

**UNIFORM FEDERAL POLICY
QUALITY ASSURANCE PROJECT PLAN
ADDENDUM NO. 2
PHASE I REMEDIAL INVESTIGATION OF
PER-AND POLYFLUOROALKYL SUBSTANCES,
NIAGARA FALLS AIR RESERVE STATION
NIAGARA FALLS, NEW YORK**

PREPARED FOR:

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DoD Contract Number: W912DR19D0005/Delivery Order: W912DR22F0247

June 2026

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**Final
Uniform Federal Policy
Quality Assurance Project Plan
Addendum No. 2
Phase I Remedial Investigation of
Per- and Polyfluoroalkyl Substances
at Niagara Falls Air Reserve Station
Niagara Falls, New York**

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LIST OF ACRONYMS AND ABBREVIATIONS

AFFF	Aqueous film-forming foam
ASD	Assistant Secretary of Defense
bgs	below ground surface
DoD	Department of Defense
EA	EA Engineering, Science, and Technology, Inc., PBC
ft	feet or foot
MCL	Maximum Contaminant Level
MICLON	Military Construction
NFARS	Niagara Falls Air Reserve Station
ng/L	nanograms per liter
NYS	New York State
PA	Preliminary Assessment
PDT	Project Delivery Team
PFAS	Per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
QAPP	Quality Assurance Project Plan
QC	Quality control
RI	Remedial Investigation
SI	Site Inspection
SL	Screening Level
SOP	Standard Operating Procedure
USACE	United State Army Corp of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UFP	Uniform Federal Policy
µg/kg	micrograms per kilogram

INTRODUCTION

This is an Addendum to the Uniform Federal Policy- (UFP) Quality Assurance Project Plan (QAPP) prepared to support Phase I Remedial Investigation (RI) activities to characterize the impact of per- and polyfluoroalkyl substances (PFAS) in identified aqueous film-forming foam (AFFF) release areas at Niagara Falls Air Reserve Station (NFARS) in Niagara Falls, New York. The Phase I RI is being conducted using a data-driven sequential approach where data is collected and presented to the project delivery team (PDT) with proposed subsequent investigative elements during scoping meetings. RI fieldwork is being conducted over a series of mobilizations (initial, second, third mobilization, etc.). Initial mobilization field activities were conducted in September 2023 in accordance with the UFP QAPP (EA Engineering, Science, and Technology, Inc., PBC [EA] 2023). This Addendum addresses the second mobilization field activities.

The 2018 Site Inspection Report identified historical AFFF releases with PFAS compounds (specifically perfluorooctane sulfonate [PFOS], perfluorooctanoic acid [PFOA], and perfluorobutane sulfonate [PFBS]) present in on-site and downgradient environmental media (ASL 2018). Based on the results of SI, AFFF sites (PFAS release areas and associated outfalls) were carried forward to the Phase I RI and included in the UFP-QAPP (EA 2023) (**Figure 1-1**):

- FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7
- SS850P: AFFF Area 2 Hanger 850
- