.4	ng/L		02/21/24 22:28	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	7.6	3.6	1.6	ng/L		02/21/24 22:28	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**70**		7.6	7.3	2.4	ng/L		02/21/24 22:28	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**220**		7.6	7.4	2.5	ng/L		02/21/24 22:28	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.6	U	7.6	3.6	0.96	ng/L		02/21/24 22:28	1
DONA	3.6	U	7.6	3.6	1.4	ng/L		02/21/24 22:28	1
HFPODA	3.8	U	7.6	3.8	1.9	ng/L		02/21/24 22:28	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.6	U	19	9.6	4.8	ng/L		02/21/24 22:28	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	1.9	1.3	0.67	ng/L		02/21/24 22:28	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.6	U	19	9.6	4.8	ng/L		02/21/24 22:28	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**2.3**	**J I M**	3.8	2.3	1.1	ng/L		02/21/24 22:28	1
Perfluorobutanesulfonic acid (PFBS)	**11**		1.9	0.96	0.29	ng/L		02/21/24 22:28	1
Perfluorobutanoic acid (PFBA)	**30**		7.6	3.8	1.9	ng/L		02/21/24 22:28	1
Perfluorodecanesulfonic acid (PFDS)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorodecanoic acid (PFDA)	**3.6**		1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.86	ng/L		02/21/24 22:28	1
Perfluorododecanoic acid (PFDoA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluoroheptanesulfonic acid (PFHpS)	**14**		1.9	0.96	0.38	ng/L		02/21/24 22:28	1
Perfluoroheptanoic acid (PFHpA)	**170**		1.9	0.96	0.50	ng/L		02/21/24 22:28	1
Perfluorohexanoic acid (PFHxA)	**170**		1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorononanesulfonic acid (PFNS)	0.96	U	1.9	0.96	0.38	ng/L		02/21/24 22:28	1
Perfluorononanoic acid (PFNA)	**17**		1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorooctanesulfonamide (FOSA)	**480**		1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorooctanoic acid (PFOA)	**470**		1.9	1.2	0.61	ng/L		02/21/24 22:28	1
Perfluoropentanesulfonic acid (PFPeS)	**29**		1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluoropentanoic acid (PFPeA)	**92**		3.8	1.9	0.96	ng/L		02/21/24 22:28	1
Perfluorotetradecanoic acid (PFTA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluorotridecanoic acid (PFTriA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluoroundecanoic acid (PFUnA)	0.96	U	1.9	0.96	0.48	ng/L		02/21/24 22:28	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.8	1.7	0.48	ng/L		02/21/24 22:28	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.8	1.9	0.96	ng/L		02/21/24 22:28	1

Client Sample ID: 31LS-08-FEB24
Date Collected: 02/08/24 09:35
Date Received: 02/10/24 09:30

Lab Sample ID: 410-160459-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.8	1.9	0.96	ng/L		02/21/24 22:28	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.8	1.9	0.48	ng/L		02/21/24 22:28	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*53.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C2-PFDoDA	*58.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C3 HFPO-DA	*75.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C3 PFBS	*79.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C3 PFHxS	*72.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C4 PFBA	*75.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C4 PFHpA	*75.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C5 PFHxA	*79.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C5 PFPeA	*74.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C6 PFDA	*67.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C7 PFUnA	*55.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C8 FOSA	*66.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C8 PFOA	*83.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C8 PFOS	*67.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
13C9 PFNA	*74.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d3-NMeFOSAA	*66.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d3-NMePFOSA	*56.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d5-NEtFOSAA	*68.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d5-NEtPFOSA	*49.1*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d7-N-MeFOSE-M	*48.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
d9-N-EtFOSE-M	*42.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
M2-4:2 FTS	*100*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
M2-6:2 FTS	*91.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*
M2-8:2 FTS	*70.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 22:28*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**1100**	**D**	19	11	5.4	ng/L		02/22/24 16:23	10
Perfluorooctanesulfonic acid (PFOS)	**810**	**D**	19	9.6	4.8	ng/L		02/22/24 16:23	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*87.4*		*20 - 150*	*02/16/24 06:37*	*02/22/24 16:23*	*10*
13C8 PFOS	*78.2*	*M*	*20 - 150*	*02/16/24 06:37*	*02/22/24 16:23*	*10*

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFTDA (20-150)	PFDoDA (20-150)	HFPODA (20-150)	C3PFBS (20-150)	C3PFHS (20-150)	PFBA (20-150)	C4PFHA (20-150)	13C5PHA (20-150)
410-160459-1	31LS-01-FEB24	55.6	66.0	77.0	90.8	75.7	61.6	77.5	74.3
410-160459-1 - DL	31LS-01-FEB24					83.1			94.1
410-160459-1 MS	31LS-01-FEB24	50.5	65.0	83.8	102	80.5	36.7	81.9	79.7
410-160459-1 MSD	31LS-01-FEB24	54.1	63.4	79.1	89.2	74.2	63.6	80.9	79.3
410-160459-2	31LS-02-FEB24	48.7 cn	62.7 cn	77.5 cn	75.2 cn	72.6 cn	74.2 cn	75.8 cn	81.7 cn
410-160459-2 - DL	31LS-02-FEB24								
410-160459-3	31LS-03-FEB24	62.4	62.8	76.8	83.3	76.8	75.0	78.3	79.2
410-160459-3 - DL	31LS-03-FEB24					79.6			89.4
410-160459-4	31LS-04-FEB24	55.4 cn	73.2 cn	79.3 cn	74.0 cn	67.6 cn	72.2 cn	75.9 cn	82.6 cn
410-160459-4 DU	31LS-04-FEB24	49.3	65.8	78.5	76.7	77.1	75.6	79.1	84.9
410-160459-5	31LS-05-FEB24	54.9	63.8	77.4	86.2	75.6	30.2	80.5	83.3
410-160459-5 - DL	31LS-05-FEB24					81.7			
410-160459-5 - DL2	31LS-05-FEB24								
410-160459-6	31LS-06-FEB24	65.5	68.6	75.9	90.7	76.2	72.7	76.3	76.8
410-160459-6 - DL	31LS-06-FEB24					88.8			93.2
410-160459-7	31LS-07-FEB24	69.0	66.1	78.0	91.7	78.1	73.7		72.3
410-160459-7 - DL	31LS-07-FEB24					89.2		90.9	92.9
410-160459-8	31LS-DUP-01-FEB24	56.1	57.9	74.0	76.9	68.7	72.2	74.1	75.4
410-160459-8 - DL	31LS-DUP-01-FEB24					84.0			
410-160459-9	31LS-08-FEB24	53.9	58.4	75.1	79.4	72.1	75.2	75.6	79.9
410-160459-9 - DL	31LS-08-FEB24					87.4			
LCS 410-473992/2-A	Lab Control Sample	57.4	63.7	75.8	71.8	57.1	75.9	70.3	79.8
LLCS 410-473992/3-A	Lab Control Sample	57.8	65.5	81.1	76.8	58.9	72.9	80.6	81.8
MB 410-473992/1-A	Method Blank	63.6	71.8	81.7	76.8	72.5	74.3	78.9	84.7

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOS (20-150)
410-160459-1	31LS-01-FEB24	75.4	76.9	73.3	76.5		85.7	73.1	79.5
410-160459-1 - DL	31LS-01-FEB24					81.8	106		
410-160459-1 MS	31LS-01-FEB24	78.9	75.9	71.2	100	69.8	76.7	78.2	94.9
410-160459-1 MSD	31LS-01-FEB24	78.7	73.3	69.1	82.1	88.2	89.2	74.3	87.3
410-160459-2	31LS-02-FEB24	76.6 cn	74.1 cn	70.0 cn	65.8 cn	70.7 cn	73.2 cn	75.8 cn	75.6 cn
410-160459-2 - DL	31LS-02-FEB24						113 cn		
410-160459-3	31LS-03-FEB24	76.2	73.3	62.2	62.5	67.0	66.9	71.4	64.6
410-160459-3 - DL	31LS-03-FEB24						78.0		
410-160459-4	31LS-04-FEB24	81.7 cn	79.6 cn	71.0 cn	66.6 cn	70.4 cn	75.9 cn	69.3 cn	78.6 cn
410-160459-4 DU	31LS-04-FEB24	76.5	77.8	71.5	68.2	76.4	72.2	70.1	72.7
410-160459-5	31LS-05-FEB24	77.9	78.5	69.1	93.6	67.4	87.0	72.3	97.3
410-160459-5 - DL	31LS-05-FEB24					86.3			
410-160459-5 - DL2	31LS-05-FEB24						90.5		
410-160459-6	31LS-06-FEB24	76.9	69.0	64.9	61.7	75.2	70.5	66.3	69.4
410-160459-6 - DL	31LS-06-FEB24						87.9		
410-160459-7	31LS-07-FEB24	78.4	64.0	66.0	61.8		63.2	69.1	69.0
410-160459-7 - DL	31LS-07-FEB24					81.9	76.6		
410-160459-8	31LS-DUP-01-FEB24	74.6	73.5	62.5		69.4	64.5	73.5	71.5
410-160459-8 - DL	31LS-DUP-01-FEB24				82.1		84.6		
410-160459-9	31LS-08-FEB24	74.8	67.6	55.6	66.2	83.3	67.6	74.9	66.9
410-160459-9 - DL	31LS-08-FEB24						78.2 M		
LCS 410-473992/2-A	Lab Control Sample	80.6	66.4	65.0	68.0	72.2	68.0	68.2	74.8

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFPeA	C6PFDA	13C7PUA	PFOSA	C8PFOA	C8PFOS	C9PFNA	d3NMFOS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
LLCS 410-473992/3-A	Lab Control Sample	80.9	71.3	62.4	66.4	76.5	65.1	73.6	72.7
MB 410-473992/1-A	Method Blank	77.8	77.6	73.9	68.9	88.7	78.4	74.3	79.7

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		d3NMFSA	d5NEFOS	d5NPFSA	NMFM	NEFM	M242FTS	M262FTS	M282FTS
Lab Sample ID	Client Sample ID	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)	(20-150)
410-160459-1	31LS-01-FEB24	58.5	64.5	54.4	54.4	48.0	120	107	85.8
410-160459-1 - DL	31LS-01-FEB24								
410-160459-1 MS	31LS-01-FEB24	81.6	66.5	75.1	61.2	51.7	129	151 *5+	100
410-160459-1 MSD	31LS-01-FEB24	64.4	70.8	59.5	57.9	53.4	112	113	83.1
410-160459-2	31LS-02-FEB24	50.1 cn	72.9 cn	49.8 cn	54.6 cn	51.1 cn	90.2 cn	77.1 cn	69.8 cn
410-160459-2 - DL	31LS-02-FEB24								
410-160459-3	31LS-03-FEB24	53.2	60.1	47.4	48.1	41.5	110	95.3	66.1
410-160459-3 - DL	31LS-03-FEB24								
410-160459-4	31LS-04-FEB24	56.4 cn	77.6 cn	55.3 cn	56.8 cn	52.3 cn	83.9 cn	88.8 M cn	69.0 cn
410-160459-4 DU	31LS-04-FEB24	53.7	72.3	50.9	53.2	49.3	97.1	99.1	85.7
410-160459-5	31LS-05-FEB24	70.5	82.4	64.9	60.2	51.6	104	98.6	84.7
410-160459-5 - DL	31LS-05-FEB24								
410-160459-5 - DL2	31LS-05-FEB24								
410-160459-6	31LS-06-FEB24	54.8	69.0	53.4	44.1	33.0	111	95.9	89.7
410-160459-6 - DL	31LS-06-FEB24								
410-160459-7	31LS-07-FEB24	55.0	67.3	51.0	48.4	41.1	119	107	81.3
410-160459-7 - DL	31LS-07-FEB24								
410-160459-8	31LS-DUP-01-FEB24	51.0	69.5	46.9	46.8	41.9	92.1	91.2	65.2
410-160459-8 - DL	31LS-DUP-01-FEB24								
410-160459-9	31LS-08-FEB24	56.1	68.6	49.1	48.3	42.7	100	91.4	70.2
410-160459-9 - DL	31LS-08-FEB24								
LCS 410-473992/2-A	Lab Control Sample	60.5	73.4	58.1	61.7	59.5	87.4	81.0	69.7
LLCS 410-473992/3-A	Lab Control Sample	58.5	77.0	57.9	58.3	55.8	94.0	92.3	77.6
MB 410-473992/1-A	Method Blank	53.7	77.3	55.8	61.7	57.3	86.9	86.9	78.2

Surrogate Legend

PFTDA = 13C2 PFTeDA
PFDoDA = 13C2-PFDoDA
HFPODA = 13C3 HFPO-DA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
PFBA = 13C4 PFBA
C4PFHA = 13C4 PFHpA
13C5PHA = 13C5 PFHxA
PFPeA = 13C5 PFPeA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFOSA = 13C8 FOSA
C8PFOA = 13C8 PFOA
C8PFOS = 13C8 PFOS
C9PFNA = 13C9 PFNA
d3NMFOS = d3-NMeFOSAA
d3NMFSA = d3-NMePFOSA
d5NEFOS = d5-NEtFOSAA
d5NPFSA = d5-NEtPFOSA

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-160459-1
Project/Site: Ft. Devens PFAS

NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 410-473992/1-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 473992

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		02/21/24 19:09	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		02/21/24 19:09	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		02/21/24 19:09	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		02/21/24 19:09	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		02/21/24 19:09	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		02/21/24 19:09	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		02/21/24 19:09	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		02/21/24 19:09	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		02/21/24 19:09	1
HFPODA	4.0	U	8.0	4.0	2.0	ng/L		02/21/24 19:09	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		02/21/24 19:09	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		02/21/24 19:09	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		02/21/24 19:09	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		02/21/24 19:09	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		02/21/24 19:09	1
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	2.0	ng/L		02/21/24 19:09	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		02/21/24 19:09	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		02/21/24 19:09	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		02/21/24 19:09	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		02/21/24 19:09	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		02/21/24 19:09	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		02/21/24 19:09	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		02/21/24 19:09	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		02/21/24 19:09	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		02/21/24 19:09	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		02/21/24 19:09	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-473992/1-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 473992

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		02/21/24 19:09	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		02/21/24 19:09	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*63.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C2-PFDoDA	*71.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C3 HFPO-DA	*81.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C3 PFBS	*76.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C3 PFHxS	*72.5*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C4 PFBA	*74.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C4 PFHpA	*78.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C5 PFHxA	*84.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C5 PFPeA	*77.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C6 PFDA	*77.6*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C7 PFUnA	*73.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C8 FOSA	*68.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C8 PFOA	*88.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C8 PFOS	*78.4*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
13C9 PFNA	*74.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d3-NMeFOSAA	*79.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d3-NMePFOSA	*53.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d5-NEtFOSAA	*77.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d5-NEtPFOSA	*55.8*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d7-N-MeFOSE-M	*61.7*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
d9-N-EtFOSE-M	*57.3*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
M2-4:2 FTS	*86.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
M2-6:2 FTS	*86.9*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*
M2-8:2 FTS	*78.2*		*20 - 150*	*02/16/24 06:37*	*02/21/24 19:09*	*1*

Lab Sample ID: LCS 410-473992/2-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.2	93.4		ng/L		99	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	625	639		ng/L		102	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	625	681		ng/L		109	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	125		ng/L		100	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.4	101		ng/L		108	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	94.8	116		ng/L		122	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	95.8	119		ng/L		124	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-473992/2-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	93.2	96.6		ng/L		104	40 - 150
DONA	94.2	113		ng/L		120	40 - 150
HFPODA	100	116		ng/L		116	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	25.0	30.2		ng/L		121	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	250	301		ng/L		120	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	25.0	32.2		ng/L		129	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	29.7		ng/L		119	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	250	296		ng/L		118	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25.0	31.0		ng/L		124	40 - 150
Perfluorobutanesulfonic acid (PFBS)	22.1	25.9		ng/L		117	40 - 150
Perfluorobutanoic acid (PFBA)	100	123		ng/L		123	40 - 150
Perfluorodecanesulfonic acid (PFDS)	24.1	24.5		ng/L		102	40 - 150
Perfluorodecanoic acid (PFDA)	25.0	28.7		ng/L		115	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	24.2	22.8		ng/L		94	40 - 150
Perfluorododecanoic acid (PFDoA)	25.0	29.0		ng/L		116	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	23.8	25.4		ng/L		107	40 - 150
Perfluoroheptanoic acid (PFHpA)	25.0	30.2		ng/L		121	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	22.8	28.7		ng/L		126	40 - 150
Perfluorohexanoic acid (PFHxA)	25.0	26.3		ng/L		105	40 - 150
Perfluorononanesulfonic acid (PFNS)	24.0	25.8		ng/L		108	40 - 150
Perfluorononanoic acid (PFNA)	25.0	27.2		ng/L		109	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	28.7		ng/L		115	40 - 150
Perfluorooctanesulfonic acid (PFOS)	23.2	25.7		ng/L		111	40 - 150
Perfluorooctanoic acid (PFOA)	25.0	28.7		ng/L		115	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	23.5	30.4		ng/L		129	40 - 150
Perfluoropentanoic acid (PFPeA)	50.0	56.3		ng/L		113	40 - 150
Perfluorotetradecanoic acid (PFTA)	25.0	28.6		ng/L		115	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	28.4		ng/L		114	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	29.1		ng/L		116	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	44.5	47.1		ng/L		106	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	50.0	51.0		ng/L		102	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-473992/2-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			50.0	51.4		ng/L		103	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			50.0	54.5		ng/L		109	40 - 150		

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFTeDA	*57.4*		*20 - 150*
13C2-PFDoDA	*63.7*		*20 - 150*
13C3 HFPO-DA	*75.8*		*20 - 150*
13C3 PFBS	*71.8*		*20 - 150*
13C3 PFHxS	*57.1*		*20 - 150*
13C4 PFBA	*75.9*		*20 - 150*
13C4 PFHpA	*70.3*		*20 - 150*
13C5 PFHxA	*79.8*		*20 - 150*
13C5 PFPeA	*80.6*		*20 - 150*
13C6 PFDA	*66.4*		*20 - 150*
13C7 PFUnA	*65.0*		*20 - 150*
13C8 FOSA	*68.0*		*20 - 150*
13C8 PFOA	*72.2*		*20 - 150*
13C8 PFOS	*68.0*		*20 - 150*
13C9 PFNA	*68.2*		*20 - 150*
d3-NMeFOSAA	*74.8*		*20 - 150*
d3-NMePFOSA	*60.5*		*20 - 150*
d5-NEtFOSAA	*73.4*		*20 - 150*
d5-NEtPFOSA	*58.1*		*20 - 150*
d7-N-MeFOSE-M	*61.7*		*20 - 150*
d9-N-EtFOSE-M	*59.5*		*20 - 150*
M2-4:2 FTS	*87.4*		*20 - 150*
M2-6:2 FTS	*81.0*		*20 - 150*
M2-8:2 FTS	*69.7*		*20 - 150*

Lab Sample ID: LLCS 410-473992/3-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF			15.1	14.6		ng/L		97	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)			100	94.7		ng/L		95	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)			100	107		ng/L		107	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)			20.0	20.2		ng/L		101	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)			14.9	15.6		ng/L		105	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)			15.2	16.6		ng/L		110	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)			15.3	18.1		ng/L		118	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-473992/3-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	14.9	14.9		ng/L		100	40 - 150
HFPODA	15.1	17.3		ng/L		115	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	16.0	18.1		ng/L		113	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	4.00	4.92		ng/L		123	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	40.0	48.8		ng/L		122	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	5.01	M	ng/L		125	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	4.00	5.11		ng/L		128	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	40.0	49.7		ng/L		124	40 - 150
Perfluorobutanesulfonic acid (PFBS)	4.00	5.62		ng/L		140	40 - 150
Perfluorobutanoic acid (PFBA)	3.54	4.01		ng/L		113	40 - 150
Perfluorodecanesulfonic acid (PFDS)	16.0	18.8		ng/L		118	40 - 150
Perfluorodecanoic acid (PFDA)	3.86	3.90		ng/L		101	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	4.00	4.92		ng/L		123	40 - 150
Perfluorododecanoic acid (PFDoA)	3.87	3.69		ng/L		95	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	4.00	4.50		ng/L		112	40 - 150
Perfluoroheptanoic acid (PFHpA)	3.81	4.27	I	ng/L		112	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	4.00	4.37		ng/L		109	40 - 150
Perfluorohexanoic acid (PFHxA)	3.64	4.82		ng/L		132	40 - 150
Perfluorononanesulfonic acid (PFNS)	4.00	4.60		ng/L		115	40 - 150
Perfluorononanoic acid (PFNA)	3.84	4.21		ng/L		110	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	4.64	M	ng/L		116	40 - 150
Perfluorooctanesulfonic acid (PFOS)	4.00	4.27	M	ng/L		107	40 - 150
Perfluorooctanoic acid (PFOA)	3.71	5.25		ng/L		141	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	4.00	4.37		ng/L		109	40 - 150
Perfluoropentanoic acid (PFPeA)	3.75	4.47		ng/L		119	40 - 150
Perfluorotetradecanoic acid (PFTA)	8.00	8.78		ng/L		110	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	4.68		ng/L		117	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	4.51		ng/L		113	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	4.00	5.21		ng/L		130	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	7.12	7.62		ng/L		107	40 - 150
	8.00	7.99		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-473992/3-A
Matrix: Water
Analysis Batch: 475548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 473992

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			8.00	8.34		ng/L		104	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			8.00	8.73		ng/L		109	40 - 150		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2 PFTeDA	*57.8*		*20 - 150*
13C2-PFDoDA	*65.5*		*20 - 150*
13C3 HFPO-DA	*81.1*		*20 - 150*
13C3 PFBS	*76.8*		*20 - 150*
13C3 PFHxS	*58.9*		*20 - 150*
13C4 PFBA	*72.9*		*20 - 150*
13C4 PFHpA	*80.6*		*20 - 150*
13C5 PFHxA	*81.8*		*20 - 150*
13C5 PFPeA	*80.9*		*20 - 150*
13C6 PFDA	*71.3*		*20 - 150*
13C7 PFUnA	*62.4*		*20 - 150*
13C8 FOSA	*66.4*		*20 - 150*
13C8 PFOA	*76.5*		*20 - 150*
13C8 PFOS	*65.1*		*20 - 150*
13C9 PFNA	*73.6*		*20 - 150*
d3-NMeFOSAA	*72.7*		*20 - 150*
d3-NMePFOSA	*58.5*		*20 - 150*
d5-NEtFOSAA	*77.0*		*20 - 150*
d5-NEtPFOSA	*57.9*		*20 - 150*
d7-N-MeFOSE-M	*58.3*		*20 - 150*
d9-N-EtFOSE-M	*55.8*		*20 - 150*
M2-4:2 FTS	*94.0*		*20 - 150*
M2-6:2 FTS	*92.3*		*20 - 150*
M2-8:2 FTS	*77.6*		*20 - 150*

Lab Sample ID: 410-160459-1 MS
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	94.1	68.7		ng/L		73	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	624	664		ng/L		106	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U M	624	721		ng/L		116	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	125	140		ng/L		112	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	93.3	100		ng/L		108	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2000		94.7	3310	E 4	ng/L		1395	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	620		95.7	286	4	ng/L		-347	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-1 MS
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ODONA	3.7	U	93.1	93.4		ng/L		100	40 - 150
HFPODA	3.7	U	94.1	104		ng/L		110	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	3.9	U	99.9	110		ng/L		110	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	0.98	U	25.0	28.1		ng/L		112	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.8	U	250	308		ng/L		123	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.4	U	25.0	32.3		ng/L		129	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	0.98	U	25.0	28.6		ng/L		114	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.8	U	250	300		ng/L		120	40 - 150
Perfluorobutanesulfonic acid (PFBS)	1.7	J I M	25.0	30.8		ng/L		117	40 - 150
Perfluorobutanoic acid (PFBA)	65		22.1	77.7		ng/L		59	40 - 150
Perfluorodecanesulfonic acid (PFDS)	160		99.9	301		ng/L		141	40 - 150
Perfluorodecanoic acid (PFDA)	0.98	U	24.1	25.7		ng/L		107	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	3.1	M	25.0	28.7		ng/L		102	40 - 150
Perfluorododecanoic acid (PFDoA)	1.9	U	24.2	21.9		ng/L		90	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	0.98	U	25.0	28.9		ng/L		116	40 - 150
Perfluoroheptanoic acid (PFHpA)	140	M	23.8	804	E 4	ng/L		2785	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	570		25.0	641	E 4	ng/L		277	40 - 150
Perfluorohexanoic acid (PFHxA)	3200	E	22.7	4690	E 4	ng/L		6530	40 - 150
Perfluorononanesulfonic acid (PFNS)	1300	E	25.0	1200	E 4	ng/L		-202	40 - 150
Perfluorononanoic acid (PFNA)	0.98	U	24.0	31.3		ng/L		130	40 - 150
Perfluorooctanesulfonamide (FOSA)	31	M	25.0	79.7	FH	ng/L		195	40 - 150
Perfluorooctanesulfonic acid (PFOS)	340		25.0	246	4	ng/L		-374	40 - 150
Perfluorooctanoic acid (PFOA)	4600	E	23.2	9930	E 4	ng/L		22850	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	2100	E	25.0	3660	E 4	ng/L		6313	40 - 150
Perfluoropentanoic acid (PFPeA)	150		23.4	190	4	ng/L		164	40 - 150
Perfluorotetradecanoic acid (PFTA)	490		49.9	781	4	ng/L		585	40 - 150
Perfluorotridecanoic acid (PFTriA)	0.98	U	25.0	28.7		ng/L		115	40 - 150
Perfluoroundecanoic acid (PFUnA)	0.98	U	25.0	28.1		ng/L		112	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	0.98	U	25.0	28.0		ng/L		112	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.8	U	44.4	51.7		ng/L		116	40 - 150
	2.0	U	49.9	54.7		ng/L		110	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-1 MS
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	49.9	49.9		ng/L		100	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	49.9	55.7		ng/L		112	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2 PFTeDA	*50.5*		*20 - 150*
13C2-PFDoDA	*65.0*		*20 - 150*
13C3 HFPO-DA	*83.8*		*20 - 150*
13C3 PFBS	*102*		*20 - 150*
13C3 PFHxS	*80.5*		*20 - 150*
13C4 PFBA	*36.7*		*20 - 150*
13C4 PFHpA	*81.9*		*20 - 150*
13C5 PFHxA	*79.7*		*20 - 150*
13C5 PFPeA	*78.9*		*20 - 150*
13C6 PFDA	*75.9*		*20 - 150*
13C7 PFUnA	*71.2*		*20 - 150*
13C8 FOSA	*100*		*20 - 150*
13C8 PFOA	*69.8*		*20 - 150*
13C8 PFOS	*76.7*		*20 - 150*
13C9 PFNA	*78.2*		*20 - 150*
d3-NMeFOSAA	*94.9*		*20 - 150*
d3-NMePFOSA	*81.6*		*20 - 150*
d5-NEtFOSAA	*66.5*		*20 - 150*
d5-NEtPFOSA	*75.1*		*20 - 150*
d7-N-MeFOSE-M	*61.2*		*20 - 150*
d9-N-EtFOSE-M	*51.7*		*20 - 150*
M2-4:2 FTS	*129*		*20 - 150*
M2-6:2 FTS	*151*	*5+	*20 - 150*
M2-8:2 FTS	*100*		*20 - 150*

Lab Sample ID: 410-160459-1 MSD
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	90.4	75.1		ng/L		83	40 - 150	9	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	600	640		ng/L		107	40 - 150	4	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U M	600	686		ng/L		114	40 - 150	5	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	120	130		ng/L		109	40 - 150	7	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.7	U	89.7	96.1		ng/L		107	40 - 150	4	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	2000		91.0	1600	4 F2	ng/L		-427	40 - 150	69	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	620		92.0	656	4 F2	ng/L		42	40 - 150	79	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-1 MSD
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	3.7	U	89.5	97.1		ng/L		109	40 - 150	4	30
DONA	3.7	U	90.4	103		ng/L		114	40 - 150	0	30
HFPODA	3.9	U	96.0	106		ng/L		110	40 - 150	4	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.98	U	24.0	28.1		ng/L		117	40 - 150	0	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.8	U	240	291		ng/L		121	40 - 150	6	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	24.0	27.3		ng/L		114	40 - 150	17	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.98	U	24.0	28.3		ng/L		118	40 - 150	1	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.8	U	240	287		ng/L		120	40 - 150	4	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	1.7	J I M	24.0	28.4		ng/L		111	40 - 150	8	30
Perfluorobutanesulfonic acid (PFBS)	65		21.2	94.5		ng/L		141	40 - 150	19	30
Perfluorobutanoic acid (PFBA)	160		96.0	270		ng/L		114	40 - 150	11	30
Perfluorodecanesulfonic acid (PFDS)	0.98	U	23.1	18.3	F2	ng/L		79	40 - 150	34	30
Perfluorodecanoic acid (PFDA)	3.1	M	24.0	29.1		ng/L		109	40 - 150	2	30
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	23.2	17.3		ng/L		74	40 - 150	23	30
Perfluorododecanoic acid (PFDoA)	0.98	U	24.0	27.2		ng/L		113	40 - 150	6	30
Perfluoroheptanesulfonic acid (PFHpS)	140	M	22.8	158	4 F2	ng/L		67	40 - 150	134	30
Perfluoroheptanoic acid (PFHpA)	570		24.0	589	4	ng/L		70	40 - 150	8	30
Perfluorohexanesulfonic acid (PFHxS)	3200	E	21.8	3400	E 4 F2	ng/L		884	40 - 150	32	30
Perfluorohexanoic acid (PFHxA)	1300	E	24.0	1250	E 4	ng/L		5	40 - 150	4	30
Perfluorononanesulfonic acid (PFNS)	0.98	U	23.0	22.6	F2	ng/L		98	40 - 150	32	30
Perfluorononanoic acid (PFNA)	31	M	24.0	52.2	F2	ng/L		89	40 - 150	42	30
Perfluorooctanesulfonamide (FOSA)	340		24.0	319	4	ng/L		-82	40 - 150	26	30
Perfluorooctanesulfonic acid (PFOS)	4600	E	22.3	4370	E 4 F2	ng/L		-1156	40 - 150	78	30
Perfluorooctanoic acid (PFOA)	2100	E	24.0	1780	E 4 F2	ng/L		-1236	40 - 150	69	30
Perfluoropentanesulfonic acid (PFPeS)	150		22.5	199	4	ng/L		211	40 - 150	5	30
Perfluoropentanoic acid (PFPeA)	490		48.0	538	4 F2	ng/L		101	40 - 150	37	30
Perfluorotetradecanoic acid (PFTA)	0.98	U	24.0	27.7		ng/L		116	40 - 150	4	30
Perfluorotridecanoic acid (PFTriA)	0.98	U	24.0	27.3		ng/L		114	40 - 150	3	30
Perfluoroundecanoic acid (PFUnA)	0.98	U	24.0	27.9		ng/L		116	40 - 150	0	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	42.7	49.4		ng/L		116	40 - 150	5	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	48.0	51.3		ng/L		107	40 - 150	6	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-1 MSD
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-01-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	48.0	51.0		ng/L		106	40 - 150	2	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	48.0	54.4		ng/L		113	40 - 150	2	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2 PFTeDA	*54.1*		*20 - 150*
13C2-PFDoDA	*63.4*		*20 - 150*
13C3 HFPO-DA	*79.1*		*20 - 150*
13C3 PFBS	*89.2*		*20 - 150*
13C3 PFHxS	*74.2*		*20 - 150*
13C4 PFBA	*63.6*		*20 - 150*
13C4 PFHpA	*80.9*		*20 - 150*
13C5 PFHxA	*79.3*		*20 - 150*
13C5 PFPeA	*78.7*		*20 - 150*
13C6 PFDA	*73.3*		*20 - 150*
13C7 PFUnA	*69.1*		*20 - 150*
13C8 FOSA	*82.1*		*20 - 150*
13C8 PFOA	*88.2*		*20 - 150*
13C8 PFOS	*89.2*		*20 - 150*
13C9 PFNA	*74.3*		*20 - 150*
d3-NMeFOSAA	*87.3*		*20 - 150*
d3-NMePFOSA	*64.4*		*20 - 150*
d5-NEtFOSAA	*70.8*		*20 - 150*
d5-NEtPFOSA	*59.5*		*20 - 150*
d7-N-MeFOSE-M	*57.9*		*20 - 150*
d9-N-EtFOSE-M	*53.4*		*20 - 150*
M2-4:2 FTS	*112*		*20 - 150*
M2-6:2 FTS	*113*		*20 - 150*
M2-8:2 FTS	*83.1*		*20 - 150*

Lab Sample ID: 410-160459-4 DU
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-04-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	76	U cn	76	U	ng/L		NC	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	250	U cn	250	U	ng/L		NC	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	250	U cn	250	U	ng/L		NC	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	50	U cn	50	U	ng/L		NC	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	38	U cn	38	U	ng/L		NC	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	330	cn	299		ng/L		9	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	4000	cn	3180		ng/L		22	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-4 DU
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-04-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	38	U cn	38	U	ng/L		NC	30
DONA	38	U cn	38	U	ng/L		NC	30
HFPODA	40	U cn	40	U	ng/L		NC	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	10	U cn	10	U	ng/L		NC	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	100	U cn	100	U	ng/L		NC	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	14	U cn	14	U	ng/L		NC	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	10	U cn	10	U	ng/L		NC	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	100	U cn	100	U	ng/L		NC	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	24	U cn	24	U M	ng/L		NC	30
Perfluorobutanesulfonic acid (PFBS)	18	J cn	20.2		ng/L		9	30
Perfluorobutanoic acid (PFBA)	110	cn	116		ng/L		6	30
Perfluorodecanesulfonic acid (PFDS)	10	U cn	10	U	ng/L		NC	30
Perfluorodecanoic acid (PFDA)	24	cn	20.8		ng/L		13	30
Perfluorododecanesulfonic acid (PFDoS)	19	U cn	19	U	ng/L		NC	30
Perfluorododecanoic acid (PFDoA)	10	U cn	10	U	ng/L		NC	30
Perfluoroheptanesulfonic acid (PFHpS)	8.2	J cn	7.69	J M	ng/L		6	30
Perfluoroheptanoic acid (PFHpA)	500	cn	517		ng/L		3	30
Perfluorohexanesulfonic acid (PFHxS)	670	cn	652		ng/L		2	30
Perfluorohexanoic acid (PFHxA)	530	cn	524		ng/L		1	30
Perfluorononanesulfonic acid (PFNS)	10	U cn	10	U	ng/L		NC	30
Perfluorononanoic acid (PFNA)	41	M cn	39.8	M	ng/L		3	30
Perfluorooctanesulfonamide (FOSA)	1900	cn	1850		ng/L		4	30
Perfluorooctanesulfonic acid (PFOS)	2700	cn	2670		ng/L		2	30
Perfluorooctanoic acid (PFOA)	720	cn	743		ng/L		3	30
Perfluoropentanesulfonic acid (PFPeS)	37	cn	37.0		ng/L		1	30
Perfluoropentanoic acid (PFPeA)	410	M cn	418	M	ng/L		1	30
Perfluorotetradecanoic acid (PFTA)	10	U cn	10	U	ng/L		NC	30
Perfluorotridecanoic acid (PFTriA)	10	U cn	10	U	ng/L		NC	30
Perfluoroundecanoic acid (PFUnA)	10	U cn	10	U	ng/L		NC	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	18	U cn	18	U	ng/L		NC	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	20	U cn	20	U	ng/L		NC	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-160459-4 DU
Matrix: Water
Analysis Batch: 475548

Client Sample ID: 31LS-04-FEB24
Prep Type: Total/NA
Prep Batch: 473992

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	20	U cn		20	U	ng/L				NC	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	20	U cn		20	U	ng/L				NC	30

Isotope Dilution	*DU %Recovery*	*DU Qualifier*	*Limits*
13C2 PFTeDA	*49.3*		*20 - 150*
13C2-PFDoDA	*65.8*		*20 - 150*
13C3 HFPO-DA	*78.5*		*20 - 150*
13C3 PFBS	*76.7*		*20 - 150*
13C3 PFHxS	*77.1*		*20 - 150*
13C4 PFBA	*75.6*		*20 - 150*
13C4 PFHpA	*79.1*		*20 - 150*
13C5 PFHxA	*84.9*		*20 - 150*
13C5 PFPeA	*76.5*		*20 - 150*
13C6 PFDA	*77.8*		*20 - 150*
13C7 PFUnA	*71.5*		*20 - 150*
13C8 FOSA	*68.2*		*20 - 150*
13C8 PFOA	*76.4*		*20 - 150*
13C8 PFOS	*72.2*		*20 - 150*
13C9 PFNA	*70.1*		*20 - 150*
d3-NMeFOSAA	*72.7*		*20 - 150*
d3-NMePFOSA	*53.7*		*20 - 150*
d5-NEtFOSAA	*72.3*		*20 - 150*
d5-NEtPFOSA	*50.9*		*20 - 150*
d7-N-MeFOSE-M	*53.2*		*20 - 150*
d9-N-EtFOSE-M	*49.3*		*20 - 150*
M2-4:2 FTS	*97.1*		*20 - 150*
M2-6:2 FTS	*99.1*		*20 - 150*
M2-8:2 FTS	*85.7*		*20 - 150*

LCMS

Prep Batch: 473992

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-160459-1	31LS-01-FEB24	Total/NA	Water	1633	
410-160459-1 - DL	31LS-01-FEB24	Total/NA	Water	1633	
410-160459-2	31LS-02-FEB24	Total/NA	Water	1633	
410-160459-2 - DL	31LS-02-FEB24	Total/NA	Water	1633	
410-160459-3	31LS-03-FEB24	Total/NA	Water	1633	
410-160459-3 - DL	31LS-03-FEB24	Total/NA	Water	1633	
410-160459-4	31LS-04-FEB24	Total/NA	Water	1633	
410-160459-5 - DL2	31LS-05-FEB24	Total/NA	Water	1633	
410-160459-5 - DL	31LS-05-FEB24	Total/NA	Water	1633	
410-160459-5	31LS-05-FEB24	Total/NA	Water	1633	
410-160459-6	31LS-06-FEB24	Total/NA	Water	1633	
410-160459-6 - DL	31LS-06-FEB24	Total/NA	Water	1633	
410-160459-7 - DL	31LS-07-FEB24	Total/NA	Water	1633	
410-160459-7	31LS-07-FEB24	Total/NA	Water	1633	
410-160459-8	31LS-DUP-01-FEB24	Total/NA	Water	1633	
410-160459-8 - DL	31LS-DUP-01-FEB24	Total/NA	Water	1633	
410-160459-9 - DL	31LS-08-FEB24	Total/NA	Water	1633	
410-160459-9	31LS-08-FEB24	Total/NA	Water	1633	
MB 410-473992/1-A	Method Blank	Total/NA	Water	1633	
LCS 410-473992/2-A	Lab Control Sample	Total/NA	Water	1633	
LLCS 410-473992/3-A	Lab Control Sample	Total/NA	Water	1633	
410-160459-1 MS	31LS-01-FEB24	Total/NA	Water	1633	
410-160459-1 MSD	31LS-01-FEB24	Total/NA	Water	1633	
410-160459-4 DU	31LS-04-FEB24	Total/NA	Water	1633	

Analysis Batch: 475548

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-160459-1	31LS-01-FEB24	Total/NA	Water	1633	473992
410-160459-2	31LS-02-FEB24	Total/NA	Water	1633	473992
410-160459-3	31LS-03-FEB24	Total/NA	Water	1633	473992
410-160459-4	31LS-04-FEB24	Total/NA	Water	1633	473992
410-160459-5	31LS-05-FEB24	Total/NA	Water	1633	473992
410-160459-6	31LS-06-FEB24	Total/NA	Water	1633	473992
410-160459-7	31LS-07-FEB24	Total/NA	Water	1633	473992
410-160459-8	31LS-DUP-01-FEB24	Total/NA	Water	1633	473992
410-160459-9	31LS-08-FEB24	Total/NA	Water	1633	473992
MB 410-473992/1-A	Method Blank	Total/NA	Water	1633	473992
LCS 410-473992/2-A	Lab Control Sample	Total/NA	Water	1633	473992
LLCS 410-473992/3-A	Lab Control Sample	Total/NA	Water	1633	473992
410-160459-1 MS	31LS-01-FEB24	Total/NA	Water	1633	473992
410-160459-1 MSD	31LS-01-FEB24	Total/NA	Water	1633	473992
410-160459-4 DU	31LS-04-FEB24	Total/NA	Water	1633	473992

Analysis Batch: 475995

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-160459-1 - DL	31LS-01-FEB24	Total/NA	Water	1633	473992
410-160459-2 - DL	31LS-02-FEB24	Total/NA	Water	1633	473992
410-160459-3 - DL	31LS-03-FEB24	Total/NA	Water	1633	473992
410-160459-5 - DL	31LS-05-FEB24	Total/NA	Water	1633	473992
410-160459-5 - DL2	31LS-05-FEB24	Total/NA	Water	1633	473992
410-160459-6 - DL	31LS-06-FEB24	Total/NA	Water	1633	473992

LCMS (Continued)

Analysis Batch: 475995 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-160459-7 - DL	31LS-07-FEB24	Total/NA	Water	1633	473992
410-160459-8 - DL	31LS-DUP-01-FEB24	Total/NA	Water	1633	473992
410-160459-9 - DL	31LS-08-FEB24	Total/NA	Water	1633	473992

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-01-FEB24

Lab Sample ID: 410-160459-1

Date Collected: 02/08/24 08:50

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 19:52
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 13:47

Client Sample ID: 31LS-02-FEB24

Lab Sample ID: 410-160459-2

Date Collected: 02/08/24 09:00

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 20:34
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 14:01

Client Sample ID: 31LS-03-FEB24

Lab Sample ID: 410-160459-3

Date Collected: 02/08/24 09:05

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 20:48
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 14:15

Client Sample ID: 31LS-04-FEB24

Lab Sample ID: 410-160459-4

Date Collected: 02/08/24 09:10

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 21:02

Client Sample ID: 31LS-05-FEB24

Lab Sample ID: 410-160459-5

Date Collected: 02/08/24 09:15

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 21:31
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 14:57
Total/NA	Prep	1633	DL2		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL2	100	475995	DS2G	ELLE	02/23/24 07:13

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Client Sample ID: 31LS-06-FEB24

Lab Sample ID: 410-160459-6

Date Collected: 02/08/24 09:20

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 21:46
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 15:39

Client Sample ID: 31LS-07-FEB24

Lab Sample ID: 410-160459-7

Date Collected: 02/08/24 09:25

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 22:00
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 15:54

Client Sample ID: 31LS-DUP-01-FEB24

Lab Sample ID: 410-160459-8

Date Collected: 02/08/24 00:00

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 22:14
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 16:08

Client Sample ID: 31LS-08-FEB24

Lab Sample ID: 410-160459-9

Date Collected: 02/08/24 09:35

Matrix: Water

Date Received: 02/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633		1	475548	UCD3	ELLE	02/21/24 22:28
Total/NA	Prep	1633	DL		473992	DX7G	ELLE	02/16/24 06:37
Total/NA	Analysis	1633	DL	10	475995	DS2G	ELLE	02/22/24 16:23

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Seres Engineering & Services LLC
Job ID: 410-160459-1
Project/Site: Ft. Devens PFAS

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24

Method Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Method	Method Description	Protocol	Laboratory
1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	ELLE
1633	Solid-Phase Extraction (SPE)	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-160459-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-160459-1	31LS-01-FEB24	Water	02/08/24 08:50	02/10/24 09:30
410-160459-2	31LS-02-FEB24	Water	02/08/24 09:00	02/10/24 09:30
410-160459-3	31LS-03-FEB24	Water	02/08/24 09:05	02/10/24 09:30
410-160459-4	31LS-04-FEB24	Water	02/08/24 09:10	02/10/24 09:30
410-160459-5	31LS-05-FEB24	Water	02/08/24 09:15	02/10/24 09:30
410-160459-6	31LS-06-FEB24	Water	02/08/24 09:20	02/10/24 09:30
410-160459-7	31LS-07-FEB24	Water	02/08/24 09:25	02/10/24 09:30
410-160459-8	31LS-DUP-01-FEB24	Water	02/08/24 00:00	02/10/24 09:30
410-160459-9	31LS-08-FEB24	Water	02/08/24 09:35	02/10/24 09:30

CHAIN-OF-CUSTODY RECORD

ARVC
Heather Levesque
669 Marina Drive, Suite B7, Charleston, SC 29492
619-370-0374

COC # 31LS-FEB24

US Army Corps of Engineers

Project Name: Former Fort Devens, PFAS Remedial Investigation	Laboratory: Eurofins Lancaster Laboratories Environmental, LLC, Lancaster, PA	Event: Seres-Arcadis JV, PFAS RI Phase II, AOC 31 Lysimeter Sampling, Feb 2024
Project Number: 2019 - 00000003	POC:	
WBS Code:	Ship to:	

Comments:
E1633DR (B) = PFAS Short HoldTime 28 days

410-160459 Chain of Custody

Code	Matrix
WG	Ground Water

Code	Container/Preservative
50	2x 500m HDPE Bottle, Cool 0° to 6°C; protected from light

IX SG 02/08/2024

Sampler: Spencer Gust

Event: Seres-Arcadis JV, PFAS RI Phase II, AOC 31 Lysimeter Sampling, Feb 2024

	Sample ID	Matrix	Date	Time	Samp Init.	Analytical Test Method: E1633DR (B)	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom	Cooler	Comments
						50						
1	31LS-01-FEB24	WG	2/8/2023	8:45	SG	X	31LS-01	MS1	0.00	0.00	1	
2	31LS-01-FEB24	WG	2/8/2023	8:50	SG	X	31LS-01	N1	0.00	0.00	1	
3	31LS-01-FEB24	WG	2/8/2023	8:55	SG	X	31LS-01	SD1	0.00	0.00	1	
4	31LS-02-FEB24	WG	2/8/2023	9:00	SG	X	31LS-02	N1	0.00	0.00	1	
5	31LS-03-FEB24	WG	2/8/2023	9:05	SG	X	31LS-03	N1	0.00	0.00	1	
6	31LS-04-FEB24	WG	2/8/2023	9:10	SG	X	31LS-04	N1	0.00	0.00	1	
7	31LS-05-FEB24	WG	2/8/2023	9:15	SG	X	31LS-05	N1	0.00	0.00	1	
8	31LS-06-FEB24	WG	2/8/2023	9:20	SG	X	31LS-06	N1	0.00	0.00	1	
9	31LS-07-FEB24	WG	2/8/2023	9:25	SG	X	31LS-07	N1	0.00	0.00	1	
10	31LS-DUP-01-FEB24	WG	2/8/2023		SG	X	31LS-08	FD1	0.00	0.00	1	
11	31LS-08-FEB24	WG	2/8/2023	9:35	SG	X	31LS-08	N1	0.00	0.00	1	
12												
13												
14												

Turnaround Time: NA

R:1.5 C:1.4

Relinquished by: (Signature) Spencer Gust
Date 02/08/2024
Time 18:30
Received by: (Signature)

Date 2/10/24 WG
Time 0930
Shipping Date:
Received by Laboratory: (Signature, Date, Time) & conditio

Login Sample Receipt Checklist

Client: Seres Engineering & Services LLC

Job Number: 410-160459-1

Login Number: 160459

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Santiago, Nathaniel

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable,where thermal pres is required(</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable,where thermal pres is required (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Heather Levesque
Seres Engineering & Services LLC
669 Marina Drive
Suite B7
Charleston, South Carolina 29492

Generated 5/29/2024 10:43:39 AM Revision 1

JOB DESCRIPTION

Ft. Devens PFAS

JOB NUMBER

410-166779-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization



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5/29/2024 10:43:39 AM
Revision 1

Authorized for release by
Kerri Sachtleben, Client Services Group Leader
Kerri.Sachtleben@et.eurofinsus.com
(717)556-7376

Compliance Statement

Analytical test results meet all requirements of the associated regulatory program (e.g., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis. Data qualifiers are applied to note exceptions. Noncompliant quality control (QC) is further explained in narrative comments.
· QC results that exceed the upper limits and are associated with non-detect samples are qualified but further narration is not required since the bias is high and does not change a non-detect result. Further narration is also not required with QC blank detection when the associated sample concentration is non-detect or more than ten times the level in the blank.
· Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD is performed, unless otherwise specified in the method.
· Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.
Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Measurement uncertainty values, as applicable, are available upon request.

Test results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as "analyze immediately" and tested in the laboratory are not performed within 15 minutes of collection.

This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied, except as otherwise agreed. We disclaim any other warranties, expressed or implied, including a warranty of fitness for particular purpose and warranty of merchantability. In no event shall Eurofins Lancaster Laboratories Environmental, LLC be liable for indirect, special, consequential, or incidental damages including, but not limited to, damages for loss of profit or goodwill regardless of (A) the negligence (either sole or concurrent) of Eurofins Lancaster Laboratories Environmental and (B) whether Eurofins Lancaster Laboratories Environmental has been informed of the possibility of such damages. We accept no legal responsibility for the purposes for which the client uses the test results. Except as otherwise agreed, no purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.



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Qualifiers

LCMS

Qualifier	Qualifier Description
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
^c	CCV Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
cn	Refer to Case Narrative for further detail
D	The reported value is from a dilution.
E	Result exceeded calibration range.
FH	MS and/or MSD recovery above control limits.
FL	MS and/or MSD recovery below control limits.
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M	Manual integrated compound.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job Narrative
410-166779-1

REVISION

The report being provided is a revision of the original report sent on 5/9/2024. The report (revision 1) is being revised due to update to MS/MSD sample ID and time of collection per client request.

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Receipt
The samples were received on 4/5/2024 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 2.0°C.

Receipt Exceptions
The Chain-of-Custody (COC) was incomplete as received. The COC is missing Sample State. This does not meet regulatory requirements.

MS/MSD volume was provided without identification of the parent sample. The client was contacted and the laboratory instructed to use sample -1 as the parent sample. 31LS-01-APR24 (410-166779-1), 31LS-01-APR24 (410-166779-1[MS]), 31LS-01-APR24 (410-166779-1[MSD]), 31LS-02-APR24 (410-166779-2), 31LS-03-APR24 (410-166779-3), 31LS-04-APR24 (410-166779-4), 31LS-05-APR24 (410-166779-5), 31LS-06-APR24 (410-166779-6), 31LS-07-APR24 (410-166779-7), 31LS-08-APR24 (410-166779-8) and 31LS-DUP-01-APR24 (410-166779-9). A revised COC providing this information was supplied by the client and appended to the report. The sample ID and time of collection were updated to match the revised COC.

PFAS
Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-08-APR24 (410-166779-8) and 31LS-DUP-01-APR24 (410-166779-9) due to limited sample volume.

Method 1633_DOD5: Reporting limits were raised for the following samples: 31LS-02-APR24 (410-166779-2), 31LS-05-APR24 (410-166779-5) and 31LS-07-APR24 (410-166779-7) due to limited sample volume.

Method 1633_DOD5: The recovery for labeled isotope: 13C8 PFOA is outside the QC acceptance limits in the closing continuing calibration verification standard, biased high. Since the recovery for the labeled isotope is within QC limits in the following samples: 31LS-01-APR24 (410-166779-1[MS]), 31LS-01-APR24 (410-166779-1[MSD]) and 31LS-03-APR24 (410-166779-3), the data is reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-01-APR24 — Lab Sample ID: 410-166779-1

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
3-Perfluoropentylpropanoic acid (5:3 FTCA)	20	J	48	24	9.5	ng/L	1		1633	Total/NA
3-Perfluoropropylpropanoic acid (3:3 FTCA)	7.9	J	9.5	4.8	1.4	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	180		7.6	7.3	2.5	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	160		7.6	3.8	1.9	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	1.2	J	1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	540		1.9	0.95	0.49	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	50		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	180		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	220		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	600		3.8	1.9	0.95	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS) - DL	5600	D	76	72	24	ng/L	10		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS) - DL	48	D	19	9.5	2.9	ng/L	10		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS) - DL	470	D	19	9.5	3.8	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1000	D	19	9.5	4.8	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL2	7900	D	190	100	54	ng/L	100		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	12000	D	190	95	48	ng/L	100		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL2	5800	D	190	120	61	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-02-APR24 — Lab Sample ID: 410-166779-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	520	cn	8.5	8.0	2.6	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	230	cn	8.5	8.1	2.7	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	84	cn	2.1	1.1	0.32	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	190	cn	8.5	4.2	2.1	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	1.1	J M cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	240	cn	2.1	1.1	0.42	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	66	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	64	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	270	cn	2.1	1.1	0.53	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-02-APR24 (Continued) — Lab Sample ID: 410-166779-2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanoic acid (PFPeA)	600	cn	4.2	2.1	1.1	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	860	D cn	21	11	5.5	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	4200	D cn	21	12	6.0	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1400	D cn	21	11	5.3	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	1400	D cn	21	14	6.8	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	8400	D cn	210	110	53	ng/L	100		1633	Total/NA
4:2 Fluorotelomer sulfonic acid (4:2 FTS) - RA	2.4	J cn	8.5	4.0	1.8	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-03-APR24 — Lab Sample ID: 410-166779-3

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	200		7.6	7.2	2.4	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	40		7.6	7.3	2.5	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	78		1.9	0.95	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	120		7.6	3.8	1.9	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	50		1.9	0.95	0.38	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	410		1.9	0.95	0.49	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	9.1		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	15		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	440		1.9	1.2	0.61	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	170		1.9	0.95	0.48	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	360		3.8	1.9	0.95	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	2100	D	19	10	5.4	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	1100	D	19	9.5	4.8	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	2600	D	19	9.5	4.8	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-04-APR24 — Lab Sample ID: 410-166779-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	380		7.8	7.5	2.5	ng/L	1		1633	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.78	J M	2.0	1.4	0.69	ng/L	1		1633	Total/NA
N-methylperfluorooctanesulfonamide (NMeFOSA)	0.85	J	2.0	0.98	0.49	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-04-APR24 (Continued) — Lab Sample ID: 410-166779-4

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	11	I	3.9	2.4	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	12		2.0	0.98	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	67		7.8	3.9	2.0	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	27		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	11		2.0	0.98	0.39	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	380		2.0	0.98	0.51	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	510		2.0	1.1	0.56	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	350		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	2.4		2.0	0.98	0.39	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	52		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	27		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	250		3.9	2.0	0.98	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA) - DL	2100	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	2600	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	820	D	20	13	6.3	ng/L	10		1633	Total/NA
4:2 Fluorotelomer sulfonic acid (4:2 FTS) - RA	4.2	J	7.8	3.7	1.7	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS) - RA	2200		7.8	7.6	2.6	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-05-APR24 — Lab Sample ID: 410-166779-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	200	cn	8.2	7.8	2.6	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	950	cn	8.2	7.9	2.7	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	3.6	J I cn	4.1	2.5	1.2	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	18	cn	2.1	1.0	0.31	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	58	cn	8.2	4.1	2.1	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.8	cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	54	cn	2.1	1.0	0.41	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	310	cn	2.1	1.0	0.54	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-05-APR24 (Continued) — Lab Sample ID: 410-166779-5

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanoic acid (PFHxA)	340	cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorononanesulfonic acid (PFNS)	1.1	J cn	2.1	1.0	0.41	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	30	cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	480	M cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	61	cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	170	cn	4.1	2.1	1.0	ng/L	1		1633	Total/NA
Perfluoroundecanoic acid (PFUnA)	0.51	J M cn	2.1	1.0	0.51	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	1700	D cn	21	11	5.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	810	D cn	21	13	6.6	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL2	6200	D cn	210	100	51	ng/L	100		1633	Total/NA

Client Sample ID: 31LS-06-APR24 — Lab Sample ID: 410-166779-6

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	110		7.8	7.5	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	40		7.8	7.6	2.6	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	51		2.0	0.98	0.29	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	84		7.8	3.9	2.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	30		2.0	0.98	0.39	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	460		2.0	0.98	0.51	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	16		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	24	M	2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	170		2.0	0.98	0.49	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	260		3.9	2.0	0.98	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3500	D	20	11	5.6	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	650	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1700	D	20	9.8	4.9	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - RA	610		2.0	1.3	0.63	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-07-APR24 — Lab Sample ID: 410-166779-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
3-Perfluoropentylpropanoic acid (5:3 FTCA)	13	J cn	50	25	10	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-07-APR24 (Continued) — Lab Sample ID: 410-166779-7

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.5	J cn	10	5.0	1.5	ng/L	1		1633	Total/NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	490	cn	8.0	7.6	2.5	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	110	cn	8.0	7.7	2.6	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	79	cn	2.0	1.0	0.30	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	260	cn	8.0	4.0	2.0	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	52	M cn	2.0	1.0	0.40	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	9.7	cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	86	cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	350	cn	2.0	1.0	0.50	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	850	cn	4.0	2.0	1.0	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA) - DL	830	D cn	20	10	5.2	ng/L	10		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	3400	D cn	20	11	5.7	ng/L	10		1633	Total/NA
Perfluorohexanoic acid (PFHxA) - DL	3000	D cn	20	10	5.0	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	1200	D cn	20	10	5.0	ng/L	10		1633	Total/NA
Perfluorooctanoic acid (PFOA) - DL	980	D cn	20	13	6.4	ng/L	10		1633	Total/NA

Client Sample ID: 31LS-08-APR24 — Lab Sample ID: 410-166779-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	49	cn	11	11	3.6	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	180	cn	11	11	3.7	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2.3	J I cn	5.7	3.4	1.7	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	7.4	cn	2.9	1.4	0.43	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	33	cn	11	5.7	2.9	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.4	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	17	cn	2.9	1.4	0.57	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	130	cn	2.9	1.4	0.75	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	760	cn	2.9	1.6	0.82	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	140	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	17	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: 31LS-08-APR24 (Continued) — Lab Sample ID: 410-166779-8

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctanesulfonamide (FOSA)	520	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS)	820	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	370	cn	2.9	1.9	0.92	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	20	cn	2.9	1.4	0.72	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	79	cn	5.7	2.9	1.4	ng/L	1		1633	Total/NA

Client Sample ID: 31LS-DUP-01-APR24 — Lab Sample ID: 410-166779-9

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	Dil Fac	D	Method	Prep Type
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	50	cn	9.2	8.7	2.9	ng/L	1		1633	Total/NA
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	170	cn	9.2	8.9	3.0	ng/L	1		1633	Total/NA
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2.1	J I cn	4.6	2.8	1.4	ng/L	1		1633	Total/NA
Perfluorobutanesulfonic acid (PFBS)	6.8	cn	2.3	1.2	0.35	ng/L	1		1633	Total/NA
Perfluorobutanoic acid (PFBA)	35	cn	9.2	4.6	2.3	ng/L	1		1633	Total/NA
Perfluorodecanoic acid (PFDA)	3.7	cn	2.3	1.2	0.58	ng/L	1		1633	Total/NA
Perfluoroheptanesulfonic acid (PFHpS)	16	cn	2.3	1.2	0.46	ng/L	1		1633	Total/NA
Perfluoroheptanoic acid (PFHpA)	130	cn	2.3	1.2	0.60	ng/L	1		1633	Total/NA
Perfluorohexanoic acid (PFHxA)	140	cn	2.3	1.2	0.58	ng/L	1		1633	Total/NA
Perfluorononanoic acid (PFNA)	17	cn	2.3	1.2	0.58	ng/L	1		1633	Total/NA
Perfluorooctanesulfonamide (FOSA)	550	M cn	2.3	1.2	0.58	ng/L	1		1633	Total/NA
Perfluorooctanoic acid (PFOA)	360	cn	2.3	1.5	0.74	ng/L	1		1633	Total/NA
Perfluoropentanesulfonic acid (PFPeS)	19	cn	2.3	1.2	0.58	ng/L	1		1633	Total/NA
Perfluoropentanoic acid (PFPeA)	79	cn	4.6	2.3	1.2	ng/L	1		1633	Total/NA
Perfluorohexanesulfonic acid (PFHxS) - DL	970	D	23	13	6.6	ng/L	10		1633	Total/NA
Perfluorooctanesulfonic acid (PFOS) - DL	770	D	23	12	5.8	ng/L	10		1633	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-01-APR24
Date Collected: 04/03/24 15:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-1
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.2	U	7.6	7.2	1.9	ng/L		04/30/24 20:59	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	48	24	9.5	ng/L		04/30/24 20:59	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	**20**	**J**	48	24	9.5	ng/L		04/30/24 20:59	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	**7.9**	**J**	9.5	4.8	1.4	ng/L		04/30/24 20:59	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**180**		7.6	7.3	2.5	ng/L		04/30/24 20:59	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.6	U	7.6	3.6	0.95	ng/L		04/30/24 20:59	1
DONA	3.6	U	7.6	3.6	1.4	ng/L		04/30/24 20:59	1
HFPODA	3.8	U M	7.6	3.8	1.9	ng/L		04/30/24 20:59	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.5	U	19	9.5	4.8	ng/L		04/30/24 20:59	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	1.9	1.3	0.67	ng/L		04/30/24 20:59	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.5	U	19	9.5	4.8	ng/L		04/30/24 20:59	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	3.8	2.3	1.1	ng/L		04/30/24 20:59	1
Perfluorobutanoic acid (PFBA)	**160**		7.6	3.8	1.9	ng/L		04/30/24 20:59	1
Perfluorodecanesulfonic acid (PFDS)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluorodecanoic acid (PFDA)	**1.2**	**J**	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.86	ng/L		04/30/24 20:59	1
Perfluorododecanoic acid (PFDoA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluoroheptanoic acid (PFHpA)	**540**		1.9	0.95	0.49	ng/L		04/30/24 20:59	1
Perfluorononanesulfonic acid (PFNS)	0.95	U M	1.9	0.95	0.38	ng/L		04/30/24 20:59	1
Perfluorononanoic acid (PFNA)	**50**		1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluorooctanesulfonamide (FOSA)	**180**		1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluoropentanesulfonic acid (PFPeS)	**220**		1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluoropentanoic acid (PFPeA)	**600**		3.8	1.9	0.95	ng/L		04/30/24 20:59	1
Perfluorotetradecanoic acid (PFTA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluorotridecanoic acid (PFTriA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluoroundecanoic acid (PFUnA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 20:59	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.8	1.7	0.48	ng/L		04/30/24 20:59	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.8	1.9	0.95	ng/L		04/30/24 20:59	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.8	1.9	0.95	ng/L		04/30/24 20:59	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.8	1.9	0.48	ng/L		04/30/24 20:59	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*61.1*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:59*	*1*
13C2-PFDoDA	*70.7*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:59*	*1*
13C3 HFPO-DA	*96.2*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:59*	*1*

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-01-APR24
Date Collected: 04/03/24 15:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-1
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	86.7		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C4 PFBA	93.4		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C4 PFHpA	90.3		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C5 PFHxA	87.1		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C5 PFPeA	90.8		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C6 PFDA	81.4		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C7 PFUnA	77.9		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C8 FOSA	122		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C8 PFOS	85.0		20 - 150	04/29/24 07:35	04/30/24 20:59	1
13C9 PFNA	98.6		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d3-NMeFOSAA	113		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d3-NMePFOSA	101		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d5-NEtFOSAA	66.3		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d5-NEtPFOSA	86.2		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d7-N-MeFOSE-M	93.2		20 - 150	04/29/24 07:35	04/30/24 20:59	1
d9-N-EtFOSE-M	91.2		20 - 150	04/29/24 07:35	04/30/24 20:59	1
M2-8:2 FTS	137		20 - 150	04/29/24 07:35	04/30/24 20:59	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	36	U	76	36	16	ng/L		05/02/24 08:00	10
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**5600**	**D**	76	72	24	ng/L		05/02/24 08:00	10
Perfluorobutanesulfonic acid (PFBS)	**48**	**D**	19	9.5	2.9	ng/L		05/02/24 08:00	10
Perfluoroheptanesulfonic acid (PFHpS)	**470**	**D**	19	9.5	3.8	ng/L		05/02/24 08:00	10
Perfluorohexanoic acid (PFHxA)	**1000**	**D**	19	9.5	4.8	ng/L		05/02/24 08:00	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFBS	99.8		20 - 150	04/29/24 07:35	05/02/24 08:00	10
13C5 PFHxA	91.0		20 - 150	04/29/24 07:35	05/02/24 08:00	10
13C8 PFOS	81.4		20 - 150	04/29/24 07:35	05/02/24 08:00	10
M2-4:2 FTS	111		20 - 150	04/29/24 07:35	05/02/24 08:00	10
M2-6:2 FTS	122		20 - 150	04/29/24 07:35	05/02/24 08:00	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**7900**	**D**	190	100	54	ng/L		05/02/24 08:13	100
Perfluorooctanesulfonic acid (PFOS)	**12000**	**D**	190	95	48	ng/L		05/02/24 08:13	100
Perfluorooctanoic acid (PFOA)	**5800**	**D**	190	120	61	ng/L		05/02/24 08:13	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	90.9		20 - 150	04/29/24 07:35	05/02/24 08:13	100
13C8 PFOA	115		20 - 150	04/29/24 07:35	05/02/24 08:13	100
13C8 PFOS	118		20 - 150	04/29/24 07:35	05/02/24 08:13	100

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-02-APR24
Date Collected: 04/03/24 14:55
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-2
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.0	U cn	8.5	8.0	2.1	ng/L		04/30/24 22:06	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	26	U cn	53	26	11	ng/L		04/30/24 22:06	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	26	U cn	53	26	11	ng/L		04/30/24 22:06	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.3	U cn	11	5.3	1.6	ng/L		04/30/24 22:06	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**520**	**cn**	8.5	8.0	2.6	ng/L		04/30/24 22:06	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**230**	**cn**	8.5	8.1	2.7	ng/L		04/30/24 22:06	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.0	U cn	8.5	4.0	1.1	ng/L		04/30/24 22:06	1
DONA	4.0	U cn	8.5	4.0	1.6	ng/L		04/30/24 22:06	1
HFPODA	4.2	U M cn	8.5	4.2	2.1	ng/L		04/30/24 22:06	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	11	U cn	21	11	5.3	ng/L		04/30/24 22:06	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.5	U cn	2.1	1.5	0.74	ng/L		04/30/24 22:06	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	11	U cn	21	11	5.3	ng/L		04/30/24 22:06	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.5	U cn	4.2	2.5	1.3	ng/L		04/30/24 22:06	1
Perfluorobutanesulfonic acid (PFBS)	**84**	**cn**	2.1	1.1	0.32	ng/L		04/30/24 22:06	1
Perfluorobutanoic acid (PFBA)	**190**	**cn**	8.5	4.2	2.1	ng/L		04/30/24 22:06	1
Perfluorodecanesulfonic acid (PFDS)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluorodecanoic acid (PFDA)	**1.1**	**J M cn**	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U cn	2.1	2.0	0.95	ng/L		04/30/24 22:06	1
Perfluorododecanoic acid (PFDoA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluoroheptanesulfonic acid (PFHpS)	**240**	**cn**	2.1	1.1	0.42	ng/L		04/30/24 22:06	1
Perfluorononanesulfonic acid (PFNS)	1.1	U M cn	2.1	1.1	0.42	ng/L		04/30/24 22:06	1
Perfluorononanoic acid (PFNA)	**66**	**cn**	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluorooctanesulfonamide (FOSA)	**64**	**cn**	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluoropentanesulfonic acid (PFPeS)	**270**	**cn**	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluoropentanoic acid (PFPeA)	**600**	**cn**	4.2	2.1	1.1	ng/L		04/30/24 22:06	1
Perfluorotetradecanoic acid (PFTA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluorotridecanoic acid (PFTriA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluoroundecanoic acid (PFUnA)	1.1	U cn	2.1	1.1	0.53	ng/L		04/30/24 22:06	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U cn	4.2	1.9	0.53	ng/L		04/30/24 22:06	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U cn	4.2	2.1	1.1	ng/L		04/30/24 22:06	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U cn	4.2	2.1	1.1	ng/L		04/30/24 22:06	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U cn	4.2	2.1	0.53	ng/L		04/30/24 22:06	1

Client Sample ID: 31LS-02-APR24

Date Collected: 04/03/24 14:55
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-2

Matrix: Water

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2 PFTeDA	58.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C2-PFDoDA	67.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C3 HFPO-DA	97.6	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C3 PFBS	129	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C3 PFHxS	88.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C4 PFBA	98.2	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C5 PFHxA	90.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C5 PFPeA	101	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C6 PFDA	78.2	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C7 PFUnA	76.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C8 FOSA	97.8	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C8 PFOS	86.2	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
13C9 PFNA	84.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d3-NMeFOSAA	89.6	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d3-NMePFOSA	79.1	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d5-NEtFOSAA	61.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d5-NEtPFOSA	71.9	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d7-N-MeFOSE-M	77.9	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
d9-N-EtFOSE-M	75.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
M2-6:2 FTS	133	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1
M2-8:2 FTS	120	cn	20 - 150	04/29/24 07:35	04/30/24 22:06	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	860	D cn	21	11	5.5	ng/L		05/02/24 08:39	10
Perfluorohexanesulfonic acid (PFHxS)	4200	D cn	21	12	6.0	ng/L		05/02/24 08:39	10
Perfluorohexanoic acid (PFHxA)	1400	D cn	21	11	5.3	ng/L		05/02/24 08:39	10
Perfluorooctanoic acid (PFOA)	1400	D cn	21	14	6.8	ng/L		05/02/24 08:39	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	101	cn	20 - 150	04/29/24 07:35	05/02/24 08:39	10
13C4 PFHpA	81.1	cn	20 - 150	04/29/24 07:35	05/02/24 08:39	10
13C5 PFHxA	92.5	cn	20 - 150	04/29/24 07:35	05/02/24 08:39	10
13C8 PFOA	83.1	cn	20 - 150	04/29/24 07:35	05/02/24 08:39	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	8400	D cn	210	110	53	ng/L		05/02/24 08:52	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	105	cn	20 - 150	04/29/24 07:35	05/02/24 08:52	100

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RA

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	2.4	J cn	8.5	4.0	1.8	ng/L		05/02/24 08:26	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
M2-4:2 FTS	142	cn	20 - 150	04/29/24 07:35	05/02/24 08:26	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-03-APR24
Date Collected: 04/03/24 14:45
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-3
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.2	U	7.6	7.2	1.9	ng/L		04/30/24 22:19	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	48	24	9.5	ng/L		04/30/24 22:19	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	24	U	48	24	9.5	ng/L		04/30/24 22:19	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.8	U	9.5	4.8	1.4	ng/L		04/30/24 22:19	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	7.6	3.6	1.6	ng/L		04/30/24 22:19	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**200**		7.6	7.2	2.4	ng/L		04/30/24 22:19	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**40**		7.6	7.3	2.5	ng/L		04/30/24 22:19	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.6	U	7.6	3.6	0.95	ng/L		04/30/24 22:19	1
DONA	3.6	U	7.6	3.6	1.4	ng/L		04/30/24 22:19	1
HFPODA	3.8	U M	7.6	3.8	1.9	ng/L		04/30/24 22:19	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.5	U	19	9.5	4.8	ng/L		04/30/24 22:19	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	1.9	1.3	0.67	ng/L		04/30/24 22:19	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.5	U	19	9.5	4.8	ng/L		04/30/24 22:19	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	3.8	2.3	1.1	ng/L		04/30/24 22:19	1
Perfluorobutanesulfonic acid (PFBS)	**78**		1.9	0.95	0.29	ng/L		04/30/24 22:19	1
Perfluorobutanoic acid (PFBA)	**120**		7.6	3.8	1.9	ng/L		04/30/24 22:19	1
Perfluorodecanesulfonic acid (PFDS)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluorodecanoic acid (PFDA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	1.9	1.8	0.86	ng/L		04/30/24 22:19	1
Perfluorododecanoic acid (PFDoA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluoroheptanesulfonic acid (PFHpS)	**50**		1.9	0.95	0.38	ng/L		04/30/24 22:19	1
Perfluoroheptanoic acid (PFHpA)	**410**		1.9	0.95	0.49	ng/L		04/30/24 22:19	1
Perfluorononanesulfonic acid (PFNS)	0.95	U	1.9	0.95	0.38	ng/L		04/30/24 22:19	1
Perfluorononanoic acid (PFNA)	**9.1**		1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluorooctanesulfonamide (FOSA)	**15**		1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluorooctanoic acid (PFOA)	**440**		1.9	1.2	0.61	ng/L		04/30/24 22:19	1
Perfluoropentanesulfonic acid (PFPeS)	**170**		1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluoropentanoic acid (PFPeA)	**360**		3.8	1.9	0.95	ng/L		04/30/24 22:19	1
Perfluorotetradecanoic acid (PFTA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluorotridecanoic acid (PFTriA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluoroundecanoic acid (PFUnA)	0.95	U	1.9	0.95	0.48	ng/L		04/30/24 22:19	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	3.8	1.7	0.48	ng/L		04/30/24 22:19	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	3.8	1.9	0.95	ng/L		04/30/24 22:19	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	3.8	1.9	0.95	ng/L		04/30/24 22:19	1

Client Sample ID: 31LS-03-APR24

Date Collected: 04/03/24 14:45
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-3
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	3.8	1.9	0.48	ng/L		04/30/24 22:19	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*47.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C2-PFDoDA	*51.2*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C3 HFPO-DA	*86.5*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C3 PFBS	*106*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C3 PFHxS	*85.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C4 PFBA	*86.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C4 PFHpA	*85.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C5 PFHxA	*80.3*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C5 PFPeA	*94.5*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C6 PFDA	*64.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C7 PFUnA	*55.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C8 FOSA	*58.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C8 PFOA	*86.1*	*^c cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C8 PFOS	*68.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
13C9 PFNA	*80.7*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d3-NMeFOSAA	*58.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d3-NMePFOSA	*50.0*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d5-NEtFOSAA	*49.7*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d5-NEtPFOSA	*47.0*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d7-N-MeFOSE-M	*53.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
d9-N-EtFOSE-M	*51.2*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
M2-4:2 FTS	*125*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
M2-6:2 FTS	*115*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*
M2-8:2 FTS	*90.5*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:19*	*1*

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**2100**	**D**	19	10	5.4	ng/L		05/02/24 09:05	10
Perfluorohexanoic acid (PFHxA)	**1100**	**D**	19	9.5	4.8	ng/L		05/02/24 09:05	10
Perfluorooctanesulfonic acid (PFOS)	**2600**	**D**	19	9.5	4.8	ng/L		05/02/24 09:05	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*97.2*		*20 - 150*	*04/29/24 07:35*	*05/02/24 09:05*	*10*
13C5 PFHxA	*96.2*		*20 - 150*	*04/29/24 07:35*	*05/02/24 09:05*	*10*
13C8 PFOS	*76.8*		*20 - 150*	*04/29/24 07:35*	*05/02/24 09:05*	*10*

Client Sample ID: 31LS-04-APR24

Date Collected: 04/03/24 14:40
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-4
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	7.8	7.5	2.0	ng/L		04/30/24 22:32	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	49	25	9.8	ng/L		04/30/24 22:32	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	49	25	9.8	ng/L		04/30/24 22:32	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-04-APR24
Date Collected: 04/03/24 14:40
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-4
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	9.8	4.9	1.5	ng/L		04/30/24 22:32	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**380**		7.8	7.5	2.5	ng/L		04/30/24 22:32	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.8	3.7	0.98	ng/L		04/30/24 22:32	1
DONA	3.7	U	7.8	3.7	1.5	ng/L		04/30/24 22:32	1
HFPODA	3.9	U M	7.8	3.9	2.0	ng/L		04/30/24 22:32	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.8	U	20	9.8	4.9	ng/L		04/30/24 22:32	1
N-ethylperfluorooctanesulfonamido acetic acid (NEtFOSAA)	**0.78**	**J M**	2.0	1.4	0.69	ng/L		04/30/24 22:32	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	**0.85**	**J**	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.8	U	20	9.8	4.9	ng/L		04/30/24 22:32	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**11**	**I**	3.9	2.4	1.2	ng/L		04/30/24 22:32	1
Perfluorobutanesulfonic acid (PFBS)	**12**		2.0	0.98	0.29	ng/L		04/30/24 22:32	1
Perfluorobutanoic acid (PFBA)	**67**		7.8	3.9	2.0	ng/L		04/30/24 22:32	1
Perfluorodecanesulfonic acid (PFDS)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluorodecanoic acid (PFDA)	**27**		2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.88	ng/L		04/30/24 22:32	1
Perfluorododecanoic acid (PFDoA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluoroheptanesulfonic acid (PFHpS)	**11**		2.0	0.98	0.39	ng/L		04/30/24 22:32	1
Perfluoroheptanoic acid (PFHpA)	**380**		2.0	0.98	0.51	ng/L		04/30/24 22:32	1
Perfluorohexanesulfonic acid (PFHxS)	**510**		2.0	1.1	0.56	ng/L		04/30/24 22:32	1
Perfluorohexanoic acid (PFHxA)	**350**		2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluorononanesulfonic acid (PFNS)	**2.4**		2.0	0.98	0.39	ng/L		04/30/24 22:32	1
Perfluorononanoic acid (PFNA)	**52**		2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluoropentanesulfonic acid (PFPeS)	**27**		2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluoropentanoic acid (PFPeA)	**250**		3.9	2.0	0.98	ng/L		04/30/24 22:32	1
Perfluorotetradecanoic acid (PFTA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluorotridecanoic acid (PFTriA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluoroundecanoic acid (PFUnA)	0.98	U M	2.0	0.98	0.49	ng/L		04/30/24 22:32	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	3.9	1.8	0.49	ng/L		04/30/24 22:32	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	3.9	2.0	0.98	ng/L		04/30/24 22:32	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	3.9	2.0	0.98	ng/L		04/30/24 22:32	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	3.9	2.0	0.49	ng/L		04/30/24 22:32	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*65.5*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:32*	*1*
13C2-PFDoDA	*81.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:32*	*1*
13C3 HFPO-DA	*105*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:32*	*1*
13C3 PFBS	*103*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:32*	*1*

Client Sample ID: 31LS-04-APR24

Date Collected: 04/03/24 14:40
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-4

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	98.4		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C4 PFBA	85.6		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C4 PFHpA	96.2		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C5 PFHxA	101		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C5 PFPeA	105		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C6 PFDA	93.2		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C7 PFUnA	91.8		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C8 PFOS	97.2		20 - 150	04/29/24 07:35	04/30/24 22:32	1
13C9 PFNA	93.7		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d3-NMeFOSAA	99.1		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d3-NMePFOSA	75.0		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d5-NEtFOSAA	83.8		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d5-NEtPFOSA	66.4		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d7-N-MeFOSE-M	68.3		20 - 150	04/29/24 07:35	04/30/24 22:32	1
d9-N-EtFOSE-M	67.0		20 - 150	04/29/24 07:35	04/30/24 22:32	1
M2-6:2 FTS	109		20 - 150	04/29/24 07:35	04/30/24 22:32	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	2100	D	20	9.8	4.9	ng/L		05/02/24 09:58	10
Perfluorooctanesulfonic acid (PFOS)	2600	D	20	9.8	4.9	ng/L		05/02/24 09:58	10
Perfluorooctanoic acid (PFOA)	820	D	20	13	6.3	ng/L		05/02/24 09:58	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	76.6		20 - 150	04/29/24 07:35	05/02/24 09:58	10
13C8 PFOA	96.7		20 - 150	04/29/24 07:35	05/02/24 09:58	10
13C8 PFOS	93.2		20 - 150	04/29/24 07:35	05/02/24 09:58	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RA

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.2	J	7.8	3.7	1.7	ng/L		05/02/24 09:18	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	2200		7.8	7.6	2.6	ng/L		05/02/24 09:18	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
M2-4:2 FTS	146		20 - 150	04/29/24 07:35	05/02/24 09:18	1
M2-8:2 FTS	121		20 - 150	04/29/24 07:35	05/02/24 09:18	1

Client Sample ID: 31LS-05-APR24

Date Collected: 04/03/24 14:35
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-5

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.8	U cn	8.2	7.8	2.1	ng/L		04/30/24 22:45	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	26	U cn	51	26	10	ng/L		04/30/24 22:45	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	26	U cn	51	26	10	ng/L		04/30/24 22:45	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.1	U cn	10	5.1	1.5	ng/L		04/30/24 22:45	1

Client Sample ID: 31LS-05-APR24
Date Collected: 04/03/24 14:35
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-5
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.9	U cn	8.2	3.9	1.7	ng/L		04/30/24 22:45	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**200**	**cn**	8.2	7.8	2.6	ng/L		04/30/24 22:45	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**950**	**cn**	8.2	7.9	2.7	ng/L		04/30/24 22:45	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.9	U cn	8.2	3.9	1.0	ng/L		04/30/24 22:45	1
DONA	3.9	U cn	8.2	3.9	1.5	ng/L		04/30/24 22:45	1
HFPODA	4.1	U M cn	8.2	4.1	2.1	ng/L		04/30/24 22:45	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	21	10	5.1	ng/L		04/30/24 22:45	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U M cn	2.1	1.4	0.72	ng/L		04/30/24 22:45	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	21	10	5.1	ng/L		04/30/24 22:45	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**3.6**	**J I cn**	4.1	2.5	1.2	ng/L		04/30/24 22:45	1
Perfluorobutanesulfonic acid (PFBS)	**18**	**cn**	2.1	1.0	0.31	ng/L		04/30/24 22:45	1
Perfluorobutanoic acid (PFBA)	**58**	**cn**	8.2	4.1	2.1	ng/L		04/30/24 22:45	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluorodecanoic acid (PFDA)	**3.8**	**cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluorododecanesulfonic acid (PFDoS)	2.0	U cn	2.1	2.0	0.93	ng/L		04/30/24 22:45	1
Perfluorododecanoic acid (PFDoA)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluoroheptanesulfonic acid (PFHpS)	**54**	**cn**	2.1	1.0	0.41	ng/L		04/30/24 22:45	1
Perfluoroheptanoic acid (PFHpA)	**310**	**cn**	2.1	1.0	0.54	ng/L		04/30/24 22:45	1
Perfluorohexanoic acid (PFHxA)	**340**	**cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluorononanesulfonic acid (PFNS)	**1.1**	**J cn**	2.1	1.0	0.41	ng/L		04/30/24 22:45	1
Perfluorononanoic acid (PFNA)	**30**	**cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluorooctanesulfonamide (FOSA)	**480**	**M cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluoropentanesulfonic acid (PFPeS)	**61**	**cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluoropentanoic acid (PFPeA)	**170**	**cn**	4.1	2.1	1.0	ng/L		04/30/24 22:45	1
Perfluorotetradecanoic acid (PFTA)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluorotridecanoic acid (PFTriA)	1.0	U cn	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluoroundecanoic acid (PFUnA)	**0.51**	**J M cn**	2.1	1.0	0.51	ng/L		04/30/24 22:45	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.9	U cn	4.1	1.9	0.51	ng/L		04/30/24 22:45	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.1	U cn	4.1	2.1	1.0	ng/L		04/30/24 22:45	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.1	U cn	4.1	2.1	1.0	ng/L		04/30/24 22:45	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.1	U cn	4.1	2.1	0.51	ng/L		04/30/24 22:45	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*59.8*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 22:45*	*1*
13C2-PFDoDA	*73.2*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 22:45*	*1*
13C3 HFPO-DA	*100*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 22:45*	*1*
13C3 PFBS	*104*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 22:45*	*1*

Client Sample ID: 31LS-05-APR24

Lab Sample ID: 410-166779-5

Date Collected: 04/03/24 14:35
Matrix: Water
Date Received: 04/05/24 09:40

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	93.5	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C4 PFBA	96.8	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C4 PFHpA	94.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C5 PFHxA	102	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C5 PFPeA	102	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C6 PFDA	87.0	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C7 PFUnA	80.6	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C8 FOSA	104	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C8 PFOS	90.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
13C9 PFNA	95.0	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d3-NMeFOSAA	97.7	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d3-NMePFOSA	85.4	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d5-NEtFOSAA	87.6	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d5-NEtPFOSA	80.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d7-N-MeFOSE-M	87.3	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
d9-N-EtFOSE-M	86.8	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
M2-4:2 FTS	143	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
M2-6:2 FTS	113	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1
M2-8:2 FTS	110	cn	20 - 150	04/29/24 07:35	04/30/24 22:45	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**1700**	**D cn**	21	11	5.9	ng/L		05/02/24 10:11	10
Perfluorooctanoic acid (PFOA)	**810**	**D cn**	21	13	6.6	ng/L		05/02/24 10:11	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	102	cn	20 - 150	04/29/24 07:35	05/02/24 10:11	10
13C8 PFOA	84.1	cn	20 - 150	04/29/24 07:35	05/02/24 10:11	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL2

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	**6200**	**D cn**	210	100	51	ng/L		05/02/24 22:23	100

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOS	110	cn	20 - 150	04/29/24 07:35	05/02/24 22:23	100

Client Sample ID: 31LS-06-APR24

Lab Sample ID: 410-166779-6

Date Collected: 04/03/24 14:30
Matrix: Water
Date Received: 04/05/24 09:40

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.5	U	7.8	7.5	2.0	ng/L		04/30/24 22:58	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	49	25	9.8	ng/L		04/30/24 22:58	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	49	25	9.8	ng/L		04/30/24 22:58	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	4.9	U	9.8	4.9	1.5	ng/L		04/30/24 22:58	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**110**		7.8	7.5	2.5	ng/L		04/30/24 22:58	1

Client Sample ID: 31LS-06-APR24
Date Collected: 04/03/24 14:30
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-6
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**40**		7.8	7.6	2.6	ng/L		04/30/24 22:58	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.7	U	7.8	3.7	0.98	ng/L		04/30/24 22:58	1
DONA	3.7	U	7.8	3.7	1.5	ng/L		04/30/24 22:58	1
HFPODA	3.9	U M	7.8	3.9	2.0	ng/L		04/30/24 22:58	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.8	U	20	9.8	4.9	ng/L		04/30/24 22:58	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.69	ng/L		04/30/24 22:58	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.8	U	20	9.8	4.9	ng/L		04/30/24 22:58	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.4	U	3.9	2.4	1.2	ng/L		04/30/24 22:58	1
Perfluorobutanesulfonic acid (PFBS)	**51**		2.0	0.98	0.29	ng/L		04/30/24 22:58	1
Perfluorobutanoic acid (PFBA)	**84**		7.8	3.9	2.0	ng/L		04/30/24 22:58	1
Perfluorodecanesulfonic acid (PFDS)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluorodecanoic acid (PFDA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.88	ng/L		04/30/24 22:58	1
Perfluorododecanoic acid (PFDoA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluoroheptanesulfonic acid (PFHpS)	**30**		2.0	0.98	0.39	ng/L		04/30/24 22:58	1
Perfluoroheptanoic acid (PFHpA)	**460**		2.0	0.98	0.51	ng/L		04/30/24 22:58	1
Perfluorononanesulfonic acid (PFNS)	0.98	U	2.0	0.98	0.39	ng/L		04/30/24 22:58	1
Perfluorononanoic acid (PFNA)	**16**		2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluorooctanesulfonamide (FOSA)	**24**	**M**	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluoropentanesulfonic acid (PFPeS)	**170**		2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluoropentanoic acid (PFPeA)	**260**		3.9	2.0	0.98	ng/L		04/30/24 22:58	1
Perfluorotetradecanoic acid (PFTA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluorotridecanoic acid (PFTriA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluoroundecanoic acid (PFUnA)	0.98	U	2.0	0.98	0.49	ng/L		04/30/24 22:58	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	3.9	1.8	0.49	ng/L		04/30/24 22:58	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	3.9	2.0	0.98	ng/L		04/30/24 22:58	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	3.9	2.0	0.98	ng/L		04/30/24 22:58	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	3.9	2.0	0.49	ng/L		04/30/24 22:58	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*53.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C2-PFDoDA	*61.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C3 HFPO-DA	*102*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C3 PFBS	*126*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C3 PFHxS	*87.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C4 PFBA	*101*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C4 PFHpA	*89.0*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*
13C5 PFHxA	*97.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 22:58*	*1*

Client Sample ID: 31LS-06-APR24

Date Collected: 04/03/24 14:30
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-6

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFPeA	98.6		20 - 150	04/29/24 07:35	04/30/24 22:58	1
13C6 PFDA	66.5		20 - 150	04/29/24 07:35	04/30/24 22:58	1
13C7 PFUnA	64.8		20 - 150	04/29/24 07:35	04/30/24 22:58	1
13C8 FOSA	65.0		20 - 150	04/29/24 07:35	04/30/24 22:58	1
13C8 PFOS	74.4		20 - 150	04/29/24 07:35	04/30/24 22:58	1
13C9 PFNA	82.8		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d3-NMeFOSAA	64.4		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d3-NMePFOSA	58.0		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d5-NEtFOSAA	58.5		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d5-NEtPFOSA	53.7		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d7-N-MeFOSE-M	63.5		20 - 150	04/29/24 07:35	04/30/24 22:58	1
d9-N-EtFOSE-M	63.4		20 - 150	04/29/24 07:35	04/30/24 22:58	1
M2-6:2 FTS	126		20 - 150	04/29/24 07:35	04/30/24 22:58	1
M2-8:2 FTS	118		20 - 150	04/29/24 07:35	04/30/24 22:58	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	37	U	78	37	17	ng/L		05/02/24 10:37	10
Perfluorohexanesulfonic acid (PFHxS)	**3500**	**D**	20	11	5.6	ng/L		05/02/24 10:37	10
Perfluorohexanoic acid (PFHxA)	**650**	**D**	20	9.8	4.9	ng/L		05/02/24 10:37	10
Perfluorooctanesulfonic acid (PFOS)	**1700**	**D**	20	9.8	4.9	ng/L		05/02/24 10:37	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	90.2		20 - 150	04/29/24 07:35	05/02/24 10:37	10
13C5 PFHxA	101		20 - 150	04/29/24 07:35	05/02/24 10:37	10
13C8 PFOS	70.7		20 - 150	04/29/24 07:35	05/02/24 10:37	10
M2-4:2 FTS	76.3		20 - 150	04/29/24 07:35	05/02/24 10:37	10

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RA

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorooctanoic acid (PFOA)	**610**		2.0	1.3	0.63	ng/L		05/02/24 10:24	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOA	86.4		20 - 150	04/29/24 07:35	05/02/24 10:24	1

Client Sample ID: 31LS-07-APR24

Date Collected: 04/03/24 14:25
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-7

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U cn	8.0	7.6	2.0	ng/L		04/30/24 23:11	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U cn	50	25	10	ng/L		04/30/24 23:11	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	**13**	**J cn**	50	25	10	ng/L		04/30/24 23:11	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	**5.5**	**J cn**	10	5.0	1.5	ng/L		04/30/24 23:11	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U cn	8.0	3.8	1.7	ng/L		04/30/24 23:11	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**490**	**cn**	8.0	7.6	2.5	ng/L		04/30/24 23:11	1

Client Sample ID: 31LS-07-APR24
Date Collected: 04/03/24 14:25
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-7
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**110**	**cn**	8.0	7.7	2.6	ng/L		04/30/24 23:11	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U cn	8.0	3.8	1.0	ng/L		04/30/24 23:11	1
DONA	3.8	U cn	8.0	3.8	1.5	ng/L		04/30/24 23:11	1
HFPODA	4.0	U M cn	8.0	4.0	2.0	ng/L		04/30/24 23:11	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U cn	20	10	5.0	ng/L		04/30/24 23:11	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U cn	2.0	1.4	0.70	ng/L		04/30/24 23:11	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U cn	20	10	5.0	ng/L		04/30/24 23:11	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.4	U cn	4.0	2.4	1.2	ng/L		04/30/24 23:11	1
Perfluorobutanesulfonic acid (PFBS)	**79**	**cn**	2.0	1.0	0.30	ng/L		04/30/24 23:11	1
Perfluorobutanoic acid (PFBA)	**260**	**cn**	8.0	4.0	2.0	ng/L		04/30/24 23:11	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluorodecanoic acid (PFDA)	1.0	U M cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U cn	2.0	1.9	0.90	ng/L		04/30/24 23:11	1
Perfluorododecanoic acid (PFDoA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluoroheptanesulfonic acid (PFHpS)	**52**	**M cn**	2.0	1.0	0.40	ng/L		04/30/24 23:11	1
Perfluorononanesulfonic acid (PFNS)	1.0	U cn	2.0	1.0	0.40	ng/L		04/30/24 23:11	1
Perfluorononanoic acid (PFNA)	**9.7**	**cn**	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluorooctanesulfonamide (FOSA)	**86**	**cn**	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluoropentanesulfonic acid (PFPeS)	**350**	**cn**	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluoropentanoic acid (PFPeA)	**850**	**cn**	4.0	2.0	1.0	ng/L		04/30/24 23:11	1
Perfluorotetradecanoic acid (PFTA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluorotridecanoic acid (PFTriA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluoroundecanoic acid (PFUnA)	1.0	U cn	2.0	1.0	0.50	ng/L		04/30/24 23:11	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U cn	4.0	1.8	0.50	ng/L		04/30/24 23:11	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U cn	4.0	2.0	1.0	ng/L		04/30/24 23:11	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U cn	4.0	2.0	1.0	ng/L		04/30/24 23:11	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U cn	4.0	2.0	0.50	ng/L		04/30/24 23:11	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*52.5*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C2-PFDoDA	*59.6*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C3 HFPO-DA	*123*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C3 PFBS	*119*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C3 PFHxS	*88.3*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C4 PFBA	*104*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C5 PFHxA	*92.5*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C5 PFPeA	*112*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*
13C6 PFDA	*67.1*	*cn*	*20 - 150*	*04/29/24 07:35*	*04/30/24 23:11*	*1*

Client Sample ID: 31LS-07-APR24

Date Collected: 04/03/24 14:25
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-7

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C7 PFUnA	67.4	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
13C8 FOSA	60.8	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
13C8 PFOS	66.8	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
13C9 PFNA	83.7	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d3-NMeFOSAA	62.9	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d3-NMePFOSA	59.3	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d5-NEtFOSAA	56.8	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d5-NEtPFOSA	52.5	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d7-N-MeFOSE-M	62.9	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
d9-N-EtFOSE-M	62.2	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
M2-4:2 FTS	145	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
M2-6:2 FTS	129	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1
M2-8:2 FTS	96.0	cn	20 - 150	04/29/24 07:35	04/30/24 23:11	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**830**	**D cn**	20	10	5.2	ng/L		05/02/24 10:50	10
Perfluorohexanesulfonic acid (PFHxS)	**3400**	**D cn**	20	11	5.7	ng/L		05/02/24 10:50	10
Perfluorohexanoic acid (PFHxA)	**3000**	**D cn**	20	10	5.0	ng/L		05/02/24 10:50	10
Perfluorooctanesulfonic acid (PFOS)	**1200**	**D cn**	20	10	5.0	ng/L		05/02/24 10:50	10
Perfluorooctanoic acid (PFOA)	**980**	**D cn**	20	13	6.4	ng/L		05/02/24 10:50	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	96.8	cn	20 - 150	04/29/24 07:35	05/02/24 10:50	10
13C4 PFHpA	93.0	cn	20 - 150	04/29/24 07:35	05/02/24 10:50	10
13C5 PFHxA	97.5	cn	20 - 150	04/29/24 07:35	05/02/24 10:50	10
13C8 PFOA	94.9	cn	20 - 150	04/29/24 07:35	05/02/24 10:50	10
13C8 PFOS	66.5	cn	20 - 150	04/29/24 07:35	05/02/24 10:50	10

Client Sample ID: 31LS-08-APR24

Date Collected: 04/03/24 14:20
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-8

Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	11	U cn	11	11	2.9	ng/L		05/01/24 11:40	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	36	U cn	72	36	14	ng/L		05/01/24 11:40	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	36	U cn	72	36	14	ng/L		05/01/24 11:40	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	7.2	U cn	14	7.2	2.2	ng/L		05/01/24 11:40	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	5.5	U cn	11	5.5	2.4	ng/L		05/01/24 11:40	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**49**	**cn**	11	11	3.6	ng/L		05/01/24 11:40	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**180**	**cn**	11	11	3.7	ng/L		05/01/24 11:40	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	5.5	U cn	11	5.5	1.4	ng/L		05/01/24 11:40	1
DONA	5.5	U cn	11	5.5	2.2	ng/L		05/01/24 11:40	1
HFPODA	5.7	U cn	11	5.7	2.9	ng/L		05/01/24 11:40	1

Client Sample ID: 31LS-08-APR24
Date Collected: 04/03/24 14:20
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-8
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	14	U cn	29	14	7.2	ng/L		05/01/24 11:40	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.0	U cn	2.9	2.0	1.0	ng/L		05/01/24 11:40	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	14	U cn	29	14	7.2	ng/L		05/01/24 11:40	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**2.3**	**J I cn**	5.7	3.4	1.7	ng/L		05/01/24 11:40	1
Perfluorobutanesulfonic acid (PFBS)	**7.4**	**cn**	2.9	1.4	0.43	ng/L		05/01/24 11:40	1
Perfluorobutanoic acid (PFBA)	**33**	**cn**	11	5.7	2.9	ng/L		05/01/24 11:40	1
Perfluorodecanesulfonic acid (PFDS)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorodecanoic acid (PFDA)	**3.4**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorododecanesulfonic acid (PFDoS)	2.7	U cn	2.9	2.7	1.3	ng/L		05/01/24 11:40	1
Perfluorododecanoic acid (PFDoA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluoroheptanesulfonic acid (PFHpS)	**17**	**cn**	2.9	1.4	0.57	ng/L		05/01/24 11:40	1
Perfluoroheptanoic acid (PFHpA)	**130**	**cn**	2.9	1.4	0.75	ng/L		05/01/24 11:40	1
Perfluorohexanesulfonic acid (PFHxS)	**760**	**cn**	2.9	1.6	0.82	ng/L		05/01/24 11:40	1
Perfluorohexanoic acid (PFHxA)	**140**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorononanesulfonic acid (PFNS)	1.4	U cn	2.9	1.4	0.57	ng/L		05/01/24 11:40	1
Perfluorononanoic acid (PFNA)	**17**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorooctanesulfonamide (FOSA)	**520**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorooctanesulfonic acid (PFOS)	**820**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorooctanoic acid (PFOA)	**370**	**cn**	2.9	1.9	0.92	ng/L		05/01/24 11:40	1
Perfluoropentanesulfonic acid (PFPeS)	**20**	**cn**	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluoropentanoic acid (PFPeA)	**79**	**cn**	5.7	2.9	1.4	ng/L		05/01/24 11:40	1
Perfluorotetradecanoic acid (PFTA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluorotridecanoic acid (PFTriA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluoroundecanoic acid (PFUnA)	1.4	U cn	2.9	1.4	0.72	ng/L		05/01/24 11:40	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.6	U cn	5.7	2.6	0.72	ng/L		05/01/24 11:40	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.9	U cn	5.7	2.9	1.4	ng/L		05/01/24 11:40	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.9	U cn	5.7	2.9	1.4	ng/L		05/01/24 11:40	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.9	U cn	5.7	2.9	0.72	ng/L		05/01/24 11:40	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*74.7*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C2-PFDoDA	*82.8*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C3 HFPO-DA	*116*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C3 PFBS	*115*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C3 PFHxS	*120*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C4 PFBA	*114*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C4 PFHpA	*119*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*
13C5 PFHxA	*115*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:40*	*1*

Client Sample ID: 31LS-08-APR24

Lab Sample ID: 410-166779-8

Date Collected: 04/03/24 14:20
Matrix: Water
Date Received: 04/05/24 09:40

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFPeA	127	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C6 PFDA	93.2	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C7 PFUnA	81.8	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C8 FOSA	91.6	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C8 PFOA	87.9	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C8 PFOS	99.8	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
13C9 PFNA	120	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d3-NMeFOSAA	80.2	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d3-NMePFOSA	63.2	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d5-NEtFOSAA	81.2	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d5-NEtPFOSA	59.7	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d7-N-MeFOSE-M	78.5	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
d9-N-EtFOSE-M	76.9	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
M2-4:2 FTS	142	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
M2-6:2 FTS	148	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1
M2-8:2 FTS	107	cn	20 - 150	04/29/24 07:35	05/01/24 11:40	1

Client Sample ID: 31LS-DUP-01-APR24

Lab Sample ID: 410-166779-9

Date Collected: 04/03/24 00:00
Matrix: Water
Date Received: 04/05/24 09:40

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	8.7	U cn	9.2	8.7	2.3	ng/L		05/01/24 11:53	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	29	U cn	58	29	12	ng/L		05/01/24 11:53	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	29	U cn	58	29	12	ng/L		05/01/24 11:53	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.8	U cn	12	5.8	1.7	ng/L		05/01/24 11:53	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	4.4	U cn	9.2	4.4	2.0	ng/L		05/01/24 11:53	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	**50**	**cn**	9.2	8.7	2.9	ng/L		05/01/24 11:53	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**170**	**cn**	9.2	8.9	3.0	ng/L		05/01/24 11:53	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	4.4	U cn	9.2	4.4	1.2	ng/L		05/01/24 11:53	1
DONA	4.4	U cn	9.2	4.4	1.7	ng/L		05/01/24 11:53	1
HFPODA	4.6	U cn	9.2	4.6	2.3	ng/L		05/01/24 11:53	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	12	U cn	23	12	5.8	ng/L		05/01/24 11:53	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.6	U cn	2.3	1.6	0.81	ng/L		05/01/24 11:53	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	12	U cn	23	12	5.8	ng/L		05/01/24 11:53	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**2.1**	**J I cn**	4.6	2.8	1.4	ng/L		05/01/24 11:53	1
Perfluorobutanesulfonic acid (PFBS)	**6.8**	**cn**	2.3	1.2	0.35	ng/L		05/01/24 11:53	1

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-DUP-01-APR24
Date Collected: 04/03/24 00:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**35**	**cn**	9.2	4.6	2.3	ng/L		05/01/24 11:53	1
Perfluorodecanesulfonic acid (PFDS)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorodecanoic acid (PFDA)	**3.7**	**cn**	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorododecanesulfonic acid (PFDoS)	2.2	U cn	2.3	2.2	1.0	ng/L		05/01/24 11:53	1
Perfluorododecanoic acid (PFDoA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluoroheptanesulfonic acid (PFHpS)	**16**	**cn**	2.3	1.2	0.46	ng/L		05/01/24 11:53	1
Perfluoroheptanoic acid (PFHpA)	**130**	**cn**	2.3	1.2	0.60	ng/L		05/01/24 11:53	1
Perfluorohexanoic acid (PFHxA)	**140**	**cn**	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorononanesulfonic acid (PFNS)	1.2	U M cn	2.3	1.2	0.46	ng/L		05/01/24 11:53	1
Perfluorononanoic acid (PFNA)	**17**	**cn**	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorooctanesulfonamide (FOSA)	**550**	**M cn**	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorooctanoic acid (PFOA)	**360**	**cn**	2.3	1.5	0.74	ng/L		05/01/24 11:53	1
Perfluoropentanesulfonic acid (PFPeS)	**19**	**cn**	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluoropentanoic acid (PFPeA)	**79**	**cn**	4.6	2.3	1.2	ng/L		05/01/24 11:53	1
Perfluorotetradecanoic acid (PFTA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluorotridecanoic acid (PFTriA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluoroundecanoic acid (PFUnA)	1.2	U cn	2.3	1.2	0.58	ng/L		05/01/24 11:53	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	2.1	U cn	4.6	2.1	0.58	ng/L		05/01/24 11:53	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.3	U cn	4.6	2.3	1.2	ng/L		05/01/24 11:53	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.3	U cn	4.6	2.3	1.2	ng/L		05/01/24 11:53	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.3	U cn	4.6	2.3	0.58	ng/L		05/01/24 11:53	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*74.7*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C2-PFDoDA	*82.6*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C3 HFPO-DA	*94.2*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C3 PFBS	*99.4*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C3 PFHxS	*95.7*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C4 PFBA	*93.2*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C4 PFHpA	*96.6*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C5 PFHxA	*95.6*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C5 PFPeA	*103*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C6 PFDA	*84.4*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C7 PFUnA	*80.4*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C8 FOSA	*80.2*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C8 PFOA	*84.9*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C8 PFOS	*91.8*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
13C9 PFNA	*98.2*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d3-NMeFOSAA	*80.0*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d3-NMePFOSA	*59.9*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d5-NEtFOSAA	*74.9*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d5-NEtPFOSA	*55.0*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d7-N-MeFOSE-M	*72.9*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
d9-N-EtFOSE-M	*72.1*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
M2-4:2 FTS	*104*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*
M2-6:2 FTS	*101*	*cn*	*20 - 150*	*04/29/24 07:35*	*05/01/24 11:53*	*1*

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-DUP-01-APR24
Date Collected: 04/03/24 00:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-9
Matrix: Water

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
M2-8:2 FTS	109	cn	20 - 150	04/29/24 07:35	05/01/24 11:53	1

Method: EPA 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	970	D	23	13	6.6	ng/L		05/02/24 11:03	10
Perfluorooctanesulfonic acid (PFOS)	770	D	23	12	5.8	ng/L		05/02/24 11:03	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	98.2		20 - 150	04/29/24 07:35	05/02/24 11:03	10
13C8 PFOS	86.1		20 - 150	04/29/24 07:35	05/02/24 11:03	10

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFTDA (20-150)	PFDoDA (20-150)	HFPODA (20-150)	C3PFBS (20-150)	C3PFHS (20-150)	PFBA (20-150)	C4PFHA (20-150)	13C5PHA (20-150)
410-166779-1	31LS-01-APR24	61.1	70.7	96.2		86.7	93.4	90.3	87.1
410-166779-1 - DL	31LS-01-APR24				99.8				91.0
410-166779-1 - DL2	31LS-01-APR24					90.9			
410-166779-1 MS	31LS-01-APR24	66.7	79.7	99.1	122	85.1	93.3	96.4	84.8
410-166779-1 MSD	31LS-01-APR24	68.2	77.6	108	140	94.4	103	102	95.4
410-166779-2	31LS-02-APR24	58.3 cn	67.4 cn	97.6 cn	129 cn	88.4 cn	98.2 cn		90.4 cn
410-166779-2 - RA	31LS-02-APR24								
410-166779-2 - DL	31LS-02-APR24					101 cn		81.1 cn	92.5 cn
410-166779-2 - DL2	31LS-02-APR24								
410-166779-3	31LS-03-APR24	47.4	51.2	86.5	106	85.9	86.8	85.8	80.3
410-166779-3 - DL	31LS-03-APR24					97.2			96.2
410-166779-4	31LS-04-APR24	65.5	81.8	105	103	98.4	85.6	96.2	101
410-166779-4 - RA	31LS-04-APR24								
410-166779-4 - DL	31LS-04-APR24								
410-166779-5	31LS-05-APR24	59.8 cn	73.2 cn	100 cn	104 cn	93.5 cn	96.8 cn	94.3 cn	102 cn
410-166779-5 - DL	31LS-05-APR24					102 cn			
410-166779-5 - DL2	31LS-05-APR24								
410-166779-6	31LS-06-APR24	53.9	61.4	102	126	87.9	101	89.0	97.4
410-166779-6 - RA	31LS-06-APR24								
410-166779-6 - DL	31LS-06-APR24					90.2			101
410-166779-7	31LS-07-APR24	52.5 cn	59.6 cn	123 cn	119 cn	88.3 cn	104 cn		92.5 cn
410-166779-7 - DL	31LS-07-APR24					96.8 cn		93.0 cn	97.5 cn
410-166779-8	31LS-08-APR24	74.7 cn	82.8 cn	116 cn	115 cn	120 cn	114 cn	119 cn	115 cn
410-166779-9 - DL	31LS-DUP-01-APR24					98.2			
410-166779-9	31LS-DUP-01-APR24	74.7 cn	82.6 cn	94.2 cn	99.4 cn	95.7 cn	93.2 cn	96.6 cn	95.6 cn
LCS 410-499571/2-A	Lab Control Sample	74.7	87.4	96.1	99.0	90.6	97.9	91.4	96.2
LLCS 410-499571/3-A	Lab Control Sample	83.5	89.9	99.3	98.5	102	103	89.6	99.0
MB 410-499571/1-A	Method Blank	73.4	78.8	88.1	88.6	79.5	84.2	81.0	86.7

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOSA (20-150)
410-166779-1	31LS-01-APR24	90.8	81.4	77.9	122		85.0	98.6	113
410-166779-1 - DL	31LS-01-APR24						81.4		
410-166779-1 - DL2	31LS-01-APR24					115	118		
410-166779-1 MS	31LS-01-APR24	98.4	88.5	86.8	92.9	76.6 cn	88.1	85.9	100
410-166779-1 MSD	31LS-01-APR24	102	93.6	89.8	103	105 cn	92.6	89.8	103
410-166779-2	31LS-02-APR24	101 cn	78.2 cn	76.4 cn	97.8 cn		86.2 cn	84.3 cn	89.6 cn
410-166779-2 - RA	31LS-02-APR24								
410-166779-2 - DL	31LS-02-APR24					83.1 cn			
410-166779-2 - DL2	31LS-02-APR24						105 cn		
410-166779-3	31LS-03-APR24	94.5	64.6	55.9	58.6	86.1 ^c cn	68.4	80.7	58.4
410-166779-3 - DL	31LS-03-APR24						76.8		
410-166779-4	31LS-04-APR24	105	93.2	91.8			97.2	93.7	99.1
410-166779-4 - RA	31LS-04-APR24								
410-166779-4 - DL	31LS-04-APR24				76.6	96.7	93.2		
410-166779-5	31LS-05-APR24	102 cn	87.0 cn	80.6 cn	104 cn		90.4 cn	95.0 cn	97.7 cn
410-166779-5 - DL	31LS-05-APR24					84.1 cn			
410-166779-5 - DL2	31LS-05-APR24						110 cn		

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-166779-1
Project/Site: Ft. Devens PFAS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Water
Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFPeA (20-150)	C6PFDA (20-150)	13C7PUA (20-150)	PFOSA (20-150)	C8PFOA (20-150)	C8PFOS (20-150)	C9PFNA (20-150)	d3NMFOS (20-150)
410-166779-6	31LS-06-APR24	98.6	66.5	64.8	65.0		74.4	82.8	64.4
410-166779-6 - RA	31LS-06-APR24					86.4			
410-166779-6 - DL	31LS-06-APR24						70.7		
410-166779-7	31LS-07-APR24	112 cn	67.1 cn	67.4 cn	60.8 cn		66.8 cn	83.7 cn	62.9 cn
410-166779-7 - DL	31LS-07-APR24					94.9 cn	66.5 cn		
410-166779-8	31LS-08-APR24	127 cn	93.2 cn	81.8 cn	91.6 cn	87.9 cn	99.8 cn	120 cn	80.2 cn
410-166779-9 - DL	31LS-DUP-01-APR24						86.1		
410-166779-9	31LS-DUP-01-APR24	103 cn	84.4 cn	80.4 cn	80.2 cn	84.9 cn	91.8 cn	98.2 cn	80.0 cn
LCS 410-499571/2-A	Lab Control Sample	93.6	90.3	92.6	72.1	87.1	92.0	92.5	76.7
LLCS 410-499571/3-A	Lab Control Sample	102	97.6	97.3	73.2	99.1	93.0	97.8	85.5
MB 410-499571/1-A	Method Blank	85.7	80.9	82.4	66.4	87.8	79.9	80.1	72.3

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	d3NMFSA (20-150)	d5NEFOS (20-150)	d5NPFSA (20-150)	NMFM (20-150)	NEFM (20-150)	M242FTS (20-150)	M262FTS (20-150)	M282FTS (20-150)
410-166779-1	31LS-01-APR24	101	66.3	86.2	93.2	91.2			137
410-166779-1 - DL	31LS-01-APR24						111	122	
410-166779-1 - DL2	31LS-01-APR24								
410-166779-1 MS	31LS-01-APR24	78.0	69.4	67.1	79.9	79.4	152 *5+	124	130
410-166779-1 MSD	31LS-01-APR24	83.2	75.3	74.7	86.9	85.7	163 *5+	136	119
410-166779-2	31LS-02-APR24	79.1 cn	61.3 cn	71.9 cn	77.9 cn	75.4 cn		133 cn	120 cn
410-166779-2 - RA	31LS-02-APR24						142 cn		
410-166779-2 - DL	31LS-02-APR24								
410-166779-2 - DL2	31LS-02-APR24								
410-166779-3	31LS-03-APR24	50.0	49.7	47.0	53.6	51.2	125	115	90.5
410-166779-3 - DL	31LS-03-APR24								
410-166779-4	31LS-04-APR24	75.0	83.8	66.4	68.3	67.0		109	
410-166779-4 - RA	31LS-04-APR24						146		121
410-166779-4 - DL	31LS-04-APR24								
410-166779-5	31LS-05-APR24	85.4 cn	87.6 cn	80.3 cn	87.3 cn	86.8 cn	143 cn	113 cn	110 cn
410-166779-5 - DL	31LS-05-APR24								
410-166779-5 - DL2	31LS-05-APR24								
410-166779-6	31LS-06-APR24	58.0	58.5	53.7	63.5	63.4		126	118
410-166779-6 - RA	31LS-06-APR24								
410-166779-6 - DL	31LS-06-APR24						76.3		
410-166779-7	31LS-07-APR24	59.3 cn	56.8 cn	52.5 cn	62.9 cn	62.2 cn	145 cn	129 cn	96.0 cn
410-166779-7 - DL	31LS-07-APR24								
410-166779-8	31LS-08-APR24	63.2 cn	81.2 cn	59.7 cn	78.5 cn	76.9 cn	142 cn	148 cn	107 cn
410-166779-9 - DL	31LS-DUP-01-APR24								
410-166779-9	31LS-DUP-01-APR24	59.9 cn	74.9 cn	55.0 cn	72.9 cn	72.1 cn	104 cn	101 cn	109 cn
LCS 410-499571/2-A	Lab Control Sample	57.9	73.4	60.5	69.5	70.7	102	84.3	90.7
LLCS 410-499571/3-A	Lab Control Sample	62.8	81.1	61.9	71.6	73.0	113	99.9	110
MB 410-499571/1-A	Method Blank	56.8	71.6	57.1	63.8	65.1	90.8	87.6	88.8

Surrogate Legend

PFTDA = 13C2 PFTeDA
PFDoDA = 13C2-PFDoDA
HFPODA = 13C3 HFPO-DA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
PFBA = 13C4 PFBA

Isotope Dilution Summary

Client: Seres Engineering & Services LLC
Job ID: 410-166779-1
Project/Site: Ft. Devens PFAS

C4PFHA = 13C4 PFHpA
13C5PHA = 13C5 PFHxA
PFPeA = 13C5 PFPeA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFOSA = 13C8 FOSA
C8PFOA = 13C8 PFOA
C8PFOS = 13C8 PFOS
C9PFNA = 13C9 PFNA
d3NMFOS = d3-NMeFOSAA
d3NMFSA = d3-NMePFOSA
d5NEFOS = d5-NEtFOSAA
d5NPFSA = d5-NEtPFOSA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
M242FTS = M2-4:2 FTS
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 410-499571/1-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 499571

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.6	U	8.0	7.6	2.0	ng/L		04/30/24 20:05	1
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	25	U	50	25	10	ng/L		04/30/24 20:05	1
3-Perfluoropentylpropanoic acid (5:3 FTCA)	25	U	50	25	10	ng/L		04/30/24 20:05	1
3-Perfluoropropylpropanoic acid (3:3 FTCA)	5.0	U	10	5.0	1.5	ng/L		04/30/24 20:05	1
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.8	U	8.0	3.8	1.7	ng/L		04/30/24 20:05	1
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	7.6	U	8.0	7.6	2.5	ng/L		04/30/24 20:05	1
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	7.7	U	8.0	7.7	2.6	ng/L		04/30/24 20:05	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3O	3.8	U	8.0	3.8	1.0	ng/L		04/30/24 20:05	1
DONA	3.8	U	8.0	3.8	1.5	ng/L		04/30/24 20:05	1
HFPODA	4.0	U M	8.0	4.0	2.0	ng/L		04/30/24 20:05	1
N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	10	U	20	10	5.0	ng/L		04/30/24 20:05	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.4	U	2.0	1.4	0.70	ng/L		04/30/24 20:05	1
N-methylperfluorooctane sulfonamide (NMeFOSA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	10	U	20	10	5.0	ng/L		04/30/24 20:05	1
N-methylperfluorooctanesulfonamidoaceti c acid (NMeFOSAA)	2.4	U	4.0	2.4	1.2	ng/L		04/30/24 20:05	1
Perfluorobutanesulfonic acid (PFBS)	1.0	U	2.0	1.0	0.30	ng/L		04/30/24 20:05	1
Perfluorobutanoic acid (PFBA)	4.0	U	8.0	4.0	2.0	ng/L		04/30/24 20:05	1
Perfluorodecanesulfonic acid (PFDS)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorodecanoic acid (PFDA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorododecanesulfonic acid (PFDoS)	1.9	U	2.0	1.9	0.90	ng/L		04/30/24 20:05	1
Perfluorododecanoic acid (PFDoA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluoroheptanesulfonic acid (PFHpS)	1.0	U	2.0	1.0	0.40	ng/L		04/30/24 20:05	1
Perfluoroheptanoic acid (PFHpA)	1.0	U	2.0	1.0	0.52	ng/L		04/30/24 20:05	1
Perfluorohexanesulfonic acid (PFHxS)	1.1	U	2.0	1.1	0.57	ng/L		04/30/24 20:05	1
Perfluorohexanoic acid (PFHxA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorononanesulfonic acid (PFNS)	1.0	U	2.0	1.0	0.40	ng/L		04/30/24 20:05	1
Perfluorononanoic acid (PFNA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorooctanesulfonamide (FOSA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorooctanesulfonic acid (PFOS)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorooctanoic acid (PFOA)	1.3	U	2.0	1.3	0.64	ng/L		04/30/24 20:05	1
Perfluoropentanesulfonic acid (PFPeS)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluoropentanoic acid (PFPeA)	2.0	U	4.0	2.0	1.0	ng/L		04/30/24 20:05	1
Perfluorotetradecanoic acid (PFTA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluorotridecanoic acid (PFTriA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluoroundecanoic acid (PFUnA)	1.0	U	2.0	1.0	0.50	ng/L		04/30/24 20:05	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.8	U	4.0	1.8	0.50	ng/L		04/30/24 20:05	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	2.0	U	4.0	2.0	1.0	ng/L		04/30/24 20:05	1

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 410-499571/1-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 499571

Analyte	MB Result	MB Qualifier	LOQ	LOD	DL	Unit	D	Analyzed	Dil Fac
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2.0	U	4.0	2.0	1.0	ng/L		04/30/24 20:05	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	2.0	U	4.0	2.0	0.50	ng/L		04/30/24 20:05	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 PFTeDA	*73.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C2-PFDoDA	*78.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C3 HFPO-DA	*88.1*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C3 PFBS	*88.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C3 PFHxS	*79.5*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C4 PFBA	*84.2*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C4 PFHpA	*81.0*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C5 PFHxA	*86.7*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C5 PFPeA	*85.7*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C6 PFDA	*80.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C7 PFUnA	*82.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C8 FOSA	*66.4*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C8 PFOA	*87.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C8 PFOS	*79.9*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
13C9 PFNA	*80.1*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d3-NMeFOSAA	*72.3*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d3-NMePFOSA	*56.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d5-NEtFOSAA	*71.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d5-NEtPFOSA	*57.1*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d7-N-MeFOSE-M	*63.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
d9-N-EtFOSE-M	*65.1*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
M2-4:2 FTS	*90.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
M2-6:2 FTS	*87.6*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*
M2-8:2 FTS	*88.8*		*20 - 150*	*04/29/24 07:35*	*04/30/24 20:05*	*1*

Lab Sample ID: LCS 410-499571/2-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	94.2	82.5		ng/L		88	40 - 150
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	625	604		ng/L		97	40 - 150
3-Perfluoropentylpropanoic acid (5:3 FTCA)	625	607		ng/L		97	40 - 150
3-Perfluoropropylpropanoic acid (3:3 FTCA)	125	120		ng/L		96	40 - 150
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	93.4	83.5		ng/L		89	40 - 150
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	94.8	108		ng/L		113	40 - 150
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	95.8	95.4		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-499571/2-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	93.2	84.9		ng/L		91	40 - 150
DONA	94.2	84.6		ng/L		90	40 - 150
HFPODA	100	96.8		ng/L		97	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	25.0	24.6		ng/L		99	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	250	238	M	ng/L		95	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	25.0	25.1		ng/L		101	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	25.0	25.9		ng/L		104	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	250	236	M	ng/L		95	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25.0	23.4		ng/L		94	40 - 150
Perfluorobutanesulfonic acid (PFBS)	22.1	20.9		ng/L		94	40 - 150
Perfluorobutanoic acid (PFBA)	100	95.2		ng/L		95	40 - 150
Perfluorodecanesulfonic acid (PFDS)	24.1	18.1		ng/L		75	40 - 150
Perfluorodecanoic acid (PFDA)	25.0	24.7		ng/L		99	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	24.2	18.8		ng/L		78	40 - 150
Perfluorododecanoic acid (PFDoA)	25.0	22.8		ng/L		91	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	23.8	18.1		ng/L		76	40 - 150
Perfluoroheptanoic acid (PFHpA)	25.0	23.2		ng/L		93	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	22.8	23.0		ng/L		101	40 - 150
Perfluorohexanoic acid (PFHxA)	25.0	21.7		ng/L		87	40 - 150
Perfluorononanesulfonic acid (PFNS)	24.0	18.3		ng/L		76	40 - 150
Perfluorononanoic acid (PFNA)	25.0	22.7	M	ng/L		91	40 - 150
Perfluorooctanesulfonamide (FOSA)	25.0	23.5	M	ng/L		94	40 - 150
Perfluorooctanesulfonic acid (PFOS)	23.2	20.5		ng/L		88	40 - 150
Perfluorooctanoic acid (PFOA)	25.0	22.6	M	ng/L		90	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	23.5	22.3		ng/L		95	40 - 150
Perfluoropentanoic acid (PFPeA)	50.0	48.0		ng/L		96	40 - 150
Perfluorotetradecanoic acid (PFTA)	25.0	24.4		ng/L		97	40 - 150
Perfluorotridecanoic acid (PFTriA)	25.0	24.7		ng/L		99	40 - 150
Perfluoroundecanoic acid (PFUnA)	25.0	21.4		ng/L		85	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	44.5	46.9		ng/L		105	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	50.0	48.5		ng/L		97	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 410-499571/2-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			50.0	44.5		ng/L		89	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			50.0	48.1		ng/L		96	40 - 150		

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 PFTeDA	*74.7*		*20 - 150*
13C2-PFDoDA	*87.4*		*20 - 150*
13C3 HFPO-DA	*96.1*		*20 - 150*
13C3 PFBS	*99.0*		*20 - 150*
13C3 PFHxS	*90.6*		*20 - 150*
13C4 PFBA	*97.9*		*20 - 150*
13C4 PFHpA	*91.4*		*20 - 150*
13C5 PFHxA	*96.2*		*20 - 150*
13C5 PFPeA	*93.6*		*20 - 150*
13C6 PFDA	*90.3*		*20 - 150*
13C7 PFUnA	*92.6*		*20 - 150*
13C8 FOSA	*72.1*		*20 - 150*
13C8 PFOA	*87.1*		*20 - 150*
13C8 PFOS	*92.0*		*20 - 150*
13C9 PFNA	*92.5*		*20 - 150*
d3-NMeFOSAA	*76.7*		*20 - 150*
d3-NMePFOSA	*57.9*		*20 - 150*
d5-NEtFOSAA	*73.4*		*20 - 150*
d5-NEtPFOSA	*60.5*		*20 - 150*
d7-N-MeFOSE-M	*69.5*		*20 - 150*
d9-N-EtFOSE-M	*70.7*		*20 - 150*
M2-4:2 FTS	*102*		*20 - 150*
M2-6:2 FTS	*84.3*		*20 - 150*
M2-8:2 FTS	*90.7*		*20 - 150*

Lab Sample ID: LLCS 410-499571/3-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF			15.1	13.2		ng/L		88	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)			100	82.3		ng/L		82	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)			100	97.7		ng/L		98	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)			20.0	18.6		ng/L		93	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)			14.9	13.8		ng/L		92	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)			15.2	14.9		ng/L		98	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)			15.3	12.9		ng/L		84	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-499571/3-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	14.9	13.3		ng/L		89	40 - 150
DONA	15.1	13.3		ng/L		88	40 - 150
HFPODA	16.0	14.7	M	ng/L		92	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	4.00	4.23		ng/L		106	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	40.0	39.1		ng/L		98	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4.00	3.65	M	ng/L		91	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	4.00	4.11		ng/L		103	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	40.0	39.1	M	ng/L		98	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4.00	3.17	J M	ng/L		79	40 - 150
Perfluorobutanesulfonic acid (PFBS)	3.54	3.48		ng/L		98	40 - 150
Perfluorobutanoic acid (PFBA)	16.0	15.2		ng/L		95	40 - 150
Perfluorodecanesulfonic acid (PFDS)	3.86	3.04		ng/L		79	40 - 150
Perfluorodecanoic acid (PFDA)	4.00	4.30		ng/L		107	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	3.87	3.11		ng/L		80	40 - 150
Perfluorododecanoic acid (PFDoA)	4.00	3.88		ng/L		97	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	3.81	3.12		ng/L		82	40 - 150
Perfluoroheptanoic acid (PFHpA)	4.00	4.13		ng/L		103	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	3.64	3.17		ng/L		87	40 - 150
Perfluorohexanoic acid (PFHxA)	4.00	3.69		ng/L		92	40 - 150
Perfluorononanesulfonic acid (PFNS)	3.84	3.15		ng/L		82	40 - 150
Perfluorononanoic acid (PFNA)	4.00	3.96	M	ng/L		99	40 - 150
Perfluorooctanesulfonamide (FOSA)	4.00	3.70	M	ng/L		92	40 - 150
Perfluorooctanesulfonic acid (PFOS)	3.71	3.74		ng/L		101	40 - 150
Perfluorooctanoic acid (PFOA)	4.00	3.99	M	ng/L		100	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	3.75	3.46		ng/L		92	40 - 150
Perfluoropentanoic acid (PFPeA)	8.00	7.28	M	ng/L		91	40 - 150
Perfluorotetradecanoic acid (PFTA)	4.00	3.76		ng/L		94	40 - 150
Perfluorotridecanoic acid (PFTriA)	4.00	4.02		ng/L		100	40 - 150
Perfluoroundecanoic acid (PFUnA)	4.00	3.41		ng/L		85	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	7.12	7.20	M	ng/L		101	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	8.00	7.36		ng/L		92	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 410-499571/3-A
Matrix: Water
Analysis Batch: 500363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 499571

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)			8.00	6.69		ng/L		84	40 - 150		
Perfluoro-3-methoxypropanoic acid (PFMPA)			8.00	7.06		ng/L		88	40 - 150		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C2 PFTeDA	*83.5*		*20 - 150*
13C2-PFDoDA	*89.9*		*20 - 150*
13C3 HFPO-DA	*99.3*		*20 - 150*
13C3 PFBS	*98.5*		*20 - 150*
13C3 PFHxS	*102*		*20 - 150*
13C4 PFBA	*103*		*20 - 150*
13C4 PFHpA	*89.6*		*20 - 150*
13C5 PFHxA	*99.0*		*20 - 150*
13C5 PFPeA	*102*		*20 - 150*
13C6 PFDA	*97.6*		*20 - 150*
13C7 PFUnA	*97.3*		*20 - 150*
13C8 FOSA	*73.2*		*20 - 150*
13C8 PFOA	*99.1*		*20 - 150*
13C8 PFOS	*93.0*		*20 - 150*
13C9 PFNA	*97.8*		*20 - 150*
d3-NMeFOSAA	*85.5*		*20 - 150*
d3-NMePFOSA	*62.8*		*20 - 150*
d5-NEtFOSAA	*81.1*		*20 - 150*
d5-NEtPFOSA	*61.9*		*20 - 150*
d7-N-MeFOSE-M	*71.6*		*20 - 150*
d9-N-EtFOSE-M	*73.0*		*20 - 150*
M2-4:2 FTS	*113*		*20 - 150*
M2-6:2 FTS	*99.9*		*20 - 150*
M2-8:2 FTS	*110*		*20 - 150*

Lab Sample ID: 410-166779-1 MS
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.2	U	93.0	75.0		ng/L		81	40 - 150		
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	617	718		ng/L		116	40 - 150		
3-Perfluoropentylpropanoic acid (5:3 FTCA)	20	J	617	758		ng/L		120	40 - 150		
3-Perfluoropropylpropanoic acid (3:3 FTCA)	8.5	J	123	133		ng/L		101	40 - 150		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	92.2	78.2		ng/L		85	40 - 150		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	3600	E	93.6	1660	4	ng/L		-2112	40 - 150		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	190	FH	94.6	442	FH	ng/L		264	40 - 150		

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-166779-1 MS
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	3.6	U	92.0	82.5		ng/L		90	40 - 150
DONA	3.6	U	93.0	90.0		ng/L		97	40 - 150
HFPODA	3.8	U M	98.7	98.9		ng/L		100	40 - 150
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.95	U	24.7	25.6		ng/L		104	40 - 150
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.5	U	247	250		ng/L		101	40 - 150
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	24.7	24.5		ng/L		99	40 - 150
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.95	U	24.7	24.6		ng/L		100	40 - 150
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.5	U	247	241		ng/L		98	40 - 150
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	24.7	21.7		ng/L		88	40 - 150
Perfluorobutanesulfonic acid (PFBS)	45	FH	21.8	73.9		ng/L		131	40 - 150
Perfluorobutanoic acid (PFBA)	160		98.7	249		ng/L		94	40 - 150
Perfluorodecanesulfonic acid (PFDS)	0.95	U	23.8	22.3		ng/L		94	40 - 150
Perfluorodecanoic acid (PFDA)	1.2	J	24.7	26.2		ng/L		102	40 - 150
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	23.9	22.7		ng/L		95	40 - 150
Perfluorododecanoic acid (PFDoA)	0.95	U	24.7	23.2		ng/L		94	40 - 150
Perfluoroheptanesulfonic acid (PFHpS)	750	M E	23.5	205	4	ng/L		-2300	40 - 150
Perfluoroheptanoic acid (PFHpA)	540		24.7	579	4	ng/L		167	40 - 150
Perfluorohexanesulfonic acid (PFHxS)	4500	E	22.5	3130	E 4	ng/L		-6027	40 - 150
Perfluorohexanoic acid (PFHxA)	1100	E	24.7	1390	E 4	ng/L		1252	40 - 150
Perfluorononanesulfonic acid (PFNS)	0.95	U M	23.7	24.1		ng/L		102	40 - 150
Perfluorononanoic acid (PFNA)	51	FL	24.7	50.7	FL	ng/L		-1	40 - 150
Perfluorooctanesulfonamide (FOSA)	180	M	24.7	272	M 4	ng/L		386	40 - 150
Perfluorooctanesulfonic acid (PFOS)	8400	E	22.9	5170	E 4	ng/L		-13995	40 - 150
Perfluorooctanoic acid (PFOA)	3700	M E	24.7	1970	E 4	ng/L		-6922	40 - 150
Perfluoropentanesulfonic acid (PFPeS)	220		23.1	252	4	ng/L		135	40 - 150
Perfluoropentanoic acid (PFPeA)	620		49.3	513	4	ng/L		-210	40 - 150
Perfluorotetradecanoic acid (PFTA)	0.95	U	24.7	24.7		ng/L		100	40 - 150
Perfluorotridecanoic acid (PFTriA)	0.95	U	24.7	24.0		ng/L		97	40 - 150
Perfluoroundecanoic acid (PFUnA)	0.95	U	24.7	23.4		ng/L		95	40 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	43.9	55.8		ng/L		127	40 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	49.3	49.4		ng/L		100	40 - 150

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-166779-1 MS
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	49.3	54.8		ng/L		111	40 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	49.3	50.9		ng/L		103	40 - 150

Isotope Dilution	*MS %Recovery*	*MS Qualifier*	*Limits*
13C2 PFTeDA	*66.7*		*20 - 150*
13C2-PFDoDA	*79.7*		*20 - 150*
13C3 HFPO-DA	*99.1*		*20 - 150*
13C3 PFBS	*122*		*20 - 150*
13C3 PFHxS	*85.1*		*20 - 150*
13C4 PFBA	*93.3*		*20 - 150*
13C4 PFHpA	*96.4*		*20 - 150*
13C5 PFHxA	*84.8*		*20 - 150*
13C5 PFPeA	*98.4*		*20 - 150*
13C6 PFDA	*88.5*		*20 - 150*
13C7 PFUnA	*86.8*		*20 - 150*
13C8 FOSA	*92.9*		*20 - 150*
13C8 PFOA	*76.6*	*cn*	*20 - 150*
13C8 PFOS	*88.1*		*20 - 150*
13C9 PFNA	*85.9*		*20 - 150*
d3-NMeFOSAA	*100*		*20 - 150*
d3-NMePFOSA	*78.0*		*20 - 150*
d5-NEtFOSAA	*69.4*		*20 - 150*
d5-NEtPFOSA	*67.1*		*20 - 150*
d7-N-MeFOSE-M	*79.9*		*20 - 150*
d9-N-EtFOSE-M	*79.4*		*20 - 150*
M2-4:2 FTS	*152*	*5+	*20 - 150*
M2-6:2 FTS	*124*		*20 - 150*
M2-8:2 FTS	*130*		*20 - 150*

Lab Sample ID: 410-166779-1 MSD
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF	7.2	U	94.2	72.6		ng/L		77	40 - 150	3	30
3-Perfluoroheptylpropanoic acid (7:3 FTCA)	24	U	625	628		ng/L		101	40 - 150	13	30
3-Perfluoropentylpropanoic acid (5:3 FTCA)	20	J	625	726		ng/L		113	40 - 150	4	30
3-Perfluoropropylpropanoic acid (3:3 FTCA)	8.5	J	125	137		ng/L		103	40 - 150	3	30
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	3.6	U	93.4	85.6		ng/L		92	40 - 150	9	30
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	3600	E	94.8	1810	4	ng/L		-1930	40 - 150	8	30
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	190	FH	95.8	510	FH	ng/L		332	40 - 150	14	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-166779-1 MSD
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	3.6	U	93.2	81.1		ng/L		87	40 - 150	2	30
DONA	3.6	U	94.2	87.0		ng/L		92	40 - 150	3	30
HFPODA	3.8	U M	100	95.9		ng/L		96	40 - 150	3	30
N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.95	U	25.0	25.8		ng/L		103	40 - 150	1	30
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	9.5	U	250	249		ng/L		100	40 - 150	1	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.3	U	25.0	22.8		ng/L		91	40 - 150	8	30
N-methylperfluorooctane sulfonamide (NMeFOSA)	0.95	U	25.0	24.7		ng/L		99	40 - 150	0	30
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	9.5	U	250	242		ng/L		97	40 - 150	0	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.3	U	25.0	22.9		ng/L		92	40 - 150	6	30
Perfluorobutanesulfonic acid (PFBS)	45	FH	22.1	81.1	FH	ng/L		162	40 - 150	9	30
Perfluorobutanoic acid (PFBA)	160		100	246		ng/L		89	40 - 150	1	30
Perfluorodecanesulfonic acid (PFDS)	0.95	U	24.1	22.3		ng/L		92	40 - 150	0	30
Perfluorodecanoic acid (PFDA)	1.2	J	25.0	27.7		ng/L		106	40 - 150	5	30
Perfluorododecanesulfonic acid (PFDoS)	1.8	U	24.2	22.9		ng/L		95	40 - 150	1	30
Perfluorododecanoic acid (PFDoA)	0.95	U	25.0	24.8		ng/L		99	40 - 150	6	30
Perfluoroheptanesulfonic acid (PFHpS)	750	M E	23.8	210	4	ng/L		-2251	40 - 150	2	30
Perfluoroheptanoic acid (PFHpA)	540		25.0	580	4	ng/L		168	40 - 150	0	30
Perfluorohexanesulfonic acid (PFHxS)	4500	E	22.7	3190	E 4	ng/L		-5686	40 - 150	2	30
Perfluorohexanoic acid (PFHxA)	1100	E	25.0	1300	E 4	ng/L		897	40 - 150	6	30
Perfluorononanesulfonic acid (PFNS)	0.95	U M	24.0	24.7		ng/L		103	40 - 150	2	30
Perfluorononanoic acid (PFNA)	51	FL	25.0	56.4	FL	ng/L		22	40 - 150	11	30
Perfluorooctanesulfonamide (FOSA)	180	M	25.0	243	4	ng/L		265	40 - 150	11	30
Perfluorooctanesulfonic acid (PFOS)	8400	E	23.2	5190	E 4	ng/L		-13722	40 - 150	0	30
Perfluorooctanoic acid (PFOA)	3700	M E	25.0	1860	E 4	ng/L		-7271	40 - 150	6	30
Perfluoropentanesulfonic acid (PFPeS)	220		23.4	269	4	ng/L		205	40 - 150	6	30
Perfluoropentanoic acid (PFPeA)	620		50.0	532	4	ng/L		-169	40 - 150	4	30
Perfluorotetradecanoic acid (PFTA)	0.95	U	25.0	25.6		ng/L		102	40 - 150	3	30
Perfluorotridecanoic acid (PFTriA)	0.95	U	25.0	24.9		ng/L		100	40 - 150	4	30
Perfluoroundecanoic acid (PFUnA)	0.95	U	25.0	24.1		ng/L		97	40 - 150	3	30
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	1.7	U	44.5	51.4		ng/L		116	40 - 150	8	30
Perfluoro-4-methoxybutanoic acid (PFMBA)	1.9	U	50.0	50.2		ng/L		100	40 - 150	2	30

Method: 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 410-166779-1 MSD
Matrix: Water
Analysis Batch: 500363

Client Sample ID: 31LS-01-APR24
Prep Type: Total/NA
Prep Batch: 499571

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	1.9	U	50.0	51.5		ng/L		103	40 - 150	6	30
Perfluoro-3-methoxypropanoic acid (PFMPA)	1.9	U	50.0	51.9		ng/L		104	40 - 150	2	30

Isotope Dilution	*MSD %Recovery*	*MSD Qualifier*	*Limits*
13C2 PFTeDA	*68.2*		*20 - 150*
13C2-PFDoDA	*77.6*		*20 - 150*
13C3 HFPO-DA	*108*		*20 - 150*
13C3 PFBS	*140*		*20 - 150*
13C3 PFHxS	*94.4*		*20 - 150*
13C4 PFBA	*103*		*20 - 150*
13C4 PFHpA	*102*		*20 - 150*
13C5 PFHxA	*95.4*		*20 - 150*
13C5 PFPeA	*102*		*20 - 150*
13C6 PFDA	*93.6*		*20 - 150*
13C7 PFUnA	*89.8*		*20 - 150*
13C8 FOSA	*103*		*20 - 150*
13C8 PFOA	*105*	*cn*	*20 - 150*
13C8 PFOS	*92.6*		*20 - 150*
13C9 PFNA	*89.8*		*20 - 150*
d3-NMeFOSAA	*103*		*20 - 150*
d3-NMePFOSA	*83.2*		*20 - 150*
d5-NEtFOSAA	*75.3*		*20 - 150*
d5-NEtPFOSA	*74.7*		*20 - 150*
d7-N-MeFOSE-M	*86.9*		*20 - 150*
d9-N-EtFOSE-M	*85.7*		*20 - 150*
M2-4:2 FTS	*163*	**5+*	*20 - 150*
M2-6:2 FTS	*136*		*20 - 150*
M2-8:2 FTS	*119*		*20 - 150*

LCMS

Prep Batch: 499571

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-166779-1	31LS-01-APR24	Total/NA	Water	1633	
410-166779-1 - DL	31LS-01-APR24	Total/NA	Water	1633	
410-166779-1 - DL2	31LS-01-APR24	Total/NA	Water	1633	
410-166779-1 - RA	31LS-01-APR24	Total/NA	Water	1633	
410-166779-2	31LS-02-APR24	Total/NA	Water	1633	
410-166779-2 - DL2	31LS-02-APR24	Total/NA	Water	1633	
410-166779-2 - RA	31LS-02-APR24	Total/NA	Water	1633	
410-166779-2 - DL	31LS-02-APR24	Total/NA	Water	1633	
410-166779-3	31LS-03-APR24	Total/NA	Water	1633	
410-166779-3 - DL	31LS-03-APR24	Total/NA	Water	1633	
410-166779-4 - RA	31LS-04-APR24	Total/NA	Water	1633	
410-166779-4	31LS-04-APR24	Total/NA	Water	1633	
410-166779-4 - DL	31LS-04-APR24	Total/NA	Water	1633	
410-166779-5	31LS-05-APR24	Total/NA	Water	1633	
410-166779-5 - DL	31LS-05-APR24	Total/NA	Water	1633	
410-166779-5 - DL2	31LS-05-APR24	Total/NA	Water	1633	
410-166779-6	31LS-06-APR24	Total/NA	Water	1633	
410-166779-6 - RA	31LS-06-APR24	Total/NA	Water	1633	
410-166779-6 - DL	31LS-06-APR24	Total/NA	Water	1633	
410-166779-7 - DL	31LS-07-APR24	Total/NA	Water	1633	
410-166779-7	31LS-07-APR24	Total/NA	Water	1633	
410-166779-8	31LS-08-APR24	Total/NA	Water	1633	
410-166779-9 - DL	31LS-DUP-01-APR24	Total/NA	Water	1633	
410-166779-9	31LS-DUP-01-APR24	Total/NA	Water	1633	
MB 410-499571/1-A	Method Blank	Total/NA	Water	1633	
LCS 410-499571/2-A	Lab Control Sample	Total/NA	Water	1633	
LLCS 410-499571/3-A	Lab Control Sample	Total/NA	Water	1633	
410-166779-1 MS	31LS-01-APR24	Total/NA	Water	1633	
410-166779-1 MSD	31LS-01-APR24	Total/NA	Water	1633	

Analysis Batch: 500363

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-166779-1	31LS-01-APR24	Total/NA	Water	1633	499571
410-166779-2	31LS-02-APR24	Total/NA	Water	1633	499571
410-166779-3	31LS-03-APR24	Total/NA	Water	1633	499571
410-166779-4	31LS-04-APR24	Total/NA	Water	1633	499571
410-166779-5	31LS-05-APR24	Total/NA	Water	1633	499571
410-166779-6	31LS-06-APR24	Total/NA	Water	1633	499571
410-166779-7	31LS-07-APR24	Total/NA	Water	1633	499571
MB 410-499571/1-A	Method Blank	Total/NA	Water	1633	499571
LCS 410-499571/2-A	Lab Control Sample	Total/NA	Water	1633	499571
LLCS 410-499571/3-A	Lab Control Sample	Total/NA	Water	1633	499571
410-166779-1 MS	31LS-01-APR24	Total/NA	Water	1633	499571
410-166779-1 MSD	31LS-01-APR24	Total/NA	Water	1633	499571

Analysis Batch: 500735

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-166779-1 - RA	31LS-01-APR24	Total/NA	Water	1633	499571
410-166779-1 - DL	31LS-01-APR24	Total/NA	Water	1633	499571
410-166779-1 - DL2	31LS-01-APR24	Total/NA	Water	1633	499571
410-166779-2 - RA	31LS-02-APR24	Total/NA	Water	1633	499571

LCMS (Continued)

Analysis Batch: 500735 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-166779-2 - DL	31LS-02-APR24	Total/NA	Water	1633	499571
410-166779-2 - DL2	31LS-02-APR24	Total/NA	Water	1633	499571
410-166779-3 - DL	31LS-03-APR24	Total/NA	Water	1633	499571
410-166779-4 - RA	31LS-04-APR24	Total/NA	Water	1633	499571
410-166779-4 - DL	31LS-04-APR24	Total/NA	Water	1633	499571
410-166779-5 - DL	31LS-05-APR24	Total/NA	Water	1633	499571
410-166779-6 - RA	31LS-06-APR24	Total/NA	Water	1633	499571
410-166779-6 - DL	31LS-06-APR24	Total/NA	Water	1633	499571
410-166779-7 - DL	31LS-07-APR24	Total/NA	Water	1633	499571
410-166779-8	31LS-08-APR24	Total/NA	Water	1633	499571
410-166779-9	31LS-DUP-01-APR24	Total/NA	Water	1633	499571
410-166779-9 - DL	31LS-DUP-01-APR24	Total/NA	Water	1633	499571

Analysis Batch: 501423

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
410-166779-5 - DL2	31LS-05-APR24	Total/NA	Water	1633	499571

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-01-APR24
Date Collected: 04/03/24 15:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 20:59
Total/NA	Prep	1633	RA		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	RA	1	500735	UUV6	ELLE	05/02/24 07:47
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 08:00
Total/NA	Prep	1633	DL2		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL2	100	500735	UUV6	ELLE	05/02/24 08:13

Client Sample ID: 31LS-02-APR24
Date Collected: 04/03/24 14:55
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 22:06
Total/NA	Prep	1633	RA		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	RA	1	500735	UUV6	ELLE	05/02/24 08:26
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 08:39
Total/NA	Prep	1633	DL2		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL2	100	500735	UUV6	ELLE	05/02/24 08:52

Client Sample ID: 31LS-03-APR24
Date Collected: 04/03/24 14:45
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 22:19
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 09:05

Client Sample ID: 31LS-04-APR24
Date Collected: 04/03/24 14:40
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 22:32
Total/NA	Prep	1633	RA		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	RA	1	500735	UUV6	ELLE	05/02/24 09:18
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 09:58

Lab Chronicle

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Client Sample ID: 31LS-05-APR24
Date Collected: 04/03/24 14:35
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 22:45
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 10:11
Total/NA	Prep	1633	DL2		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL2	100	501423	Q7NP	ELLE	05/02/24 22:23

Client Sample ID: 31LS-06-APR24
Date Collected: 04/03/24 14:30
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 22:58
Total/NA	Prep	1633	RA		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	RA	1	500735	UUV6	ELLE	05/02/24 10:24
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 10:37

Client Sample ID: 31LS-07-APR24
Date Collected: 04/03/24 14:25
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500363	Q7NP	ELLE	04/30/24 23:11
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 10:50

Client Sample ID: 31LS-08-APR24
Date Collected: 04/03/24 14:20
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500735	UUV6	ELLE	05/01/24 11:40

Client Sample ID: 31LS-DUP-01-APR24
Date Collected: 04/03/24 00:00
Date Received: 04/05/24 09:40

Lab Sample ID: 410-166779-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	1633			499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633		1	500735	UUV6	ELLE	05/01/24 11:53
Total/NA	Prep	1633	DL		499571	RC3V	ELLE	04/29/24 07:35
Total/NA	Analysis	1633	DL	10	500735	UUV6	ELLE	05/02/24 11:03

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Seres Engineering & Services LLC
Job ID: 410-166779-1
Project/Site: Ft. Devens PFAS

Laboratory: Eurofins Lancaster Laboratories Environment Testing, LLC

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	0001.01	11-30-24

Method Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Method	Method Description	Protocol	Laboratory
1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	ELLE
1633	Solid-Phase Extraction (SPE)	EPA	ELLE

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Environment Testing, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Seres Engineering & Services LLC
Project/Site: Ft. Devens PFAS

Job ID: 410-166779-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
410-166779-1	31LS-01-APR24	Water	04/03/24 15:00	04/05/24 09:40
410-166779-2	31LS-02-APR24	Water	04/03/24 14:55	04/05/24 09:40
410-166779-3	31LS-03-APR24	Water	04/03/24 14:45	04/05/24 09:40
410-166779-4	31LS-04-APR24	Water	04/03/24 14:40	04/05/24 09:40
410-166779-5	31LS-05-APR24	Water	04/03/24 14:35	04/05/24 09:40
410-166779-6	31LS-06-APR24	Water	04/03/24 14:30	04/05/24 09:40
410-166779-7	31LS-07-APR24	Water	04/03/24 14:25	04/05/24 09:40
410-166779-8	31LS-08-APR24	Water	04/03/24 14:20	04/05/24 09:40
410-166779-9	31LS-DUP-01-APR24	Water	04/03/24 00:00	04/05/24 09:40



410-166779 Chain of Custody

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Chain of Custody Record

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	Sampler: Spencer Gust	Lab PM: Sachtleben, Kerri S	Carrier Tracking No(s):	COC No: 410-116625-28883.1
Heather Levesque	Phone: 616.834.8108	E-Mail: Kerri.Sachtleben@et.eurofinsus.com	State of Origin:	Page: Page 1 of 2
Company: Seres Engineering & Services LLC	PWSID:			Job #:
Address: 669 Marina Drive Suite B7	Due Date Requested:			
City: Charleston	TAT Requested (days):			
State, Zip: SC, 29492	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 2019 - 00000003			
Email: halevesque@seres-es.com	WO #:			
Project Name: Ft. Devens PFAS	Project #: 41008470			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	E1633DR (B)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
31LS-01-APR24	04/03/2024	15:00	G	W			X	1	
31LS-02-APR24	04/03/2024	14:55	G	W			X	1	
31LS-03-APR24	04/03/2024	14:45	G	W			X	1	
31LS-04-APR24	04/03/2024	14:40	G	W			X	1	
31LS-05-APR24	04/03/2024	14:35	G	W			X	1	
31LS-06-APR24	04/03/2024	14:30	G	W			X	1	
31LS-07-APR24	04/03/2024	14:25	G	W			X	1	
31LS-08-APR24	04/03/2024	14:20	G	W			X	1	
31LS-DUP-01-APR24	04/03/2024		G	W			X	1	
MS/MSD	04/03/2024	15:05	G	W			X	2	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by: Spencer Gust	Date/Time: 04/03/2024	Company: SERES	Received by: FedEx	Date/Time:	Company
Relinquished by:	Date/Time: 16:00	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: R: 2.1 C: 2.0

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410-166779 Chain of Custody

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Chain of Custody Record

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	Sampler: Spencer Gust	Lab PM: Sachtleben, Kerri S	Carrier Tracking No(s):	COC No: 410-116625-28883.1
	Phone: 616.834.8108	E-Mail: Kerri.Sachtleben@et.eurofinsus.com	State of Origin:	Page: Page 1 of 2
Heather Levesque				Job #:
Company: Seres Engineering & Services LLC	PWSID:			
Address: 669 Marina Drive Suite B7	Due Date Requested:			
City: Charleston	TAT Requested (days):			
State, Zip: SC, 29492	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 2019 - 00000003			
Email: halevesque@seres-es.com	WO #:			
Project Name: Ft. Devens PFAS	Project #: 41008470			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	E1633DR (R)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
31LS-01-APR24	04/03/2024	15:00	G	W			X	3 ~~1~~	MS/MSD
31LS-02-APR24	04/03/2024	14:55	G	W			X	1	
31LS-03-APR24	04/03/2024	14:45	G	W			X	1	
31LS-04-APR24	04/03/2024	14:40	G	W			X	1	
31LS-05-APR24	04/03/2024	14:35	G	W			X	1	
31LS-06-APR24	04/03/2024	14:30	G	W			X	1	
31LS-07-APR24	04/03/2024	14:25	G	W			X	1	
31LS-08-APR24	04/03/2024	14:20	G	W			X	1	
31LS-DUP-01-APR24	04/03/2024		G	W			X	1	
~~MS/MSD~~	~~04/03/2024~~	~~15:05~~	G	W			X	2	

MS/MSD correction made by Heather Levesque on 05/22/2024 Heather Levesque

Digitally signed by Heather Levesque DN: cn=Heather Levesque, o=, ou=, email=halevesque@seres-es.com, c=US Date: 2024.05.22 09:59:12 -04'00'

Possible Hazard Identification

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:		Time:		Method of Shipment:	
Relinquished by: Spencer P Gust	Date/Time: 04/03/2024	Company: SERES	Received by: FedEx	Date/Time:	Company		
Relinquished by:	Date/Time: 16:00	Company	Received by:	Date/Time:	Company		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company		

Custody Seals Intact: ☒ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: R: 2.1 C: 2.0

Ver: 06/08/2021

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5/29/2024 (Rev. 1)

Login Sample Receipt Checklist

Client: Seres Engineering & Services LLC

Job Number: 410-166779-1

Login Number: 166779

List Source: Eurofins Lancaster Laboratories Environment Testing, LLC

List Number: 1

Creator: Santiago, Nathaniel

Question	Answer	Comment
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature acceptable,where thermal pres is required(</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV:Container Temp acceptable,where thermal pres is required (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	False	Refer to Job Narrative for details.
There are no discrepancies between the containers received and the COC.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Is the Field Sampler's name present on COC?	True	
Sample custody seals are intact.	N/A	
VOA sample vials do not have headspace >6mm in diameter (none, if from WV)?	N/A	

Appendix E

AOC 31 Lysimeter Sampling:
PFOA, PFOS, and PFHxS Results & Relationships

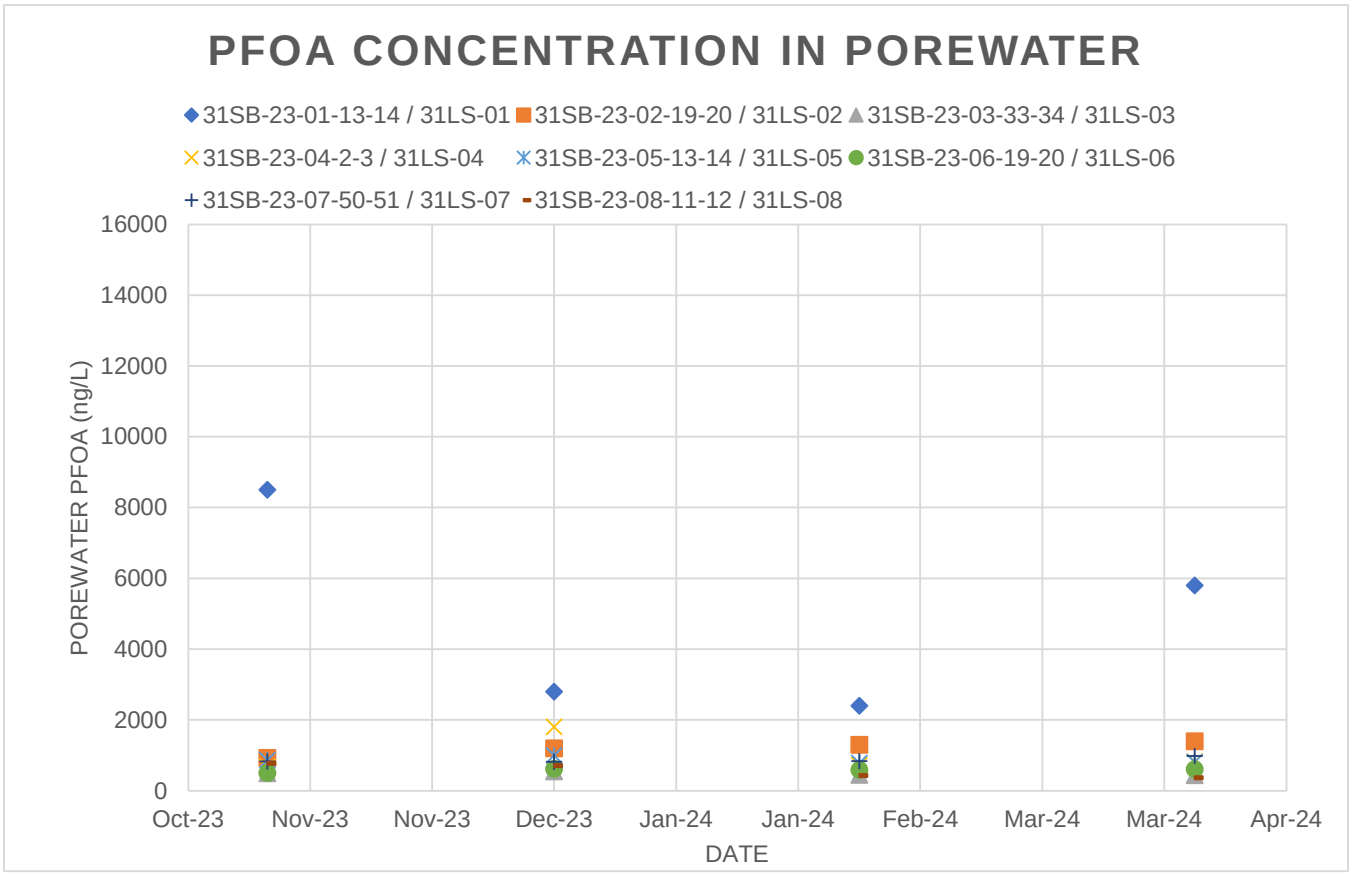


Figure E-1. PFOA in Porewater

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

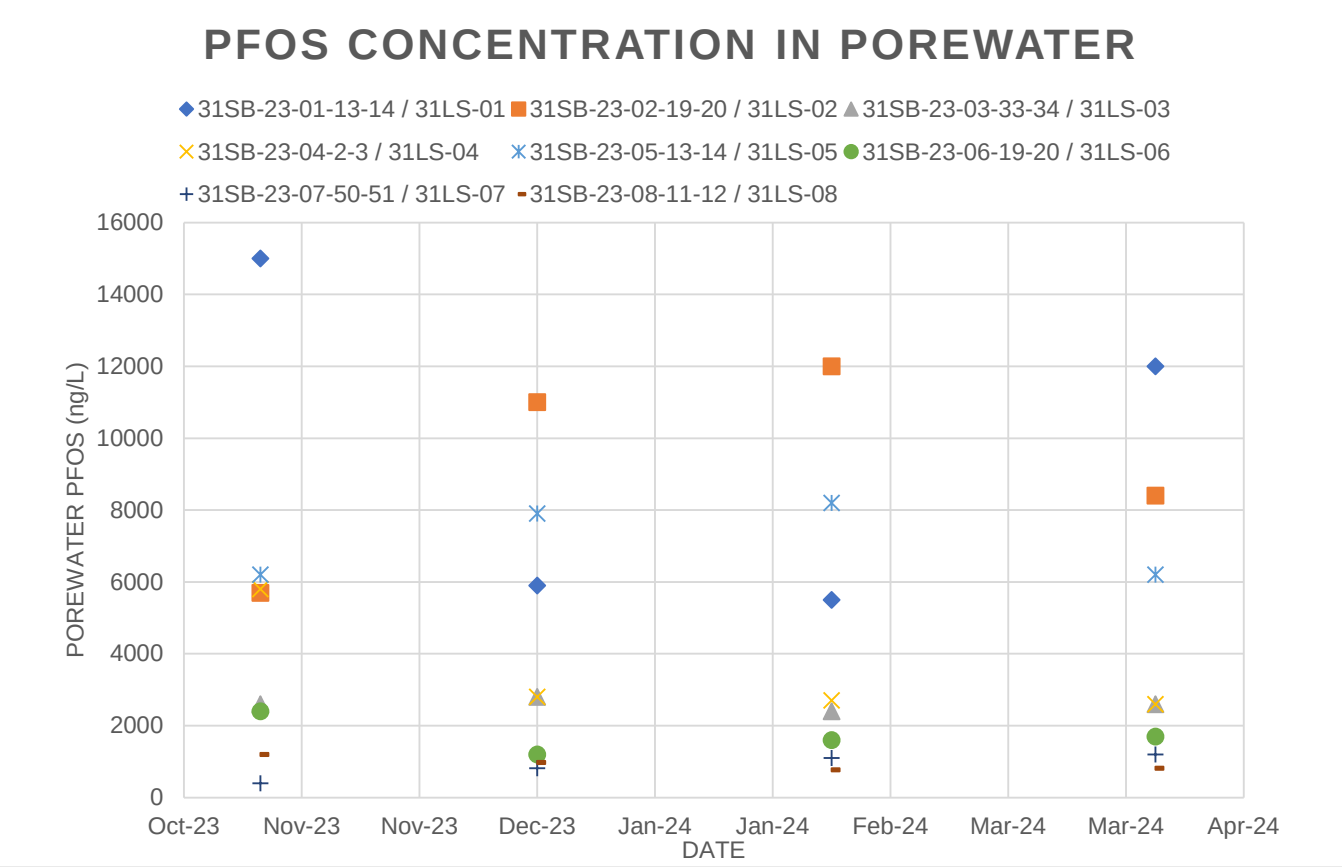


Figure E-2. PFOS in Porewater

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

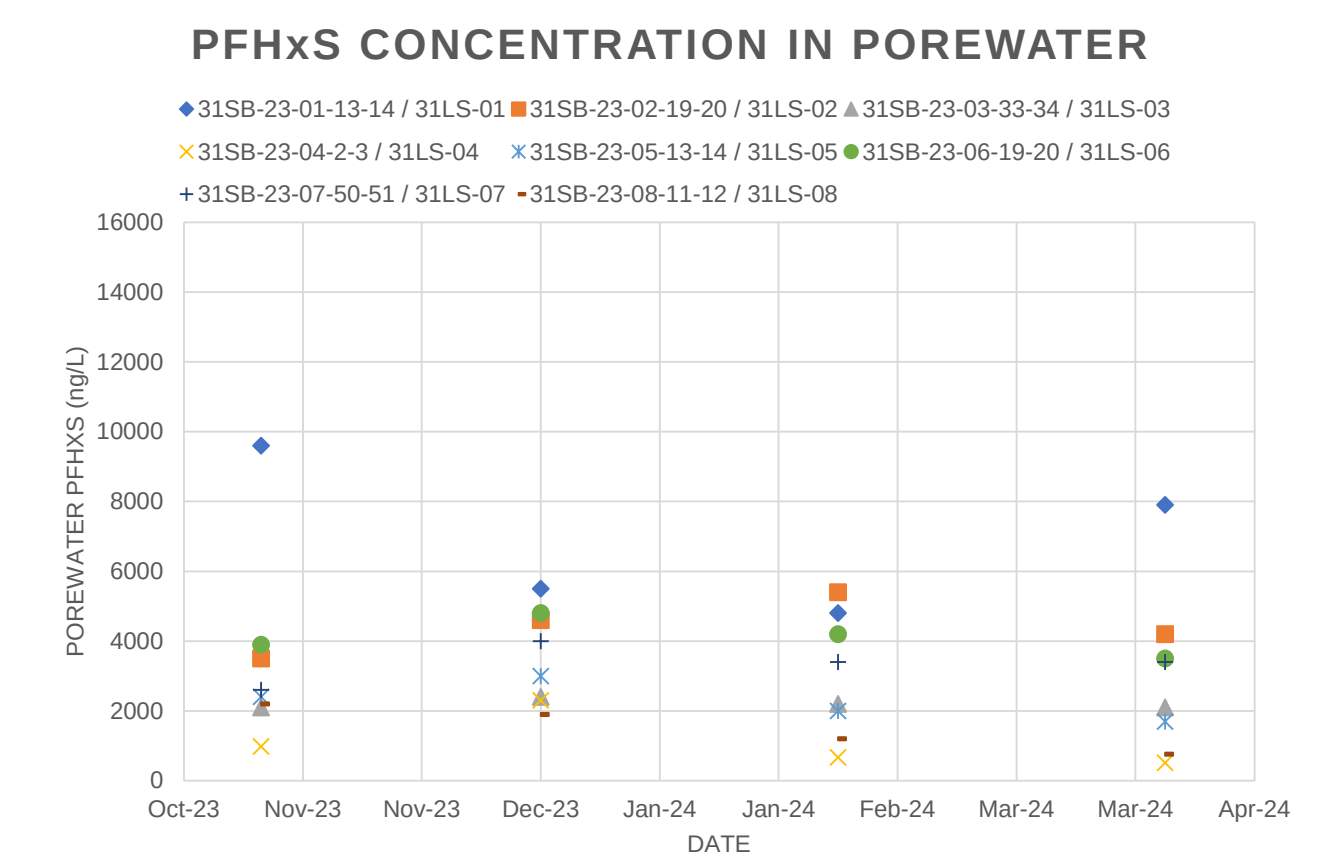


Figure E-3. PFHxS in Porewater

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

The equations and input parameters presented here forth within this Appendix E are relevant to Section 3.4 of this ISS Pilot Test Work Plan for Treatment of PFAS in Soils.

Laboratory SPLP-induced leachate results are not expected to be equal to leachate results that would be observed under field conditions because the relative amounts of soil and water differ between the laboratory SPLP procedure and natural site conditions (New Jersey Department of Environmental Protection [NJDEP] 2013). Therefore, the SPLP-induced leachate results were corrected to those expected under field conditions at AOC 31, following the process presented in NJDEP's Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Synthetic Precipitation Leaching Procedure Guidance Document (NJDEP 2013). The two equations used to calculate the corrected field leachate concentrations from the laboratory SPLP-induced leachate concentrations follow:

Equation (1) – Calculate the soil-water partition coefficient (K_d). Calculate a unique K_d per analyte per lysimeter.

$$K_d = \frac{(C_T M_S - C_{SPLP} V_L)/\, M_S}{C_{SPLP}}$$

Where:

K_d = the soil-water partition coefficient (L/Kg)

C_T = the total concentration of the contaminant in the SPLP soil sample (mg/kg)
C_T values are presented in Table 3 and Appendix D

M_S = the total weight of the soil sample submitted for SPLP analysis (kg)
M_S (31LS-01) = .43366 kg
M_S (31LS-02) = .42411 kg
M_S (31LS-03) = .42874 kg
M_S (31LS-04) = .42253 kg
M_S (31LS-05) = .43972 kg
M_S (31LS-06) = .04997 kg
M_S (31LS-07) = .43624 kg
M_S (31LS-08) = .42951 kg

C_{SPLP} = the concentration of contaminant in the SPLP leachate (mg/L)
C_{SPLP} values are presented in Table 3 and Appendix D

V_L = the volume of the SPLP leachate (L)
V_L (31LS-01) = .4337 L
V_L (31LS-02) = .4241 L
V_L (31LS-03) = .4287 L
V_L (31LS-04) = .4225 L
V_L (31LS-05) = .4397 L
V_L (31LS-06) = .05 L
V_L (31LS-07) = .4363 L
V_L (31LS-08) = .4295 L

Equation (2) – Calculate the corrected field leachate concentration (C_L). Calculate a unique C_L per analyte per lysimeter.

$$C_L = \frac{C_T}{K_d + \frac{\theta_w + \theta_a H'}{\rho_b}}$$

Where:

C_L = corrected field leachate concentration (mg/L).

K_d = the soil-water partition coefficient (L/Kg) – calculated using **Equation (1)**

ρ_b = bulk density of the soil (1.442 kg/L)

θ_w = soil moisture content

θ_w values are presented in Appendix D

θ_a = soil air content (0.18) - assumed

H' = the dimensionless Henry's law constant

H' (PFOA) = 1.59 x 10^{-4} (Agency for Toxic Substances and Disease Registry 2021)

H' (PFOS) = 1.38 x 10^{-7} (Health Canada 2016)

H' (PFHxS) = 7.94 x10^{-4} (Plassman, et al. 2011)

Log_{10} values of the corrected field leachate concentrations were plotted against log_{10} values of the soils concentrations to generate the plots presented within this Appendix E as Figures E-4, E-5, and E-6. Linear trendline equations derived from these graphs were used to compute potential vadose zone soils clean up targets, as described in Section 3.4 of this ISS Pilot Test Work Plan for Treatment of PFAS in Soils.

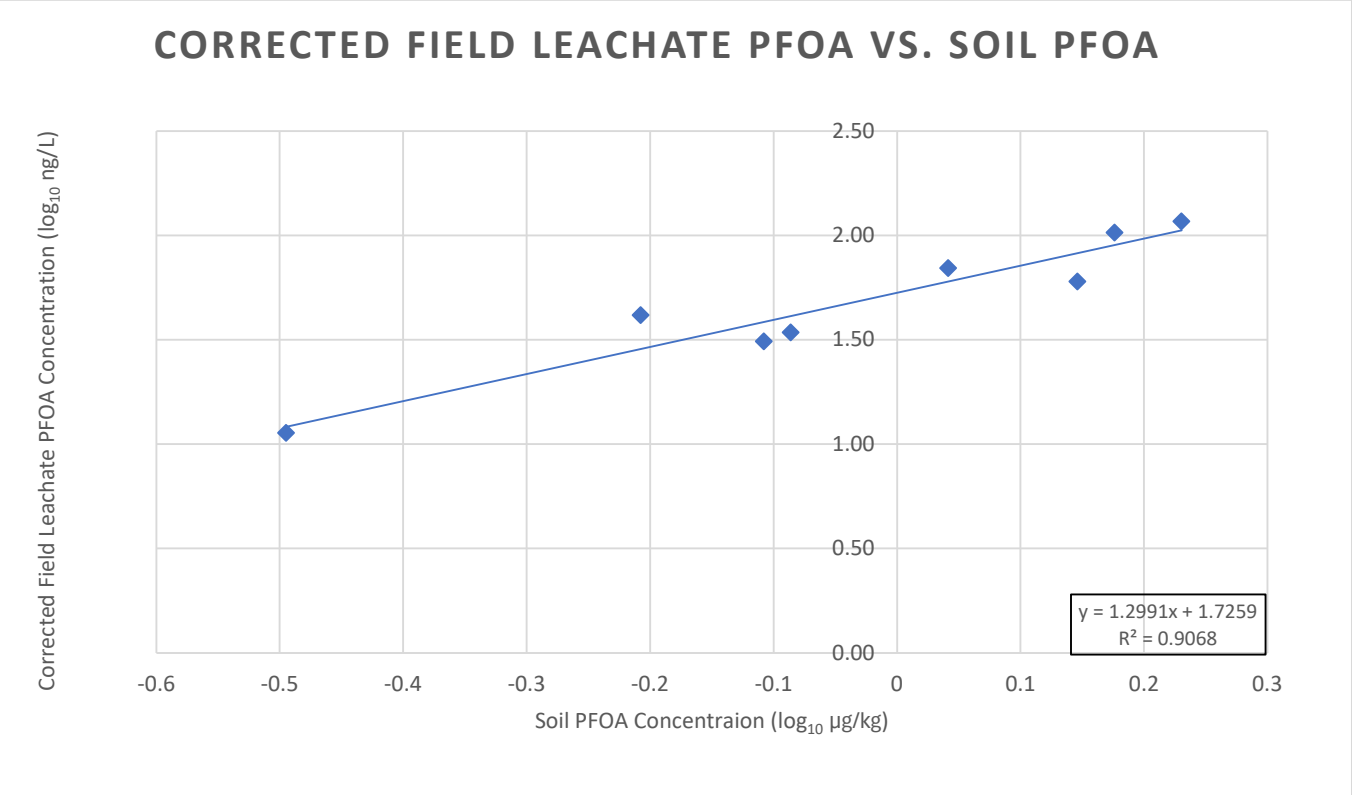


Figure E-4. PFOA Corrected Field Leachate vs. Soil

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

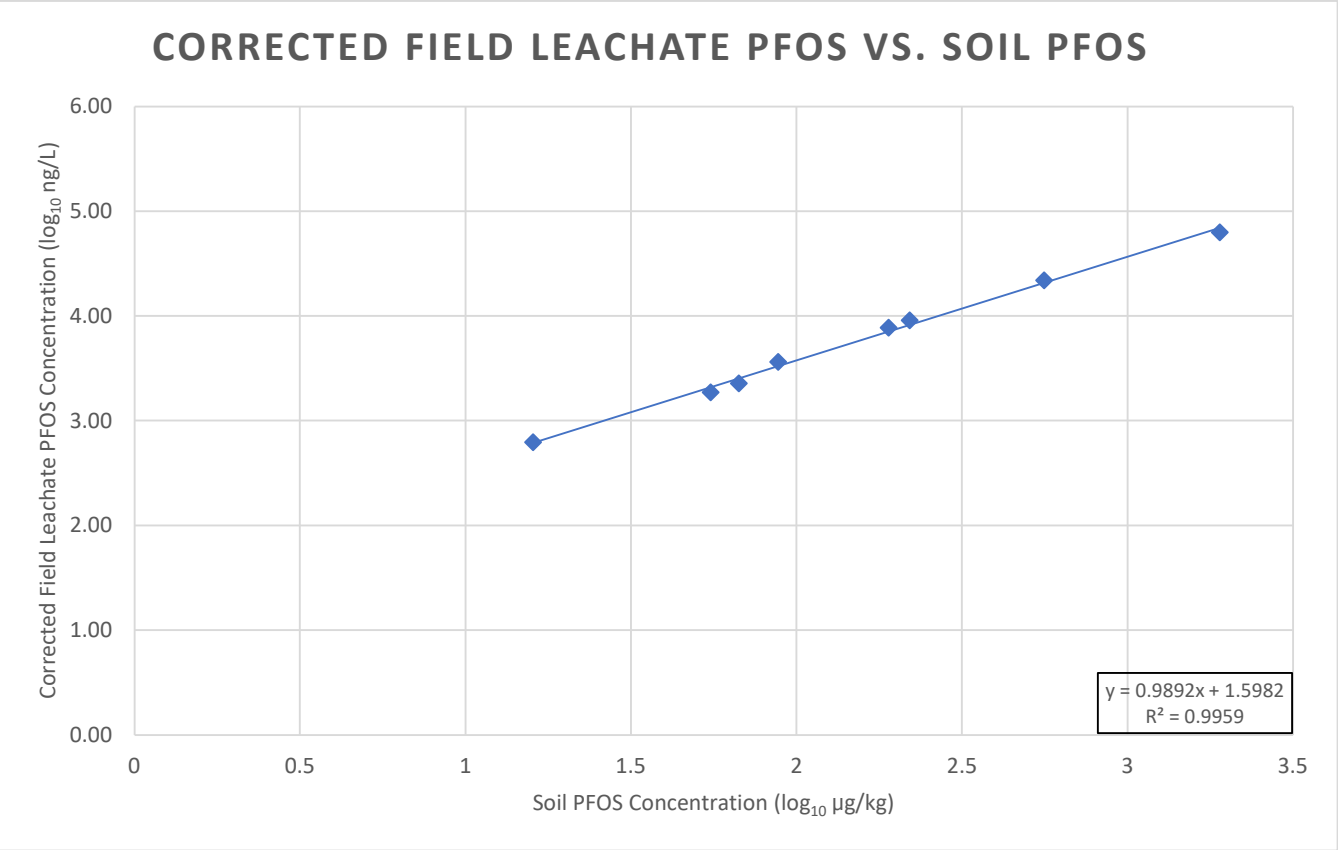


Figure E-5. PFOS Corrected Field Leachate vs. Soil

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

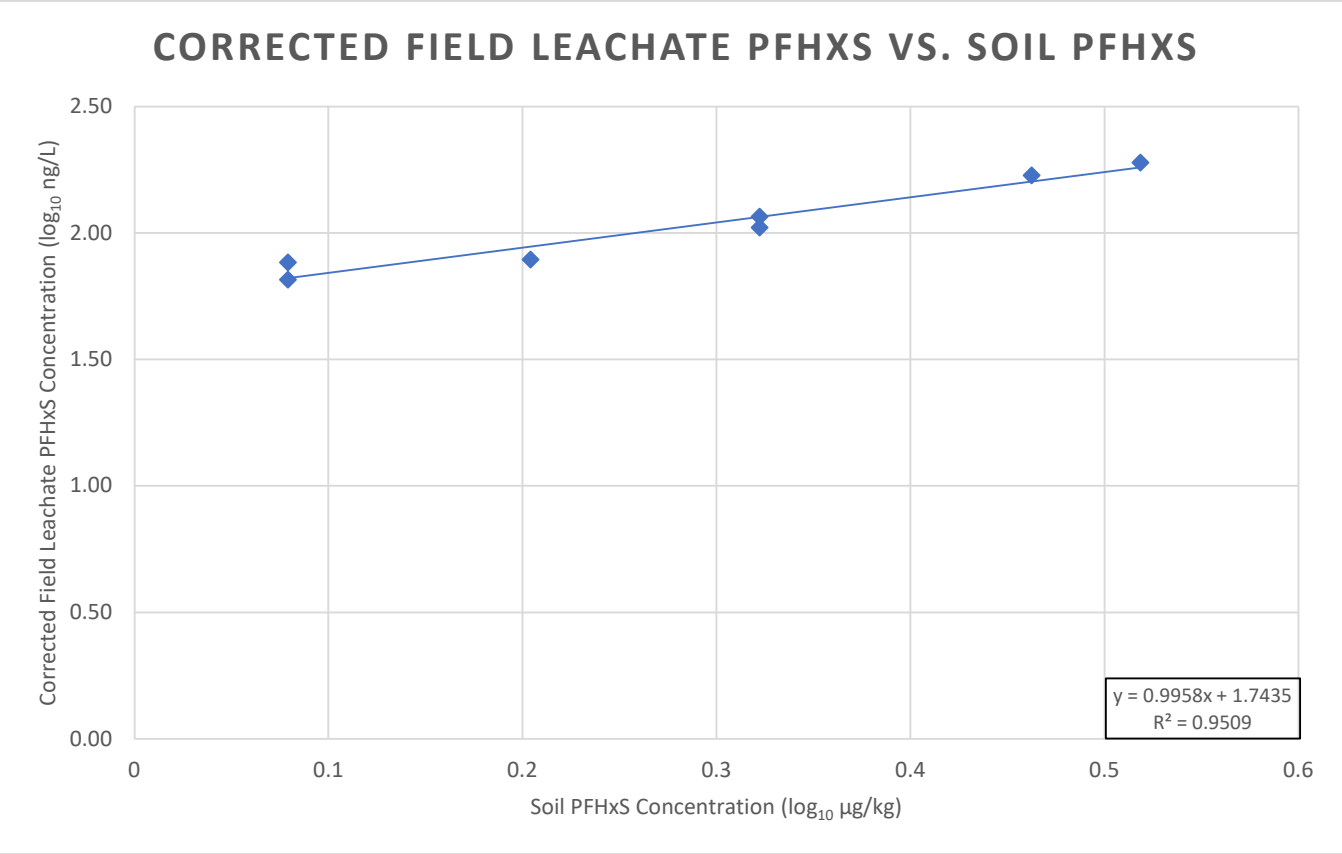


Figure E-6. PFHxS Corrected Field Leachate vs. Soil

ng/L = nanograms per liter

µg/kg = micrograms per kilogram

Appendix F

Treatability Study Reports

Soil Washing Treatability Study Report
PFAS Impacted Soil
Ft. Devens (MA)

Prepared for:

Arcadis

November 2023

Prepared by:

ART Engineering LLC

21340 Chrysalis Cay Loop

Land O Lakes, FL 34637

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APPENDICES

Appendix 1: LABORATORY ANALYTICAL REPORTS

EXECUTIVE SUMMARY

Arcadis US, Inc. (Arcadis) and ART Engineering LLC (ART) have performed a joint treatability study to evaluate the efficacy of using soil washing/physical separation to decontaminate PFAS (Per- and Polyfluorinated Substances) from contaminated soil materials collected from the Fort Devens Military Installation in Massachusetts.

Samples were collected by KOMAN Government Solutions (KGS) at Fort Devens from Aera of Concern 31, a former fire training area with known PFAS impacts in soil and groundwater. The collected samples were shipped to the Arcadis Treatability Study Laboratory in Durham, NC for performance of the treatability study. This treatability study evaluated use of a commercially available water-based soil washing process to remove PFAS from PFAS impacted soils. This study involved characterization of the soils in terms of initial PFAS concentration prior to treatment and soil particle size distribution. Soil washing testing involved performance of Wet Screening to separate Oversize (soil fraction greater than 2.0 mm, i.e. gravel), water-based Hydraulic Separation to separate Sand (soil fraction 0.063 – 2.0 mm) from the Fines (soil fraction less than 0.063 mm), and Secondary Treatment of the Oversize and the Sand for enhanced PFAS removal.

Conclusions & Recommendations

This study has demonstrated that Soil Washing appears to be a very effective technology to achieve a Total PFAS Source Removal Efficiency of 99.6% for the combined Oversize and Sand fractions. Because of the high content of sand and gravel in Ft. Devens' soils, a volume reduction (total amount of treated soil available beneficial reuse) on the order of 95% may be achievable. The high PFAS Source Removal Efficiency was achieved through a combination of water-based separation with Secondary Treatment using proprietary additives.

In this study, it was found that the bulk of the PFAS-mass transferred into the water phase and the Fines (soil fraction less than 63 microns). Incorporation of a PFAS water treatment system needs to be an integral part of the full-scale soil washing process to remove PFAS from the water phase and allow for reuse of the process water in a closed-loop process. Water treatment processes such as Foam Concentration, Ion-Exchange and Carbon Filtration have been reported to be effective for removal of PFAS from the water phase, but evaluation and testing of water treatment techniques was beyond the scope of this study.

Based on the success of this study, it is recommended that this study is expanded to include the following:

1) Define Project Treatment Goals in terms of a "Target Treatment Standard" or "Target Total PFAS Mass Reduction (i.e. Source Removal)".
2) Optimize and fine-tune the Soil Washing Process and Secondary Treatment
3) Test water treatment techniques to allow closed-loop water treatment
4) Estimate costs for Full-Scale implementation of Soil Washing at Ft. Devens.

1.0 Field Sample Collection

Samples were collected by KOMAN Government Solutions (KGS) at Fort Devens from Aera of Concern (AOC) 31 in June 2022 during a PFAS Remedial Investigation. AOC 31 is a former fire training area with known PFAS impacts in soil and groundwater. PFAS contamination from the FTA has been characterized as migrating in groundwater toward the downgradient Nashua River. The highest concentrations of PFAS in soil are generally in the center of the FTA at 0-20 feet below ground surface (bgs).

A total of eight samples were collected in 5-gallon high-density polyethylene buckets (eight total buckets). The buckets were filled with soil cuttings from 2 soil borings collected using a hollow stem auger (HSA) drill rig. Soil borings were extended to 20 feet below ground surface (bgs) in the center of the former FTA. At each soil boring, a sample was collected at 0-5 ft bgs, 5-10 ft bgs, 10-15 ft bgs and 15-20 ft bgs.

Samples were shipped to the Arcadis Treatability Testing Laboratory in Durham, NC for performance of the treatability study.

2.0 Laboratory Treatability Testing Study Description

The treatability testing was performed in three phases involved the following tasks:

Phase 1: Treatability Study Tasks performed by Arcadis prior to initiation of the study:

Prior to commencing the treatability study, all the buckets of soil collected in the field were combined and homogenized using a cone-and-quarter method. Soil was then placed back into 5-gallon buckets for storage. Approximately 12 gallons of soil from three soil buckets were required for the soil washing treatability trial.

One composite soil sample was collected from each of the three buckets for PFAS analysis (three samples total). The average PFAS concentrations of the three samples was used to establish a “baseline” or “untreated” PFAS concentration of the soil. The baseline PFAS concentration was used to evaluate treatment performance and PFAS mass reduction during the soil washing trial.

Phase 2: Treatability Study Tasks performed by ART/Arcadis-Team in Round 1

Round 1 Tests included establishing a baseline of the soil contaminant level, particle size distribution and simulation of water-based physical separation of the soil into various size fractions. The following tasks were performed as part of Round 1 Testing:

- Sample Homogenization and Pre-screening at 12.5 mm (½”). Determine the ratio of soil fraction plus 12.5 mm and minus 12.5 mm.
- Chemical Analysis of Soil Fraction less than 2 mm to establish a baseline prior to treatment.
- Processing of 8 kg (~18 lbs) of Soil through Basic Soil washing including Wet Screening and Hydraulic Separation to produce following products:

  - Washed Oversize Fraction 4.75 - 12.5 mm
  - Washed Oversize Fraction 2.0 - 4.75 mm
  - Sand after Hydraulic Separation
  - Sand after Hydraulic Separation and water rinse at 0.063 mm
  - Fines Filter Cake soil fraction less than ~0.063 mm
  - Wash Water after flocculation and filtration at 0.45 um
- Chemical Analysis for various soil products and water phase.

Phase 3: Treatability Study Tasks performed by ART/Arcadis-Team in Round 2

Round 2 Tests were performed to further enhance the overall contaminant removal efficiency based on the results of Round 1 Tests. The following tasks were performed as part of Round 2 Testing:

- Performance of two Secondary Treatment Tests on the Oversize Fraction (2.0-12.5 mm)
- Performance of four Secondary Treatment Tests on Sand Fraction after Hydraulic Separation

Secondary Treatment tests using proprietary methods and additives were performed on both the Oversize Fraction (2.0-12.5 mm) and Sand Fraction after Hydraulic Separation (~0.063-2.0 mm). Two Secondary Treatment tests were performed on the Oversize Fraction and four tests were performed on the Sand Fraction.

A subsample of the Oversize Fraction after Secondary Treatment was crushed and submitted for Chemical Analysis. For the Sand Fraction, a subsample after Secondary Treatment was rinsed on at 0.063 mm sieve and submitted for Chemical Analysis.

3.0 Chemical Analysis

Samples for PFAS analysis were submitted in three batches. The triplicate baseline soil composite samples were sent to Pace Analytical Gulf Coast in Baton Rouge, LA (Pace Gulf Coast) at the same time as the Round 1 soil washing samples on November 18, 2022. All samples were analyzed via EPA Draft Method 1633. Additionally, the triplicate baseline samples were evaluated using total oxidizable precursor (TOP) assay analyzed through Modified EPA Method 537, noted in the laboratory report as PFAS Top Assay QSM B15 (Pre) and PFAS Top Assay QSM B15 (Post).

Pace Gulf Coast requested additional sample material for two of the soil products generated in Round 1 in order to report accurate results. Duplicate samples of the lost samples were available and had been under constant refrigeration below 4 degrees Celsius since the samples were generated. These duplicate samples were shipped to Pace Gulf Coast on March 10, 2023. This did not affect the completeness or results of this study.

Round 2 samples were sent to Pace Analytical Services, LLC in West Columbia, SC (Pace West Columbia) on May 24, 2023 due to laboratory delays at Pace Gulf Coast. All samples were analyzed via EPA Draft Method 1633.

Full laboratory analytical reports are provided in Appendix 1.

4.0 Results

Results of the study are documented in the Summary Tables and Data Tables 1 through 5. Photos of various fractions & products and analytical reports are included as attachments.

4.1 Particle Size Analysis

Results of the soil Particle Size Analysis are shown in **Table 2**. The soil consisted of 21.1% Oversize Material (+ 2.0 mm), 76.5% Sand (0.063-2.0 mm) and 2.4% fines (< 0.063 mm). This would classify the soil at Ft. Devens as "Gravelly Sand". The low percentage of fines and high percentage of sand and gravel make this soil an ideal candidate for soil washing.

4.2 Baseline PFAS Soil Analysis

Samples FD-BASELINE-01, FD-BASELINE-02 and FD-BASELINE-03 are triplicate soil samples collected by Arcadis prior to the start of the study. The results of the triplicate samples were averaged to create a single "baseline" or "untreated" concentration for the soil. Sample FD-01 was collected by ART at the start of the study. Sample FD-01 was first pre-screened at 2.0 mm to remove gravel; the soil fraction passing the 2.0 mm sieve (Sample ID: FD-01) was submitted for PFAS analysis.

The triplicate samples are considered representative of site soil that would be treated during a pilot or full-scale demonstration. Due to screening at 2.0 mm, the FD-01 sample contained no coarse-grained soil (gravel) greater than 2 mm, representing the PFAS level in the sand and fines fraction less than 2.0 mm. Fine-grained soil generally contains higher concentrations of PFAS and this sample represents the untreated sand and fines fraction before washing treatment. For this report, baseline PFAS concentrations calculated by averaging the triplicate results are primarily used to evaluate treatment performance.

Results of the initial soil chemical analysis are presented in **Table 1a** and **Table 1b**. Total PFAS concentrations were calculated by summing all detected PFAS compounds for a sample. **Table 1a** shows that the FD-BASELINE results on the whole soil (including gravel) compared well to the results of soil fraction less than 2.0 mm (FD-01). The levels of individual PFAS-analytes and Total PFAS level detected in soil fraction less than 2.0 mm (FD-01) were slightly higher as compared to FD-BASELINE which was expected given the finer particle size and generally higher contaminant retention capacity of finer soil fractions.

4.3 Results of Round 1 Testing

Results of the processing of 8 kilograms (kg) (~18 lbs) of soil through Basic Soil Washing including Wet Screening at 2.0 mm and use of Hydraulic Separation to separate Sand and Fines fractions, are shown in **Table 3a** and **Table 3b**.

Total PFAS Removal Efficiency Ranged from 80% to 92% for the Washed Oversize Fractions to greater than 99% for the Sand Fraction after Hydraulic Separation and Water Rinse. The total level of PFAS analyzed in the fines filter cake was elevated at 471 µg/kg, which was slightly above the untreated soil levels. This suggests that the bulk of the PFAS-mass was transferred into the Wash Water.

The PFAS level in the wash water was analyzed at 35 µg/L. Using a ratio of "1 part of soil" to "5 parts of wash water" to perform the Wet Screening and Hydraulic Separation, it can be calculated that a total amount of PFAS of 5 x 35µg/L = 175 µg/kg PFAS was transferred from the soil into the wash water. This demonstrates that bulk of the PFAS-mass is water soluble and transferred into the water phase during the washing process.

4.4 Results of Round 2 Testing

To evaluate whether Secondary Treatment of the Oversize Fraction and the Sand Fraction would further enhance the PFAS removal efficiency, a series of Secondary Treatment tests were performed on the Oversize Fraction 2.0-12.5 mm and Sand Fraction after Wet Screening and Hydraulic Separation. Secondary treatment of the Fines Fraction was not conducted.

Results of Secondary Treatment of the Sand Fraction are presented in **Tables 4a** and **4b**. Through use of Secondary Treatment, an incremental PFAS removal efficiency ranging from 40.3% to 81.7% was achieved for a Total Cumulative PFAS removal efficiency of 99.9% for the Sand Fraction.

Results of Secondary Treatment of the Oversize Fraction are presented in **Tables 5a** and **5b**. Through use of Secondary Treatment, an incremental PFAS removal efficiency ranging from 84.6% to 89.5 % was achieved for a Total Cumulative PFAS removal efficiency of 98.4% for the Oversize Fraction.

For the combined Oversize and Sand Fractions, a Total PFAS Source Removal Efficiency greater than 99 % was achieved.

5.0 Findings and Conclusions

The main findings and conclusions for this study are as follows:

- A Total PFAS Source Removal Efficiency of greater than 99% was achieved for the combined Oversize and Sand Fractions. This high removal efficiency was achieved through a combination of water-based separation followed by Secondary Treatment with proprietary additives.
- In the washing process, the bulk of the PFAS mass was transferred into the water phase with elevated levels of PFAS contained in the Fines Fraction (< 0.063 mm)) due to the high adsorption capacity of fine particles. Based on the favorable soil particle size distribution of 2.4% fines (< 0.063 mm), a volume reduction (recovered soil available beneficial reuse) on the order of 95% may be achievable at Ft. Devens.

- Proprietary additives were tested and found to enhance the overall PFAS removal efficiency from Oversize and Sand fractions. When using any additives to the soil washing process, the effect on water treatment needs to be evaluated.
- Water treatment processes such as Foam Concentration, Ion-Exchange and Carbon Filtration have been reported to be effective for removal of PFAS from water phase, but evaluation and testing of water treatment techniques was beyond the scope of this study. It is recommended that this study is expanded to include water treatment methods.

6.0 Recommendations

Based on the success of this study, it is recommended that this study is expanded to include the following:

1) Define Project Treatment Goals in terms of a "Target Treatment Standard" or "Target Total PFAS Mass Reduction (i.e. Source Removal)".
2) Optimize and fine-tune the Soil Washing Process & Secondary Treatment.
3) Test water treatment techniques to allow closed-loop water Treatment.
4) Estimate costs for Full-Scale implementation of Soil Washing at Ft. Devens.

TABLES

Table 1a: Initial Untreated Soil Analysis

Sample ID	FD-BASELINE-01 Sampled by Arcadis		FD-BASELINE-02 Sampled by Arcadis		FD-BASELINE-03 Sampled by Arcadis		FD-BASELINE CALCULATED AVERAGE		FD-01 Sampled by ART	
Description	Untreated Soil (Triplicate Baseline Homogenate)						Untreated Soil (Triplicate Average)		Untreated Soil Size Fraction < 2.0 mm	
Analysis	PFAS *) (ug/kg)		PFAS *) (ug/kg)		PFAS *) (ug/kg)		PFAS *) (ug/kg)		PFAS *) (ug/kg)	
Analyte	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
11Cl-PF3OUdS	0.401	U	0.401	U	0.4	U		U	0.4	U
3:3FTCA	0.501	U	0.501	U	0.5	U		U	0.5	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	0.401	U	0.401	U	0.4	U		U	0.4	U
5:3FTCA	2.5	U	2.5	U	2.5	U		U	2.5	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	**0.758**	J	**0.688**	J	**0.746**	J	**0.73**		**0.89**	
7:3FTCA	2.5	U	2.5	U	2.5	U		U	2.5	U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	**33.2**		**33.6**		**36.6**		**34**		**36**	
9Cl-PF3ONS	0.401	U	0.401	U	0.4	U		U	0.4	U
ADONA	0.401	U	0.401	U	0.4	U		U	0.4	U
NEtFOSA	0.15	U	0.15	U	0.15	U		U	0.15	U
NEtFOSAA	**0.109**	J	**0.111**	J	**0.13**	J	**0.12**		**0.18**	J
NEtFOSE	1	U	1	U	1	U		U	1	U
NMeFOSA	**0.289**		**0.278**		**0.286**		**0.28**		**0.21**	
NMeFOSAA	**2.56**		**2.6**		**2.55**		**2.6**		**3.3**	
NMeFOSE	1	U	1	U	1	U		U	1	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.2	U	0.2	U	0.2	U		U	0.2	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.2	U	0.2	U	0.2	U		U	0.2	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)	0.401	U	0.401	U	0.4	U		U	0.4	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.2	U	0.2	U	0.2	U		U	0.2	U
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.2	U	0.2	U	0.2	U		U	0.2	U
Perfluorobutanesulfonic acid (PFBS)	**0.067**	J	**0.073**	J	**0.06**	J	**0.067**		**0.054**	J
Perfluorobutanoic acid (PFBA)	**0.254**	J	0.401	U	0.4	U	**0.085**		0.4	U
Perfluorodecane sulfonic acid (PFDS)	**0.736**		**0.762**		**0.578**		**0.69**		**0.80**	
Perfluorodecanoic acid (PFDA)	**0.293**		**0.292**		**0.313**		**0.30**		**0.33**	
Perfluorododecanoic acid (PFDoA)	**0.054**	J	**0.054**	J	**0.06**	J	**0.056**		**0.054**	J
Perfluoroheptanesulfonic acid (PFHpS)	**0.374**		**0.368**		**0.383**		**0.38**		**0.42**	
Perfluoroheptanoic acid (PFHpA)	**0.545**		**0.566**		**0.579**		**0.56**		**0.67**	
Perfluorohexanesulfonic acid (PFHxS)	**3.96**		**4.18**		**4.31**		**4.2**		**5.3**	
Perfluorohexanoic acid (PFHxA)	**0.737**		**0.844**		**0.803**		**0.79**		**0.85**	
Perfluorononanesulfonic acid (PFNS)	**0.453**		**0.437**		**0.379**		**0.42**		**0.48**	
Perfluorononanoic acid (PFNA)	**0.24**		**0.224**		**0.262**		**0.24**		**0.26**	
Perfluorooctane Sulfonamide (FOSA)	**74**		**72.3**		**81.8**		**76**		**82**	
Perfluorooctanesulfonic acid (PFOS)	**130**		**113**		**136**		**126**		**157**	
Perfluorooctanoic acid (PFOA)	**2.06**		**2.17**		**2.29**		**2.2**		**2.5**	
Perfluoropentanesulfonic acid (PFPeS)	**0.13**	J	**0.106**	J	**0.122**	J	**0.12**		**0.12**	J
Perfluoropentanoic acid (PFPeA)	**0.304**	J	**0.318**	J	**0.312**	J	**0.31**		**0.33**	J
Perfluorotetradecanoic acid (PFTA)	0.1	U	0.1	U	0.1	U		U	0.1	U
Perfluorotridecanoic acid (PFTrDA)	0.1	U	0.1	U	0.1	U		U	0.1	U
Perfluoroundecanoic acid (PFUnA)	**0.086**	J	**0.088**	J	**0.096**	J	**0.090**		**0.087**	J
PFDoS	**0.27**		**0.28**		**0.3**		**0.28**		**0.32**	

Massachusetts - MA-6 List
USEPA Screening Levels: PFBS Screening Level: 600 ng/l ; HFPO-DA:
Analyte Detected
***: PFAS determined via "EPA 1633 Draft" Method**
U: Analyte not Detected
J: Analyte below Reporting Limit but above Method Detection Limit

Table 1b: Initial Untreated Soil Analysis - Summary

Sample ID	FD-BASELINE-01 Sampled by Arcadis	FD-BASELINE-02 Sampled by Arcadis	FD-BASELINE-03 Sampled by Arcadis	FD-BASELINE CALCULATED AVERAGE	FD-01 Sampled by ART
Description	Untread Soil (Triplicate Baseline Homogenate)			Untreated Soil (Triplicate Average)	Untreated Soil Size Fraction < 2.0 mm
	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)
TOTAL PFAS	251	233	269	251	293

Table 2: Soil Particle Size Distribution

Size Fraction	Description	Soil Fraction < 12.5 mm		Soil Particle Size Whole Soil CALCULATED	Soil Particle Size Whole Soil
		Net Mass Dry (g)	Mass Distribution on Dry Weight Basis (%)	Mass Distribution on Dry Weight Basis (%)	Mass Distribution on Dry Weight Basis (%)
> 12.5 mm	Oversize (> 2.0 mm)	-		3.3%	21.1%
4.75-12.5 mm		27.4	11.2%	10.8%	
2.0-4.75 mm		17.6	7.2%	7.0%	
1.0-2.0 mm	Sand Fraction (0.063 - 2.0 mm)	38.1	15.6%	15.1%	76.5%
0.5-1.0 mm		72.3	29.6%	28.6%	
0.25-0.5 mm		57.4	23.5%	22.7%	
0.125-0.25 mm		21.4	8.7%	8.5%	
0.063-0.125mm		4.4	1.8%	1.7%	
0.038-0.063 mm	Fines Fraction (< 0.063 mm)	1.4	0.6%	0.6%	2.4%
<0.038 mm (fines)		4.6	1.9%	1.8%	
Total		244.6	100.0%	100.0%	100.0%

Table 3a: Basic Soil Washing Results

Sample ID	FD-BASELINE		FD-02		FD-OS 4.75-12.5		FD-03		FD-04		FD-FC		FD-W	
Description	Untreated Soil (Calculated Average)		Washed Oversize 2.0 - 4.75 mm		Washed Oversize 4.75 - 12.5 mm		Sand 0.063 - 2.0 mm after Hydraulic Separation		Sand > 0.063 mm after Hydraulic Separation and Water Rinse		Filter Cake		Wash Water	
Analysis	PFAS * (ug/kg)		PFAS * (ug/kg)		PFAS * (ug/kg)		PFAS * (ug/kg)		PFAS * (ug/kg)		PFAS * (ug/kg)		PFAS* (ng/L)	
Analyte	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
11Cl-PF3OUdS		U	0.4	U	0.79	U	0.4	U	0.4	U	0.4	U	8.36	U
3:3FTCA		U	0.5	U	0.98	U	0.5	U	0.5	U	0.5	U	12.5	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)		U	0.4	U	0.79	U	0.4	U	0.4	U	0.4	U	8.36	U
5:3FTCA		U	2.5	U	4.9	U	2.5	U	2.5	U	2.5	U	25.1	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	0.73		0.153	J	0.20	J	0.4	U	0.4	U	1.64		151	
7:3FTCA		U	2.5	U	4.9	U	2.5	U	2.5	U	2.5	U	41.8	U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	34		2.22		3.0		0.876		0.4	U	37.6		4880	
9Cl-PF3ONS		U	0.4	U	0.98	U	0.4	U	0.4	U	0.4	U	8.36	U
ADONA		U	0.4	U	0.79	U	0.4	U	0.4	U	0.4	U	8.36	U
NEtFOSA		U	0.15	U	0.20	U	0.15	U	0.15	U	0.127	J	2.09	U
NEtFOSAA	0.12		0.029	J	0.20	U	0.1	U	0.1	U	0.669		11.9	
NEtFOSE		U	1	U	2.0	U	1	U	1	U	1	U	20.9	U
NMeFOSA	0.28		0.151	J	0.079	J	0.037	J	0.1	U	10.3		58.2	
NMeFOSAA	2.6		0.296		0.20	U	0.236		0.1	U	12.5		241	
NMeFOSE		U	1	U	2.0	U	1	U	1	U	1	U	20.9	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		U	0.2	U	0.98	U	0.2	U	0.2	U	0.2	U	4.18	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		U	0.2	U	0.39	U	0.2	U	0.2	U	0.2	U	4.18	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)		U	0.4	U	0.98	U	0.4	U	0.4	U	0.4	U	8.36	U
Perfluoro-3-methoxypropanoic acid (PFMPA)		U	0.2	U	0.39	U	0.2	U	0.2	U	0.2	U	4.18	U
Perfluoro-4-methoxybutanoic acid (PFMBA)		U	0.2	U	0.39	U	0.2	U	0.2	U	0.2	U	4.18	U
Perfluorobutanesulfonic acid (PFBS)	0.067		0.1	U	0.28		0.1	U	0.1	U	0.136	J	17.3	
Perfluorobutanoic acid (PFBA)	0.085		0.806		0.30	J	0.4	U	0.4	U	0.239	J	26.3	
Perfluorodecane sulfonic acid (PFDS)	0.69		0.06	J	0.037	J	0.1	U	0.1	U	4.87		11.1	
Perfluorodecanoic acid (PFDA)	0.30		0.042	J	0.20	U	0.1	U	0.1	U	0.406		43.5	
Perfluorododecanoic acid (PFDoA)	0.056		0.1	U	0.20	U	0.1	U	0.1	U	0.508		2.09	U
Perfluoroheptanesulfonic acid (PFHpS)	0.38		0.029	J	0.23		0.1	U	0.1	U	0.329		90.3	
Perfluoroheptanoic acid (PFHpA)	0.56		0.039	J	0.21		0.031	J	0.1	U	0.392		130	
Perfluorohexanesulfonic acid (PFHxS)	4.2		0.272		2.9		0.131	J	0.061	J	4.19		917	
Perfluorohexanoic acid (PFHxA)	0.79		0.085	J	1.0		0.16	U	0.16	U	1.04		169	
Perfluorononanesulfonic acid (PFNS)	0.42		0.1	U	0.029	J	0.1	U	0.1	U	1.53		42.4	
Perfluorononanoic acid (PFNA)	0.24		0.047	J	0.048	J	0.1	U	0.1	U	0.311		48.8	
Perfluorooctane Sulfonamide (FOSA)	76		6.64		10		3.11		0.805		198		10,000	
Perfluorooctanesulfonic acid (PFOS)	126		8.56		28		4.15		0.788		192		17,200	
Perfluorooctanoic acid (PFOA)	2.2		0.134	J	2.3		0.122	J	0.037	J	1.71		454	
Perfluoropentanesulfonic acid (PFPeS)	0.12		0.1	U	0.33		0.1	U	0.1	U	0.231		21.1	
Perfluoropentanoic acid (PFPeA)	0.31		0.099	J	0.19	J	0.2	U	0.2	U	0.307	J	66.3	
Perfluorotetradecanoic acid (PFTA)		U	0.1	U	0.20	U	0.1	U	0.1	U	0.065	J	2.09	U
Perfluorotridecanoic acid (PFTrDA)		U	0.1	U	0.20	U	0.1	U	0.1	U	0.095	J	2.09	U
Perfluoroundecanoic acid (PFUnA)	0.090		0.1	U	0.20	U	0.1	U	0.1	U	0.369		5.55	
PFDoS	0.28		0.041	J	0.025	J	0.1	U	0.1	U	1.57		2.09	U

Massachusetts - MA-6 List
USEPA Screening Levels: PFBS Screening Level: 600 ng/l ; HFPO-DA:
Analyte Detected
*: PFAS determined via "EPA 1633 Draft" Method
U: Analyte not Detected
J: Analyte below Reporting Limit (RL) but above Method Detection Limit

Table 3b: Basic Soil Washing Results - Summary

Sample ID	FD-BASELINE	FD-02	FD-OS 4.75-12.5	FD-03	FD-04	FD-FC	FD-W
Description	Untreated Soil (Calculated Average)	Washed Oversize 2.0 - 4.75 mm	Washed Oversize 4.75 - 12.5 mm	Sand 0.063 - 2.0 mm after Hydraulic Separation	Sand > 0.063 mm after Hydraulic Separation and Water Rinse	Filter Cake	Wash Water
	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/L)
TOTAL PFAS	251	20	49	9	1.7	471	35
PRELIMINARY TREATMENT GOAL	2	2	2	2	2		
TOTAL PFAS SOURCE REMOVAL EFFICIENCY (Related to Untreated Soil)	-	92.1%	80.5%	96.5%	99.3%		

Table 4a: Advanced Soil Washing: Secondary Treatment Sand Fraction

Sample ID	FD-BASELINE		FD-04		FD-SA1		FD-SA2		FD-SA3		FD-SA4	
Description	Untreated Soil (Calculated Average)		Sand > 0.063 mm after Hydraulic Separation and Water Rinse		Sand 0.063 - 2.0 mm After Secondary Treatment Test 1		Sand 0.063 - 2.0 mm After Secondary Treatment Test 2		Sand 0.063 - 2.0 mm After Secondary Treatment Test 3		Sand 0.063 - 2.0 mm After Secondary Treatment Test 4	
Analysis	PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)	
Analyte	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
11Cl-PF3OUdS		U	0.4	U	0.80	U	0.81	U	0.81	U	0.83	U
3:3FTCA		U	0.5	U	1.0	U	1.0	U	1.0	U	1.0	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)		U	0.4	U	0.80	U	0.81	U	0.81	U	0.83	U
5:3FTCA		U	2.5	U	5.0	U	5.0	U	5.1	U	5.2	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	0.73		0.4	U	0.80	U	0.81	U	0.81	U	0.83	U
7:3FTCA		U	2.5	U	5.0	U	5.0	U	5.1	U	5.2	U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	34		0.4	U	0.80	U	0.81	U	0.81	U	0.83	U
9Cl-PF3ONS		U	0.4	U	1.0	U	1.0	U	1.0	U	1.0	U
ADONA		U	0.4	U	0.80	U	0.81	U	0.81	U	0.83	U
NEtFOSA		U	0.15	U	0.20	U	0.20	U	0.20	U	0.21	U
NEtFOSAA	0.12		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
NEtFOSE		U	1	U	2.0	U	2.0	U	2.0	U	2.1	U
NMeFOSA	0.28		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
NMeFOSAA	2.6		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
NMeFOSE		U	1	U	2.0	U	2.0	U	2.0	U	2.1	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		U	0.2	U	1.0	U	1.0	U	1.0	U	1.0	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		U	0.2	U	0.40	U	0.40	U	0.40	U	0.42	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)		U	0.4	U	1.0	U	1.0	U	1.0	U	1.0	U
Perfluoro-3-methoxypropanoic acid (PFMPA)		U	0.2	U	0.40	U	0.40	U	0.40	U	0.42	U
Perfluoro-4-methoxybutanoic acid (PFMBA)		U	0.2	U	0.40	U	0.40	U	0.40	U	0.42	U
Perfluorobutanesulfonic acid (PFBS)	0.067		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorobutanoic acid (PFBA)	0.085		0.4	U	0.11	J	0.81	U	0.81	U	0.83	U
Perfluorodecane sulfonic acid (PFDS)	0.69		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorodecanoic acid (PFDA)	0.30		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorododecanoic acid (PFDoA)	0.056		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluoroheptanesulfonic acid (PFHpS)	0.38		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluoroheptanoic acid (PFHpA)	0.56		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorohexanesulfonic acid (PFHxS)	4.2		0.061	J	0.040	J	0.20	U	0.20	U	0.21	U
Perfluorohexanoic acid (PFHxA)	0.79		0.16	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorononanesulfonic acid (PFNS)	0.42		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorononanoic acid (PFNA)	0.24		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorooctane Sulfonamide (FOSA)	76		0.805		0.26		0.18	J	0.12	J	0.18	
Perfluorooctanesulfonic acid (PFOS)	126		0.788		0.60		0.46	J	0.19		0.83	
Perfluorooctanoic acid (PFOA)	2.2		0.037	J	0.20	U	0.20	U	0.20	U	0.21	U
Perfluoropentanesulfonic acid (PFPeS)	0.12		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluoropentanoic acid (PFPeA)	0.31		0.2	U	0.40	U	0.40	U	0.40	U	0.42	U
Perfluorotetradecanoic acid (PFTA)		U	0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluorotridecanoic acid (PFTrDA)		U	0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
Perfluoroundecanoic acid (PFUnA)	0.090		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U
PFDoS	0.28		0.1	U	0.20	U	0.20	U	0.20	U	0.21	U

Massachusetts - MA-6 List
USEPA Screening Levels: PFBS Screening Level: 600 ng/l ; HFPO-DA:
Analyte Detected
*: PFAS determined via "EPA 1633 Draft" Method
U: Analyte not Detected
J: Analyte below Reporting Limit (RL) but above Method Detection Limit (MDL)

Table 4b: Advanced Soil Washing: Secondary Treatment Sand Fraction - Summary

Sample ID	FD-BASELINE	FD-04	FD-SA1	FD-SA2	FD-SA3	FD-SA4
Description	Untreated Soil (Calculated Average)	Sand > 0.063 mm after Hydraulic Separation and Water Rinse	Sand 0.063 - 2.0 mm After Secondary Treatment Test 1	Sand 0.063 - 2.0 mm After Secondary Treatment Test 2	Sand 0.063 - 2.0 mm After Secondary Treatment Test 3	Sand 0.063 - 2.0 mm After Secondary Treatment Test 4
	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)
TOTAL PFAS	251	1.7	1.0	0.6	0.3	1.0
PRELIMINARY TREATMENT GOAL	2	2	2	2	2	2
INCREMENTAL PFAS SOURCE REMOVAL EFFICIENCY	-	-	40.3%	62.2%	81.7%	40.3%
TOTAL CUMULATIVE PFAS SOURCE REMOVAL EFFICIENCY (Related to Untreated Soil)	-	99.3%	99.6%	99.7%	99.9%	99.6%

Table 5a: Advanced Soil Washing: Secondary Treatment Oversize Fraction (> 2.0 mm)

Sample ID	FD-BASELINE		FD-OS2.0-4.75		FD-OS4.75-12.5		CALCULATED		FD-OSA1		FD-OSA2	
Description	Untreated Soil (Calculated Average)		Washed Oversize 2.0 - 4.75 mm		Washed Oversize 4.75 - 12.5 mm		Washed Oversize 2.0 - 12.5 mm CALCULATED VALUE		Washed Oversize 2.0-12.5 mm after Secondary Treatment Test 1		Washed Oversize 2.0-12.5 mm after Secondary Treatment Test 2	
Analysis	PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)		PFAS* (ug/kg)	
Analyte	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
11Cl-PF3OUdS		U	0.4	U	0.79	U			0.77	U	0.79	U
3:3FTCA		U	0.5	U	0.98	U			0.97	U	0.98	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)		U	0.4	U	0.79	U			0.77	U	0.79	U
5:3FTCA		U	2.5	U	4.9	U			4.8	U	4.9	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	0.73		0.153	J	0.20	J	0.18		0.77	U	0.79	U
7:3FTCA		U	2.5	U	4.9	U			4.8	U	4.9	U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	34		2.22		3.0		2.7		0.54	J	0.54	J
9Cl-PF3ONS		U	0.4	U	0.98	U			0.97	U	0.98	U
ADONA		U	0.4	U	0.79	U			0.77	U	0.79	U
NEtFOSA		U	0.15	U	0.20	U			0.19	U	0.20	U
NEtFOSAA	0.12		0.029	J	0.20	U	0.13		0.19	U	0.20	U
NEtFOSE		U	1	U	2.0	U			1.9	U	2.0	U
NMeFOSA	0.28		0.151	J	0.079	J	0.11		0.19	U	0.20	U
NMeFOSAA	2.6		0.296		0.20	U	0.24		0.19	U	0.20	U
NMeFOSE		U	1	U	2.0	U			1.9	U	2.0	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		U	0.2	U	0.98	U			0.97	U	0.98	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		U	0.2	U	0.39	U			0.39	U	0.39	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)		U	0.4	U	0.98	U			0.97	U	0.98	U
Perfluoro-3-methoxypropanoic acid (PFMPA)		U	0.2	U	0.39	U			0.39	U	0.39	U
Perfluoro-4-methoxybutanoic acid (PFMBA)		U	0.2	U	0.39	U			0.39	U	0.39	U
Perfluorobutanesulfonic acid (PFBS)	0.067		0.1	U	0.28		0.21		0.19	U	0.023	J
Perfluorobutanoic acid (PFBA)	0.085		0.806		0.30	J	0.50		0.77	U	0.79	U
Perfluorodecane sulfonic acid (PFDS)	0.69		0.06	J	0.037	J	0.046		0.19	U	0.20	U
Perfluorodecanoic acid (PFDA)	0.30		0.042	J	0.20	U	0.14		0.19	U	0.20	U
Perfluorododecanoic acid (PFDoA)	0.056		0.1	U	0.20	U	0.16		0.19	U	0.20	U
Perfluoroheptanesulfonic acid (PFHpS)	0.38		0.029	J	0.23		0.15		0.19	U	0.033	J
Perfluoroheptanoic acid (PFHpA)	0.56		0.039	J	0.21		0.14		0.19	U	0.20	U
Perfluorohexanesulfonic acid (PFHxS)	4.2		0.272		2.9		1.88		0.12	J	0.30	
Perfluorohexanoic acid (PFHxA)	0.79		0.085	J	1.0		0.64		0.075	J	0.094	J
Perfluorononanesulfonic acid (PFNS)	0.42		0.1	U	0.029	J	0.057		0.19	U	0.20	U
Perfluorononanoic acid (PFNA)	0.24		0.047	J	0.048	J	0.048		0.19	U	0.20	U
Perfluorooctane Sulfonamide (FOSA)	76		6.64		10		8.7		1.3		1.2	
Perfluorooctanesulfonic acid (PFOS)	126		8.56		28		20		1.9		3.6	
Perfluorooctanoic acid (PFOA)	2.2		0.134	J	2.3		1.5		0.19	U	0.20	U
Perfluoropentanesulfonic acid (PFPeS)	0.12		0.1	U	0.33		0.24		0.19	U	0.024	J
Perfluoropentanoic acid (PFPeA)	0.31		0.099	J	0.19	J	0.15		0.39	U	0.39	U
Perfluorotetradecanoic acid (PFTA)		U	0.1	U	0.20	U			0.19	U	0.20	U
Perfluorotridecanoic acid (PFTrDA)		U	0.1	U	0.20	U			0.19	U	0.20	U
Perfluoroundecanoic acid (PFUnA)	0.090		0.1	U	0.20	U			0.19	U	0.20	U
PFDoS	0.28		0.041	J	0.025	J	0.031		0.19	U	0.20	U

Massachusetts - MA-6 List
USEPA Screening Levels: PFBS Screening Level: 600 ng/l ; HFPO-DA:
Analyte Detected
*: PFAS determined via "EPA 1633 Draft" Method
U: Analyte not Detected
J: Analyte below Reporting Limit (RL) but above Method Detection Limit (MDL)

Table 5b: Advanced Soil Washing: Secondary Treatment Oversize Fraction (> 2.0 mm) - Summary

Sample ID	FD-BASELINE	FD-OS2.0-4.75	FD-OS4.75-12.5	CALCULATED	FD-OSA1	FD-OSA2
Description	Untreated Soil (Calculated Average)	Washed Oversize 2.0 - 4.75 mm	Washed Oversize 4.75 - 12.5 mm	Washed Oversize 2.0 - 12.5 mm CALCULATED VALUE	Washed Oversize 2.0-12.5 mm after Secondary Treatment Test 1	Washed Oversize 2.0-12.5 mm after Secondary Treatment Test 2
	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)	PFAS (ug/kg)
TOTAL PFAS	251	20	49	38	3.9	5.8
PRELIMINARY TREATMENT GOAL	2	2	2	2	2	2
INCREMENTAL PFAS SOURCE REMOVAL EFFICIENCY	-	-	-	-	89.5%	84.6%
TOTAL CUMULATIVE PFAS SOURCE REMOVAL EFFICIENCY (Related to Untreated Soil)	-	92.1%	80.4%	85.0%	98.4%	97.7%

PHOTOS



Photo 1: Ft. Devens - Soil as Received



Photo 2: Soil Oversize Size Fraction + 12.5 mm after Dry Screening



Photo 3: Soil Oversize Size Fraction 4.75 - 12.5 mm after Dry Screening



Photo 3: Soil Particle Size Fractions (< 4.75 mm) after Wet Screening & Drying

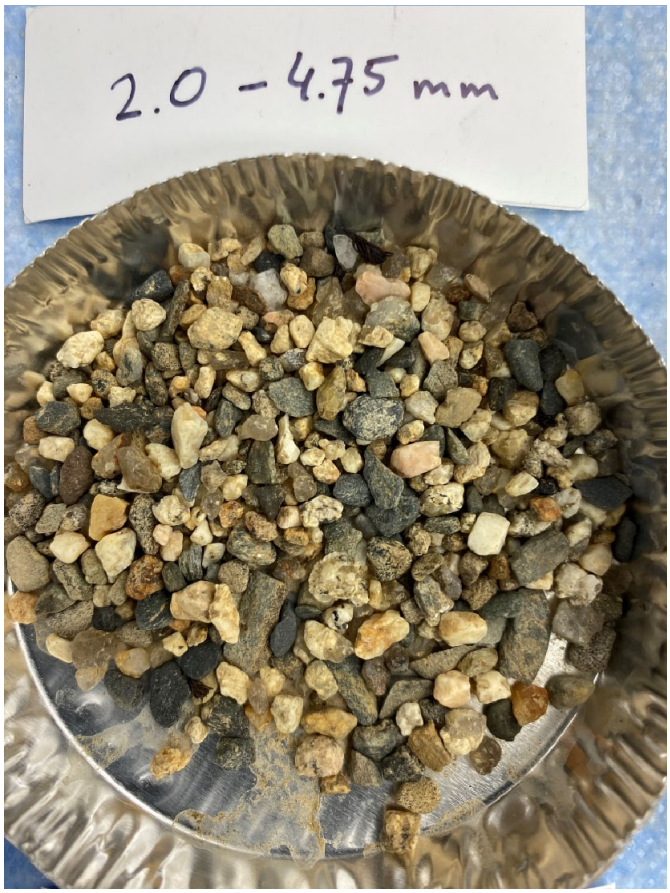


Photo 4: Size Fraction 2.0 – 4.75 mm



Photo 5: Size Fraction 1.0 – 2.0 mm



Photo 6: Size Fraction 0.5 – 1.0 mm

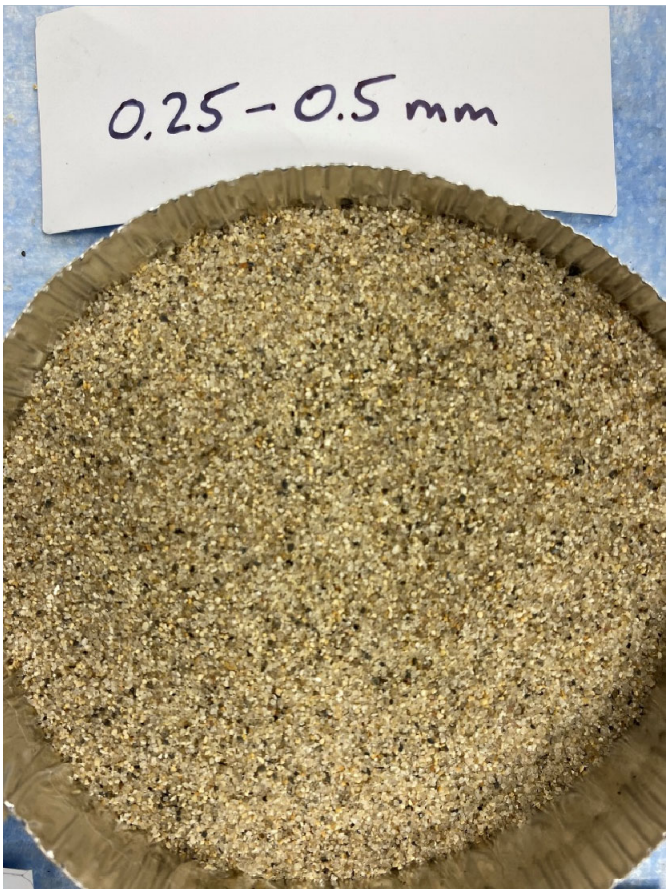


Photo 7: Size Fraction 0.25 – 0.5 mm

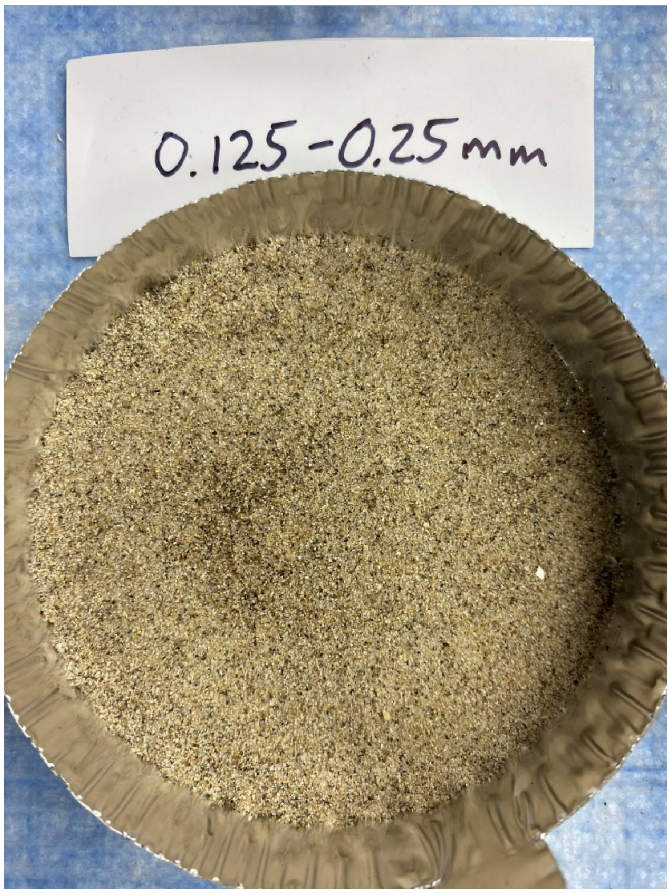


Photo 8: Size Fraction 0.125 – 0.25 mm



Photo 9: Size Fraction 0.063 – 0.125 mm

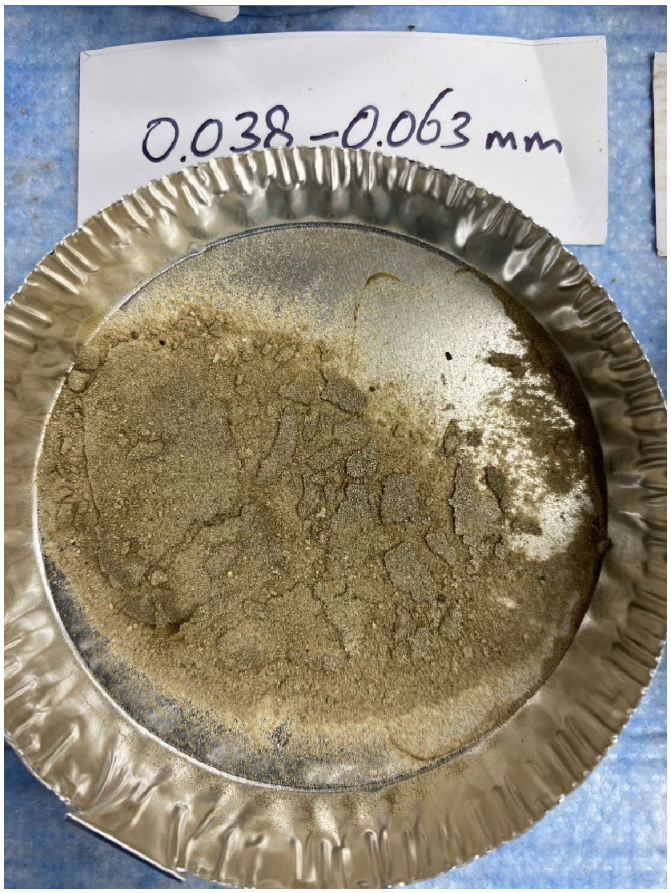


Photo 10: Size Fraction 0.038 – 0.063 mm

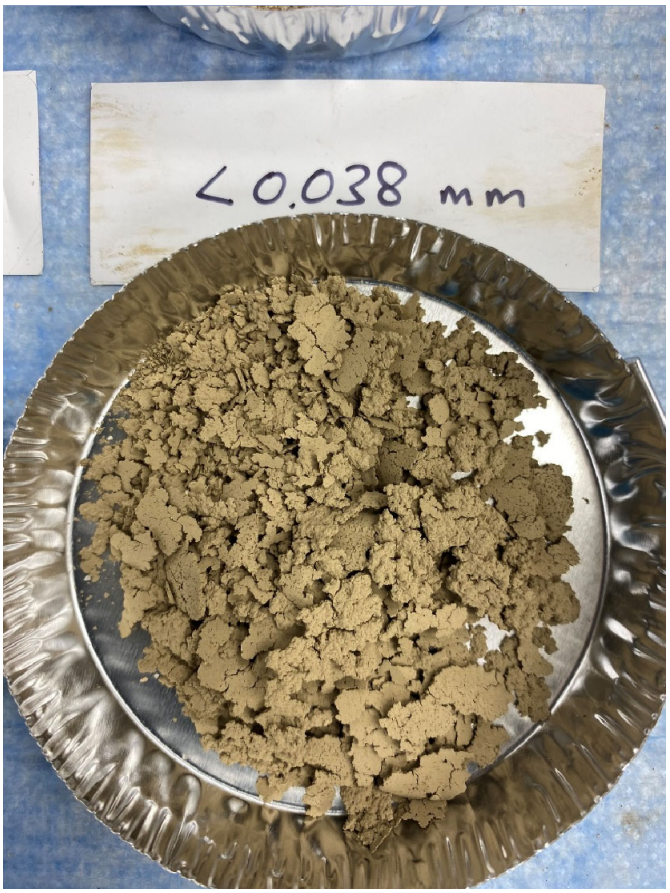


Photo 11: Size Fraction Less than 0.038 mm



Photo 12: Wet Screening at 2.0 mm



Photo 13: Soil Oversize Fraction 2.0 – 4.75 mm after Wet Screening

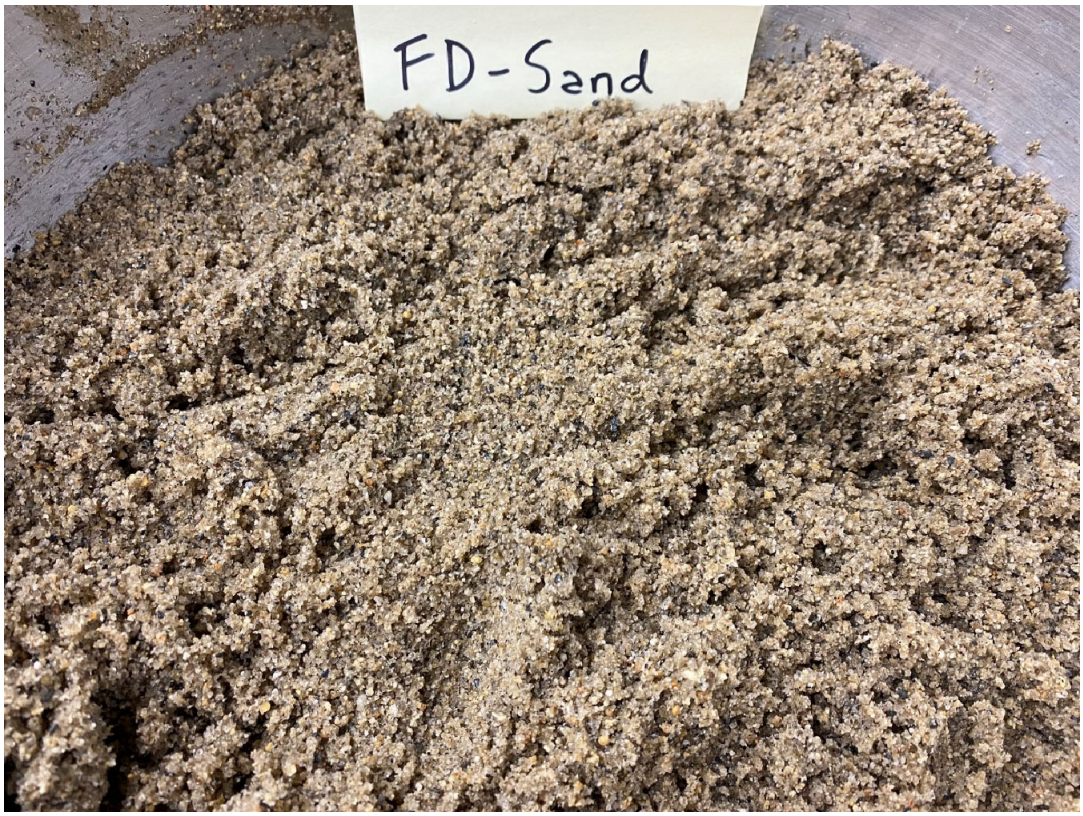


Photo 14: Sand Fraction < 2.0 mm after Wet Screening and Hydraulic Separation



Photo 15: Filter Cake – Fines Fraction less than ~0.063 mm after Flocculation and Dewatering



Photo 16: Wash Water Flocculation

United States Army Corps of Engineers
New England District

In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results

Area of Contamination 31 – Former Fire Training Area
Former Fort Devens Army Installation
Devens, Massachusetts

IDIQ Contract No. W912WJ19D0014
Task Order No. W912WJ20F0105

September 8, 2025

In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results

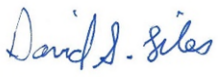
Area of Contamination 31 – Former Fire Training Area
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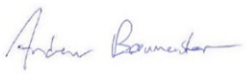
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Acronyms and Abbreviations

µg	microgram
µg/kg	microgram per kilogram
%	percent
AOC 31	Area of Contamination 31
Arcadis	Arcadis U.S., Inc.
Arcadis Treatability Laboratory	Arcadis Treatability Laboratory in Durham, North Carolina
BFS	blast furnace slag cement
cm/s	centimeters per second
DoD	United States Department of Defense
Fort Devens	Former Fort Devens Army Installation
HDPE	high density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
ISS	in situ stabilization/solidification
LEAF	Leaching Environmental Assessment Framework
MassDEP	Massachusetts Department of Environmental Protection
mL	milliliter
mm	millimeter
ng	nanogram
ng/L	nanogram per liter or part per trillion
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate or perfluorooctane sulfonic acid
PFOSA	perfluorooctanesulfonamide

PFPeA	perfluoropentanoic acid
PFPrA	perfluoropropanoic acid
PLC	Portland limestone cement
site	former Fort Devens Army Installation (Fort Devens) located in Devens, Massachusetts
TFSI	bis(trifluoromethylsulfonyl)amine
TOP	Total Oxidizable Precursor
tsf	tons per square foot
UCS	unconfined compressive strength
USEPA	United States Environmental Protection Agency

1 Introduction and Objectives

The Arcadis Treatability Laboratory in Durham, North Carolina (Arcadis Treatability Laboratory) performed a bench-scale treatability study to evaluate and support design considerations for a proposed field-scale in-situ solidification/stabilization (ISS) pilot test for treatment of soils impacted by per- and polyfluoroalkyl substances (PFAS) at Area of Contamination 31 (AOC 31) at the former Fort Devens Army Installation (Fort Devens) located in Devens, Massachusetts (the "site"). ISS is a well-established source area sequestration and treatment technology that has been demonstrated effective in addressing a broad range of environmental contaminant classes. ISS for PFAS-impacted soils can employ two primary mechanisms to suppress the leaching and mobility of PFAS from soil to groundwater. The first mechanism is stabilization, which uses sorptive admixtures to bind PFAS molecules and suppress their leachability. The second mechanism is solidification, which uses cement to encapsulate PFAS-impacted soils within a low permeability monolith, thereby decreasing the surface area exposed to infiltrating water and further limiting leaching.

The specific objectives of this treatability study were to:

- Evaluate commercially available sorptive media products to identify the type and dose of product most effective at stabilizing PFAS mass in the site-specific study soils.
- Evaluate formulations and dosage rates of commercially available cements to identify the most effective formulation to solidify the study soils. In particular, the treated soil matrix will need to have suitable physical properties to withstand anticipated current and future site activities and surface/subsurface loads without settling or deteriorating.
    - A target minimum unconfined compressive strength (UCS) of 50 pounds per square inch (psi) was established for the treatability study. This target minimum is typical for in-situ soil mixing applications because it is supportive of post-implementation equipment mobilization. The target UCS for a field-scale pilot test would be developed prior to implementation based on geotechnical investigation results and the anticipated current and future use of the pilot test area.
- Evaluate the ability of selected admixtures to achieve reduction in the hydraulic conductivity of the study soils resulting from treatment.
    - A target maximum hydraulic conductivity for the treated soil matrix would be developed based on in-situ field data but is anticipated to be on the order of $1x10^{-6}$ centimeters per second (cm/s).
- Evaluate the extent to which the ISS-treated soil encapsulates the PFAS mass present in study soils and the extent to which solidified and unsolidified test mixes immobilize PFAS, as determined through bench-scale leaching assessments.

2 Materials and Methods

2.1 Sample Receipt, Homogenization, and Baseline Analyses

The Arcadis Treatability Laboratory received a set of soil samples from Fort Devens AOC 31 on August 16, 2022. Soil samples were received in eight individual five-gallon buckets. The sample identifications (IDs) and associated sampling depths are listed in Table 1.

The eight individual soil samples were homogenized into a single representative composite sample using a coning and quartering technique. First, a large, clean polyethylene sheet was laid on the laboratory floor to prevent cross-contamination during the homogenization process. Then, the samples were placed in the middle of the sheet to form a central, uniform, conical pile that was subsequently separated using shovels. This pile was first separated into four equal sections at the corners of the sheet. Alternating heaps, the soil was then re-combined in a new, central pile. This process was repeated five times. After the fifth repetition, the homogenized soil was distributed evenly between the original eight buckets for storage until further use. Shovels used in this process were decontaminated with deionized water and Alconox detergent.

Three buckets were randomly selected to be subsampled for baseline PFAS analysis by Pace Gulf Coast Laboratory in Baton Rouge, Louisiana (Pace Gulf Coast). Baseline PFAS analysis was performed by Third Draft Method 1633 and Total Oxidizable Precursor (TOP) Assay QSM B15. Baseline PFAS analysis by TOP Assay QSM B15 included the evaluation of pre- and post-TOP assay. Duplicate moisture content analysis of the composite soil was performed by subsampling two buckets at random. These samples were processed for moisture content by gravimetric oven drying at the Arcadis Treatability Laboratory; results are presented in Table 2.

2.2 Sorptive Media Batch Testing

Bench-scale batch testing was performed to evaluate the ability of commercially available PFAS-sorptive amendments to limit PFAS flux from site soils into the aqueous phase. The testing also provided initial insight into optimal dosing rates for each tested amendment.

Soil used in the batch testing was prepared by obtaining one kilogram (kg) from each of three random buckets of composite soil. This 3 kg soil sample was sieved with a No. 8 mesh (2.36-millimeter [mm] opening size) sieve to remove any oversized particles and to add a degree of standardization to the soil particle size introduced into each batch test reactor vessel. An average of 17.7% of the total soil sample mass was removed as oversized particles. Soil moisture content analysis of the material passing the No. 8 sieve was performed in duplicate, and the average moisture content result was used in the determination of sorptive media addition rates by soil dry mass. Moisture content analysis was performed by gravimetric oven drying at the Arcadis Treatability Laboratory; results are presented in Table 2.

RemBind 100X and Cetco FLUORO-SORB 100 were the primary sorptive media evaluated in this batch testing. RemBind 100 and FLUORO-SORB 200 were also evaluated at a single addition rate for comparative purposes. A total of 14 batch reactors, plus an equipment blank, were created, as summarized in Table 3.

City of Durham, North Carolina tap water was used in the 14 batch reactors. Duplicate control reactors were created with only site soil and tap water, no sorbent added. An additional reactor, FD-Blank, was created with only tap water (i.e., without any site soil or sorbent) to assess the potential for cross-contamination introduced by either the tap water or the centrifuge tubes used as the reaction vessels. Five addition rates of sorbent were tested for both RemBind 100X and FLUORO-SORB 100: 1.0%, 2.0%, 2.5%, 3.0%, and 4.0%. Batch test reactors were also created to test addition rates of 2.0% RemBind 100 (Sample ID: FD-RB-2-1) and 2% FLUORO-SORB 200 (Sample ID: FD-FS-2-1). Corning® 500 milliliter (mL) polypropylene centrifuge tubes served as the reaction vessels for these tests. Each vessel received 200 grams of sieved and composited site soil, 400 mL of tap water, and PFAS sorbent; sorbent doses are listed in Table 3. Once all the components were added to the reaction vessels, they were tightly sealed and placed horizontally on a roller table for continuous agitation and mixing for 120 hours. Because Third Draft Method 1633 required more than a liter of sample for each PFAS analysis, multiple replicate reaction vessels were created for each test condition.

Following mixing, the reaction vessels representing test conditions FD-Blank, FD-FS-2, FD-FS-3, FD-FS-4, and FD-FS-5 were removed from the roller table and centrifuged using a Sorvall Model RC-3 for 20 minutes at 4800 revolutions per minute, or a relative centrifugal force of 6216. The clean supernatant water representing each test condition was then poured into three 500 mL high density polyethylene (HDPE) sample bottles (i.e., three sample bottles were generated for each test condition). The centrifuge malfunctioned during centrifugation of the second batch of reaction vessels so the reaction vessels representing the remaining test conditions could not be centrifuged. These vessels were left to settle quiescently until solid particulates were visually observed to have settled to the bottom of the centrifuge tubes to the greatest degree practicable. Because suspended particulate that appeared to be sorbent particles too low in density to settle gravimetrically was still observed in many of these vessels, the supernatant water from these vessels was strained prior to sample collection. Entrainment of any of these suspended particles into an analytical sample presented a possible bias in aqueous phase PFAS concentrations. To minimize potential bias in visible floating particulate following centrifugation, the supernatant generated from the test vessels that had previously undergone successful centrifugation was also strained. To strain each sample, a 100-mL polypropylene pipette was used to extract particulate-free water from below the floating particulate layer and above the settled solids layer. New pipettes were used for each sample to avoid potential cross contamination. The contents of the pipette were emptied through a HDPE mesh into a polypropylene beaker to prevent the introduction of large solids into the final sample aliquot. Aqueous sample was then transferred from the beaker to the three 500 mL HDPE bottles that served as the final analytical sample for each test condition. PFAS analysis of the batch testing water samples was conducted at Pace Gulf Coast by Third Draft Method 1633.

2.3 Preliminary Solidification Performance Testing

A series of preliminary solidification test mixes were created to evaluate optimal addition rate(s) of solidifying admixture(s) to achieve geotechnical performance targets. A preliminary evaluation of three initial solidification test mix formulations revealed that Type IL Portland-limestone cement (PLC) addition rates by soil dry mass of 7.5%, 10%, and 12.5% achieved the target minimum UCS of 50 psi at two days of curing. Six additional test mix formulations were then created with one or more solidifying agents and bentonite clay. Two mixes received only PLC, two mixes received a mixture of PLC and ground-granulated blast furnace slag cement (BFS), and two mixes received PLC, BFS, and bentonite clay. As with the batch testing, tap water was used as the mixing water in creating these test mixes. Mix designs are presented in Table 4.

Each mix was created in a stainless-steel mixing bowl using a Hobart Model HL-200 planetary mixer. The PLC and BFS were added as dry materials directly into the soil, immediately followed by the addition of mixing water. Mixing water was added slowly in small increments during the mixing process to gauge the water balance of the soil. In the creation of mixes receiving bentonite, the bentonite clay was first pre-hydrated with a portion of the total mixing water volume and sheared for several minutes using a stainless-steel mixing paddle attached to an electric variable speed drill. This shearing step is necessary to initiate the swelling properties of the bentonite clay. The resultant bentonite slurry was added to the test mixtures and blended into the mixes using the planetary mixer.

Once the mixtures were fully mixed (based on visual assessment), miniature slump cone tests were performed on each test mix as a quantitative measure of mix workability and water addition. The miniature slump method was derived from ASTM Method C143-00, which requires a volume of sample too large to be feasibly tested at bench scale. A miniature slump cone has a height of 150 mm, a bottom diameter of 100 mm, and a top diameter of 75 mm. The miniature slump measurement was then converted to a standard slump measurement in inches using the following equation, as determined by Malusis et al. (2008)[1]:

$$S_S = (60 + 1.8S_M)/25.4$$

where

S_S = Standard Slump (in inches)
S_M = Miniature Slump (in mm)

Target standard slump values typically range from 4 to 7 inches, with lower slump values being desirable if the soil characteristics are amenable to lower mixing water addition rates while still achieving a workable state. The standard slump values measured in the six preliminary solidification test mixes ranged from 3.6 inches (Mix-8) to 4.6 inches (Mix-5 and Mix-7).

Following miniature slump testing, each mix was packed into a series of two-inch-diameter by four-inch-tall plastic cylindrical geotechnical molds. Each mold was packed in lifts with vigorous tapping during filling to preclude the entrainment of air pockets within the cured samples. Completed molds were placed inside large Ziploc bags at ambient laboratory temperature to cure until further processing. One mold from each mix was tested for early strength development at one and four days of curing using a pocket penetrometer. The maximum reading on the pocket penetrometer used in this study was 4.50 tons per square foot (tsf), and all six mixes developed strength exceeding that range at day four. Penetrometer readings are provided in Table 4.

At seven days of curing, one mold from each test mix was submitted to Geotechnics Inc. in Raleigh, North Carolina (Geotechnics) to be tested for UCS by ASTM D1633. Two molds from each test mix were submitted to Geotechnics at 28 days of curing for duplicate UCS analysis. After reviewing the results of UCS testing (Table 5), one mold each from Mix-4, Mix-6, and Mix-8 were submitted to Geotechnics to be analyzed for hydraulic conductivity by ASTM D5084.

2.4 Final Test Mix Creation and Performance Testing

A final phase of bench-scale testing was conducted to confirm geotechnical and stabilization performance of optimal blends of admixtures and to evaluate PFAS leachability from these mix formulations using the United

[1] Malusis, Michael, Jeffrey Evans, Michael McLane, and Nikki Woodward. “A Miniature Cone for Measuring the Slump of Soil-Bentonite Cutoff Wall Backfill.” Geotechnical Testing Journal 31, no. 5 (n.d.): 373–80.

States Environmental Protection Agency's (USEPA) Leaching Environmental Assessment Framework (LEAF). Specifically, two LEAF methods were used to assess PFAS leachability during this evaluation:

- LEAF 1314 – Liquid-Solid Partitioning as a Function of Liquid-Solid Ratio for Constituents in Solid Materials Using an Up-Flow Percolation Column Procedure
- LEAF 1315 – Mass Transfer Rates of Constituents in Monolithic or Compacted Granular Materials Using a Semi-Dynamic Tank Leaching Procedure

Three solidified mixes and three unsolidified mixes were evaluated during this bench-scale testing phase. As with previous phases of testing, all admixture addition rates were by soil dry mass. Test mix designs are described in the following subsections.

2.4.1 Solidified Mix Evaluation

Upon reviewing the PFAS sorption results from the sorbent batch testing and the geotechnical performance results from the solidification test mixes, three final ISS mix designs were evaluated for UCS by ASTM 1633, hydraulic conductivity by ASTM D5084, and PFAS leachability by LEAF Method 1315/USEPA Method 1633:

- 2.5% PLC + 5% BFS
- 2.5% PLC + 5% BFS + 1% RemBind 100X
- 2.5% PLC + 5% BFS + 1% FLUORO-SORB 100

All three mixes received cement doses of 2.5% PLC and 5% BFS by soil dry mass. These mixes were assigned sample IDs LEAF-1, LEAF-2, and LEAF-3. In addition to the cement admixtures, LEAF-1 received 1% FLUORO-SORB 100 by soil dry mass and LEAF-2 received 1% RemBind 100X by soil dry mass. LEAF-3 did not receive a PFAS-sorptive admixture and served as a cement-only control. Mix designs are detailed in Table 5.

Each mix received 3 kg of composited and No. 8-sieved soil. Mixes were created in a stainless-steel mixing bowl using a Hobart Model HL-200 planetary mixer. The admixtures (i.e., PLC, BFS, and corresponding PFAS sorbent) were added as dry materials directly to the soil and immediately followed by the addition of mixing water. The amount of mixing water added to each mix and the resulting water-to-admixture ratios are included in Table 5.

Following homogenization, a miniature slump test was conducted to confirm workability and mixing water balance. The test mixes were then packed into a series of two-inch-diameter by four-inch-tall plastic cylindrical geotechnical molds. Each mold was packed in lifts with vigorous tapping during filling to preclude the entrainment of air pockets within the cured samples. Completed molds were placed inside large Ziploc bags at ambient laboratory temperature to cure until further processing. One mold from each mix was tested for early strength development at one and four days of curing using a pocket penetrometer. The maximum reading on the pocket penetrometer used in this study was 4.50 tsf, and all three mixes developed strength exceeding that range at day three. Penetrometer readings are provided in Table 5

At seven days of curing, one mold from each test mix was submitted to Geotechnics to be tested for UCS by ASTM D1633. Two molds from each test mix were submitted to Geotechnics at 28 days of curing for duplicate UCS analysis. One mold from each mix was also evaluated for hydraulic conductivity by ASTM D5084 at 28 days of curing.

Following the geotechnical performance evaluation, one mold from each of the three solidified mixes was evaluated for PFAS leachability. Leachability testing was performed by Eurofins Pittsburgh using the protocol detailed in USEPA LEAF Method 1315, "Mass Transfer Rates of Constituents in Monolithic or Compacted

Granular Materials Using a Semi-Dynamic Tank Leaching Procedure." Leachate renewal was performed according to the standard LEAF 1315 schedule. The leachates produced at LEAF 1315 leaching intervals T03, T04, and T09 were submitted for PFAS analysis. This testing program therefore generated three unique leachate samples from each of the three solidified mix samples subjected to the LEAF 1315 leaching program, for a total of nine leachate samples. These leachate samples were shipped from Eurofins Pittsburgh to Pace Gulf Coast for PFAS analysis by USEPA Method 1633. Eurofins Pittsburgh performed analyses of pH by USEPA 9040C, dissolved oxygen by SM 4500, and specific conductance by SM2510B on all nine leachate samples.

2.4.2 Unsolidified Mix Evaluation

In addition to the solidified test mixes, a series of tests were conducted to evaluate the ability of RemBind 100X and FLUORO-SORB 100 to limit PFAS leachability in the absence of solidification. Three unsolidified mixes were evaluated for PFAS leachability by LEAF Method 1314/USEPA Method 1633:

- Soil-only control (no adsorptive media)
- 1% RemBind 100X
- 1% FLUORO-SORB 100

These mixes were assigned sample IDs LEAF-4, LEAF-5, and LEAF-6. The first sample, LEAF-4, was unamended composited and No. 8-sieved site soil, which served as a control. The second sample, LEAF-5, received 1% RemBind 100X by soil dry mass. The third sample, LEAF-6, received 1% FLUORO-SORB 100 by soil dry mass. Mix designs are detailed in Table 6.

Each mix received 4.9 kg of composited and No. 8-sieved soil. Mixes were created in a stainless-steel mixing bowl using a Hobart Model HL-200 planetary mixer. The admixtures (RemBind 100X and FLUORO-SORB 100) were added as dry materials directly to the soil. No mixing water was added to these samples. The control sample, LEAF-4, was also mixed in the planetary mixer to ensure consistency in sample preparation. Each of the three samples was transferred into two-gallon HDPE pails, and the three pails were then shipped to Eurofins Pittsburgh for leachability testing.

Leachability testing was performed by Eurofins Pittsburgh using the protocol detailed in USEPA LEAF Method 1314, "Liquid-Solid Partitioning as a Function of Liquid-Solid Ratio for Constituents in Solid Materials Using an Up-Flow Percolation Column Procedure." Leachate collection, compositing, and PFAS analysis was performed according to a modified variant of "Option E" in the LEAF 1314 schedule of fraction collections. Five samples of LEAF 1314 leachate were submitted for PFAS analysis:

- leaching interval T01;
- a composited sample of leaching intervals T02, T03, and T04;
- leaching interval T05;
- a composited sample of leaching intervals T06, T07, and T08; and
- leaching interval T09.

This testing program therefore generated five unique leachate samples from each of the three unsolidified mix samples subjected to the LEAF 1314 leaching program, for a total of 15 leachate samples. These leachate samples were shipped from Eurofins Pittsburgh to Pace Gulf Coast for PFAS analysis by USEPA Method 1633. Prior to compositing leachate samples for subsequent PFAS analysis, Eurofins Pittsburgh performed analyses of

pH by USEPA 9040C, dissolved oxygen by SM 4500, and specific conductance by SM2510B on all 27 leachate samples.

3 Results and Discussion

3.1 Baseline Soil Sample Results

The results of PFAS characterization performed on the coned-and-quartered composite baseline soil samples by Third Draft Method 1633 and by QSM B15 (pre- and post-TOP) are presented in Tables 7 and 8, respectively.

Results from the Third Draft Method 1633 analysis show perfluorooctanesulfonic acid (PFOS) to be the predominant PFAS present in the soil samples (average concentration of 126 µg/kg), followed by perfluorooctanesulfonamide (PFOSA) (average concentration of 76.0 µg/kg), 1H,1H,2H,2H-perfluorodecane sulfonic acid (8:2 FTS) (average concentration of 34.5 µg/kg), and perfluorohexanesulfonic acid **(**PFHxS) (average concentration of 4.15 µg/kg).

Pre- and post-TOP assay results are useful for evaluating the potential presence of precursors in the soil matrix. Results from the pre- and post-TOP assay by QSM B15 show increased concentrations of the short-chain perfluoroalkyl carboxylates perfluoropentanoic acid (PFPeA), perfluorohexanoic acid (PFHxA), and perfluoroheptanoic acid (PFHpA) following the oxidative digestion step. Because these compounds are known terminal end products of PFAS precursor mass conversion, these results indicate that PFAS precursor compounds capable of transformation into perfluoroalkyl acids may also be present in site soils. Post-TOP results also show the disappearance of PFOSA, a known precursor compound to PFOS, following the oxidative digestion step. The average PFOS concentration measured in the post-TOP samples was 38.9 µg/kg and in the pre-TOP sample was 131 µg/kg, a 70% reduction in detected PFOS concentration following the oxidative digestion step. Because PFOS is not considered to be degradable by the oxidative processes used in the TOP assay, this result may implicate a difficulty in obtaining representative results for certain PFAS during the TOP assay assessment.

3.2 Sorptive Media Batch Testing Results

The results of PFAS analysis by Third Draft Method 1633 of the batch testing supernatant water samples are presented in Table 9. This discussion focuses on the results pertaining to the six PFAS (PFOS, perfluorooctanoic acid [PFOA], PFHxS, perfluorononanoic acid [PFNA], PFHpA, and perfluorodecanoic acid [PFDA]) that were regulated in drinking water by Massachusetts Department of Environmental Protection (MassDEP) at the time of the assessment plus the two compounds hexafluoropropylene oxide dimer acid (HFPO-DA, otherwise known as “GenX”) and perfluorobutanesulfonic acid (PFBS). The Department of Defense (DoD) has subsequently accepted risk screening levels for the following 10 PFAS compounds: PFOS, PFOA, perfluorobutanoic acid (PFBA), PFBS, PFHxA, PFHxS, bis(trifluoromethylsulfonyl)amine (TFSI), HFPO-DA, and perfluoropropanoic acid (PFPrA).[2]

The highest PFAS concentrations were in the duplicate unamended control samples FD-CONTROL-A and FD-CONTROL-B. PFOS was detected an average concentration of 48,000 nanograms per liter [ng/L]), PFHxS at an average of 2,600 ng/L), PFOA at an average of 1300 ng/L), PFHpA at an average of 365 ng/L), PFNA at an average of 135 ng/L), PFDA at an average of 99.5 ng/L), and PFBS at an average 29.5 ng/L). HPFO-DA was not detected above the analytical detection limit in either sample (4.2 ng/L and 4.1 ng/L, respectively).

PFAS analysis of the sorptive media-amended batch test supernatant samples generally showed effective suppression of PFAS flux from the soil fraction into the aqueous phase. The degree to which each sorbent and

[2] There are no current USEPA-approved analytical methods to measure TFSI and PFPrA.

amendment rate limited partitioning of PFAS from soil into the aqueous phase supernatant was assessed by dividing the concentration of the PFAS compound in the sorptive media-amended sample by the average concentration of that compound detected in the unamended control samples, and then subtracting that value from one to return a percent reduction in leached PFAS compared with the control samples. In cases where a compound was not detected above the analytical method detection limit in a sorptive media-amended sample, the analytical detection limit was used as a conservative measure of leaching suppression. Because HFPO-DA was not detected in the control samples or any of the sorptive media-amended samples, the percent reduction calculation was not performed for this compound.

Results of the leached PFAS assessment are presented in Table 10. The results show that, on average, concentrations of the eight PFAS evaluated were lower by more than 99% in the aqueous supernatant from the sorptive media-amended samples compared with the aqueous supernatant from the unamended controls. All tested sorptive media were found to offer desirable suppression of PFAS partitioning from soil into the aqueous phase, and no significant improvements in PFAS flux limitation were observed by increasing the media addition rates. Based on these results, formulations of 1% RemBind 100X and 1% FLUORO-SORB 100 were selected for further evaluation.

3.3 Preliminary Solidification Performance Testing Results

The results of preliminary solidification performance testing are presented in Table 11. All six mix formulations exceeded the target minimum UCS of 50 psi at seven days of curing, with all six achieving UCS values greater than 100 psi. After 28 days of curing, the mix formulations that contained both PLC and BFS achieved higher UCS values than the corresponding formulation with only PLC. Although UCS testing was not performed beyond 28 days, blends of PLC and BFS are known to continue hydrating and developing additional strength over longer timescales than PLC alone. The addition of bentonite to Mixes 8 and 9 did not significantly affect the strength development of those mix formulations when compared with the corresponding formulations without bentonite (Mixes 6 and 7, respectively). Mixes that received total cement addition rates of 10% by soil dry mass developed strength values exceeding those typically required to meet in-situ solidification remedial performance goals

All three test mix formulations that received total cement addition rates of 7.5% by soil dry mass exceeded the UCS target by a comfortable margin; therefore, those three mixes, Mix-4, Mix-6, and Mix-8, were selected for hydraulic conductivity testing. Mixes 6 and 8, each of which received 2.5% PLC and 5% BFS, demonstrated hydraulic conductivity values below the target maximum of $1x10^{-6}$ cm/s. Mix-8, which received 1% bentonite by soil dry mass in addition to the cements, achieved a slightly lower hydraulic conductivity than Mix-6, which did not receive bentonite. Mix-4, which received 7.5% PLC, achieved a hydraulic conductivity of just greater than the targeted maximum. Based on these results, a cement formulation of 2.5% PLC and 5% BFS by soil dry mass was selected as offering the most desirable combination of geotechnical performance, cost, and implementability, and was carried forward into subsequent testing.

3.4 Final Performance Testing Results

3.4.1 Geotechnical Performance Results

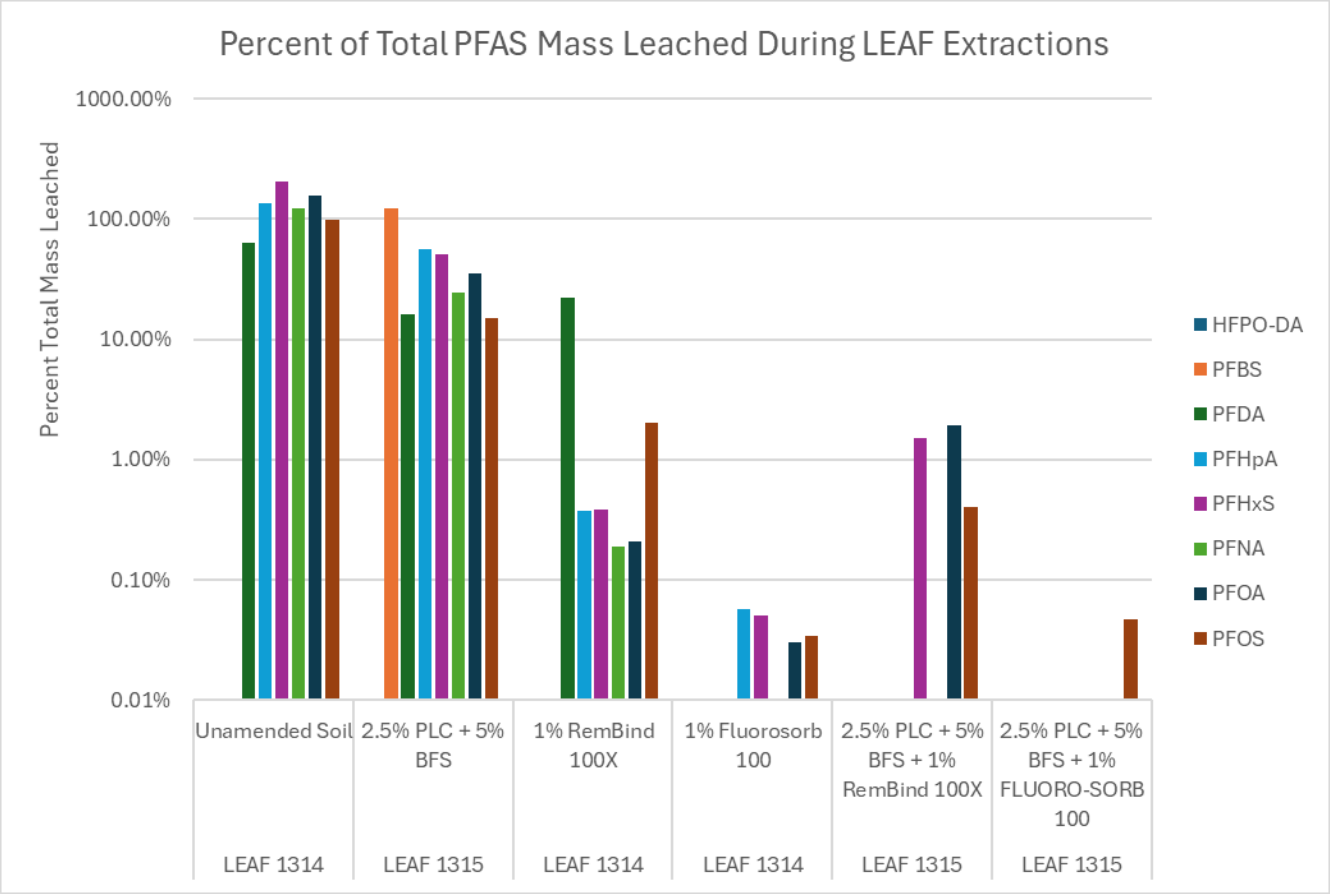
The results of geotechnical performance testing conducted on the three final solidification test mixes are presented in Table 12. The three mixes, each of which received 2.5% PLC and 5% BFS by soil dry mass, achieved higher seven-day UCS and similar 28-day UCS results during final performance testing than these same

formulations did during preliminary testing (see Section 3.3). Sample LEAF-1, which in addition to the cement received 1% FLUORO-SORB 100 by soil dry mass, achieved a hydraulic conductivity value less than the target maximum of $1x10^{-6}$ cm/sec. Samples LEAF-2 and LEAF-3, which received 1% RemBind 100X and no sorptive media addition, respectively, had hydraulic conductivity values that were slightly greater than the target maximum.

3.4.2 Solidified Mix PFAS Leaching Performance Assessment

PFAS leaching results from each of the three solidified test mixes subjected to LEAF Method 1315 are presented in Table 13. Table 14 and Exhibit 1 present the calculated percentage of total available PFAS mass leached from the soil during the leaching program for the six MassDEP-regulated PFAS plus HFPO-DA[3] and PFBS. The results of pH, dissolved oxygen, and specific conductance analyses on individual leachate samples are presented in Table 15.

Exhibit 1. PFAS Mass Leached During LEAF Tests



The calculated results shown in Table 14 and Exhibit 1 were used as the basis for the solidified test mix performance assessment. The percent of total PFAS mass leached directly represents the degree to which the admixtures prevented PFAS leachability from amended soils. The percent of total PFAS mass leached was determined by comparing the total PFAS mass leached from each test mix during the LEAF 1315 leaching

[3] HFPO-DA was not detected in any leachate sample, so percent reduction was not calculation for this compound.

program to the mass of PFAS originally present in the soil subjected to leaching. The mass of PFAS originally present in the test mix subjected to LEAF 1315 leaching was determined by multiplying the mass of soil present in the test cylinder by the average PFAS concentration in the baseline composite soil samples. The sum of the mass of cement, sorptive media, mixing water, and native soil moisture was subtracted from the total mass of the sample to derive the dry mass of soil in each sample. The average PFAS concentration in the composite soil sample used to create the test mix was used to estimate the initial mass of PFAS in the test cylinder. PFAS concentrations in the three non-contiguous leachate samples generated from each LEAF 1315 leaching program (T03, T04, and T09) were used to estimate the mass of PFAS leached during the 63-day LEAF 1315 leaching program. These calculations are illustrated in the following steps using the determination of PFOS mass leached from sample ID "LEAF-3," which was the cement-amended control mix that did not receive sorptive media, as an example.

1. The mass of dry soil present in the test cylinder (0.3206 kg for the LEAF-3 sample) was multiplied by the average PFOS concentration by soil dry mass in the soil composited to create the test mix (126 µg/kg for the LEAF-3 sample; see Table 8) and divided by 1000 to estimate the initial mass of PFOS in ng present in the test cylinder. The estimated initial PFOS mass in the LEAF-3 test cylinder was 40,503 ng.
2. The PFOS concentration in the leachate samples generated from the LEAF-3 test cylinder at leaching intervals T03, T04, and T09 (252 ng/L, 650 ng/L, and 324 ng/L, respectively) were multiplied by the 1800 mL leachate interval volume to estimate the mass of PFOS leached from the test cylinder during each interval. The calculated PFOS mass estimates were 453.6 ng, 1170 ng, and 583.2 ng, respectively.
3. Daily mass leaching rates were estimated using the results from Step 2. The leachate from interval T03 was in contact with the test cylinder for one day, giving a daily rate of PFOS mass leached of 453.6 ng/day. The leachate from interval T04 was in contact with the test cylinder for five days, giving an average daily rate of PFOS mass leached of 234 ng/day. The leachate from interval T09 was in contact with the test cylinder for 14 days, giving an average daily rate of PFOS mass leached of 41.7 ng/day.
4. The estimated average daily rates in Step 3 were plotted against the total number of days of the LEAF 1315 leaching program. The program day was plotted on the X-axis and daily leaching rate was plotted on the Y-axis. The daily PFOS leaching rate derived from T03 was applied to day two of the program, the daily leaching rate derived from T04 was applied to days three through seven of the program, and the daily leaching rate derived from T09 was applied to days 50 through 63 of the program.
5. A power trendline was fit to the resulting plot. For the plot of PFOS from the LEAF-3 sample, the coefficient of determination was 0.95 and the resultant trendline equation was $y=684.6x^{-0.692}$.
6. The trendline equation was used to estimate the mass leached during the full 63-day LEAF program. For the LEAF-3 sample, the estimated PFOS mass leached during the LEAF 1315 leaching process was 6,139ng.
7. The estimated leached mass was divided by the estimated initial mass in the test cylinder to calculate a percent of total mass leached. For PFOS in the LEAF-3 sample, the leached mass of 6,139ng was divided by the initial mass of 40,503ng PFOS, showing 15.2% of the total PFOS mass leached from the sample during LEAF extractions (see Table 14).

When performing the trendline calculations, the analytical detection limit was used for the mass estimate in cases where one or more leaching intervals returned detectable PFAS, but PFAS were not detected in other leaching intervals from the same test cylinder.

3.4.3 Unsolidified Mix PFAS Leaching Performance Assessment

PFAS leaching results from the three unsolidified test mixes subjected to LEAF Method 1314 are presented in Table 16. Table 14 and Exhibit 1 present the calculated percentage of total available PFAS mass leached from the soil during the leaching program for the six MassDEP-regulated PFAS plus HFPO-DA[4] and PFBS. The results of pH, dissolved oxygen, and specific conductance measured on individual leachate samples are presented in Table 17.

Like the LEAF 1315 leaching assessment, the calculated results shown in Table 14 and Exhibit 1 were used as the basis for the unsolidified test mix performance assessment. The percent of total PFAS mass leached was determined by comparing the total PFAS mass leached from each test mix during the LEAF 1314 leaching program to the mass of PFAS originally present in the soil subjected to leaching. The mass of PFAS originally present in the test mix subjected to LEAF 1314 leaching was determined by multiplying the mass of soil present in the test cylinder by the average PFAS concentration in the baseline composite soil samples. The sum of the mass of sorptive media and native soil moisture was subtracted from the total mass of the sample to derive the dry mass of soil in each sample. The average baseline PFAS concentration in the composite soil sample used to create the text mix was used to estimate the initial mass of PFAS in the test cylinder. PFAS concentrations in the five leachate samples generated from each LEAF 1314 leaching program (T01, T02-T04 composite, T05, T06-T08 composite, and T09) were used to estimate the total PFAS mass leached during the entire testing interval. These calculations are illustrated in the following steps using the determination of PFOS mass leached from sample ID “LEAF-4,” which was the unamended control mix that did not receive sorptive media, as an example.

1. The mass of dry soil present in the test cylinder (4.7107 kg for the LEAF-4 sample) was multiplied by the average PFOS concentration by soil dry mass in the soil composited to create the test mix (126 µg/kg for the LEAF-04 sample; see Table 8) and divided by 1000 to estimate the initial mass of PFOS in ng present in the test cylinder. The calculated initial mass of PFOS present in the LEAF-4 test cylinder was 595,140 ng.
2. The PFOS concentration in the leachate samples generated from the LEAF-4 test cylinder at leaching intervals T01, T02-T04 composite, T05, T06-T08 composite, and T09 (220,000 ng/L, 43,200 ng/L, 7.2 ng/L, 132 ng/L, and 29 ng/L, respectively) were multiplied by the leachate volumes produced at each of the five intervals to estimate the mass of PFOS leached during each interval. The leachate volumes for intervals T01, T02-T04 composite, T05, T06-T08 composite, and T09 for the LEAF-4 test cylinder were 1,578 mL, 5,358 mL, 2,312 mL, 35,272 mL, and 2,077 mL, respectively. The calculated leached PFOS mass estimates were 347,182 ng, 231,466 ng, 16.7 ng, 4,656 ng, and 60.2 ng, respectively.
3. The mass estimates from Step 2 were summed to estimate the total mass leached during the LEAF 1314 leaching process. For the LEAF-4 sample, the estimated PFOS mass leached during the LEAF 1314 program was 583,380 ng.
4. The estimated leached mass was divided by the estimated initial mass in the test cylinder to calculate a percent of total mass leached. For PFOS in the LEAF-4 sample, the estimated leached mass of 583,380 ng was divided by the estimated initial mass of 595,140 ng PFOS, showing 98% of the total PFOS mass leached from the sample during LEAF extractions (see Table 14).

[4] HFPO-DA was not detected in any leachate sample, so percent reduction was not calculation for this compound.

3.4.4 PFAS Leachability Performance Comparison

The percentages of PFAS mass leached during the LEAF leaching programs (see Table 14) were used as a basis of comparison between the performance of solidified and unsolidified test mix formulations. In instances where a compound was not detected in any sample, that Table 14 entry was assigned “NP” (not performed).

The greatest degree of PFAS leaching was observed in the unsolidified, unamended soil sample (LEAF-4), followed by the solidified mix that received no sorptive media (LEAF-3). Among the mixes receiving sorptive media, the unsolidified 1% RemBind 100X mix, LEAF-5, showed the greatest degree of leaching. Next in terms of percent of total PFAS leaching from mixes receiving sorptive media were the solidified mix that received 1% RemBind 100x (LEAF-2), the unsolidified mix that received 1% FLUORO-SORB 100 (LEAF-6), and the solidified mix that received 1% FLUORO-SORB 100 (LEAF-1).

Of the eight compounds included in these calculations, only PFOS was detected in any leachate sample generated from the solidified mix containing 1% FLUORO-SORB 100 (LEAF-1). Three compounds (PFOS, PFOA, and PFHxS) were detected in leachate samples generated from the solidified mix containing 1% RemBind 100X (LEAF-2). Four compounds (PFOS, PFOA, PFHxS, and PFHpA) were detected in leachate samples generated from the unsolidified mix containing 1% FLUORO-SORB 100 (LEAF-6). Six compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA) were detected in leachate samples generated from both the unsolidified mix containing 1% RemBind 100X (LEAF-5) and the unsolidified, unamended soil (LEAF-4). Seven compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, PFDA, and PFBS) were detected in leachate samples generated from the solidified mix that did not receive any sorptive media (LEAF-3).

Generally, all mixes amended with either 1% RemBind 100X or 1% FLUORO-SORB 100 were found to significantly reduce the leachability of PFAS when compared with the unamended control soil sample and the solidified sample that received only cement. The greatest mass of PFAS leached from sorptive admixture-amended samples was from the sample that received 1% RemBind 100X and was leached by LEAF 1314. However, the majority of this PFAS mass was released in a single leachate fraction, the composite of intervals T02 through T04. This anomalous result may reflect the inadvertent incorporation of PFAS-bearing particulate into the final methanol extraction step of this test interval rather than a true leached mass. PFAS concentrations were significantly lower in leachate samples from the preceding and subsequent test intervals for this soil sample.

4 Conclusions

Overall, the bench-scale treatability study results indicate that mix formulations of 2.5% PLC, 5% BFS, and either 1% FLUORO-SORB 100 or 1% RemBind 100X would provide good performance in reducing leaching of PFAS from AOC 31 vadose zone soils. Either formulation would be an appropriate candidate for a field-scale ISS pilot test for treatment of AOC 31 soils impacted by PFAS.

Tables

Table 1: Bench-Scale Study Sample IDs and Depths
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Bucket Number	Bucket Label	Sampling Depth feet bgs
1	31-MW-21-01	0 – 5
2	31B-21-01	0 – 5
3	31SB-21-01	0 – 5
4	31SB-21-01	5 – 10
5	31-MW-21-01	5 – 10
6	31-MW-21-01	10 – 15
7	31-MW-21-01	15 – 20
8	31SB-21-01	15 – 20

Acronyms and Abbreviations:
bgs = below ground surface
ID = identification

Table 2: Moisture Content Analysis Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Pan wt.	Pan + Wet	Pan + Dry	Gravimetric Moisture	Average Gravimetric Moisture
	g	g	g	%	%
Composite Soil (A)	1.966	55.548	53.547	3.73%	3.67%
Composite Soil (B)	2.059	62.182	60.016	3.60%	
Composited & No. 8 Sieved Soil (A)	1.3	31.9	30.7	3.92%	3.95%
Composited & No. 8 Sieved Soil (B)	1.3	29.0	27.9	3.97%	

Acronyms and Abbreviations:
ID = identification
g = grams
wt. = weight
% = percent

Table 3: Batch Testing Reactor Design
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Fixant Type	Soil Mass (native moisture)	Water Added	Sorbent Dose (by soil dry mass)	Sorbent Mass (by soil dry mass)
		g	mL	%	g
FD-Blank	None	0	400	0%	0.000
FD-Control-A	None	200	400	0%	0.000
FD-Control-B	None	200	400	0%	0.000
FD-RB-1	RemBind 100X	200	400	1.0%	1.921
FD-RB-2	RemBind 100X	200	400	2.0%	3.842
FD-RB-2-1	RemBind 100	200	400	2.0%	3.842
FD-RB-3	RemBind 100X	200	400	2.5%	4.803
FD-RB-4	RemBind 100X	200	400	3.0%	5.763
FD-RB-5	RemBind 100X	200	400	4.0%	7.684
FD-FS-1	Fluorosorb 100	200	400	1.0%	1.921
FD-FS-2	Fluorosorb 100	200	400	2.0%	3.842
FD-FS-2-1	Fluorosorb 200	200	400	2.0%	3.842
FD-FS-3	Fluorosorb 100	200	400	2.5%	4.803
FD-FS-4	Fluorosorb 100	200	400	3.0%	5.763
FD-FS-5	Fluorosorb 100	200	400	4.0%	7.684

Acronyms and Abbreviations:
ID = identification
g = grams
mL = milliliters
% = percent

Table 4: Preliminary Solidification Performance Testing Mix Design
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Cement Pretest Mix Design														Slump Readings		Pocket Penetrometer Readings	
Mix Number	Boring Location	Mix Description	Soil Wet Mass	Soil Moisture (gravimetric)	Soil Dry Mass	PLC Addition	PLC Mass	BFS Addition	BFS Mass	Bentonite Addition	Bentonite Mass	Admixture Total	W/A	Miniature Slump	Standard Slump	Day 1	Day 4
			g	%	g	% dry soil	g	% dry soil	g	% dry soil	g	% dry soil		mm	in	tsf	tsf
Mix-4	Fort Devens Composite	7.5% PLC	3000.0	3.95%	2881.5	7.5%	216.1	0%	0.0	0%	0.0	7.5%	2.06	130	3.8	>4.50	>4.50
Mix-5		10% PLC	3000.0	3.95%	2881.5	10%	288.2	0%	0.0	0%	0.0	10.0%	1.54	118	4.6	>4.50	>4.50
Mix-6		2.5% PLC + 5% BFS	3000.0	3.95%	2881.5	2.5%	72.0	5%	144.1	0%	0.0	7.5%	2.09	127	4.0	3.25	>4.50
Mix-7		3.3% PLC + 6.7% BFS	3000.0	3.95%	2881.5	3.3%	95.1	6.7%	193.1	0%	0.0	10.0%	1.56	119	4.6	4.50	>4.50
Mix-8		2.5% PLC + 5% BFS + 1% Bentonite	3000.0	3.95%	2881.5	2.5%	72.0	5%	144.1	1%	28.8	8.5%	2.20	133	3.6	4.00	>4.50
Mix-9		3.3% PLC + 6.7% BFS + 1% Bentonite	3000.0	3.95%	2881.5	3.3%	95.1	6.7%	193.1	1%	28.8	11.0%	1.65	125	4.1	>4.50	>4.50

Acronyms and Abbreviations:
BFS = blast furnace slag
in = inches
g = grams
mL = milliliters
mm = millimeters
PLC = Type IL Portland-limestone cement
tsf = tons per square foot
W/A = water-to-admixture ratio
% = percent

Table 5: Final Solidification and Leachability Performance Testing Mix Design
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Final Solidified Test Mix Design																Slump Readings		Pocket Penetrometer Readings
Mix Number	Boring Location	Mix Description	Soil Wet Mass	Soil Moisture (gravimetric)	Soil Dry Mass	PLC Addition	PLC Mass	BFS Addition	BFS Mass	Sorbent Type	Sorbent Dose	Sorbent Mass	Admixture Total	Admixture Total	Mixing Water	W/A	Miniature Slump	Standard Slump	Day 3
			g	%	g	% dry soil	g	% dry soil	g		% dry soil	g	% dry soil	g	g		mm	in	tsf
LEAF-1	Fort Devens Composite	2.5% PLC + 5% BFS + 1% Fluorosorb 100	3000	3.95%	2881.5	2.50%	72.0	5.00%	144.08	Fluorosorb 100	1.00%	28.815	8.50%	244.9	441.8	1.80	129	3.85	>4.50
LEAF-2		2.5% PLC + 5% BFS + 1% RemBind 100X	3000	3.95%	2881.5	2.50%	72.0	5.00%	144.08	RemBind 100X	1.00%	28.815	8.50%	244.9	473.3	1.93	146	2.65	>4.50
LEAF-3		2.5% PLC + 5% BFS	3000	3.95%	2881.5	2.50%	72.0	5.00%	144.08	None	0.00%	0	7.50%	216.1	419.4	1.94	130	3.78	>4.50

Acronyms and Abbreviations:
BFS = Grade 120 ground-granulated blast furnace slag cement
in = inches
g = grams
mm = millimeters
PLC = Type IL Portland-limestone cement
tsf = tons per square foot
W/A = water-to-admixture ratio
% = percent

Table 6: Final Unsolidified Testing Mix Design
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Mix Number	Boring Location	Mix Description	Soil Wet Mass	Soil Moisture (gravimetric)	Soil Dry Mass	PFAS Fixant Dose	PFAS Fixant Mass
			g	%	g	% dry soil	g
LEAF-4	Fort Devens Composite	Control - No additions	4900	3.95%	4706.45	0.0%	0
LEAF-5		1% RemBind 100X	4900	3.95%	4706.45	1.00%	47.065
LEAF-6		1% Fluorosorb 100	4900	3.95%	4706.45	1.00%	47.065

Acronyms and Abbreviations:
PFAS = per- and polyfluoroalkyl substances
g = grams
% = percent

Table 7: PFAS Concentrations in Baseline Soil Samples (USEPA Third Draft Method 1633)
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-Baseline-01		FD-Baseline-02		FD-Baseline-03		FD-Baseline-Average	
Description		Triplicate 1		Triplicate 2		Triplicate 3		Average of the Triplicate Results	
Sample Collection Day		10/5/2022		10/5/2022		10/5/2022		10/5/2022	
Method/Analyte		Result	Q	Result	Q	Result	Q	Result	Q
PFAS by USEPA Draft Method 1633 (Third Draft)									
11Cl-PF3OUdS	µg/kg	0.401	U	0.401	U	0.400	U	0.401	U
3:3FTCA	µg/kg	0.501	U	0.501	U	0.500	U	0.501	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.401	U	0.401	U	0.400	U	0.401	U
5:3FTCA	µg/kg	2.50	U	2.50	U	2.50	U	2.50	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	µg/kg	**0.758**	J	**0.688**	J	**0.746**	J	**0.731**	J
7:3FTCA	µg/kg	2.50	U	2.50	U	2.50	U	2.50	U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg	**33.2**		**33.6**		**36.6**		**34.5**	
9Cl-PF3ONS	µg/kg	0.401	U	0.401	U	0.400	U	0.401	U
ADONA	µg/kg	0.401	U	0.401	U	0.400	U	0.401	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)	µg/kg	0.401	U	0.401	U	0.400	U	0.401	U
NEtFOSA	µg/kg	0.150	U	0.150	U	0.150	U	0.150	U
NEtFOSAA	µg/kg	**0.109**	J	**0.111**	J	**0.130**	J	**0.117**	J
NEtFOSE	µg/kg	1.00	U	1.00	U	1.00	U	1.00	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	µg/kg	0.200	U	0.200	U	0.200	U	0.200	U
NMeFOSA	µg/kg	**0.289**		**0.278**		**0.286**		**0.284**	
NMeFOSAA	µg/kg	**2.56**		**2.60**		**2.55**		**2.57**	
NMeFOSE	µg/kg	1.00	U	1.00	U	1.00	U	1.00	U
Perfluorobutanoic acid (PFBA)	µg/kg	**0.254**	J	0.401	U	0.400	U	0.352	U
Perfluorobutanesulfonic acid (PFBS)	µg/kg	**0.067**	J	**0.073**	J	**0.060**	J	**0.067**	J
Perfluorodecanoic acid (PFDA)	µg/kg	**0.293**		**0.292**		**0.313**		**0.299**	
Perfluorodecane sulfonic acid (PFDS)	µg/kg	**0.736**		**0.762**		**0.578**		**0.692**	
Perfluorododecanoic acid (PFDoA)	µg/kg	**0.054**	J	**0.054**	J	**0.060**	J	**0.056**	J
PFDoS	µg/kg	**0.270**		**0.280**		**0.300**		**0.283**	
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	µg/kg	0.200	U	0.200	U	0.200	U	0.200	U
Perfluoroheptanoic acid (PFHpA)	µg/kg	**0.545**		**0.566**		**0.579**		**0.563**	
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg	**0.374**		**0.368**		**0.383**		**0.375**	
Perfluorohexanoic acid (PFHxA)	µg/kg	**0.737**		**0.844**		**0.803**		**0.795**	
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	**3.96**		**4.18**		**4.31**		**4.15**	
Perfluoro-4-methoxybutanoic acid (PFMBA)	µg/kg	0.200	U	0.200	U	0.200	U	0.200	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	µg/kg	0.200	U	0.200	U	0.200	U	0.200	U
Perfluorononanoic acid (PFNA)	µg/kg	**0.240**		**0.224**		**0.262**		**0.242**	
Perfluorononanesulfonic acid (PFNS)	µg/kg	**0.453**		**0.437**		**0.379**		**0.423**	
Perfluorooctanoic acid (PFOA)	µg/kg	**2.06**		**2.17**		**2.29**		**2.17**	
Perfluorooctanesulfonic acid (PFOS)	µg/kg	**130**		**113**		**136**		**126**	
Perfluorooctane Sulfonamide (PFOSA)	µg/kg	**74.0**		**72.3**		**81.8**		**76.0**	
Perfluoropentanoic acid (PFPeA)	µg/kg	**0.304**	J	**0.318**	J	**0.312**	J	**0.311**	J
Perfluoropentanesulfonic acid (PFPeS)	µg/kg	**0.130**	J	**0.106**	J	**0.122**	J	**0.119**	J
Perfluorotetradecanoic acid (PFTA)	µg/kg	0.100	U	0.100	U	0.100	U	0.100	U
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.100	U	0.100	U	0.100	U	0.100	U
Perfluoroundecanoic acid (PFUnA)	µg/kg	**0.086**	J	**0.088**	J	**0.096**	J	**0.090**	J

Lab Qualifiers:
Bold indicates the analyte was detected above the MDL.
J or I indicates the result is between the MDL and LOQ.
J or I indicates the DOD flag on analyte in the parent sample for MS/MSD outside acceptance criteria.
U indicates the compound was analyzed for but not detected.

Acronyms and Abbreviations:
ID = identification
LOQ = limit of quantification
MDL = method detection limit
PFAS = per- and polyfluoroalkyl substances
Q = qualifier
USEPA = United States Environmental Protection Agency
µg/kg = micrograms per kilogram

Table 8: PFAS Concentrations in Baseline Soil Samples (QSM B15)
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-Baseline-01		FD-Baseline-01		FD-Baseline-02		FD-Baseline-02		FD-Baseline-03		FD-Baseline-03		FD-Baseline-Average	
Description		Triplicate 1: First Run		Triplicate 1: Second Run		Triplicate 2: First Run		Triplicate 2: Second Run		Triplicate 3: First Run		Triplicate 3: Second Run		Average of Triplicate Results (Second Run pre-TOP)	
Sample Collection Day		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022	
Method/Analyte		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Pre-TOP by QSM B15															
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	**0.163**		**2.08**		**0.206**		**2.42**		**0.173**		**2.35**		**2.28**	
11Cl-PF3OUdS	µg/kg	0.00517	UQJ	0.049	UJ	0.00515	UQ	0.048	U	0.00518	UQ	0.049	U	0.049	UJ
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.021	UQ	0.197	U	0.021	UQ	0.194	U	0.021	UQ	0.195	U	0.195	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	µg/kg	**0.042**	JQ	**0.871**	J	**0.060**	JQ	**0.685**	J	**0.046**	JQ	**0.707**	J	**0.754**	J
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg	**1.93**	QJ	**25.2**	J	**2.48**	Q	**30.6**		**2.03**	Q	**28.2**		**28.0**	J
9Cl-PF3ONS	µg/kg	0.010	UQJ	0.098	UJ	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	UJ
ADONA	µg/kg	0.00517	UQ	0.049	U	0.00515	UQ	0.048	U	0.00518	UQ	0.049	U	0.049	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)	µg/kg	0.052	UQ	0.492	U	0.051	UQ	0.484	U	0.052	UQ	0.488	U	0.488	U
NEtFOSA	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
NEtFOSAA	µg/kg	**0.00873**	J	**0.115**	J	**0.012**	J	**0.158**	J	**0.011**	J	**0.123**	J	**0.132**	J
NEtFOSE	µg/kg	0.010	U	0.098	U	0.010	U	0.097	U	0.010	U	0.098	U	0.098	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
NMeFOSA	µg/kg	**0.031**	JQ	**0.243**	J	**0.00624**	JQ	**0.303**	J	**0.033**	JQ	**0.276**	J	**0.274**	J
NMeFOSAA	µg/kg	**0.042**	JQ	**0.674**	J	**0.061**	JQ	**0.730**	J	**0.054**	JQ	**0.680**	J	**0.695**	J
NMeFOSE	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluorobutanoic acid (PFBA)	µg/kg	**0.00704**	JQ	**0.125**	J	**0.010**	JQ	**0.159**	J	**0.00848**	JQ	**0.123**	J	**0.136**	J
Perfluorobutanesulfonic acid (PFBS)	µg/kg	**0.00354**	JQ	**0.052**	J	**0.00517**	JQ	**0.066**	J	**0.00425**	JQ	**0.052**	J	**0.057**	J
Perfluorodecanoic acid (PFDA)	µg/kg	**0.018**	JQ	**0.235**	J	**0.025**	JQ	**0.323**	J	**0.020**	JQ	**0.279**	J	**0.279**	J
Perfluorodecane sulfonic acid (PFDS)	µg/kg	**0.015**	JQJ	**0.395**	JJ	**0.033**	JQ	**0.548**	J	**0.028**	JQ	**0.380**	J	**0.441**	JJ
Perfluorododecanoic acid (PFDoA)	µg/kg	**0.00341**	JQ	**0.037**	J	**0.00603**	JQ	**0.056**	J	**0.0044**	JQ	**0.048**	J	**0.047**	J
PFDoS	µg/kg	**0.011**	JQJ	**0.169**	JJ	**0.016**	JQ	**0.226**	J	**0.014**	JQ	**0.209**	J	**0.201**	JJ
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluoroheptanoic acid (PFHpA)	µg/kg	**0.033**	JQ	**0.433**	J	**0.048**	JQ	**0.598**	J	**0.039**	JQ	**0.504**	J	**0.512**	J
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg	**0.014**	JQ	**0.177**	J	**0.020**	JQ	**0.246**	J	**0.017**	JQ	**0.213**	J	**0.212**	J
Perfluorohexanoic acid (PFHxA)	µg/kg	**0.045**	JQ	**0.600**	J	**0.066**	JQ	**0.839**	J	**0.051**	JQ	**0.691**	J	**0.710**	J
PFHxDA	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	**0.244**	QJ	**3.32**	J	**0.362**	Q	**4.65**		**0.281**	Q	**3.97**		**3.98**	J
Perfluoro-4-methoxybutanoic acid (PFMBA)	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	µg/kg	0.010	UQ	0.098	U	0.010	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluorononanoic acid (PFNA)	µg/kg	**0.013**	JQ	**0.170**	J	**0.018**	JQ	**0.245**	J	**0.015**	JQ	**0.210**	J	**0.208**	J
Perfluorononanesulfonic acid (PFNS)	µg/kg	**0.00781**	JQJ	**0.260**	JJ	**0.010**	JQ	**0.290**	J	**0.014**	JQ	**0.297**	J	**0.282**	JJ
Perfluorooctanoic acid (PFOA)	µg/kg	**0.121**	QJ	**1.71**	J	**0.175**	Q	**2.35**		**0.136**	Q	**1.99**		**2.02**	J
PFODA	µg/kg	0.00517	UQJ	0.049	UJ	0.00515	UQ	0.048	U	0.00518	UQ	0.049	U	0.049	UJ
Perfluorooctanesulfonic acid (PFOS)	µg/kg	**7.27**	QJ	**103**	J	**11.0**		**168**		**8.46**		**123**		**131**	J
Perfluorooctane Sulfonamide (FOSA)	µg/kg	**3.59**	QJ	**42.6**	J	**3.72**	Q	**63.3**		**4.09**		**51.6**		**52.5**	J
Perfluoropentanoic acid (PFPeA)	µg/kg	**0.018**	JQ	**0.252**	J	**0.025**	JQ	**0.352**	J	**0.021**	JQ	**0.268**	J	**0.291**	J
Perfluoropentanesulfonic acid (PFPeS)	µg/kg	**0.00658**	JQ	**0.084**	J	**0.010**	JQ	**0.124**	J	**0.00824**	JQ	**0.105**	J	**0.104**	J
Perfluorotetradecanoic acid (PFTA)	µg/kg	0.00517	UQ	0.049	U	0.00515	UQ	0.048	U	0.00518	UQ	0.049	U	0.049	U
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.010	UQ	0.098	U	0.01	UQ	0.097	U	0.010	UQ	0.098	U	0.098	U
Perfluoroundecanoic acid (PFUnA)	µg/kg	**0.00347**	JQ	**0.059**	J	**0.00649**	JQ	**0.090**	J	**0.00611**	JQ	**0.077**	J	**0.075**	J

Table 8: PFAS Concentrations in Baseline Soil Samples (QSM B15)
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-Baseline-01		FD-Baseline-01		FD-Baseline-02		FD-Baseline-02		FD-Baseline-03		FD-Baseline-03		FD-Baseline-Average	
Description		Triplicate 1: First Run		Triplicate 1: Second Run		Triplicate 2: First Run		Triplicate 2: Second Run		Triplicate 3: First Run		Triplicate 3: Second Run		Average of Triplicate Results (Second Run pre-TOP)	
Sample Collection Day		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022	
Method/Analyte		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Post-TOP by QSM B15															
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
11Cl-PF3OUdS	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.193	U	NP		0.194	U	NP		0.198	U	NP		0.195	U
6:2 Fluorotelomer sulfonic acid (6:2FTS)	µg/kg	**0.145**	J	NP		**0.232**	J	NP		**0.164**	J	NP		**0.180**	J
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
9Cl-PF3ONS	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
ADONA	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
Perfluoro-2-proxypropanoic acid (HFPO-DA)	µg/kg	0.483	U	NP		0.485	U	NP		0.496	U	NP		0.488	U
NEtFOSA	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
NEtFOSAA	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
NEtFOSE	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
NMeFOSA	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
NMeFOSAA	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
NMeFOSE	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluorobutanoic acid (PFBA)	µg/kg	**2.59**		NP		**0.638**	J	NP		**2.44**		NP		**1.89**	J
Perfluorobutanesulfonic acid (PFBS)	µg/kg	**0.048**	J	NP		0.048	U	NP		**0.042**	J	NP		**0.046**	UJ
Perfluorodecanoic acid (PFDA)	µg/kg	**0.251**	J	NP		0.097	U	NP		**0.115**	J	NP		**0.154**	UJ
Perfluorodecane sulfonic acid (PFDS)	µg/kg	**0.072**	J	NP		0.097	U	NP		**0.051**	J	NP		**0.073**	UJ
Perfluorododecanoic acid (PFDoA)	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
PFDoS	µg/kg	0.097	U	NP		**0.032**	J	NP		0.099	U	NP		**0.076**	UJ
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluoroheptanoic acid (PFHpA)	µg/kg	**7.45**		NP		**0.612**	J	NP		**5.11**		NP		**4.39**	J
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg	**0.156**	J	NP		0.048	U	NP		**0.088**	J	NP		**0.097**	UJ
Perfluorohexanoic acid (PFHxA)	µg/kg	**84.2**		NP		**13.1**		NP		**64.9**		NP		**54.1**	
PFHxDA	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	**4.39**		NP		**0.653**	J	NP		**3.00**		NP		**2.68**	J
Perfluoro-4-methoxybutanoic acid (PFMBA)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluorononanoic acid (PFNA)	µg/kg	**0.616**	J	NP		**0.079**	J	NP		**0.325**	J	NP		**0.340**	J
Perfluorononanesulfonic acid (PFNS)	µg/kg	**0.098**	J	NP		0.097	U	NP		**0.045**	J	NP		**0.080**	UJ
Perfluorooctanoic acid (PFOA)	µg/kg	**18.9**		NP		**1.79**		NP		**12.3**		NP		**11.0**	
PFODA	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
Perfluorooctanesulfonic acid (PFOS)	µg/kg	**77.9**		NP		**3.41**		NP		**35.5**		NP		**38.9**	
Perfluorooctane Sulfonamide (FOSA)	µg/kg	0.048	U	NP		0.048	U	NP		0.050	U	NP		0.049	U
Perfluoropentanoic acid (PFPeA)	µg/kg	**7.13**		NP		**1.70**		NP		**5.97**		NP		**4.93**	

Table 8: PFAS Concentrations in Baseline Soil Samples (QSM B15)
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-Baseline-01		FD-Baseline-01		FD-Baseline-02		FD-Baseline-02		FD-Baseline-03		FD-Baseline-03		FD-Baseline-Average	
Description		Triplicate 1: First Run		Triplicate 1: Second Run		Triplicate 2: First Run		Triplicate 2: Second Run		Triplicate 3: First Run		Triplicate 3: Second Run		Average of Triplicate Results (Second Run pre-TOP)	
Sample Collection Day		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022		10/5/2022	
Method/Analyte		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Perfluoropentanesulfonic acid (PFPeS)	µg/kg	**0.096**	J	NP		**0.025**	J	NP		**0.074**	J	NP		**0.065**	J
Perfluorotetradecanoic acid (PFTA)	µg/kg	0.048	U	NP		0.048	U	NP		0.074	U	NP		0.057	U
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.097	U	NP		0.097	U	NP		0.099	U	NP		0.098	U
Perfluoroundecanoic acid (PFUnA)	µg/kg	**0.027**	J	NP		0.048	U	NP		0.050	U	NP		**0.042**	UJ

Lab Qualifiers:
Bold indicates the analyte was detected above the MDL.
J or I indicates the result is between the MDL and LOQ.
J indicates the DOD flag on analyte in the parent sample for MS/MSD outside acceptance criteria.
U indicates the compound was analyzed for but not detected.
Q indicates a non-compliant QC Result (See Q Flag Application Report).
NP indicates the test was not performed on this sample.

Acronyms and Abbreviations:
ID = identification
LOQ = limit of quantification
MDL = method detection limit
MS/MSD = matrix spike and matrix spike duplicate
TOP = total oxidizable precursor
Q = qualifier
QC = quality control
µg/kg = micrograms per kilogram

Table 9: Batch Testing Analytical Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-BLANK		FD-CONTROL-A		FD-CONTROL-B		FD-FS-1		FD-FS-2	
Description		Tap water only		Tap water and soil only		Tap water and soil only		FS-100 1%		FS-100 2%	
Analyte (EPA Draft Method 1633, ng/L)		Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
PFAS by USEPA Third Draft Method 1633											
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ng/L	4.1	U	4.2	U	4.1	U	4	U	4.1	U
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2FTS)	ng/L	4.1	U	**9600**		**11000**		**1.9**	J	4.1	U
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2FTS)	ng/L	4.1	U	**0.83**	J	**0.99**	J, M-03	4	U	4.1	U
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2FTS)	ng/L	5.2	U	**350**		**350**		**48**		5.1	U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	ng/L	26	U	**5.9**	J	**6.1**	J	25	U	26	U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	ng/L	26	U	**36**		**37**		25	U	26	U
3-Perfluoropropyl propanoic acid (3:3FTCA)	ng/L	5.2	U	**4.7**	J	**2.4**	J	5.1	U	5.1	U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	4.1	U	4.2	U	4.1	U	4	U	4.1	U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ng/L	4.1	U	4.2	U	4.1	U	4	U	4.1	U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ng/L	4.1	U	4.2	U	4.1	U	4	U	4.1	U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)	ng/L	1	U	**0.3**	J, Q, M-03	**0.25**	J, Q, M-03	1	U	1	U, Q
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	1	U	**25**	M-03	**26**	M-03	1	U	1	U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	ng/L	10	U	10	U, Q	10	U, Q	10	U	10	U
N-methyl perfluorooctanesulfonamide (NMeFOSA)	ng/L	1	U	100	U, M-03	**67**	M-03	1	U, M-03	1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	1	U	**130**	M-03	**130**	M-03	1	U	1	U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	ng/L	10	U	10	U	10	U, Q	10	U	10	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ng/L	2.1	U	2.1	U	2.1	U	2	U	2	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	ng/L	2.1	U	2.1	U	2.1	U	2	U	2	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	ng/L	2.1	U	2.1	U	2.1	U	2	U	2	U
Perfluoro-4-methoxybutanoic acid (PFMBA)	ng/L	2.1	U	2.1	U	2.1	U	2	U	2	U
Perfluorobutanesulfonic acid (PFBS)	ng/L	**6.3**	M-03	**29**		**30**		1	U	1	U
Perfluorobutanoic acid (PFBA)	ng/L	**22**	B, M-03	**110**	B	**100**	B	**0.86**	B, J	**5.2**	B
Perfluorodecanesulfonic acid (PFDS)	ng/L	1	U	**130**		**140**		1	U	1	U
Perfluorodecanoic acid (PFDA)	ng/L	1	U, M-03	**89**		**110**		1	U	1	U
Perfluorododecanesulfonic acid (PFDoS)	ng/L	1	U	**3.2**		**4.5**		1	U	1	U
Perfluorododecanoic acid (PFDoA)	ng/L	1	U	**0.86**	J, M-03	**1.8**	M-03	1	U	1	U
Perfluoroheptanesulfonic acid (PFHpS)	ng/L	1	U	**530**		**540**		1	U	1	U
Perfluoroheptanoic acid (PFHpA)	ng/L	**0.88**	J	**370**		**360**		**2.3**		1	U
Perfluorohexanesulfonic acid (PFHxS)	ng/L	**1.3**	M-03	**2700**		**2500**		**0.46**	J, M-03	1	U, M-03
Perfluorohexanoic acid (PFHxA)	ng/L	**1.1**		**480**		**490**		**2.7**		**0.56**	J
Perfluorononanesulfonic acid (PFNS)	ng/L	1	U	**270**	M-03	**310**		1	U	1	U
Perfluorononanoic acid (PFNA)	ng/L	**0.35**	J, M-03	**130**	M-03	**140**	M-03	1	U	1	U
Perfluorooctanesulfonamide (PFOSA)	ng/L	1	U, M-03	**22000**	S, M-03	**24000**	M-03	**6.1**	M-03	**3.1**	
Perfluorooctanesulfonic acid (PFOS)	ng/L	**5.8**		**47000**	M-03	**49000**	M-03	**6.7**	M-03	**4.2**	M-03
Perfluorooctanoic acid (PFOA)	ng/L	**3.7**	M-03	**1300**		**1300**		**1.1**	M-03	1	U, M-03
Perfluoropentanesulfonic acid (PFPeS)	ng/L	**0.33**	J, M-03	**68**		**72**		1	U	1	U
Perfluoropentanoic acid (PFPeA)	ng/L	2.1	U	**200**		**210**		2	U	**0.24**	J, M-03
Perfluorotetradecanoic acid (PFTeDA)	ng/L	1	U	1	U	1	U	1	U	1	U
Perfluorotridecanoic acid (PFTrDA)	ng/L	1	U	1	U	1	U, M-03	1	U	1	U
Perfluoroundecanoic acid (PFUnA)	ng/L	1	U	**6**	M-03	**9.2**		1	U	1	U

Table 9: Batch Testing Analytical Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-FS-3		FD-FS-4		FD-FS-5		FD-FS-2-1		FD-RB-1	
Description		FS-100 2.5%		FS-100 3%		FS-100 4%		FS-200 2%		Rembind 100x 1%	
Analyte (EPA Draft Method 1633, ng/L)		Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
PFAS by USEPA Third Draft Method 1633											
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ng/L	4	U	3.9	U	4.2	U	4.1	U	4.4	U
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2FTS)	ng/L	4	U	3.9	U	**11**		**2.4**	J, M-03	4.4	U
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2FTS)	ng/L	4	U	3.9	U	4.2	U	4.1	U	4.4	U
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2FTS)	ng/L	5	U	4.9	U	5.2	U	**4.2**	J, M-03	5.5	U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	ng/L	25	U	24	U	26	U	26	U	28	U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	ng/L	25	U	24	U	26	U	26	U	28	U
3-Perfluoropropyl propanoic acid (3:3FTCA)	ng/L	5	U	4.9	U	5.2	U	5.2	U	5.5	U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	4	U	3.9	U	4.2	U	4.1	U	4.4	U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ng/L	4	U	3.9	U	4.2	U	4.1	U	4.4	U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ng/L	4	U	3.9	U	4.2	U	4.1	U	4.4	U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	ng/L	10	U	9.7	U	11	U	10	U	11	U
N-methyl perfluorooctanesulfonamide (NMeFOSA)	ng/L	1	U	0.97	U	1	U, M-03	1	U	1.1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	ng/L	10	U	9.7	U	10	U	10	U	11	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ng/L	2	U	1.9	U	2.1	U	2.1	U	2.2	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	ng/L	2	U	1.9	U	2.1	U	2.1	U	2.2	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	ng/L	2	U	1.9	U	2.1	U	2.1	U	2.2	U
Perfluoro-4-methoxybutanoic acid (PFMBA)	ng/L	2	U	1.9	U	2.1	U	2.1	U	2.2	U
Perfluorobutanesulfonic acid (PFBS)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorobutanoic acid (PFBA)	ng/L	**6.3**	B	**6.3**	B	**8.1**	B	**7**	B, M-03	4.4	U
Perfluorodecanesulfonic acid (PFDS)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorodecanoic acid (PFDA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorododecanesulfonic acid (PFDoS)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorododecanoic acid (PFDoA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluoroheptanesulfonic acid (PFHpS)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluoroheptanoic acid (PFHpA)	ng/L	1	U	0.97	U	1	U	**0.35**	J, M-03	1.1	U
Perfluorohexanesulfonic acid (PFHxS)	ng/L	**0.18**	J, M-03	0.97	U	**0.76**	J, M-03	**0.54**	J, M-03	**0.26**	J, M-03
Perfluorohexanoic acid (PFHxA)	ng/L	**0.34**	J, M-03	**0.32**	J	1	U	**1.7**	M-03	1.1	U
Perfluorononanesulfonic acid (PFNS)	ng/L	1	U	0.97	U	1	U, M-03	1	U	1.1	U
Perfluorononanoic acid (PFNA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorooctanesulfonamide (PFOSA)	ng/L	**4.3**	M-03	**2.6**	M-03	**18**	M-03	**9.6**	M-03	**4.4**	M-03
Perfluorooctanesulfonic acid (PFOS)	ng/L	**7.7**	M-03	**3.4**	M-03	**35**	M-03	**15**	M-03	**6.1**	M-03
Perfluorooctanoic acid (PFOA)	ng/L	1	U, M-03	0.97	U	**0.46**	J, M-03	**0.86**	J, M-03	1.1	U, M-03
Perfluoropentanesulfonic acid (PFPeS)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluoropentanoic acid (PFPeA)	ng/L	2	U	1.9	U	2.1	U	2.1	U	2.2	U
Perfluorotetradecanoic acid (PFTeDA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluorotridecanoic acid (PFTrDA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U
Perfluoroundecanoic acid (PFUnA)	ng/L	1	U	0.97	U	1	U	1	U	1.1	U

Table 9: Batch Testing Analytical Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Result Units	FD-RB-2		FD-RB-3		FD-RB-4		FD-RB-5		FD-RB-2-1	
Description		Rembind 100x 2%		Rembind 100x 2.5%		Rembind 100x 3%		Rembind 100x 4%		Rembind 100 2%	
Analyte (EPA Draft Method 1633, ng/L)		Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
PFAS by USEPA Third Draft Method 1633											
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2FTS)	ng/L	4.1	U	5.3	U	**4.6**		**1.7**	J	**2.4**	J, M-03
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2FTS)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2FTS)	ng/L	5.2	U	6.7	U	**14**		5.1	U	**2.7**	J, M-03
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	ng/L	26	U	33	U	26	U	26	U	27	U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	ng/L	26	U	33	U	26	U	26	U	27	U
3-Perfluoropropyl propanoic acid (3:3FTCA)	ng/L	5.2	U	6.7	U	5.2	U	5.1	U	5.3	U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	ng/L	10	U	13	U	10	U	10	U	11	U
N-methyl perfluorooctanesulfonamide (NMeFOSA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	ng/L	10	U	13	U	10	U	10	U	11	U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ng/L	2.1	U	2.7	U	2.1	U	2	U	2.1	U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	ng/L	2.1	U	2.7	U	2.1	U	2	U	2.1	U
Perfluoro-3-methoxypropanoic acid (PFMPA)	ng/L	2.1	U	2.7	U	2.1	U	2	U	2.1	U
Perfluoro-4-methoxybutanoic acid (PFMBA)	ng/L	2.1	U	2.7	U	2.1	U	2	U	2.1	U
Perfluorobutanesulfonic acid (PFBS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluorobutanoic acid (PFBA)	ng/L	4.1	U	5.3	U	4.2	U	4.1	U	4.3	U
Perfluorodecanesulfonic acid (PFDS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluorodecanoic acid (PFDA)	ng/L	1	U	1.3	U	**0.36**	J, M-03	1	U	1.1	U
Perfluorododecanesulfonic acid (PFDoS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluorododecanoic acid (PFDoA)	ng/L	1	U	1.3	U	1	U, M-03	1	U	1.1	U
Perfluoroheptanesulfonic acid (PFHpS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluoroheptanoic acid (PFHpA)	ng/L	1	U	1.3	U	**0.34**	J, M-03	1	U	1.1	U
Perfluorohexanesulfonic acid (PFHxS)	ng/L	1	U, M-03	1.3	U	**0.4**	J, M-03	**0.21**	J, M-03	1.1	U, M-03
Perfluorohexanoic acid (PFHxA)	ng/L	1	U	1.3	U	**0.83**	J, M-03	1	U	1.1	U
Perfluorononanesulfonic acid (PFNS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluorononanoic acid (PFNA)	ng/L	1	U	1.3	U	**0.46**	J, M-03	1	U	1.1	U
Perfluorooctanesulfonamide (PFOSA)	ng/L	**3.2**	M-03	**1.9**	M-03	**2.5**	M-03	**5.5**	M-03	**4.5**	M-03
Perfluorooctanesulfonic acid (PFOS)	ng/L	**5**	M-03	**3**	M-03	**17**	M-03	**9.4**	M-03	**8.2**	M-03
Perfluorooctanoic acid (PFOA)	ng/L	1	U	1.3	U	**0.68**	J, M-03	1	U	1.1	U, M-03
Perfluoropentanesulfonic acid (PFPeS)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluoropentanoic acid (PFPeA)	ng/L	2.1	U	2.7	U	2.1	U	2	U	2.1	U
Perfluorotetradecanoic acid (PFTeDA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluorotridecanoic acid (PFTrDA)	ng/L	1	U	1.3	U	1	U	1	U	1.1	U
Perfluoroundecanoic acid (PFUnA)	ng/L	1	U	1.3	U	1	U, M-03	1	U	1.1	U

Table 9: Batch Testing Analytical Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Lab Qualifiers
Bold indicates the analyte was detected above the MDL.
U indicates the compound was not detected at or above the limit of detection
B indicates the compoind was detected in the method blank
J indicates the estimated result is less than limit of quantitation and greater than detection limit
Q indicates surrogate failure
M-03 indicates incorrect auto integration

Acronyms and Abbreviations:
ID = identification
MDL = method detection limit
PFAS = per- and polyfluoroalkyl substances
Post-TOP = post-total oxidizable precursor
Q = qualifier
USEPA = United States Environmental Protection Agency
ng/L = nanograms per liter
% = percent

Table 10: Sorptive Media Batch Testing Percent Reduction in Leached PFAS
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID:	FD-FS-1	FD-FS-2	FD-FS-3	FD-FS-4	FD-FS-5	FD-FS-2-1	FD-RB-1	FD-RB-2	FD-RB-3	FD-RB-4	FD-RB-5	FD-RB-2-1
Amendment:	FS-100 1%	FS-100 2%	FS-100 2.5%	FS-100 3%	FS-100 4%	FS-200 2%	RB- 100X 1%	RB- 100X 2%	RB- 100X 2.5%	RB- 100X 3%	RB- 100X 4%	RB- 100 2%
HFPO-DA	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
PFBS	>96.61%	>96.61%	>96.61%	>96.71%	>96.61%	>96.61%	>96.27%	>96.61%	>95.59%	>96.61%	>96.61%	>96.27%
PFDA	>98.99%	>98.99%	>98.99%	>99.03%	>98.99%	>98.99%	>98.89%	>98.99%	>98.69%	>99.64%	>98.99%	>98.89%
PFHpA	99.37%	>99.73%	>99.73%	>99.73%	>99.73%	99.90%	>99.70%	>99.73%	>99.64%	99.91%	>99.73%	>99.70%
PFHxS	99.98%	>99.96%	99.99%	>99.96%	99.97%	99.98%	99.99%	>99.96%	>99.95%	99.98%	99.99%	>99.96%
PFNA	>99.26%	>99.26%	>99.26%	>99.28%	>99.26%	>99.26%	>99.19%	>99.26%	>99.04%	99.66%	>99.26%	>99.19%
PFOS	99.99%	99.99%	99.98%	99.99%	99.93%	99.97%	99.99%	99.99%	99.99%	99.96%	99.98%	99.98%
PFOA	99.92%	>99.92%	>99.92%	>99.93%	99.96%	99.93%	>99.92%	>99.92%	>99.90%	99.95%	>99.92%	>99.92%
Average	>99.16%	>99.21%	>99.21%	>99.23%	>99.21%	>99.26%	>99.13%	>99.21%	>98.97%	>99.39%	>99.21%	>99.13%

Acronyms and Abbreviations:
ID = identification
NP = calculation not performed because this compound was not detected in any leachate sample
% = percent

Table 11: Preliminary Solidification Performance Testing Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Mix Number	Boring Location	Mix Description	Day 7 UCS	Day 28 UCS			Hydraulic Conductivity
				Dup 1	Dup 2	AVG	
			psi	psi			cm/sec
Mix-4	Fort Devens Composite	7.5% PLC	102.3	180.5	178.2	179.4	2.6E-06
Mix-5		10% PLC	306.1	375.5	390.9	383.2	NP
Mix-6		2.5% PLC + 5% BFS	118.6	346.3	295.7	321.0	5.9E-07
Mix-7		3.3% PLC + 6.7% BFS	175.3	578.4	639.5	609.0	NP
Mix-8		2.5% PLC + 5% BFS + 1% Bentonite	109.3	341.1	340.2	340.7	4.8E-07
Mix-9		3.3% PLC + 6.7% BFS + 1% Bentonite	190.4	575.8	513.3	544.6	NP

Acronyms and Abbreviations
AVG = average
BFS = Grade 120 ground-granulated blast furnace slag cement
cm/sec = centimeters per second
Dup = duplicate
NP = testing not performed at this interval
PLC = Type IL Portland-limestone cement
psi = pounds per square inch
UCS = unconfined compressive strength
% = percent

Table 12: Final Solidification Testing Geotechnical Performance Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Table 12: Final Solidification Testing Geotechnical Performance Results							
Mix Number	Boring Location	Mix Description	Day 7 UCS	Day 28 UCS			Hydraulic Conductivity
				Dup 1	Dup 2	AVG	
			psi	psi			cm/sec
LEAF-1	Ft Devens Homogenized	2.5% PLC + 5% BFS + 1% Fluorosorb 100	210.5	351.4	380.1	365.7	6.3E-07
LEAF-2		2.5% PLC + 5% BFS + 1% RemBind 100X	212.6	259.0	357.4	308.2	1.7E-06
LEAF-3		2.5% PLC + 5% BFS	161.9	328.9	316.5	322.7	2.3E-06

Acronyms and Abbreviations
AVG = average
BFS = Grade 120 ground-granulated blast furnace slag cement
cm/sec = centimeters per second
Dup = duplicate
PLC = Type IL Portland-limestone cement
psi = pounds per square inch
UCS = unconfined compressive strength
% = percent

Table 13: LEAF 1315 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID:	Result Units	LEAF-1						LEAF-2					
Description		1% FluoroSorb 100						1% RemBind 100X					
Time Interval:		T03: Day 2	Q	T04 : Day 7	Q	T09: Day 63	Q	T03: Day 2	Q	T04 : Day 7	Q	T09: Day 63	Q
Leached PFAS by USEPA Method 1633													
11Cl-PF3OUdS	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
3:3 FTCA	ng/L	4.6	ND	4.7	ND	4.8	ND	4.7	ND, 1B	4.5	ND	4.5	ND
4:2 FTS	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
5:3 FTCA	ng/L	23.2	ND	23.3	ND	23.8	ND	23.4	ND, 1B	22.5	ND	22.4	ND
6:2 FTS	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
7:3 FTCA	ng/L	23.2	ND	23.3	ND	23.8	ND	23.4	ND, 1B	22.5	ND	22.4	ND
8:2 FTS	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	**4.2**	
9Cl-PF3ONS	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
ADONA	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
HFPO-DA	ng/L	3.7	ND	3.7	ND	3.8	ND	3.7	ND, 1B	3.6	ND	3.6	ND
NEtFOSAA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
NEtFOSA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
NEtFOSE	ng/L	9.3	ND	9.3	ND	9.5	ND	9.4	ND, 1B	9	ND	9	ND
NFDHA	ng/L	1.9	ND	1.9	ND	1.9	ND	1.9	ND, 1B	1.8	ND	1.8	ND
NMeFOSAA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
NMeFOSA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
NMeFOSE	ng/L	9.3	ND	9.3	ND	9.5	ND	9.4	ND, 1B	9	ND	9	ND
PFBA	ng/L	**9.1**		**9.3**		3.8	ND	3.7	ND, 1B	**6.1**		3.7	ND, 1b, H2, N
PFBS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFDA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFDS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFDoA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFDoS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFEESA	ng/L	1.9	ND	1.9	ND	1.9	ND	1.9	ND, 1B	1.8	ND	1.8	ND
PFHpA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFHpS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFHxA	ng/L	0.93	ND	**1.1**		**1.2**		0.94	ND, 1B	**0.91**		**1.1**	
PFHxS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	**1.6**		**1.4**	
PFMBA	ng/L	1.9	ND	1.9	ND	1.9	ND	1.9	ND, 1B	1.8	ND	1.8	ND
PFMPA	ng/L	1.9	ND	1.9	ND	1.9	ND	1.9	ND, 1B	1.8	ND	1.8	ND
PFNA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFNS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFOA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	**0.92**		**0.98**	
PFOS	ng/L	**1.3**		**1.9**		0.95	ND	**2.6**	1B	**13.1**		**14.4**	
PFOSA	ng/L	**2.2**		**3.8**		**3.4**		**2.9**	1B	**11.0**		**11.6**	
PFPeA	ng/L	1.9	ND	1.9	ND	1.9	ND	1.9	ND, 1B	1.8	ND	**5.5**	1b, H2, N2
PFPeS	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFTeDA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFTrDA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND
PFUnA	ng/L	0.93	ND	0.93	ND	0.95	ND	0.94	ND, 1B	0.9	ND	0.9	ND

Table 13: LEAF 1315 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

LEAF-3					
Control: No Sorbent					
T03: Day 2	Q	T04 : Day 7	Q	T09: Day 63	Q
3.8	ND,CC, L1	3.7	ND	3.8	ND
4.8	ND	4.6	ND	4.8	ND
3.8	ND	3.7	ND	3.8	ND
23.8	ND	23.1	ND	24	ND
4.1		**9.2**		**7.1**	
23.8	ND	23.1	ND	24	ND
70.2		**120**		**127**	
3.8	ND,CC, L1	3.7	ND	3.8	ND
3.8	ND,CC, L1	3.7	ND	3.8	ND
3.8	ND	3.7	ND	3.8	ND
0.95	ND	0.93	ND	0.96	ND
0.95	ND	0.93	ND	0.96	ND
9.5	ND	9.3	ND	9.6	ND
1.9	ND, L1	1.9	ND	1.9	ND
0.95	ND	**1.4**		0.96	ND
0.95	ND	0.93	ND	0.96	ND
9.5	ND	9.3	ND	9.6	ND
3.8	ND	**7.1**		**4.6**	
0.95	ND	**2.1**		**1.9**	
0.95	ND	**1.3**		**0.97**	
0.95	ND	0.93	ND	0.96	ND
0.95	ND	0.93	ND	0.96	ND
0.95	ND	0.93	ND	0.96	ND
1.9	ND	1.9	ND	1.9	ND
2.9		**10.7**		**6.0**	
0.95	ND	**2.3**		**1.1**	
7.8		**25.7**		**14.6**	
20.6		**72.4**		**40.1**	
1.9	ND, L1	1.9	ND	1.9	ND
1.9	ND	1.9	ND	1.9	ND
0.95	ND	**2.0**		0.96	ND
0.95	ND	0.93	ND	0.96	ND
9.4		**26.9**		**13.2**	
252		**650**		**324**	
168		**408**		**208**	
3.6		**10.9**		**6.1**	
0.95	ND	2.3	ND	**1.2**	
0.95	ND	0.93	ND	0.96	ND
0.95	ND	0.93	ND	0.96	ND
0.95	ND	0.93	ND	0.96	ND

Table 13: LEAF 1315 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Lab Qualifiers:

Bold indicates the analyte was detected above the MDL.
1b indicates a matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.
H2 indicates extraction or preparation was conducted outside EPA method holding time.
L1 indicates analyte recovery in the laboratory control sample was above QC limits. Results for this analyte in assoiciated samples may be biased high.
N2 indicates that the lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply.
ND indicates the analyte was analyzed for but not detected.

Acronyms and Abbreviations:

ID = identification
ng/L = nanograms per liter
PFAS = per- and polyfluoroalkyl substances
Q = qualifier
% = percent

Table 14: Percent of Total PFAS Mass Leached During LEAF Extractions
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Leaching Method	LEAF 1314	LEAF 1315	LEAF 1314	LEAF 1314	LEAF 1315	LEAF 1315
Sample ID	LEAF-4	LEAF-3	LEAF-5	LEAF-06	LEAF-2	LEAF-1
Sample Description	Unamended Soil	2.5% PLC + 5% BFS	1% RemBind 100X	1% Fluorosorb 100	2.5% PLC + 5% BFS + 1% RemBind 100X	2.5% PLC + 5% BFS + 1% FLUORO-SORB 100
HFPO-DA	NP	NP	NP	NP	NP	NP
PFBS	NP	121.70%	NP	NP	NP	NP
PFDA	63.71%	16.19%	22.05%	NP	NP	NP
PFHpA	136.94%	56.06%	0.37%	0.06%	NP	NP
PFHxS	207.73%	51.49%	0.38%	0.05%	1.50%	NP
PFNA	123.78%	24.62%	0.19%	NP	NP	NP
PFOA	157.77%	35.77%	0.21%	0.03%	1.91%	NP
PFOS	98.02%	15.16%	2.02%	0.03%	0.41%	0.05%

Note:
Percentages greater than 100% reflect the inherent variablity in soil analysis and subsequently propagated through these calculations.

Acronyms and Abbreviations:
ID = identification
NP = calculation not performed because this compound was not detected in any leachate sample
PFAS = per- and polyfluoroalkyl substances
% = percent

Table 15: LEAF 1315 DO, pH, SC Measurements
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Dissolved Oxygen		pH		Specific Conductance	
	mg/L		SU		µmhos/cm	
	Result	Q	Result	Q	Result	Q
LEAF-1 T01	8.7	HF	10.3		39	
LEAF-1 T02	9.6	HF	10.5		180	
LEAF-1 T03	9.6	HF	10.9		220	
LEAF-1 T04	9.0	HF	11.0		290	
LEAF-1 T05	9.0	HF	11.2		350	
LEAF-1 T06	9.3	HF	11.1	H	370	
LEAF-1 T07	9.7	HF	11.1		330	
LEAF-1 T08	9.6	HF	10.9		210	
LEAF-1 T09	9.7	HF	11.0		280	
LEAF-2 T01	9.4	HF	10.4		45	
LEAF-2 T02	9.1	HF	10.8		240	
LEAF-2 T03	9.4	HF	10.9		200	
LEAF-2 T04	9.7	HF	11.0		330	
LEAF-2 T05	9.6	HF	11.1		320	
LEAF-2 T06	9.6	HF	11.1	H	340	
LEAF-2 T07	9.5	HF	11.1		300	
LEAF-2 T08	8.9	HF	10.9		190	
LEAF-2 T09	10.0	HF	11.0		270	
LEAF-3 T01	8.8	HF	10.7		95	
LEAF-3 T02	9.4	HF	10.8		200	
LEAF-3 T03	9.8	HF	10.9		180	
LEAF-3 T04	9.6	HF	11.1		350	
LEAF-3 T05	9.3	HF	11.1		360	
LEAF-3 T06	9.0	HF	11.2	H	390	
LEAF-3 T07	9.4	HF	11.2		400	
LEAF-3 T08	9.4	HF	11.0		240	
LEAF-3 T09	9.3	HF	11.1		310	

Lab Qualifiers:

H indicates the sample was prepped or analyzed beyond the specified holding time. This does not meet regulatory requirements.

HF indicates the parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Acronyms and Abbreviations:

ID = identification
mg/L = milligrams per liter
Q = qualifier
SU = standard units
µmhos/cm = microhos per centimeter

Table 16: LEAF 1314 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID:	Result Units	LEAF-4										LEAF-5								
Description		Control: No Fixant										1% RemBind 100X								
Time Interval:		T01	Q	T02-T04	Q	T05	Q	T06-T08	Q	T09	Q	T01	Q	T02-T04	Q	T05	Q	T06-T08	Q	T09	Q
Leached PFAS by EPA Method 1633																					
11Cl-PF3OUdS	ng/L	468	ND	36.8	ND, CC	3.7	ND	3.6	ND, CC, L1	3.7	ND, CC, L1	0.88	ND	3.6	ND	3.8	ND	3.7	ND, CC, L1	3.7	ND, L1
3:3 FTCA	ng/L	741	ND	46.1	ND	4.6	ND	4.5	ND	4.6	ND	1.4	ND	4.6	ND	4.7	ND	4.6	ND	4.6	ND
4:2 FTS	ng/L	316	ND	36.8	ND	3.7	ND	3.6	ND	3.7	ND	0.6	ND	3.6	ND	3.8	ND	3.7	ND	3.7	ND
5:3 FTCA	ng/L	940	ND	230	ND	23	ND	22.3	ND	22.8	ND	1.8	ND	22.8	ND	23.5	ND	22.9	ND	22.9	ND
6:2 FTS	ng/L	**2300**		**38.0**		3.7	ND	3.6	ND	3.7	ND	0.89	ND	3.6	ND	3.8	ND	3.7	ND	3.7	ND
7:3 FTCA	ng/L	1280	ND	230	ND	23	ND	22.3	ND	22.8	ND	2.4	ND	22.8	ND	23.5	ND	22.9	ND	22.9	ND
8:2 FTS	ng/L	**26800**		**5700**		3.7	ND	**257**		**15.9**		**4.8**		**3330**		3.8	ND	3.7	ND	3.7	ND
9Cl-PF3ONS	ng/L	367	ND	36.8	ND, CC	3.7	ND	3.6	ND, CC, L1	3.7	ND, CC, L1	0.69	ND	3.6	ND	3.8	ND	3.7	ND, CC, L1	3.7	ND, L1
ADONA	ng/L	286	ND	36.8	ND, CC	3.7	ND	3.6	ND, CC, L1	3.7	ND, CC, L1	0.54	ND	3.6	ND	3.8	ND	3.7	ND, CC, L1	3.7	ND, L1
HFPO-DA	ng/L	445	ND	36.8	ND	3.7	ND	3.6	ND	3.7	ND	0.84	ND	3.6	ND	3.8	ND	3.7	ND	3.7	ND
NEtFOSA	ng/L	72.2	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.14	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
NEtFOSAA	ng/L	142	ND	9.2	ND	0.92	ND	**8.0**		**4.2**		0.27	ND	**10.7**		0.94	ND	0.92	ND	0.92	ND
NEtFOSE	ng/L	1180	ND	92.1	ND	9.2	ND	8.9	ND	9.1	ND	2.2	ND	9.1	ND	9.4	ND	9.2	ND	9.2	ND
NFDHA	ng/L	246	ND	18.4	ND	1.8	ND	1.8	ND, CC, L1	1.8	ND, CC, L1	0.47	ND	1.8	ND	1.9	ND	1.8	ND, CC, L1	1.8	ND, L1
NMeFOSA	ng/L	76.4	ND	9.2	ND	0.92	ND	**5.6**		**4.6**		0.14	ND	**2.9**		0.94	ND	0.92	ND	0.92	ND
NMeFOSAA	ng/L	93	ND	9.2	ND	0.92	ND	**3.1**		0.91	ND	0.18	ND	**540**		0.94	ND	0.92	ND	0.92	ND
NMeFOSE	ng/L	758	ND	92.1	ND	9.2	ND	8.9	ND	9.1	ND	1.4	ND	9.1	ND	9.4	ND	9.2	ND	9.2	ND
PFBA	ng/L	272	ND	36.8	ND	3.7	ND	3.6	ND	3.7	ND	0.52	ND	3.6	ND	3.8	ND	3.7	ND	3.7	ND
PFBS	ng/L	52	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.098	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFDA	ng/L	90.6	ND	**142**		0.92	ND	**3.9**		0.91	ND	0.17	ND	**53.2**		0.94	ND	0.92	ND	0.92	ND
PFDS	ng/L	76.7	ND	**21.9**		0.92	ND	**13.8**		**13.9**		0.15	ND	**19.8**		0.94	ND	0.92	ND	0.92	ND
PFDoA	ng/L	84.6	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.16	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFDoS	ng/L	170	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.32	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFEESA	ng/L	239	ND	18.4	ND	1.8	ND	1.8	ND	1.8	ND	0.45	ND	1.8	ND	1.9	ND	1.8	ND	1.8	ND
PFHpA	ng/L	**3270**		**59.4**		0.92	ND	**1.3**		0.91	ND	0.15	ND	**1.7**		0.94	ND	0.92	ND	0.92	ND
PFHpS	ng/L	**961**		**38.3**		0.92	ND	0.89	ND	0.91	ND	0.11	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFHxA	ng/L	**4000**		**80.8**		0.92	ND	**4.6**		**2.2**		**1.7**		**4.1**		0.94	ND	0.92	ND	0.92	ND
PFHxS	ng/L	**24200**		**425**		**0.94**		**3.9**		**2.4**		**2.5**		**6.1**		0.94	ND	0.92	ND	0.92	ND
PFMBA	ng/L	148	ND	18.4	ND	1.8	ND	1.8	ND, L1	1.8	ND, L1	0.28	ND	1.8	ND	1.9	ND	1.8	ND, L1	1.8	ND, L1
PFMPA	ng/L	160	ND	18.4	ND	1.8	ND	1.8	ND	1.8	ND	0.3	ND	1.8	ND	1.9	ND	1.8	ND	1.8	ND
PFNA	ng/L	**812**		**24.2**		0.92	ND	0.89	ND	0.91	ND	0.16	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFNS	ng/L	109	ND	**101**		0.92	ND	**24.7**		**1.1**		0.21	ND	**102**		0.94	ND	0.92	ND	0.92	ND
PFOA	ng/L	**9620**		**163**		0.92	ND	**2.7**		**1.7**		**1.1**		**3.4**		0.94	ND	0.92	ND	0.92	ND
PFOS	ng/L	**220000**		**43200**		**7.2**		**132**		**29.0**		**34.5**		**2030**		**3.4**		**2.0**		**1.3**	
PFOSA	ng/L	**33600**		**33800**		**4.0**		**730**		**188**		**6.4**		50	ND	**1.2**		0.92	ND	0.92	ND
PFPeA	ng/L	**2120**		**42.0**		1.8	ND	1.8	ND	1.8	ND	**3.2**		1.8	ND	1.9	ND	1.8	ND	1.8	ND
PFPeS	ng/L	58.2	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.11	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFTeDA	ng/L	83.8	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.16	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFTrDA	ng/L	98	ND	9.2	ND	0.92	ND	0.89	ND	0.91	ND	0.19	ND	0.91	ND	0.94	ND	0.92	ND	0.92	ND
PFUnA	ng/L	90.8	ND	9.2	ND	0.92	ND	**6.1**		**4.5**		0.17	ND	**5.1**		0.94	ND	0.92	ND	0.92	ND

Table 16: LEAF 1314 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID:	Result Units	LEAF-6									
Description		1% FluoroSorb 100									
Time Interval:		T01	Q	T02-T04	Q	T05	Q	T06-T08	Q	T09	Q
Leached PFAS by EPA Method 1633											
11Cl-PF3OUdS	ng/L	0.86	ND	3.8	ND	3.8	ND	3.8	ND, L1	3.6	ND, L1
3:3 FTCA	ng/L	1.4	ND	4.7	ND	4.7	ND	4.7	ND	4.5	ND
4:2 FTS	ng/L	0.58	ND	3.8	ND	3.8	ND	3.8	ND	3.6	ND
5:3 FTCA	ng/L	1.7	ND	23.7	ND	23.6	ND	23.7	ND	22.7	ND
6:2 FTS	ng/L	0.87	ND	3.8	ND	3.8	ND	3.8	ND	3.6	ND
7:3 FTCA	ng/L	2.4	ND	23.7	ND	23.6	ND	23.7	ND	22.7	ND
8:2 FTS	ng/L	**11.7**		**7.1**		3.8	ND	3.8	ND	3.6	ND
9Cl-PF3ONS	ng/L	0.68	ND	3.8	ND	3.8	ND	3.8	ND, L1	3.6	ND, L1
ADONA	ng/L	0.53	ND	3.8	ND	3.8	ND	3.8	ND, L1	3.6	ND
HFPO-DA	ng/L	0.82	ND	3.8	ND	3.8	ND	3.8	ND	3.6	ND
NEtFOSA	ng/L	0.13	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
NEtFOSAA	ng/L	0.26	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
NEtFOSE	ng/L	2.2	ND	9.5	ND	9.4	ND	9.5	ND	9.1	ND
NFDHA	ng/L	0.45	ND	1.9	ND	1.9	ND	1.9	ND, L1	1.8	ND
NMeFOSA	ng/L	0.14	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
NMeFOSAA	ng/L	0.17	ND	**1.2**		0.94	ND	0.95	ND	0.91	ND
NMeFOSE	ng/L	1.4	ND	9.5	ND	9.4	ND	9.5	ND	9.1	ND
PFBA	ng/L	0.5	ND	3.8	ND	3.8	ND	3.8	ND	3.6	ND
PFBS	ng/L	0.096	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFDA	ng/L	0.17	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFDS	ng/L	0.14	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFDoA	ng/L	0.16	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFDoS	ng/L	0.31	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFEESA	ng/L	0.44	ND	1.9	ND	1.9	ND	1.9	ND	1.8	ND
PFHpA	ng/L	**0.99**		0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFHpS	ng/L	0.1	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFHxA	ng/L	**3.0**		0.95	ND	0.94	ND	**0.96**		0.91	ND
PFHxS	ng/L	**1.4**		**1.3**		0.94	ND	0.95	ND	0.91	ND
PFMBA	ng/L	0.27	ND	1.9	ND	1.9	ND	1.9	ND, L1	1.8	ND, L1
PFMPA	ng/L	0.3	ND	1.9	ND	1.9	ND	1.9	ND	1.8	ND
PFNA	ng/L	0.15	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFNS	ng/L	0.2	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFOA	ng/L	**2.0**		0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFOS	ng/L	**18.1**		**20.4**		**3.8**		**1.2**		0.91	ND
PFOSA	ng/L	**20.8**		**14.7**		**2.6**		**1.3**		0.91	ND
PFPeA	ng/L	**3.5**		1.9	ND	1.9	ND	1.9	ND	1.8	ND
PFPeS	ng/L	0.11	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFTeDA	ng/L	0.15	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFTrDA	ng/L	0.18	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND
PFUnA	ng/L	0.17	ND	0.95	ND	0.94	ND	0.95	ND	0.91	ND

Table 16: LEAF 1314 Leachate PFAS Results
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Lab Qualifiers:
Bold indicates the analyte was detected above the MDL.
CC indicates the continuing calibration for this compound is outside of method control limits. The result is estimated.
J indicates the estimated concentration is above the adjusted method detection limit and below the adjusted reporting limit.
L1 indicates the analyte recovery in the laboratory control sample was above QC limits. Results for this analyte in associated samples may be biased high.
M1 indicates the matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
ND indicates the analyte analyzed for but not detected.

Acronyms and Abbreviations:
ID = identification
NP = Calculation not performed, no detectable concentrations of this compound found in any leachate sample
PFAS = per- and polyfluoroalkyl substances
Q = qualifier
QC = quality control
% = percent

Table 17: LEAF 1314 DO, pH, SC Measurements
In-Situ Soil Solidification and Stabilization Bench-Scale Treatability Study Results
Area of Concern 31 - Former Fort Devens Army Installation
Devens, Massachusetts

Sample ID	Dissolved Oxygen		pH		Specific Conductance	
	mg/L		SU		µmhos/cm	
	Result	Q	Result	Q	Result	Q
LEAF-4 T01	8.4	HF	7.7		270	
LEAF-4 T02	9.1	HF	7.9		140	
LEAF-4 T03	9.4	HF	8.0		100	
LEAF-4 T04	8.2	HF	7.9		72	
LEAF-4 T05	9.6	HF	7.7		58	
LEAF-4 T06	9.3	HF	7.8		41	
LEAF-4 T07	9.2	HF	8.2		32	
LEAF-4 T08	9.6	HF	7.9		28	
LEAF-4 T09	9.3	HF	7.8		24	
LEAF-5 T01	9.6	HF	8.1		230	
LEAF-5 T02	8.5	HF	8.2		150	
LEAF-5 T03	9.4	HF	8.2		120	
LEAF-5 T04	9.0	HF	8.1		92	
LEAF-5 T05	8.5	HF	8.0		78	
LEAF-5 T06	9.6	HF	7.9		54	
LEAF-5 T07	9.8	HF	8.1		39	
LEAF-5 T08	9.4	HF	7.9		31	
LEAF-5 T09	9.1	HF	7.9		25	
LEAF-6 T01	9.2	HF	7.9		1400	
LEAF-6 T02	9.5	HF	8.1		350	
LEAF-6 T03	9.6	HF	8.1		140	
LEAF-6 T04	9.7	HF	8.1		80	
LEAF-6 T05	9.0	HF	8.2		64	
LEAF-6 T06	9.5	HF	8.0		47	
LEAF-6 T07	9.8	HF	8.3		36	
LEAF-6 T08	9.8	HF	7.9		33	
LEAF-6 T09	9.5	HF	7.9		26	

Lab Qualifiers:
H indicates the sample was prepped or analyzed beyond the specified holding time. This does not meet regulatory requirements.
HF indicates the parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Acronyms and Abbreviations:
ID = identification
mg/L = milligrams per liter
Q = qualifier
SU = standard units
µmhos/cm = microhos per centimeter

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Appendix G

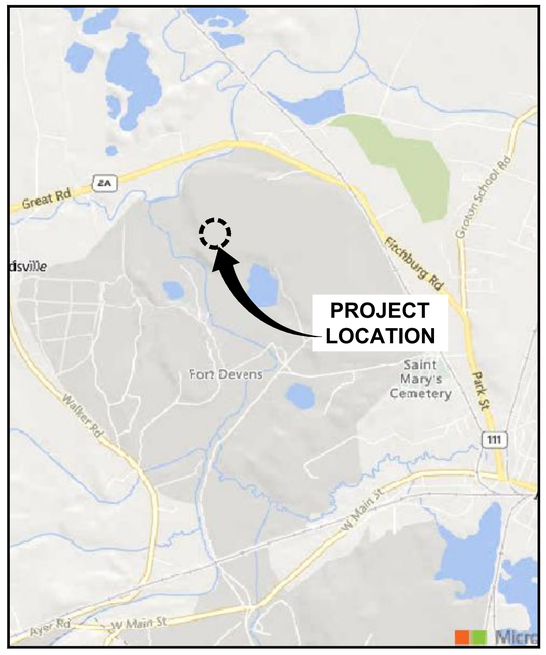
AOC 31 ISS Pilot Test Drawings and Specifications

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DESIGN DRAWINGS

PROPOSED REMEDIAL ACTION

AOC 31
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS



LOCATION MAP

0 1500' 3000'

GRAPHIC SCALE



DATE ISSUED

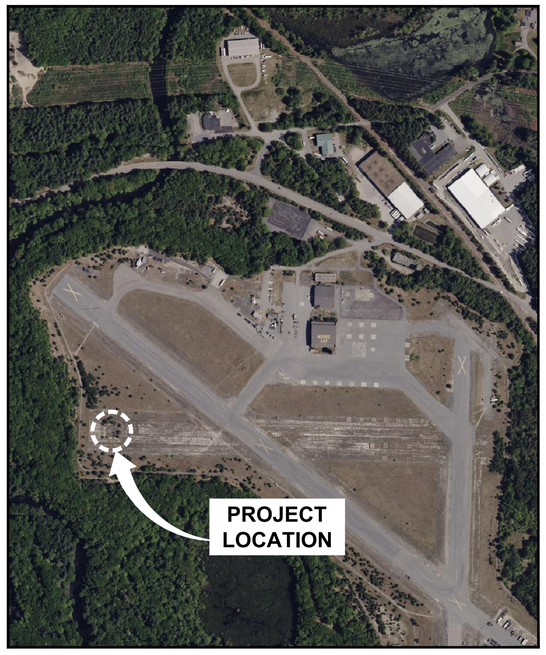
SEPTEMBER 2025

INDEX TO DRAWINGS

	COVER SHEET
1	GENERAL NOTES AND LEGEND
2	GENERAL NOTES
3	GENERAL NOTES
4	EXISTING CONDITIONS PLAN
5	SOIL MIXING PLAN
6	DETAILS

SERES Engineering & Services, LLC

ARCADIS a joint venture



AERIAL PHOTO

0 500' 1000'

GRAPHIC SCALE

LEGEND:

- LOD — LIMIT OF DISTURBANCE
- PROPOSED MIXING LIMITS (20' DEPTH)
- SW — PROPOSED STRAW WATTLE
- x — x — PROPOSED SPLIT RAIL FENCE
- PROPOSED STABILIZED CONSTRUCTION ENTRANCE AND ACCESS ROAD
- 265 — EXISTING CONTOUR (1-FT INTERVAL)
- TEMPORARY STOCKPILE LOCATION
- NATIVE SOIL BERM

GENERAL NOTES

1. BASE MAP FROM AVAILABLE AERIAL IMAGERY. VERTICAL COORDINATE SYSTEM IS UNKNOWN. ALL UTILITIES SHOWN ARE APPROXIMATE.
2. SCALES ARE AS INDICATED ON EACH DRAWING.
3. THE GENERAL NOTES AND LEGEND PROVIDED ON THIS SHEET APPLY TO ALL DRAWINGS, UNLESS OTHERWISE INDICATED.
4. CONTOUR INTERVAL IS 1 FOOT, UNLESS OTHERWISE INDICATED.
5. ALL WORK SHALL BE PERFORMED WITHIN THE LIMITS OF DISTURBANCE PRESENTED HEREIN.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING SURVEY CONTROL TO VERIFY EXISTING SITE GRADES AND CONDITIONS. THE ENGINEER WILL PROVIDE THE CONTRACTOR WITH SURVEY CONDITIONS AND COPIES OF ALL DRAWINGS IN ELECTRONIC FORMAT.
7. ALL EXISTING DIMENSIONS, CONTOUR LINES AND FIELD CONDITIONS SHALL BE VERIFIED BY THE CONTRACTOR AND A LICENSED MASSACHUSETTS SURVEYOR PRIOR TO START OF ANY CONSTRUCTION. DIFFERENCES NOTED BY THE CONTRACTOR BETWEEN BASE MAP INFORMATION AND ACTUAL SITE CONDITIONS SHALL BE SUBMITTED TO THE FIELD ENGINEER PRIOR TO START OF WORK.
8. THE LOCATION AND DEPTH OF ALL SUBSURFACE UTILITIES SHOWN ARE APPROXIMATE AND ARE BASED ON OBVIOUS ABOVE GROUND PHYSICAL UTILITY APPURTENANCES. ARCADIS PERFORMED INVESTIGATIVE SOIL BORINGS AT THE SITE. THESE DETAILS ARE PROVIDED WITHIN THE CONTRACT DOCUMENTS. ADDITIONAL UTILITIES MAY EXIST.
9. CONTRACTOR SHALL NOTIFY MASSACHUSETTS ONE-CALL (811) AT LEAST FIVE (5) BUSINESS DAYS PRIOR TO COMMENCEMENT OF WORK TO VERIFY UTILITY LOCATIONS AND PERFORM A MARKOUT SURVEY. CONTRACTOR SHALL RE-NOTIFY MASSACHUSETTS ONE-CALL AND RE-ESTABLISH ACTIVE UTILITY TICKET AS REQUIRED.
10. THE CONTRACTOR SHALL PREPARE, IMPLEMENT, AND BE RESPONSIBLE FOR ALL REQUIREMENTS OF THE HEALTH AND SAFETY PROGRAM THROUGHOUT CONSTRUCTION. CONTRACTOR SHALL COMPLY WITH ALL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REQUIREMENTS. THE CONTRACTOR SHALL MAINTAIN AND IMPLEMENT THE SITE HEALTH AND SAFETY PLAN IN CONFORMANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES, AND REGULATIONS. THE CONTRACTOR SHALL ENSURE THAT THEIR EMPLOYEES AND SUBCONTRACTORS ARE OSHA TRAINED ACCORDING TO CFR 1910:120 AND HAVE THE CAPABILITIES OF IMPLEMENTING THE HEALTH AND SAFETY PLAN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE HEALTH AND SAFETY OF THE CONTRACTOR'S EMPLOYEES AND SUBCONTRACTORS.
11. THE CONTRACTOR SHALL COORDINATE NECESSARY TRAFFIC CONTROLS WITHIN THE PROJECT WORK LIMITS AND OBTAIN NECESSARY LOCAL PERMITS THAT MAY BE REQUIRED IN CONJUNCTION WITH VEHICLE USE ON PUBLIC ROADS.
12. THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS FOR IMPLEMENTATION OF THE EXCAVATION OF SOIL DESIGNATED FOR DISPOSAL, IN-SITU SOIL STABILIZATION (ISS), AND SITE RESTORATION AS SHOWN ON THESE CONTRACT DRAWINGS AND WITHIN THE LIMITS OF DISTURBANCE.

1.0 INTRODUCTION

THE ENCLOSED DRAWINGS AND SPECIFICATIONS CONTAIN INFORMATION FOR THE REMEDIATION OF IMPACTED SOILS AT THE AREA OF CONCERN 31 – FORMER FIRE TRAINING AREA
FORMER FORT DEVENS ARMY INSTALLATION IN MASSACHUSETTS.

CLIENT: UNITED STATES ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT
ENGINEER: SERES-ARCADIS 8(A) JV 2, LLC (ARCADIS)
CONTRACTOR: TO BE DETERMINED

2.0 GENERAL NOTES:

2.1 APPARENT HORIZONTAL DATUM IS THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NORTH AMERICAN DATUM OF 1983 (NAD83).

2.2 VERTICAL DATUM IS UNKNOWN.

2.3 LOCATIONS OF ALL STRUCTURES/UTILITIES SHOWN ARE APPROXIMATE. INFORMATION RELATED TO SUBSURFACE CONDITIONS SHOULD BE CONSIDERED AS GENERALLY REPRESENTATIVE AND SHOULD NOT BE RELIED UPON AS A COMPLETE DEPICTION OF SITE CONDITIONS.

2.4 ADDITIONAL SITE FEATURES MAY BE PRESENT THAT ARE NOT SHOWN. THE CONTRACTOR WILL VERIFY ALL EXISTING CONDITIONS, INCLUDING ABOVE-GRADE AND SUBSURFACE FEATURES.

2.5 PROMPTLY NOTIFY THE ENGINEER UPON DISCOVERY, AND BEFORE CONDITIONS ARE FURTHER DISTURBED OF PHYSICAL CONDITIONS AT THE SITE THAT DIFFER FROM THOSE INDICATED.

2.6 PROMPTLY, AFTER DISCOVERING, GIVE WRITTEN AND ORAL NOTICE TO THE ENGINEER OF DELAYS IN PROJECT SCHEDULE DUE TO EQUIPMENT MALFUNCTION, WEATHER, OR GENERAL FAILURE TO MEET PRODUCTION STANDARDS.

2.7 COMPLY WITH ALL REQUIREMENTS OF ANY ISSUED PERMITS AND ANY APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.

2.8 UTILIZE GOOD HOUSEKEEPING PRACTICES TO MAINTAIN A NEAT AND ORDERLY SITE AT ALL TIMES. REFUSE, DEBRIS AND WASTE MATERIALS WILL NOT UNDER ANY CIRCUMSTANCES BE PLACED WITHIN ANY AREA NOT IDENTIFIED FOR SUCH PURPOSE. ALL CONSTRUCTION REFUSE, DEBRIS AND WASTE MATERIALS WILL BE DISPOSED OF PROMPTLY AND PROPERLY. ALL CONSTRUCTION EQUIPMENT WILL BE REMOVED FROM THE SITE UPON COMPLETION OF THE CONSTRUCTION ACTIVITIES.

2.9 EQUIPMENT USED IN THE STAGING OR REMEDIATION AREAS THAT USES FUEL, OIL OR HYDRAULIC FLUID WILL BE INSPECTED DAILY FOR LEAKAGE. ANY EQUIPMENT REPAIR, FUEL STORAGE AND/OR REFUELING OF VEHICLES WILL BE CONDUCTED AT A CONTAINED LOCATION OUTSIDE OF THE REMEDIATION AREA.

2.10 SUBMIT A HASP AND A REMEDIATION EXECUTION PLAN FOR THE PROPOSED EXCAVATION AND SOIL MIXING WORK. THE WORK PLAN WILL INCLUDE, AT A MINIMUM THE PROPOSED METHODS, EQUIPMENT, SHORING EQUIPMENT, PROJECT SCHEDULE, SEQUENCE AND/OR MATERIALS TO PERFORM THE WORK, AND CONSTRUCTION QUALITY ASSURANCE AND QUALITY CONTROL PROGRAM.

2.11 DAILY PROGRESS REPORTS WILL BE SUBMITTED BY THE CONTRACTOR AT THE BEGINNING OF THE FOLLOWING DAY TO PROVIDE A DESCRIPTION OF DAILY WORK ACTIVITIES, LIST SITE PERSONNEL, DETAILS OF EQUIPMENT USED AND ITS PERFORMANCE, ESTIMATED AND ACTUAL DAILY PRODUCTION RATES, ANY DELAYS ENCOUNTERED AND IF SO, RELEVANT DETAILS OF THE DELAY AND ITS CAUSE AND RESOLUTION, APPROVALS, EXCAVATED MATERIAL VOLUME ESTIMATES, SOIL MIXING VOLUME ESTIMATES MATERIAL MANAGEMENT AT THE STAGING AREA, RESTORATION, AND OTHER RELEVANT ASPECTS.

3.0 HEALTH AND SAFETY

3.1 THE CONTRACTOR WILL BE SOLELY RESPONSIBLE FOR ALL SAFETY PROGRAMS FOR THEIR EMPLOYEES, SUBCONTRACTORS, AND ANY OTHER PERSONS WHO MAY BE AFFECTED THEREBY. THE CONTRACTOR WILL PREPARE A SITE-SPECIFIC HASP THAT WILL BE REVIEWED BY THE ENGINEER PRIOR TO THE START OF ANY WORK.

3.2 HASP SHALL ADDRESS AND INCLUDE THE FOLLOWING:

a. LIST OF EMERGENCY CONTACT INFORMATION.
b. CONTRACTOR'S ORGANIZATIONAL STRUCTURE. ORGANIZATIONAL STRUCTURE TO BE UPDATED, AS NECESSARY, TO REFLECT CURRENT STATUS OF SITE OPERATIONS AND PERSONNEL.
c. HAZARD ANALYSIS FOR EACH TASK AND OPERATION FOUND IN THE WORK PLAN.
d. SDS FOR ALL CONTRACTOR CONTROLLED MATERIALS KEPT ON SITE.
e. EMPLOYEE TRAINING ASSIGNMENTS INCLUDING COPIES OF OSHA 40-HOUR, 24-HOUR SUPERVISED FIELD ACTIVITIES, 8-HOUR SUPERVISORS, AND 8-HOUR REFRESHER TRAINING CERTIFICATES FOR EACH CONTRACTOR AND SUBCONTRACTOR EMPLOYEE ASSIGNED TO THE PROJECT.
f. PPE TO BE USED BY EMPLOYEES FOR EACH TASK AND OPERATION BEING CONDUCTED.
g. MEDICAL SURVEILLANCE REQUIREMENTS: MEDICAL CLEARANCE CERTIFICATES FOR ALL CONTRACTOR AND SUBCONTRACTOR EMPLOYEES ASSIGNED TO THE PROJECT.
h. FREQUENCY AND TYPES OF AIR AND PERSONNEL MONITORING, INCLUDING METHODS OF MAINTENANCE AND CALIBRATION OF MONITORING EQUIPMENT.
i. SITE CONTROL MEASURES TO PREVENT UNQUALIFIED OR UNPROTECTED WORKERS FROM ENTERING RESTRICTED AREAS.
j. EMERGENCY RESPONSE PLAN FOR COMMUNICATING ROUTES OF ESCAPE AND GATHERING POINTS DURING AN EMERGENCY SITUATION (SEE BELOW)
k. DECONTAMINATION PROCEDURES

3.3 ACCIDENT REPORTING AND INVESTIGATION SHALL COMPLY WITH 29 CFR 1904.29, INCLUDING USING OSHA 300, 300-A, AND 301 FORMS (OR EQUIVALENT) TO DOCUMENT ALL ACCIDENTS THAT RESULT IN BODILY INJURY. COPIES OF COMPLETED ACCIDENT REPORTS SHALL BE SUBMITTED TO THE CLIENT AND ENGINEER WITHIN 24 HOURS. BASED UPON RESULTS OF ACCIDENT INVESTIGATION, MODIFY THE HASP AS REQUIRED BY CHANGING TASKS OR PROCEDURES TO PREVENT REOCCURRENCE OF ACCIDENT.

3.4 AN EMERGENCY RESPONSE PLAN SHALL BE INCLUDED IN THE HASP AND IS IN COMPLIANCE WITH 29 CFR 1910.120(l), WHICH ADDRESSES THE FOLLOWING ELEMENTS:

a. EMERGENCY RECOGNITION AND PREVENTION.
b. PRE-EMERGENCY PLANNING AND PROCEDURES FOR REPORTING INCIDENTS TO APPROPRIATE AGENCIES FOR POTENTIAL CHEMICAL EXPOSURES, PERSONAL INJURIES, FIRES/EXPLOSIONS, ENVIRONMENTAL SPILLS AND RELEASES.
c. ROUTE MAPS TO NEAREST PRE-NOTIFIED MEDICAL FACILITY.
d. PERSONNEL ROLES, LINES OF AUTHORITY, COMMUNICATIONS.
e. POSTED INSTRUCTIONS AND A LIST OF EMERGENCY CONTACTS.
f. CRITERIA AND PROCEDURES FOR SITE EVACUATION (EMERGENCY ALERTING

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SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

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Professional Engineer's Name: -		
Professional Engineer's No.		
State: MA	Date Signed: .	Project Mgr.: .
Designed by: .	Drawn by: GS	Checked by: .

SERES Engineering & Services, LLC
ARCADIS a joint venture

AOC 31 • FORMER FORT DEVENS ARMY INSTALLATION • DEVENS, MASSACHUSETTS
PROPOSED REMEDIAL ACTION

GENERAL NOTES AND LEGEND

ARCADIS Project No. 30247920

Date SEPTEMBER 2025

ARCADIS
19 West College Ave., Suite 250
Yardley, PA 19067
Tel: 267.685.1800

1

PROCEDURES/EMPLOYEE ALARM SYSTEM, EMERGENCY PERSONAL PROTECTIVE EQUIPMENT (PPE) AND EQUIPMENT, SAFE DISTANCES, PLACES OF REFUGE, EVACUATION ROUTES, SITE SECURITY AND CONTROL).

g. SPECIFIC PROCEDURES FOR DECONTAMINATION AND MEDICAL TREATMENT OF INJURED PERSONNEL.

h. PROCEDURES FOR CRITIQUE OF EMERGENCY RESPONSES AND FOLLOW-UP.

i. MEET WITH THE LOCAL EMERGENCY RESPONSE AGENCIES PRIOR TO THE START OF CONSTRUCTION. THE PURPOSE OF THE MEETING IS FOR THE RESOLUTION OF CONFLICT (IF CONFLICT EXISTS) AND TO ENSURE THAT THE EMERGENCY RESPONDERS ARE EQUIPPED TO RESPOND TO AN EMERGENCY AT THE SITE.

3.5 THE CONTRACTOR WILL PROVIDE EVIDENCE OF ALL ONSITE PERSONNEL COMPLETING OSHA 40-HOUR TRAINING AND 8-HOUR REFRESHER TRAINING AND MAINTAIN COPIES ONSITE, PRIOR TO INITIATING REMEDIAL CONSTRUCTION ACTIVITIES.

3.6 THE CONTRACTOR IS RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY MEASURES AND PROGRAMS IN CONNECTION WITH THE PROJECT. THE CONTRACTOR WILL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF AND WILL PROVIDE THE NECESSARY PRECAUTIONS TO PROTECT SITE WORKERS, CONSTRUCTION OBSERVATION PERSONNEL, AND SITE VISITORS.

3.7 THE CONTRACTOR WILL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF PUBLIC BODIES HAVING JURISDICTION FOR THE SAFETY OF PERSONS OR PROPERTY OR TO PROTECT THEM FROM DAMAGE, INJURY, OR LOSS, INCLUDING, WITHOUT LIMITATION, THE DEPARTMENT OF LABOR SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION PROMULGATED UNDER THE OSHA OF 1970 (PL 91-596) AND UNDER SECTION 107 OF THE CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (PL 91-54) AND AMENDMENTS THERETO. THE CONTRACTOR WILL COMPLY WITH THE REQUIREMENTS SET FORTH UNDER 29 CFR 1910 AND 29 CFR 1926.

3.8 THE CONTRACTOR WILL FURNISH AND PLACE PROPER GUARDS FOR PREVENTION OF ACCIDENTS, AND PROVIDE ALL EXCAVATION SHORING/BRACING, SCAFFOLDING, SHIELDING, DUST/VAPOR/ODOR PROTECTION, MECHANICAL/ELECTRICAL PROTECTION, SPECIAL GROUNDING, SAFETY RAILINGS, BARRIERS, PROPER WORKING EQUIPMENT WITH FUNCTIONING SAFETY MECHANISMS (E.G., LIFT GATE WARNING SIGNALS), ALL SITE SAFETY SIGNAGE, OR OTHER SAFETY FEATURES REQUIRED. AS NEEDED, THE CONTRACTOR WILL PROVIDE AND MAINTAIN SUFFICIENT LIGHT DURING NIGHT HOURS TO SECURE SUCH PROTECTION.

3.9 THE CONTRACTOR WILL PROVIDE A LIST OF ALL CHEMICAL PRODUCTS AND AN SDS FOR ALL CHEMICAL PRODUCTS TO BE BROUGHT ON-SITE. THE LIST MUST BE APPROVED BY THE ENGINEER PRIOR TO BEING BROUGHT ON-SITE.

4.0 SUBMITTALS & PROGRESS MEETINGS

4.1 SHALL CONFIRM A CONSTRUCTION SCHEDULE WITH THE ENGINEER AT LEAST TWO WEEKS (10 BUSINESS DAYS) PRIOR TO ANY WORK AT THE SITE. CONSTRUCTION SCHEDULE SHALL BE PRESENTED IN MICROSOFT PROJECT FORMAT SHOWING ESTIMATED START DATE, DURATION AND COMPLETION TIMES FOR EACH ACTIVITY. ANY DEVIATION FROM THE ORIGINALLY PROPOSED SCHEDULE MUST BE COMMUNICATED TO THE ENGINEER WITHIN 24-HOURS.

4.2 SHALL MAKE PROPER AND TIMELY NOTIFICATION OF ALL WORK AND INSPECTIONS TO REGULATORY OR GOVERNING AGENCIES AS REQUIRED BY PERMITS.

4.3 PROVIDE SUBMITTALS IN ACCORDANCE WITH THESE NOTES AT LEAST 10 DAYS PRIOR TO PERFORMING THE WORK OR IMPORTING THE MATERIAL COVERED IN THE SUBMITTAL. SUBMITTALS ANTICIPATED AS PART OF THIS PROJECT INCLUDE, BUT ARE NOT LIMITED TO:

a. SCHEDULE OF VALUES
b. CONTRACTOR'S EXECUTION PLAN
c. SUBMITTAL REGISTER
d. INSURANCE CERTIFICATES
e. MASSACHUSETTS ONE CALL – 811
f. PROJECT TEAM SUBMITTAL
g. PROJECT SCHEDULE
h. PROGRESS REPORTS & UPDATED PROJECT SCHEDULES
i. EQUIPMENT DECONTAMINATION CERTIFICATE
j. SUBSTANTIAL COMPLETION NOTIFICATION
k. SUBSTANTIAL COMPLETION CERTIFICATE
l. SITE SPECIFIC HEALTH AND SAFETY PLAN
m. PERSONNEL CERTIFICATIONS– HAZWOPER, ETC
n. EROSION CONTROL MATERIALS AND DEVICES
o. GEOTEXTILES MATERIALS & CERTIFICATES
p. TEMPORARY CONTROLS – STRAW WATTLE & INLET PROTECTION
q. FILL MATERIAL SUPPLIER INFORMATION, ANALYTICAL & GEOTECHNICAL RESULTS
r. AGGREGATE MATERIAL SUPPLIER INFORMATION, ANALYTICAL & GEOTECHNICAL RESULTS
s. PROJECT SURVEYOR
t. PRE-CONSTRUCTION CONFIRMATION SURVEY
u. INTERIM SURVEY DATA, AS-BUILT, POINTS FILES, ETC
v. FINAL AS-BUILT PLANS
w. QUALITY ASSURANCE AND QUALITY CONTROL PROGRAM AND SAMPLING
x. DETAILED DAILY REPORT

4.4 BEFORE SUBMITTING EACH SUBMITTAL, THE CONTRACTOR WILL HAVE:

a. REVIEWED AND COORDINATED EACH SUBMITTAL WITH OTHER SUBMITTALS AND WITH THE REQUIREMENTS OF THE PROJECT.
b. DETERMINED AND VERIFIED ALL FIELD MEASUREMENTS, QUANTITIES, DIMENSIONS, INSTALLATION REQUIREMENTS, MATERIALS AND SIMILAR INFORMATION WITH RESPECT THERETO.
c. DETERMINED AND VERIFIED ALL INFORMATION RELATIVE TO THE CONTRACTOR'S RESPONSIBILITIES FOR MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION, AND SAFETY PRECAUTIONS AND PROGRAMS INCIDENT THERETO.

4.5 EACH SUBMITTAL WILL BEAR A STAMP OR SPECIFIC WRITTEN CERTIFICATION THAT THE CONTRACTOR HAS SATISFIED THE CONTRACTOR'S OBLIGATIONS WITH RESPECT TO THE CONTRACTOR'S REVIEW AND APPROVAL OF THAT SUBMITTAL.

4.6 EACH SUBMITTAL WILL GIVE THE ENGINEER SPECIFIC WRITTEN NOTICE OF ANY VARIATIONS THAT THE SUBMITTAL MAY HAVE FROM THE REQUIREMENTS OF THE PROJECT. THIS NOTICE WILL BE BOTH A WRITTEN COMMUNICATION SEPARATE FROM THE SUBMITTAL AND BY A SPECIFIC NOTATION MADE ON EACH SUBMITTAL PROVIDED TO THE ENGINEER FOR REVIEW OF EACH SUCH VARIATION.

4.7 PROVIDE A SEPARATE LETTER OF TRANSMITTAL WITH EACH SUBMITTAL, THAT INCLUDES THE FOLLOWING INFORMATION:

a. CONTRACTOR'S NAME.
b. PROJECT NAME.
c. CONTRACT NAME AND NUMBER.
d. SUBMITTAL NUMBER.
e. REFERENCE TO NOTE REQUIRING SUBMITTAL.
f. CONTRACTOR'S STAMP OR SPECIFIC WRITTEN CERTIFICATION.

4.8 ENGINEER WILL PROVIDE TIMELY REVIEW OF SUBMITTALS. THE ENGINEER REVIEW WILL DETERMINE IF THE ITEMS COVERED BY THE SUBMITTALS WILL, AFTER INSTALLATION OR INCORPORATION IN THE WORK, CONFORM TO THE INFORMATION GIVEN AND BE COMPATIBLE WITH THE DESIGN CONCEPT OF THE COMPLETED.

a. ENGINEER'S REVIEW WILL NOT EXTEND TO MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES OF CONSTRUCTION OR TO SAFETY PRECAUTIONS OR PROGRAMS INCIDENT THERETO. THE REVIEW OF A SEPARATE ITEM AS SUCH WILL NOT INDICATE APPROVAL OF THE ASSEMBLY IN WHICH THE ITEM FUNCTIONS.
b. ENGINEER'S REVIEW WILL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY VARIATION FROM THE REQUIREMENTS OF THE PROJECT DOCUMENTS UNLESS THE CONTRACTOR HAS COMPLIED WITH THE REQUIREMENTS OF SUBMITTAL AND THE ENGINEER HAS GIVEN WRITTEN AGREEMENT OF EACH SUCH VARIATION BY SPECIFIC WRITTEN NOTATION THEREOF INCORPORATED IN OR ACCOMPANYING THE SUBMITTAL.

5.0 UTILITIES:

5.1 NOTIFY DIG SAFELY MASSACHUSETTS (811) AT LEAST 5 DAYS IN ADVANCE OF ANY LAND DISTURBANCE ACTIVITY.

5.2 UNDERGROUND UTILITIES SHOWN ARE COMPILED FROM PLANS OF RECORD AND MUST BE VERIFIED BY THE CONTRACTOR IN THE FIELD PRIOR TO COMMENCING CONSTRUCTION. ADDITIONAL SITE FEATURES AND UTILITIES MAY BE PRESENT THAT ARE NOT SHOWN. CONTRACTOR SHALL NOTIFY ENGINEER IF UNKNOWN UTILITY IS ENCOUNTERED/IDENTIFIED.

5.3 THE CONTRACTOR IS RESPONSIBLE FOR SUBCONTRACTING/COORDINATING WITH AN APPROPRIATE PRIVATE UTILITY LOCATOR TO LOCATE AND IDENTIFY UNDERGROUND UTILITIES WITHIN PROPERTY LIMITS.

5.4 THE CONTRACTOR SHALL INSPECT AND CONFIRM EXISTING/ABANDONED UTILITIES THAT TRANSECT THE AREAS OF CONCERN. UTILITIES SHALL BE REMOVED BEYOND THE PROPOSED LIMITS OF THE AREAS OF CONCERN TO ENSURE REMEDIATION WORK CAN BE IMPLEMENTED. THE UTILITIES SHALL BE CAPPED/SEALED AS REQUIRED.

6.0 SURVEY:

6.1 ESTABLISH AND MAINTAIN SURVEY CONTROL DURING THE PERFORMANCE OF WORK. COORDINATE SYSTEM SHALL BE BASED IN NORTH AMERICAN DATUM 83 (NAD 83) MASSACHUSETTS STATE PLANE. ELEVATION SHALL BE BASED ON NORTH AMERICAN VERTICAL DATUM 88 (NAVD88).

6.2 DOCUMENT PRE-CONSTRUCTION, EXCAVATION AND SOIL MIXING LIMITS, AND RESTORED CONDITIONS VIA A CERTIFIED PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF MASSACHUSETTS. CONTRACTOR WILL PROVIDE AN ELECTRONIC COPY OF THE SURVEY (AUTOCAD 2017 OR EARLIER) IN ADDITION TO RECORD DRAWINGS STAMPED BY PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF MASSACHUSETTS AT PROJECT COMPLETION.

6.3 SURVEY WILL BE ON A MAXIMUM 5' X 5' GRID (CONSISTENT POSITIONS FOR PRE-CONSTRUCTION, EXCAVATION LIMITS, AND RESTORED CONDITIONS). ADDITIONAL SURVEY WILL ALSO BE PERFORMED AT ABRUPT CHANGES IN GRADE.

6.4 THE ACCURACY OF ALL SURVEY LAYOUT DATA SHALL BE PLUS OR MINUS ONE TENTH (0.1) FOOT HORIZONTAL.

6.5 THE ACCURACY OF ALL SURVEY LAYOUT DATA SHALL BE AT OR MINUS 0.1 FOOT VERTICAL.

6.6 TOPOGRAPHY SHALL BE PREPARED WITH 1 FOOT CONTOURS.

7.0 SITE ACCESS & TRAFFIC CONTROL:

7.1 SHALL SECURE ALL WORK AREAS WITH TEMPORARY CONSTRUCTION FENCING (ORANGE BARRICADE) TO PREVENT INTRUSION BY UNAUTHORIZED VEHICLES OR PEDESTRIANS.

7.2 RESPONSIBLE FOR PROVIDING SAFE AND ADEQUATE VEHICLE/EQUIPMENT ACCESS AND EGRESS TO THE REMEDIATION AREAS OF CONCERN TO FACILITATE THE REMEDIATION WORK TO THE HORIZONTAL AND VERTICAL LIMITS IDENTIFIED OR AS DIRECTED BY THE ENGINEER.

7.3 RESPONSIBLE FOR PROVIDING TEMPORARY TRAFFIC CONTROL MEASURES (E.G., FLAGGERS, SIGNS, CONES, ETC.) AS REQUIRED TO ACCESS THE SITE WITH HEAVY EQUIPMENT AND WASTE HAULERS AS TO NOT DISRUPT LOCAL TRAFFIC.

8.0 EROSION AND SEDIMENTATION CONTROL:

8.1 RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ALL NECESSARY TEMPORARY EROSION AND SEDIMENT CONTROLS THROUGHOUT CONSTRUCTION IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND THE SOIL EROSION AND SEDIMENT CONTROL PLAN.

8.2 RESPONSIBLE FOR ANY SEDIMENTATION AND EROSION CONTROL MEASURES REQUIRED BY REGULATORY AUTHORITY REGARDLESS OF WHETHER OR NOT THEY ARE EXPLICITLY STATED HEREIN. THE CONTRACTOR SHOULD REVIEW THE MASSACHUSETTS STANDARDS.

8.3 INSPECT AND REPAIR EROSION CONTROL MEASURES AT LEAST DAILY, PRIOR TO EACH ANTICIPATED RAINFALL, AND FOLLOWING RAINFALL EVENTS OF 0.5 INCHES OR MORE. ANY DAMAGE INCURRED BY EROSION WILL BE RECTIFIED IMMEDIATELY. NAMES AND CERTIFICATIONS OF QUALIFIED INSPECTORS IN ACCORDANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN SHALL BE PROVIDED.

8.4 NO EXCAVATION SPOIL DIRT, CONSTRUCTION TRASH, OR DEBRIS, ETC., SHALL BE DEPOSITED IN THE DRAINAGE COURSE ADJACENT TO THE SITE.

8.5 MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES MUST CONTINUE UNTIL THE SITE IS PERMANENTLY STABILIZED AND THE CONTROLS ARE REMOVED.

8.6 ALL EROSION CONTROL DEVICES WILL BE INSPECTED DAILY AND MAINTAINED AS NECESSARY FOR THE DURATION OF THE PROJECT. ALL PRACTICAL PRECAUTIONS WILL BE USED TO PREVENT EROSION OR DEPOSITION OF SEDIMENTS OFFSITE BY RUNOFF OR WIND. THE CONTRACTOR WILL CLEAN THE WORK AREA AND CONSTRUCTION LAY DOWN AREA AT THE END OF EACH WORKDAY TO PREVENT WIND DEPOSITION OF FUGITIVE DUST.

9.0 DUST CONTROL:

9.1 CONTROL DUST GENERATED DURING THE PROJECT, AS NECESSARY. ODORS WILL BE CONTROLLED TO THE SATISFACTION OF THE ENGINEER. THE CONTRACTOR WILL BE RESPONSIBLE FOR COSTS ASSOCIATED WITH PROJECT DELAYS ASSOCIATED WITH UNCONTROLLED DUST EMISSIONS.

9.2 THE ENGINEER SHALL MONITOR THE PERIMETER SITE AIR QUALITY. THE ENGINEER WILL NOTIFY THE CONTRACTOR WHEN THERE ARE EXCURSIONS ABOVE THE AIRBORNE PARTICULATE ACTION LEVELS ESTABLISHED IN THE AIR MONITORING PLAN. WORK WILL BE SUSPENDED IF THE PARTICULATE LEVELS (INCLUDING LEVELS CAUSED BY MOISTURE CONDITIONING) AT THE PERIMETER OF THE SITE ARE EXCEEDED. THESE WORK STOPPAGES ARE THE RESPONSIBILITY OF THE CONTRACTOR AND WILL NOT BE A BASIS FOR AN EXTENSION OF TIME OR ADDITIONAL MONEY FOR DOWN TIME AND IS NOT CONSIDERED TO BE STAND-BY TIME.

9.3 AT THE DISCRETION OF THE ENGINEER, WORK WILL BE SUSPENDED IF VISUAL DUST IS OBSERVED. THESE WORK STOPPAGES ARE THE RESPONSIBILITY OF THE CONTRACTOR AND WILL NOT BE A BASIS FOR AN EXTENSION OF TIME OR ADDITIONAL MONEY FOR DOWN TIME AND IS NOT CONSIDERED TO BE STAND-BY TIME.

9.4 DUST CONTROL MEASURES WILL COMPLY WITH THE FOLLOWING MANAGEMENT PRACTICES:

a. WATERING ACTIVE CONSTRUCTION AREAS, IF NEEDED.
b. COVERING TRUCKS THAT WILL HAUL SOIL AND OTHER LOOSE MATERIALS.
c. CLEANING TRUCKS AND TIRES TO MINIMIZE THE TRACKING OF DRY MATERIALS ONTO LOCAL ROADS.

9.5 CONTRACTOR SHALL PERFORM AIR MONITORING WITHIN THE WORK ZONES IN ACCORDANCE WITH OSHA GUIDELINES TO ENSURE WORKER SAFETY.

10.0 EXCAVATION:

10.1 FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, ACCESSORIES, AND APPURTENANCES NECESSARY TO PREPARE THE AREA OF CONCERN, EXCAVATE AND REGRADE SITE SOILS IN PREPARATION FOR ISS WORK.

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Professional Engineer's Name		
Professional Engineer's No.		
State: MA	Date Signed:	Project Mgr.:
Designed by:	Drawn by: GS	Checked by:

SERES Engineering & Services, LLC
ARCADIS a joint venture

AOC 31 ● FORMER FORT DEVENS ARMY INSTALLATION ● DEVENS, MASSACHUSETTS
PROPOSED REMEDIAL ACTION

GENERAL NOTES

ARCADIS Project No. 30247920

Date SEPTEMBER 2025

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2

10.2 THE HORIZONTAL LIMITS OF EXCAVATION/ISS ACTIVITIES WILL BE PHYSICALLY DELINEATED IN THE FIELD BY THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE FOR EXECUTING AND VERIFYING THE SPECIFIED EXCAVATION ELEVATION IS REACHED AND DOCUMENTED BY SURVEY.

10.3 PROVIDE ALL NECESSARY SHORING, SLOPING AND/OR BENCHING FOR OPEN EXCAVATION AND WILL BE RESPONSIBLE FOR DESIGN OF SUCH SLOPING AND BENCHING, IN ACCORDANCE WITH OSHA CONSTRUCTION STANDARDS (29 CFR – PART 1926, SUBPART P).

10.4 PROJECT EQUIPMENT THAT COMES IN CONTACT WITH IMPACTED EXCAVATED MATERIALS WILL BE APPROPRIATELY DECONTAMINATED.

11.0 MATERIAL HANDLING AND STAGING:

11.1 RESPONSIBLE FOR THE REGRADING OF SITE SOILS TO SAFELY IMPLEMENT THE ISS WORK. SOILS UTILIZED TO BERM SOILS AROUND THE PROPOSED ISS TREATMENT CELLS, SHALL BE REGRADED AND CONTOURED AS PER THESE CONTRACT DRAWINGS.

11.2 SURFICIAL TOP SOIL MAY BE TEMPORARILY STOCKPILED ADJACENT TO THE WORK AREA AND REUSED ONCE THE ISS WORK HAS BEEN COMPLETED.

11.3 DEPOSITION OF REMOVED MATERIAL IN PLACES OTHER THAN THOSE DESIGNATED OR OTHERWISE PREVIOUSLY APPROVED IS STRICTLY PROHIBITED AND MAY REQUIRE THE CONTRACTOR TO MOVE SUCH MISPLACED MATERIAL AT NO COST TO THE ENGINEER. WHEN NOTIFIED BY THE ENGINEER OF ANY VIOLATION OF THE FOREGOING PROVISIONS, THE CONTRACTOR SHALL TAKE IMMEDIATE CORRECTIVE ACTION. SHOULD THE CONTRACTOR REFUSE OR FAIL TO PROMPTLY CORRECT SUCH VIOLATION, THE ENGINEER MAY ORDER ALL OR PART OF THE WORK STOPPED PENDING CORRECTION AND THE CONTRACTORS WILL NOT CLAIM OR BE ENTITLED TO AN EXTENSION OF CONTRACT COMPLETION TIME, EXCESS COSTS, OR DAMAGES DUE TO TIME LOST BY SUCH A STOP WORK ORDER.

12.0 INSITU SOIL STABILIZATION (ISS)

12.1 THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, AND EQUIPMENT AND PERFORM ALL OPERATIONS NECESSARY FOR THE ISS, AS DESCRIBED ON THESE CONSTRUCTION DRAWINGS.

12.2 THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS TO EXECUTE THE WORK. CONTRACTOR SHALL SHORE THE EXCAVATION AND ISS AREAS REQUIRED TO SAFELY PERFORM THE WORK.

12.3 THE ISS CELL SHALL COVER THE ENTIRE PILOT AREA AS DEPICTED ON THESE CONSTRUCTION DRAWINGS.

12.4 THE CONTRACTOR SHALL PROVIDE GROUT MIX MATERIALS (I.E., SPECIFIED REAGENTS AND WATER) IN SUFFICIENT QUANTITIES TO ALLOW FOR UNINTERRUPTED ISS ACTIVITIES AND THE PRODUCTION RATE AS DETERMINED BY THE CONTRACTOR.

12.5 THE CONTRACTOR SHALL CALCULATE AND PROVIDE IN AN ACCEPTABLE FORMAT, THE FOLLOWING ISS GROUT MIX PARAMETERS:

a. BASED ON AN APPROXIMATE AVERAGE DRY DENSITY OF 115–120 POUNDS PER CUBIC FOOT (PCF), AND AN AVERAGE MOISTURE CONTENT OF 9–12 PERCENT SHOW THE CALCULATION THAT INDICATES THE WEIGHT OF SOIL BEING TREATED IN THE PILOT ISS AREA (CONTRACTOR TO VERIFY VALUES).

b. SHOW THE CALCULATION THAT INDICATES THE QUANTITY OF GROUT MATERIALS REQUIRED FOR THE PILOT TEST ISS AREA BY A PERCENTAGE OF THE TOTAL WEIGHT OF TREATED SOIL. THE FOLLOWING MIX DESIGN SHALL BE USED FOR ISS INSTALLATION:

c. TEST CELL 1 – THE FOLLOWING PERCENTAGES OF SOLIDIFIED MIXTURE COMPONENTS ARE RELATIVE TO THE TOTAL CALCULATED DRY WEIGHT OF THE SOIL TREATED THROUGHOUT ENTIRE SOIL MIXING CELL:

FLUORO–SORB 100 – AT 1–PERCENT.

PORTLAND CEMENT (PC) TYPE 1L AT 2.5–PERCENT.

GROUND GRANULAR BLAST FURNACE SLAG (BFS) CEMENT AT 5–PERCENT.

d. TEST CELL 2 – THE FOLLOWING PERCENTAGES OF SOLIDIFIED MIXTURE COMPONENTS ARE RELATIVE TO THE TOTAL CALCULATED DRY WEIGHT OF THE SOIL TREATED THROUGHOUT ENTIRE SOIL MIXING CELL:

FLUORO–SORB 100 – AT 1–PERCENT.

ONCE THE INITIAL AMENDMENT MIXING OF THE SOIL IN TEST CELL 2 IS COMPLETED, UTILIZE THE FOLLOWING PERCENTAGES OF SOLIDIFIED MIXTURE COMPONENTS ARE RELATIVE TO THE TOTAL CALCULATED DRY WEIGHT OF THE SOIL TREATED THROUGHOUT THE UPPER 10–FEET OF THE SOIL MIXING CELL TO IMPROVE SOIL UNCONFINED COMPRESSIVE STRENGTH.

PORTLAND CEMENT (PC) TYPE 1L AT 2.5–PERCENT.

GROUND GRANULAR BLAST FURNACE SLAG (BFS) CEMENT AT 5–PERCENT.

e. SHOW CALCULATIONS OF ESTIMATED VOLUME EXPANSION OF TREATED SOILS (SWELLING) BASED ON AMOUNTS OF WATER WITHIN GROUT MIXTURE AND ESTIMATED GROUNDWATER CONTAINED WITHIN EACH ISS AREA. THE VOLUME EXPANSION MUST BE KEPT BELOW 25 PERCENT.

f. BASED ON IN–SITU FIELD CONDITIONS, THE WATER TO BE ADDED TO THE BASELINE COMPOSITE GROUT MIXTURE IS 1.5 WATER TO BINDER RATIO. OTHER WATER TO BINDER RATIOS MAY BE NECESSARY BASED ON FIELD CONDITIONS ENCOUNTERED AND ARE ACCEPTABLE AS LONG AS THE RATIO USED ALLOWS GROUT TO BE EFFECTIVELY PUMPED, ALLOWS EQUIPMENT TO ACHIEVE DESIGN DEPTH, PROVIDES ENOUGH WATER TO BE EFFECTIVELY MIXED, AND MEET ALL OTHER REQUIREMENT OF THE SPECIFICATION. IF THE CONTRACTOR PROPOSES WATER TO BINDER RATIOS OTHER THAN 1.5 THE CONTRACTOR MUST SUBMIT A REQUEST TO THE ENGINEER FOR APPROVAL TO ALTER THE GROUT MIXTURE WATER QUANTITIES.

12.6 PERFORMANCE CRITERIA

a. THE ISS MIXING SHALL COVER THE ENTIRE ISS PILOT AREA AND MEET ALL TARGET DEPTHS AS DEPICTED ON THE DESIGN DRAWINGS. THE CONTRACTOR SHALL EVENLY DISTRIBUTE THE AMENDMENTS AS DETAILED IN SECTION 12.5 TO RESULT IN A HOMOGENEOUS MIXTURE.

b. MIXING SHALL BE DEEMED COMPLETE BY ENGINEER AND OWNER OVERSIGHT PERSONNEL.

c. THE CONTRACTOR SHALL BE REQUIRED TO THOROUGHLY MIX THE ISS AREA AS REQUIRED TO ACHIEVE A HOMOGENEOUS MIXTURE.

d. THE CONTRACTOR MUST SUPPORT ON COLLECTING THE VERIFICATION ISS SAMPLES AS DIRECTED BY THE ENGINEER. THE ENGINEER WILL BE RESPONSIBLE FOR THE ANALYTICAL TESTING.

e. THE ENGINEER WILL BE ON SITE DURING ALL ISS OPERATIONS TO OBSERVE AND DOCUMENT THE OVERALL ISS OPERATION.

f. ISS ACTIVITIES SHALL BE PERFORMED IN A MANNER SO AS TO MINIMIZE SWELL AND MINIMIZE THE QUANTITY OF FLOWABLE MATERIAL AT GROUND SURFACE.

13.0 BACKFILL AND SITE GRADING

13.1 THE CONTRACTOR SHALL REGRADE BERM MATERIAL AND MOUND MATERIALS. THE CONTRACTOR SHALL ALLOW ISS TREATED SOILS TO STABILIZE FOR 48–HOURS PRIOR TO THE PLACEMENT OF BACKFILL MATERIAL OR STOCKPILED TOP SOIL.

14. SITE RESTORATION AND DEMOBILIZATION:

14.1 ALL AREAS IMPACTED BY OR OTHERWISE DISTURBED DURING THE PROJECT, INCLUDING BUT NOT LIMITED TO SITE ACCESS AND TEMPORARY STAGING, WILL BE RESTORED BY THE CONTRACTOR TO PRE–CONSTRUCTION CONDITIONS, MOUNDING SOILS AS NEEDED AT THE ISS TEST CELL AREAS, IN A TIMELY MANNER AND PRIOR TO CONTRACTOR DEMOBILIZATION.

14.2 CONTRACTOR SHALL BEAR ALL COSTS AND RESPONSIBILITY FOR REPAIRS TO ANY ON–SITE AND/OR OFF– SITE FEATURES (FENCING, UTILITIES, SIDEWALKS, ROADS, ETC.) AND/OR SURFACES DAMAGED AS A RESULT OF CONSTRUCTION ACTIVITIES. ALL REPAIRS/REPLACEMENTS WILL MEET OR EXCEED EXISTING CONDITIONS.

14.3 ALL EQUIPMENT OPERATED WITHIN THE PROJECT WORK LIMITS WILL BE DECONTAMINATED IN ACCORDANCE WITH BEST MANAGEMENT PRACTICES PRIOR TO ARRIVING ONSITE AND PRIOR TO LEAVING THE SITE. PROJECT EQUIPMENT THAT COMES IN CONTACT WITH IMPACTED MATERIALS WILL BE APPROPRIATELY DECONTAMINATED PRIOR TO LEAVING THE SITE. THE CONTRACTOR WILL PREVENT TRACKING OF SOIL MATERIALS ONTO OFF–SITE AREAS. ANY SOIL MATERIALS TRACKED, SPILLED OR DROPPED ONTO OFF–SITE AREAS, WILL BE IMMEDIATELY CLEANED UP BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE ENGINEER.

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Professional Engineer's No.: .		
State: MA	Date Signed: .	Project Mgr.: .
Designed by: .	Drawn by: GS	Checked by: .

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ARCADIS a joint venture

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EXCAV-DESIGN-X-BASEMAP
EXCAV-DESIGN-X-CONTOURS

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Professional Engineer's Name
-
Professional Engineer's No.
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State	Date Signed	Project Mgr.
MA	.	.
Designed by	Drawn by	Checked by
	GS	.

SERES Engineering & Services, LLC
ARCADIS a joint venture

AOC 31 ● FORMER FORT DEVENS ARMY INSTALLATION ● DEVENS, MASSACHUSETTS
PROPOSED REMEDIAL ACTION

EXISTING CONDITIONS PLAN

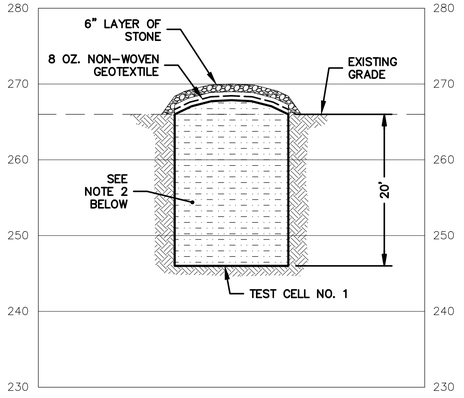
ARCADIS Project No.
30247920

Date
SEPTEMBER 2025

ARCADIS
19 West College Ave., Suite 250
Yardley, PA 19067
Tel: 267.685.1800

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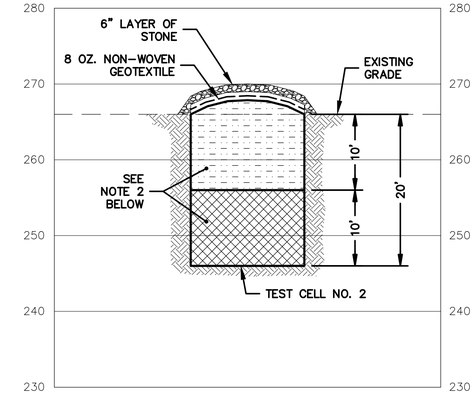
TEST CELL NO. 1 NOTES:

1. CONTRACTOR SHALL PERFORM SOIL MIXING AS DETAILED IN SPECIFICATION 12.5, PART C.
2. THE ENTIRE TEST CELL SHALL BE MIXED AND HOMOGENIZED THROUGHOUT THE ENTIRE CELL WITH FLUORO-SORB 100, PORTLAND CEMENT AND BLAST FURNACE SLAG CEMENT.

TEST CELL NO. 1 CROSS SECTION 1

0 10' 20'

SCALE: 1"=10'



TEST CELL NO. 2 NOTES:

1. CONTRACTOR SHALL PERFORM SOIL MIXING AS DETAILED IN SPECIFICATION 12.5, PART D.
2. THE ENTIRE TEST CELL SHALL BE MIXED AND HOMOGENIZED THROUGHOUT THE ENTIRE CELL WITH FLUORO-SORB 100. UPON COMPLETION OF THE THOROUGH HOMOGENIZATION, PORTLAND CEMENT AND BLAST FURNACE SLAG CEMENT WILL BE MIXED WITHIN THE UPPER 10-FEET.

TEST CELL NO. 2 CROSS SECTION 2

0 10' 20'

SCALE: 1"=10'

LEGEND:

STABILIZED AND SOLIDIFIED SOILS

STABILIZED ONLY SOILS

NOTES:

1. THE CONTRACTOR SHALL DETERMINE THE OVERALL LENGTH OF CONSTRUCTION ENTRANCE REQUIRED TO ACCESS AND PERFORM THE SOIL MIXING WORK.
2. THE LIMITS AND OVERALL PLACEMENT OF THE STRAW WATTLE IS APPROXIMATE. CONTRACTOR SHALL ENSURE PERIMETER OF THE LIMITS OF DISTURBANCE HAVE THIS EROSION CONTROL MEASURE INSTALLED PRIOR TO CONSTRUCTION WORK, AND REMOVED ONCE THE AREA HAS BEEN RESTORED.
3. MIXING SHALL BE DEEMED COMPLETE BY ENGINEER AND OWNER OVERSIGHT PERSONNEL.
4. RESTORATION WILL INCLUDE THE PLACEMENT OF 8-OUNCE NON-WOVEN GEOTEXTILE MATERIAL AND PLACEMENT OF AASHTO NO. 3 STONE.
5. THE CONSTRUCTION ACCESS ROAD MATERIAL MAY REMAIN IN PLACE.
6. NATIVE SOIL BERM (DETAIL 7, DRAWING 6) WILL BE INSTALLED AROUND THE PERIMETER OF EACH ISS PILOT TEST CELL (OFFSET A MAXIMUM OF 5 -FEET).
7. DOUBLE SPLIT RAIL FENCE (DETAIL 5, DRAWING 6) WILL BE INSTALLED AROUND THE PERIMETER OF EACH ISS PILOT TEST CELL (OFFSET A MINIMUM OF 5-FEET).
8. UPON COMPLETION OF SOIL MIXING AT BOTH TEST CELLS, PERIMETER BERMS SOILS SHALL BE REGRADED AND MOUNDED OVER THE TEST CELLS.
9. THE TEMPORARY MATERIAL STAGING AREA SHALL BE CENTRALLY LOCATED AND BE UTILIZED FOR THE PRE-EXCAVATED MATERIAL FROM BOTH TREATMENT CELLS. FINAL LOCATION TO BE DETERMINED IN THE FIELD IN AGREEMENT BETWEEN CONTRACTOR AND ENGINEER.

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AOC31-EXCAV-DESIGN-Hillshade.jpg
EXCAV-DESIGN-X-BASEMAP
EXCAV-DESIGN-X-CONTOURS

30' 0 30' 60'

1"=30'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

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Professional Engineer's Name: -		
Professional Engineer's No.: -		
State: MA	Date Signed: -	Project Mgr.: -
Designed by: -	Drawn by: GS	Checked by: -

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PROPOSED REMEDIAL ACTION

SOIL MIXING PLAN

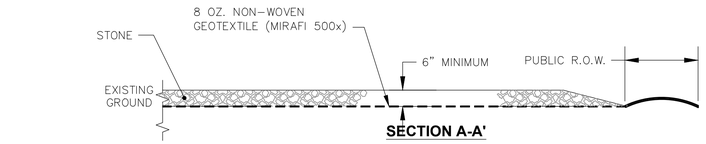
ARCADIS Project No. 30247920

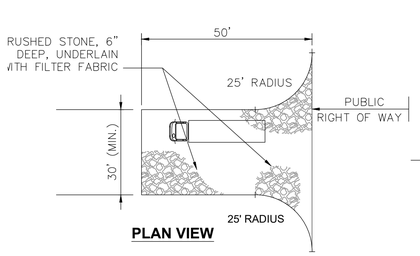
Date SEPTEMBER 2025

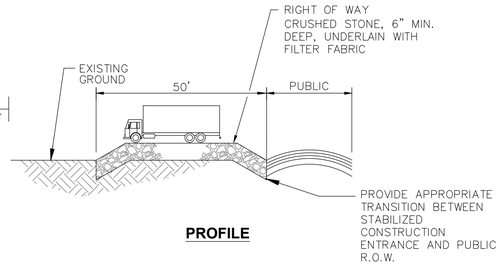
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TABLE OF LENGTHS OF CONSTRUCTION EXITS ON SLOPING ROAD BEDS	
LENGTH OF STONE REQUIRED	
PERCENT SLOPE OF ROADWAY	COARSE GRAINED SOILS
0 TO 2%	50 ft.
2 TO 5%	100 ft.
>5%	ENTIRE SURFACE STABILIZED WITH HOT MIX ASPHALT BASE COARSE, MIX I-2





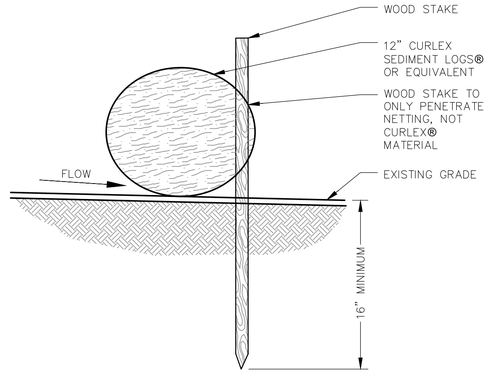


NOTE:

1. THIS DETAIL IS BASED ON COUNTY AND STATE STANDARDS. DUE TO LIMITED AVAILABLE AREA, ACTUAL STABILIZED CONSTRUCTION ENTRANCES INSTALLED FOR THIS PROJECT SHALL BE SIZED APPROPRIATELY FOR THE SITE AND PROPORTIONALLY TO THIS DETAIL.

STABILIZED CONSTRUCTION ENTRANCE 1

NOT TO SCALE

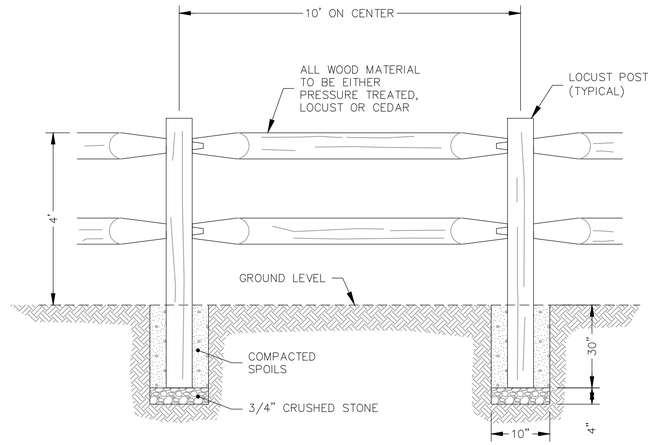


NOTES:

1. WHERE STRAW WATTLE CANNOT BE STAKED INTO THE GROUND, SAND BAGS SHALL BE USED TO WEIGH DOWN THE STRAW WATTLE.
2. MAINTENANCE SHALL BE PERFORMED AFTER EVERY STORM EVENT OR MORE FREQUENTLY AS NEEDED AND MATERIAL REMOVED WHEN NECESSARY TO PERMIT ADEQUATE SEDIMENT TRAPPING.

STRAW WATTLE DETAIL (TYPICAL) 2

NOT TO SCALE

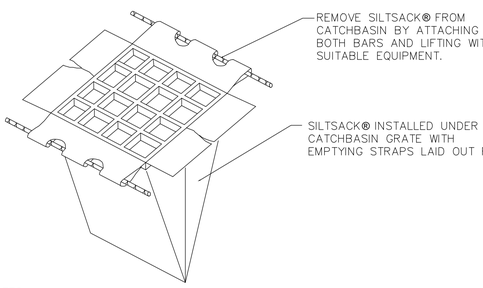


NOTES:

1. ALL WOOD MATERIALS SHALL BE TREATED WOOD, OR WOOD OF A NATURAL RESISTANCE TO DECAY -FINAL MATERIAL APPROVAL BY THE ENGINEER. MATERIALS SHALL BE FREE FROM LOOSE KNOTS, CRACKS, AND OTHER IMPERFECTIONS.
2. 2-RAIL "AMERICAN STYLE" SPLIT RAIL SYSTEM SHALL BE USED.
3. POSTS SHALL BE 18-INCH CIRCUMFERENCE (APPROX. 25 SQUARE INCHES). ANY DEVIATIONS SHALL BE APPROVED BY ENGINEER. 3-RAIL POSTS SHALL BE APPROXIMATELY 84-INCHES IN HEIGHT. ANY DEVIATIONS SHALL BE APPROVED BY ENGINEER.
4. POSTS SHALL BE BURIED 30-INCHES INTO GROUND.

SPLIT RAIL FENCE DETAIL 5

NOT TO SCALE

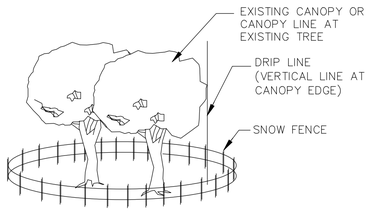


NOTES:

1. REMOVE DRAIN GRATE AND INSERT SILTSACK® TYPE A OR EQUIVALENT, MAKING SURE EMPTYING STRAPS ARE LAID FLAT OUTSIDE OF BASIN.
2. REPLACE DRAIN GRATE TO HOLD SILTSACK® OR EQUIVALENT INTO POSITION.
3. MAINTENANCE – AS SILTSACK® OR EQUIVALENT BECOMES FULL OF SEDIMENT, REMOVE WITH FRONT END LOADER (OR OTHER SUITABLE EQUIPMENT) AND EMPTY IN AN APPROVED LOCATION.
4. REPLACE EMPTIED SILTSACK® OR EQUIVALENT BACK INTO CATCH BASIN.

INLET PROTECTION 3

NOT TO SCALE

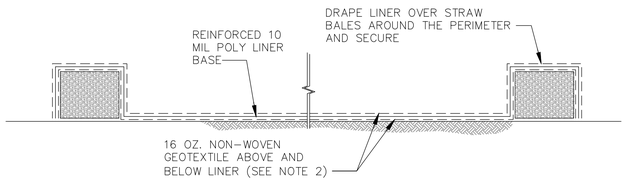


NOTE:

1. FOLLOWING CLEARING OF TREES AS NECESSARY TO PERFORM THE WORK, CONTRACTOR SHALL SUPPLY AND INSTALL TREE PROTECTION FOR REMAINING EXISTING TREES OR TREE GROUPS ON THE PROJECT PROPERTY AS NECESSARY TO PROTECT & PRESERVE TREES FROM DAMAGE.

TREE PROTECTION 4

NOT TO SCALE

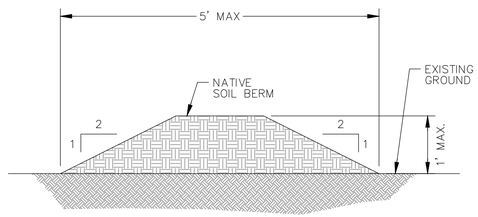


NOTES:

1. COVER TEMPORARY STOCKPILES WITH A PROPERLY ANCHORED PLASTIC COVER (NO LESS THAN 10 MIL), EXCEPT WHILE MATERIAL IS ACTIVELY BEING MANAGED (PLACED OR REMOVED). THE COVER WILL BE PROVIDED TO MINIMIZE POTENTIAL SILTATION/MIGRATION OF SOIL/DEBRIS BEYOND THE STAGING AREAS AND TO MINIMIZE LEACHATE GENERATION.
2. NON-WOVEN GEOTEXTILE SHALL BE 16 OZ./SQ.YD. MINIMUM.
3. A PORTION OF THE TEMPORARY STOCKPILE AREA WILL BE RESERVED FOR EQUIPMENT DECONTAMINATION.
4. TEMPORARY STOCKPILE AREA SHALL BE CENTRALLY LOCATED BETWEEN BOTH TREATMENT CELLS.
5. ALTERNATIVE STOCKPILE AREA CONFIGURATIONS CAN BE PROPOSED BY CONTRACTOR FOR APPROVAL BY THE ENGINEER.
6. AT THE COMPLETION OF THE PROJECT, THE TEMPORARY STAGING AREA SHALL BE RE-GRADED AND RESTORED TO MATCH EXISTING CONDITIONS.

TEMPORARY STOCKPILE AREA 6

NOT TO SCALE



NATIVE SOILS BERM 7

NOT TO SCALE

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SCALE(S) AS INDICATED

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Professional Engineer's Name: .		
Professional Engineer's No.: .		
State: MA	Date Signed: .	Project Mgr.: .
Designed by: JB	Drawn by: GS	Checked by: .

SERES Engineering & Services, LLC
ARCADIS a joint venture

AOC 31 • FORMER FORT DEVENS ARMY INSTALLATION • DEVENS, MASSACHUSETTS
PROPOSED REMEDIAL ACTION

DETAILS

ARCADIS Project No.: 30247920
Date: SEPTEMBER 2025

ARCADIS
19 West College Ave., Suite 250
Yardley, PA 19067
Tel: 267.685.1800

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Appendix H

FLUORO-SORB® 100 Data Sheets and Case Studies

SAFETY DATA SHEET

1. Identification

Product identifier **FLUORO-SORB® 100 adsorbent**

Other means of identification

CAS number 68953-58-2

Recommended use adsorbent or absorbent technical function of substance

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name CETCO, a Minerals Technologies Company

Address 2870 Forbs Avenue
Hoffman Estates, IL 60192
United States

Telephone General Information 800.527.9948

Website http://www.cetco.com

E-mail safetydata@mineralstech.com

Emergency phone number 1.866.519.4752 (US, CA, MX) 1 760.476.3962

Americas 1.866.519.4752 (US, Canada, Mexico) 1 760 476 3962

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity, repeated exposure	Category 1

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements



Signal word Danger

Hazard statement May cause cancer. Causes damage to organs through prolonged or repeated exposure.

Precautionary statement

Prevention Do not handle until all safety precautions have been read and understood. Do not breathe dust. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection. Observe good industrial hygiene practices.

Response If exposed or concerned: Get medical advice/attention.

Storage Store in accordance with local/regional/national regulations.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information 100% of the substance consists of component(s) of unknown acute oral toxicity. 100% of the substance consists of component(s) of unknown acute dermal toxicity. 100% of the substance consists of component(s) of unknown acute inhalation toxicity. 100% of the substance consists of component(s) of unknown acute hazards to the aquatic environment. 100% of the substance consists of component(s) of unknown long-term hazards to the aquatic environment.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Quaternary ammonium compounds, bis (hydrogenated tallow alkyl)dimethyl, salts with bentonite		68953-58-2	100

Constituents

Chemical name	Common name and synonyms	CAS number	%
QUARTZ (SIO2)		14808-60-7	<= 6
CRISTOBALITE		14464-46-1	<= 2

Composition comments Occupational Exposure Limits for constituents are listed in Section 8.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Eye contact Do not rub eyes.

Ingestion Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed Dusts may irritate the respiratory tract, skin and eyes. Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Move containers from fire area if you can do so without risk.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect dust using a vacuum cleaner equipped with HEPA filter. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. Put material in suitable, covered, labeled containers. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Do not breathe dust. When using, do not eat, drink or smoke. Should be handled in closed systems, if possible. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store in tightly closed container. Store in a well-ventilated place. Keep out of the reach of children. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	PEL	0.05 mg/m3	Respirable dust.
QUARTZ (SIO2) (CAS 14808-60-7)	PEL	0.05 mg/m3	Respirable dust.

US. OSHA Table Z-3 (29 CFR 1910.1000)

Additional components	Type	Value	Form
INERT OR NUISANCE DUSTS	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	TWA	0.05 mg/m3	Respirable.
		1.2 mppcf	Respirable.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.

US. ACGIH Threshold Limit Values

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	TWA	0.025 mg/m3	Respirable fraction.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	TWA	0.05 mg/m3	Respirable dust.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.05 mg/m3	Respirable dust.

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection

Applicable for industrial settings only. Chemical respirator with organic vapor cartridge, full facepiece, dust and mist filter.

Skin protection

Hand protection

Applicable for industrial settings only. Wear appropriate chemical resistant gloves.

Other	Applicable for industrial settings only. Use of an impervious apron is recommended.
Respiratory protection	Applicable for industrial settings only. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Chemical respirator with organic vapor cartridge, full facepiece, dust and mist filter.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Observe any medical surveillance requirements. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Solid.
Form	Micropowder. Powder. or Granular.
Color	Grey.
Odor	Slight. fatty odor
Odor threshold	Not available.
pH	6 - 9
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	275 °F (135 °C)
Viscosity	Not available.
Other information	
Explosive properties	Not explosive.
Flammability	>= 950 °F (>= 510 °C)
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.

Hazardous decomposition products No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation Dust may irritate respiratory system.

Skin contact Dust or powder may irritate the skin.

Eye contact Dust may irritate the eyes.

Ingestion Knowledge about health hazard is incomplete.

Symptoms related to the physical, chemical and toxicological characteristics Dusts may irritate the respiratory tract, skin and eyes.

Information on toxicological effects

Acute toxicity Not known.

Toxicological data

Constituents	Species	Test Results
CRISTOBALITE (CAS 14464-46-1)		
Acute		
Oral		
LD50	Rat	> 22500 mg/kg

Skin corrosion/irritation Due to partial or complete lack of data the classification is not possible.

Serious eye damage/eye irritation Due to partial or complete lack of data the classification is not possible.

Respiratory or skin sensitization

Respiratory sensitization Due to partial or complete lack of data the classification is not possible.

Skin sensitization Due to partial or complete lack of data the classification is not possible.

Germ cell mutagenicity Due to partial or complete lack of data the classification is not possible.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

CRISTOBALITE (CAS 14464-46-1)	1 Carcinogenic to humans.
QUARTZ (SIO2) (CAS 14808-60-7)	1 Carcinogenic to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

CRISTOBALITE (CAS 14464-46-1)	Cancer
QUARTZ (SIO2) (CAS 14808-60-7)	Cancer

US. National Toxicology Program (NTP) Report on Carcinogens

CRISTOBALITE (CAS 14464-46-1)	Known To Be Human Carcinogen. Reasonably Anticipated to be a Human Carcinogen.
QUARTZ (SIO2) (CAS 14808-60-7)	Known To Be Human Carcinogen.

Reproductive toxicity Due to partial or complete lack of data the classification is not possible.

Specific target organ toxicity - single exposure Due to partial or complete lack of data the classification is not possible.

Specific target organ toxicity - repeated exposure Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard Due to partial or complete lack of data the classification is not possible.

Chronic effects Causes damage to organs through prolonged or repeated exposure.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Toxic Substances Control Act (TSCA)

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

CRISTOBALITE (CAS 14464-46-1)	Cancer
QUARTZ (SIO2) (CAS 14808-60-7)	Cancer
CRISTOBALITE (CAS 14464-46-1)	lung effects
QUARTZ (SIO2) (CAS 14808-60-7)	lung effects
CRISTOBALITE (CAS 14464-46-1)	immune system effects
QUARTZ (SIO2) (CAS 14808-60-7)	immune system effects
CRISTOBALITE (CAS 14464-46-1)	kidney effects
QUARTZ (SIO2) (CAS 14808-60-7)	kidney effects

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No (Exempt)

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

US state regulations

California Proposition 65



WARNING: This product can expose you to QUARTZ (SIO2), which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

California Proposition 65 - CRT: Listed date/Carcinogenic substance

QUARTZ (SIO2) (CAS 14808-60-7) Listed: October 1, 1988

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

CRISTOBALITE (CAS 14464-46-1)
QUARTZ (SIO2) (CAS 14808-60-7)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-July-2019

Revision date 12-December-2019

Version # 15

HMIS® ratings Health: 3*
Flammability: 0
Physical hazard: 0

NFPA ratings Health: 2
Flammability: 0
Instability: 0

Disclaimer CETCO, a Minerals Technologies Company cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available. The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The manufacturer expressly does not make any representations, warranties, or guarantees as to its accuracy, reliability or completeness nor assumes any liability, for its use. It is the user's responsibility to verify the suitability and completeness of such information for each particular use.

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Revision information This document has undergone significant changes and should be reviewed in its entirety.

FLUORO-SORB® P & 100 ADSORBENTS

ADSORPTION MEDIA FOR THE REMEDIATION AND REMOVAL OF PFAS

DESCRIPTION

FLUORO-SORB® Adsorbent is a proprietary, surface-modified clay media that is proven to effectively treat perfluoroalkyl and polyfluoroalkyl substances (PFAS) in a variety of removal and remediation applications. FLUORO-SORB® P and FLUORO-SORB® 100 Adsorbents feature a grain size distribution that makes them ideal for deployment in groundwater treatment via subsurface injection, soil stabilization, and water pre-treatment processes such as dissolved air flotation (DAF) and clarifiers. FLUORO-SORB® Adsorbent exhibits fast PFAS adsorption kinetics with a unique composition that resists competitive adsorption from other water constituents and co-contaminants.



FLUORO-SORB® P ADSORBENT



FLUORO-SORB® 100 ADSORBENT

SUPERIOR TECHNOLOGY

- Fast kinetics optimizes PFAS reduction in water pre-treatment
- Can be mechanically mixed in situ and ex situ
- Can be slurried in water for subsurface injection
- Penetrates below grade soil to capture PFAS
- Immobilizes PFAS in groundwater through adsorption
- Mitigates leaching and contaminant migration
- In situ stabilization for source zone treatment
- Low dosing (0.5 – 3%) typically achieves effective remediation

PACKAGING

~50 lb (~22.7 kg) bags, 40 per pallet, or ~2000 lb (~907.2 kg) supersacks. All pallets are plastic-wrapped.

For technical inquiries, project-specific questions, and to obtain a sample for your laboratory testing or pilot treatability study, please contact a CETCO sales representative or send an inquiry to cetco@mineralstech.com.

PFAS TREATMENT AND REMEDIATION APPLICATIONS

- AFFF-impacted source zone remediation
- Groundwater
- In situ and ex situ soil stabilization
- Subsurface injection
- Water pre-treatment (DAF/Clarifier)

TYPICAL PROPERTIES

MATERIAL PROPERTY	FLUORO-SORB® P ADSORBENT	FLUORO-SORB® 100 ADSORBENT
Specific Gravity	1.72	1.74
Pour Bulk Density	30.1 lb/ft^3 (483 kg/m^3)	50 lb/ft^3 (800 kg/m^3)
Tapped Bulk Density	42.4 lb/ft^3 (680 kg/m^3)	61 lb/ft^3 (977 kg/m^3)
Permeability	N/A	2.2 x 10-3 cm/s
% Passing – Upper	97% through #60 mesh (0.25 mm)	92% through #20 mesh (0.85 mm)
% Passing – Lower	80% through #200 mesh (0.075 mm)	8% through #200 mesh (0.075 mm)
Median Particle Diameter (D50)	0.0123 mm	0.45 mm
Effective Size (D10)	0.0021 mm	0.08 mm

North America: 847.851.1800 | 800.527.9948 | www.CETCO.com

UPDATED: AUGUST 2024

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FORM: TDS_FLUORO-SORB_P_AND_100_ ADSORBENTS_AM_EN_202408

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SELFRIDGE AIR FORCE BASE PFAS SOIL REMEDIATION: FLUORO-SORB® P ADSORBENT IN-SITU SOIL STABILIZATION

Proactive environmental remediation from Air Force bases, like the efforts made by Selfridge Air Force base, can be monumental in protecting the local groundwater and surface water from contaminants like per- and polyfluoroalkyl substances (PFAS). Air Force bases have historically used aqueous film-forming foams (AFFF) for fire-fighting training and fire suppression systems for prevention of large scale, liquid-based fuel fires. Use of AFFF has the consequence of introducing PFAS to the environment. Since PFAS are persistent, bio-accumulative, and can be toxic to the environment, strong remediation efforts are crucial to prevent future risk by protect the local environment and drinking water sources.

Selfridge Air Force base evaluated in-situ soil stabilization for use in a full-scale application to remediate contaminated areas on the base. For this study, the first phase used a bench scale USEPA Method 1312 Synthetic Precipitation Leaching Procedure (SPLP) to evaluate appropriate dosing concentrations required to sufficiently stabilize PFAS contamination in the site soil. The second phase included field-scale soil mixing to sequester PFAS contamination and prevent leaching of PFAS to other environmental compartments.



PROJECT DETAILS

In Situ Soil Stabilization

LOCATION

Michigan, U.S.

PRODUCT USED

FLUORO-SORB® P Adsorbent

CHALLENGE:

In Situ Soil Stabilization was evaluated for use in a full-scale application at Selfridge Air Force base. For this study, the first phase used a bench scale USEPA Method 1312 Synthetic Precipitation Leaching Procedure (SPLP) to evaluate appropriate dosing concentrations required to sufficiently stabilize PFAS contamination in the site soil.

SOLUTION:

PART 1: SOIL MIXING FLUORO-SORB® P ADSORBENT TO EVALUATE AMENDMENT CONCENTRATIONS

FLUORO-SORB® P Adsorbent was evaluated at 0.25%, 0.5%, 1%, and 2% dry weight in lab soil mixing experiments using the SPLP leaching procedure and USEPA 1633 analysis. Roughly 3600 grams of site soil was mixed iteratively using an EIRICH EL5 Profi Mixer (star blade rotation speed = 1200 RPM clockwise, bowl rotation speed = 88 RPM clockwise) at 15-minute increments until achieving the target amendment concentrations as shown in Figure 1.

Grab soil samples were collected from various locations across the 8-acre contamination site for the lab-mixing test to determine the optimal % amendment of FLUORO-SORB® P Adsorbent appropriate for the full-scale soil stabilization. Amendment concentrations of 0.25% to 2% displayed >99.9% reduction for all treatment areas.

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JUNE 2025

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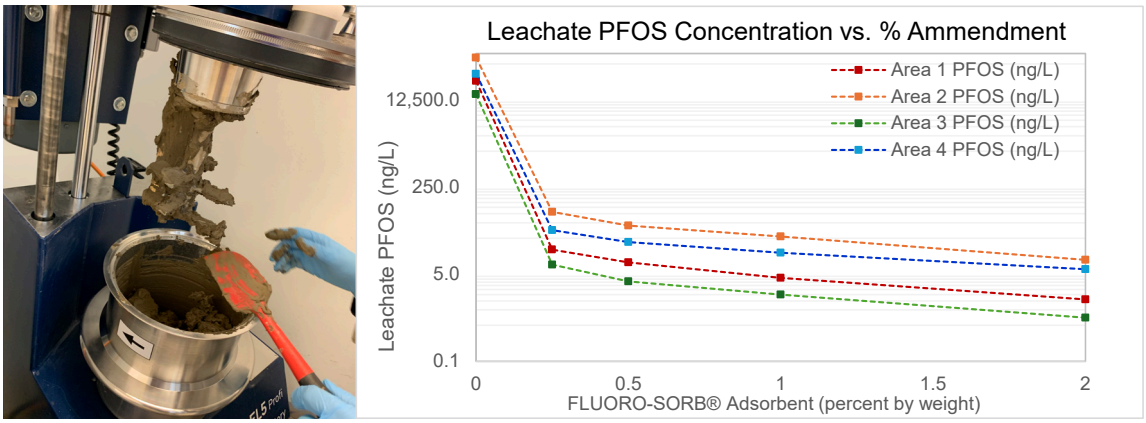


Figure 1: (Left): Lab-scale soil mixing process using the EIRICH EL5 Profi Mixer. (Right): PFOS leachate reduction as a function of % FLUORO-SORB® P Adsorbent in lab-mixing study.

Leachate from SPLP analysis on unamended soil contained 16 - 83 µg/L. This was reduced to 4 – 44 ng/L and 2 – 27ng/L for 0.5% and 1% amendment respectively.

PART 2: FIELD-SCALE SOIL MIXING AND LEACHING REDUCTION

Based on the results of the bench-scale leaching tests, an adsorbent amendment concentration of 0.5-1% was used for the field-scale ISS, with 1% amendment used at the higher concentration areas and 0.5% amendement used at the lower concentrations zones. These amendment doses were attained across 8-acres of soil with a rotary spreader.

Full scale study results show a significant decrease in PFOS leaching with FLUORO-SORB® P Adsorbent amendments from 0.5 to 1%. The FLUORO-SORB® P Adsorbent ISS reduced leaching of PFOS from 95 to 100% with field mixing, reducing soil concentrations from 10 – 40 µg/L to 0.012 – 2 µg/L.

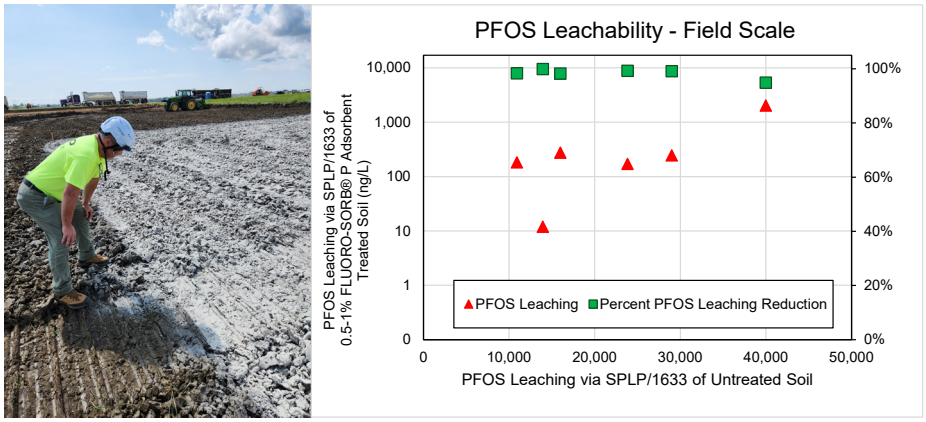


Figure 2: (Left): Deployment into soil at Air Force base, displaying field mixing (0.5 to 1% FS) which was performed with a rotary spreader over an 8-acre area of contaminated soils. (Right): Leachate concentrations with 0.5 to 1% FLUORO-SORB® P Adsorbent amendment (left axis – red) compared to concentrations in raw site soil without amendment (x-axis) as well as overall % leaching reduction (right axis – green).

CONCLUSION:

Bench testing and the field-scale trial demonstrated that PFOS leaching can be mitigated via FLUORO-SORB® P Adsorbent in-situ soil stabilization with amendment concentrations from 0.5 to 1%. The field study showed 98-100% leaching reduction, reducing leaching from µg/L to ng/L concentrations. This method is an efficient, cost-effective technique for AFFF source zone management at fire training and suppression sites on military and industrial PFAS-impacted soils.

FLUORO-SORB® 100 Adsorbent Offers Cost-Effective Soil Remediation Strategy

A firefighting training facility had high levels of PFAS and TPH contamination due to repeated use of aquous film-forming foam (AFFF) and recurrent petrol and diesel fires, respectively. A series of treatability studies were conducted to conclude that FLUORO-SORB 100 adsorbent was an effective and cost-effective strategy to treat the impacted soils via in-situ stabilization and solidification and permeable reactive barrier, without being affected by the TPH co-contaminants.







PROJECT DETAILS

Fire Training Center

Remediation Contractor: ATG Group

LOCATION

Southampton, United Kingdom

PRODUCTS USED

FLUORO-SORB® 100 adsorbent

CHALLENGE:

A fire training center located near Southampton, United Kingdom had high levels of PFAS contamination after recurrent use of aqueous film-forming foam (AFFF). Groundwater and near-surface soils had PFAS contamination levels exceeding 100 ppb (parts per billion) with long-chain compounds, PFOS and PFOA. Additionally, the fire training facility had been used for petrol and diesel fires, causing significant TPH (total petroleum hydrocarbons) contamination, creating a scenario of co-contamination.

Because the site was situated near a tidal marine estuary, additional challenges included poor geotechnical ground conditions due to marine silts and groundwater tidal influences as well as the presence of high sulfates.

SOLUTION:

The team looked to devise a remediation strategy that not only maximized removal levels, but was also cost-conscious for this public sector client with a limited budget. Treatability trials were conducted on site soil samples. Treated with various combinations of FLUORO-SORB 100 adsorbent and cementitious binders, six 500g mono-

FLUORO-SORB® 100 Adsorbent Offers Cost-Effective Soil Remediation Strategy

liths were formed. Separate 64-day tank tests were conducted on each based on EA NEN7375:2004/US EPA 1315. The treatability studies determined that the leachate samples had undetectable levels of PFAS and TPH, making FLUORO-SORB 100 adsorbent an effective additive for in-situ solidification and stabilization of PFAS contaminated soil, even when the soil has TPH co-contaminants present. Conversely, granular activated carbon (GAC) can be fouled by TPH and reduce its PFAS adsorption effectiveness.

As a result of these findings, impacted soils were excavated and disposed of while near-surface soils were treated via in-situ stabilization and solidification utilizing FLUORO-SORB 100 adsorbent. A permeable reactive barrier (PRB) was installed on the downgradient boundary also utilizing FLUORO-SORB 100 adsorbent.

RESULT:

FLUORO-SORB 100 adsorbent not only proved to be a cost-effective solution, but it was proven to be more effective than Granular Activated Carbon (GAC) and Ion Exchange Resin. The remediation plan offers the site a long-term solution of more than 20 years.

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case-study-fluorosorb-iss-prb-firefighting-center-na-en-202011-v1

Appendix I

Responses to Agency Comments

US Army Corps of Engineers ®

New England District
696 Virginia Road
Concord, Massachusetts
01742-2751

Project Name:	Former Fort Devens Army Installation		
Location:	Devens, Massachusetts	Reviewers:	Shawn Lowry (USEPA) and Joanne Dearden (MassDEP)
Document Name:			
Draft In Situ Stabilization/ Solidification Pilot Test Work plan for Treatment of Per- and Polyfluoroalkyl Substances in Soils, Operable Unit 14 – Area of Contamination 31 – Former Fire Training Area, Former Fort Devens Army Installation, Devens, Massachusetts, April 2025			

No.	Ref. Page / Para.	COMMENT	RESPONSE
		EPA Comments - Shawn Lowry (1 August 2025)	
1.	General	Please clarify the long-term fate of the test cells after the monitoring period ends: does Army intend to excavate these cells?	The test cells will remain in place after the monitoring period ends. In Situ Stabilization/ Solidification (ISS) is being evaluated as a viable full-scale remedy for PFAS in soils at AOC 31 and, if selected, the test cells would be integrated into the overall ISS monolith to the extent practicable.
2.	General	The text notes that installation of the test cells will include the addition of amendment, blending, and the excavation and backfilling of soils. Will soils be compacted during backfilling? Will backfilling be completed to original grade? Please also explain whether any excess soil associated with the excavation is anticipated, and if so, how that would be managed.	Soils within the test cells will be mixed with amendments and homogenized into a slurry that will solidify into a monolith. Compaction will not be required. Bulking of the mixed soil and amendments is anticipated, and perimeter berms (using native soil) will be created around each test cell to allow for this expansion. After the test cell (including the bulk material) has solidified, a layer of 8-ounce non-woven geotextile will be installed and covered with approximately 6-inches of AASHTO No. 3 stone. The perimeter native soil berms will be re-graded to promote positive drainage away from the test cells.

No.	Ref. Page / Para.	COMMENT	RESPONSE
3.	Specific PDF Page 32	The footnote on this page states, “All potable water at the former Fort Devens and Town of Ayer is currently pre-treated for PFAS, so this source water will also have been documented as PFAS-free based on the pre-treatment”. Please clarify whether all sources of water used in this treatability study will be analyzed for PFAS prior to use. Please also define “PFAS-free” as it is used here.	Three primary samples and one duplicate of the potable water source water (fire hydrant water) to be used in this treatability study will be collected to document PFAS-free conditions. Table 5 of the Draft ISS Pilot Test Work Plan summarizes these samples in the “Pre ISS Implementation” row. “PFAS-free” as it is used in this Work Plan indicates laboratory analytical results that are non-detect for PFAS compounds listed in Draft 4 Method 1633 (S-A JV samples) and/or Method 533 (public water supply). Footnote 6 on page 26 of the workplan (with respect to section 6.1.7) has been updated to clarify.
4.	Specific PDF Page 37	The text states, “A 2-year period also may not provide enough time for the “signal” of shallow (0 to 20 ft bgs) vadose zone soil treatment to reach groundwater approximately 70 ft bgs and travel downgradient to the monitoring wells”. Does Army have a contingency action to cover this possibility?	The performance of the pilot study will be based on the soils LEAF testing and lysimeter porewater results. Performance monitoring groundwater samples are being collected to document changes in PFAS concentrations in groundwater in the event they are observed during the monitoring period.

US Army Corps of Engineers ®

New England District
696 Virginia Road
Concord, Massachusetts
01742-2751

		MassDEP Comments - Joanne Dearden (14 August 2025)	
1.	Specific Section 2 3rd Paragraph First Bullet Pages 3 and 4	a. PFHxS and PFOA are mentioned as the second most detected PFAS analytes in soil at AOC 31. However, the pie charts displayed on Figure 7 indicate that PFDoA was detected in many of the AOC 31 soil samples. Please confirm if PFDoA should also be mentioned here. b. The treatment pilot test described in this work plan targets soils from 0 to 20 feet bgs. Please describe why this depth interval was selected as the target treatment interval.	a. The dark blue color on the pie charts displayed in Figure 7 represents 8:2 FtS, not PFDoA. PFDoA was reported at a concentration above the laboratory reporting limit in only four of 533 AOC 31 soil samples, and at an estimated concentration between the laboratory detection and reporting limits in 29 additional AOC 31 soil samples. Section 2, page 3 of the Work Plan text has been updated to mention 8:2 FtS. b. Based on previous soil sampling data, the majority of the PFAS mass in soils was present in the 0-20 feet bgs range. PFOS was the most prevalent PFAS analyte in Site samples collected in the planned pilot test area. Vertical concentration profiles for PFOS are depicted in Figures 6, 6a, 6b, and 6c. PFOS concentrations drop order(s) of magnitude in samples collected from 25 feet bgs. Additionally, excavating beneath 20 feet bgs would add complexity, hazards, and costs to the pilot testing program.
2.	Specific Section 3.3 Last Paragraph Page 9 and Figure 9	The following text is included in Section 3.3 “The three simple AFs were calculated by dividing the mean top-of-saturated-zone groundwater concentration at locations 31VP-21-01, 31VP-21-02, and 31VP-P21-04 (located directly below soil borings 31SB-21-01, 31SB-21-02, and 31SB-21-04, respectively; Figure 9) by the mean vadose zone porewater concentration detected from all four porewater sampling events from all eight lysimeters.” On Figure 9, a purple dot symbol indicates soil borings. The locations are identified as 31-VP-21-01, 31VP-21-02, and 31VP-21-04; however, the associated data boxes show groundwater results. It is not clear if Figure 9 displays the same information as described in the Section 3.3 text. Please clarify if the IDs and symbols are correct as shown on Figure 9.	The IDs and symbols are correct as shown on Figure 9. Top-of-saturated zone groundwater grab samples were collected from the three soil borings (31SB-21-01, 31SB-21-02, and 31SB-21-04) using a new clean PVC screen installed in each boring. One grab groundwater sample was collected per soil boring. No permanent well or lysimeter was installed.

3.	Specific Section 4.2 Exhibit 4-2 Page 11	Please clarify if the PFOS concentration and removal efficiently percentage for Fines is correct as shown, as the Fines PFOS concentration of 192 µg/kg is greater than the Untreated PFOS concentration of 126.33 µg/kg.	The objective of the treatability trial was to treat the coarse grained fraction of soil and separate the fine grained fraction. This volume reduction approach was considered the most cost effective soil washing option for Devens as the bulk of the soil is coarse grained and only approximately 2% of the soil consisted of fines. Other soil washing processes can reduce PFAS in the fine grained fraction through the addition of chemical reagents and additional treatment processes, however this comes with an increased cost and was not conducted during the treatability testing. An increase in PFOS concentration per unit weight of fines recovered from soil washing occasionally occurs in soil washing. The fine particles have a larger surface area and a higher organic content than the sand fraction. Consequently, PFOS and other PFAS are preferentially present in the fines fraction.
4.	Specific Section 4.3 First Bullet Page 13	Please note the manufacturer(s) for the PFAS fixants RemBind® 100X and FLUORO-SORB® 100.	RemBind® 100x is manufactured by RemBind, Pty Ltd., a subsidiary of Ziltek, Pty Ltd. (Australia). FLUORO-SORB® 100 is manufactured by Colloid Environmental Technologies Co. (CETCO), a division of Minerals Technologies Inc. (USA). Section 4.3, page 13 of the Work Plan has been updated to include this information.

5.	Specific Section 4.3 Last Paragraph Page 17	Based on the results of the bench-scale study FLUORO-SORB® 100 was selected as the ISS fixant to be used during the field pilot test. a. Please provide some details on the product (i.e. composition, etc.). Also, include a product sheet and safety data sheet for FLUORO-SORB® 100. b. Please provide citations for any case studies on the field-scale application of the FLUORO-SORB® 100 to treat PFAS in soil. c. Please include a discussion regarding any limitations on the duration of which the product is effective in stabilizing PFAS. d. Please include a discussion regarding any secondary contaminants as well as any physical or chemical changes that should be considered which could have an adverse impact on the soil from the product application.	a. As described by the manufacturer, FLUORO-SORB® 100 Adsorbent is a proprietary, surface-modified clay media proven to effectively treat PFAS in a variety of removal and remediation applications. FLUORO-SORB® 100 Adsorbent features a grain size distribution well suited for deployment in soil stabilization. FLUORO-SORB® 100 Adsorbent exhibits fast PFAS adsorption kinetics with a composition that resists competitive adsorption from other water constituents and co-contaminants. Product information and the safety data sheet can be accessed at the following links: CETCO FLUORO-SORB® 100 Website FLUORO-SORB® 100 Product Technical Data Sheet FLUORO-SORB® 100 SDS The FLUORO-SORB® Product Technical Data Sheet and Safety Data Sheet has been added to the Work Plan via a new Appendix (Appendix H). b. Case studies on field-scale applications of FLUORO-SORB® 100 to treat PFAS in soil can be accessed at the following link: FLORO-SORB® 100 Case Studies and Publications Search FLUORO-SORB® 100 case studies has been added to the Work Plan via the new Appendix (Appendix H). c. The bench scale treatability study evaluated the effectiveness of FLUORO-SORB® 100 for ISS in a laboratory environment following prescriptive quality assurance / quality control guidelines through the evaluation process. The next step is

			to evaluate the performance of FLUORO-SORB® 100 during the pilot test field program. Long-term monitoring and performance results generated during the field pilot study will be compared with the laboratory treatability study results to further understand the short-term and long-term effectiveness of FLUORO-SORB® 100 for ISS in a field application. Section 4.3, page 18 of the Work Plan has been updated to include this. d. Based on manufacturer information, there are no known secondary contaminants or physical or chemical changes that could adversely impact soil from FLUORO-SORB® 100.

6.	Specific Section 6 Figure 10	The proposed location of Test Cell No.2 appears to be located parallel to and upgradient of the proposed Permeable Reactive Barrier for the pilot study for the treatment of PFAs in groundwater. Please clarify if this is the case and if the test cell location may have any impact on the PFAS pilot study for groundwater.	The Permeable Reactive Barrier (PRB) for the pilot study for treatment of PFAS in groundwater will be installed between 60 and 150 feet below ground surface (bgs), while the ISS Test Cells will be installed between ground surface and 20 feet bgs. The top of the saturated zone at the Site is approximately 70 feet bgs. The PRB will be installed hydraulically downgradient of AOC 31, and the ISS Test Cells will be installed within AOC 31. Although the locations selected for the two pilot tests are proximate, they are not anticipated to impact one another based on their vertical separation. Specifically, the ISS Test Cells are not expected to have an impact on the results of the PFAS pilot study for groundwater because: 1. Upgradient groundwater is also impacted by PFAS. See Figures 2 and 3. 2. The time for vadose zone porewater to migrate from the ISS Test Cell area to groundwater is unknown but could take longer than the post implementation performance monitoring schedule. Also see the response to EPA 8/1/2025 comment #4.
7.	Specific Section 6.1.6 3rd Paragraph Page 23	The statement is made that the soil collected from discrete samples from the upper and lower portions of Test Cell No.1 and the upper portion of Test Cell No. 2 will be analyzed for select organics (aluminum, calcium, magnesium, iron, and sulfur). Please describe why these metals were selected and how the results will be used to evaluate the pilot study test.	These metals were selected for analysis because they will be present at higher concentrations in soils following addition of the solidification amendments (blast furnace slag cement and/or Portland limestone cement). Analyzing soil samples collected from discrete locations within the solidified cell portions for these metals is intended to provide a data set to further validate mixing homogeneity. Section 6.1.6 (page 24), Section 6.1.7.1 (page 28), and Section 6.1.7.2 (page 29) of the Work Plan have been updated to include this information.

8.	Specific Section 6.1.7 Page 24	Please describe how the amendments are added into each test cell prior to mixing. Are there any specific procedures required for adding the amendments?	Amendments will be delivered to the Site in super-sack bundles of pre-determined mass set by the manufacturer. The volumes/masses utilized will be measured (via bundle counting) and recorded by Site personnel. Amendments will be direct loaded from the supply bundles into the test cells using heavy equipment such as an excavator and supporting skid steer. Mixing water will be metered at a predetermined volume and pumped to the test cell via hoses. The amendments will be mixed within the test cells using the excavator standard bucket and/or skeleton bucket, rake, or mechanical mixing head attachments.
9.	Specific Section 6.1.7.1 1st Paragraph Page 26	Please describe how soil samples are collected and analyzed post treatment, after the soil is stabilized and solidified by the treatment mix, specifically the portland limestone cement and blast furnace slag material. After the treatment will the soil become a solid mass?	Samples of treated soils will be collected into molds (2-inch by 4-inch plastic cylindrical molds) in the field immediately after test cell mixing is determined to be complete. At the time of collection, the treated soils will not have had the time to cure into a solidified mass. The collection process is described in Section 6.1.7.1, second paragraph, pages 26-27 of the Work Plan. The molds will be allowed to cure for 28 days. Then, as described in Section 6.1.9.1 and Table 4, LEAF 1315 will be performed on the solidified samples to extract leachate (LEAF 1315 is specific to solidified masses). One (1) LEAF 1315 procedure will produce nine (9) leachate samples. The leachate samples will be analyzed for PFAS and dissolved organic carbon. Geotechnical analysis will also be performed on the solidified samples, as described in Section 6.1.9.1 and Table 4 of the Work Plan.

10.	Specific Section 6.1.8 2nd Paragraph Page 28	Proposed lysimeters will have porewater collection cups set at a depth of 25 feet bgs. At that proposed depth, will the porewater sample collected be representative of porewater from 0 to 20 feet bgs (the target soil treatment interval) or would the sample be more representative of pore water from 20 – 25 feet bgs where there is no treatment? Please clarify.	Initially, the porewater collected at 25 feet depth (if any is present) will be representative of porewater present at that depth before initiation of pilot testing. Following installation of the Test Cells, water from precipitation events that migrates vertically downward through the vadose zone and into these lysimeters positioned below the test cells will be representative of porewater conditions from ground surface through 25 feet bgs. In reality, following installation of the Test Cells above them, these lysimeters may be dry, as discussed in Section 6.1.9.3, pages 30-31 of the Work Plan: *"Lysimeter data may or may not show a decrease in PFAS concentrations in porewater because percolation of rainfall is anticipated to be stopped and/or greatly reduced by ISS, and the existing porewater concentrations may not be affected without additional percolation through the vadose zone. The performance monitoring porewater sampling and analysis details are presented in Table 5."*
11.	Specific Section 6.1.9.1 First Bullet Page 29	Please describe why LEAF Method 1315 is the analytical method used for the post treatment samples compared to the LEAF Method 1314 described for the baseline sampling.	The LEAF 1315 method is specific to testing of solidified masses. The LEAF 1314 method is specific to testing unsolidified masses. This is presented in Section 4.3, page 15 of the Work Plan.
12.	Specific Section 6.1.9.3 1st Paragraph Page 30	This section discusses how groundwater performance monitoring will be conducted to assess the effectiveness of soil treatment and the leaching of PFAS to groundwater. Please clarify whether groundwater levels will also be monitored to assess how the low permeability test cells intended to decrease water infiltration impact localized groundwater levels.	Static groundwater levels will be measured in the performance monitoring wells that will be sampled during the pilot test. The low permeability test cells are expected to have a negligible impact on local groundwater levels because groundwater recharge to the saturated zone beneath the pilot test area comes from a much larger area than will be solidified by the two 15 foot by 15 foot vadose zone test cells.

13.	Specific Section 6.1.10 1st Paragraph Page 31	This section describes how the bermed soil around the test cells will be regraded and mounded in the area. Please clarify if the bermed soil is the soil that will be excavated from the test cell.	Yes, the bermed soils will be the native soils excavated from the top of the test cells. This is further described in Section 6.1.7, page 24 of the Work Plan. See also the response to EPA 8/1/2025 comment #2.
14.	Specific Section 6.1.10 2nd Paragraph Page 31	A. Please identify any anticipated IDW or other waste that would require offsite disposal. B. Please also reference the 2024 IDW Waste Management Plan for PFAS Remedial Investigations in this paragraph. ***C.*** Area 3 QAPP Addendum (S-A JV 2024a) – Please revise to include ***for AOC-31 Pilot Tests for PFAS in Soil and Groundwater.*** D. Please clarify what will happen to the test cells after the pilot study is completed. Will the test cells remain in place and if so, will that have any potential impact or limitation on future use of the site?	A. General construction debris, personal protective equipment, and miscellaneous refuse will be generated and placed in a roll-off container and disposed at the local landfill as municipal solid waste. One roll-off container (10 cubic yards) of general waste is anticipated to be generated. No IDW or other PFAS-impacted waste that would require off-site disposal is expected to be generated during the pilot testing. ISS bulk material will remain within each test cell, and decontamination of equipment will also be performed over the test cells. Lysimeters installed below each test cell will generate minimal cuttings, if any, because they will be installed through the 6-inch PVC pipe pre-installed through the center of each cell. If any unexpected waste is generated, it will be containerized, characterized, and properly disposed of off-site in accordance with the QAPP, QAPP Addendum, and IDW Management Plan. Section 6.1.10, page 32/33 has been updated to include this information. B. This edit has been made to section 6.1.10, page 33 the Work Plan. C. This edit has been made to section 6.1.10, page 33 the Work Plan. D. Please see response to EPA 8/1/2025 comment #1.
END OF COMMENTS			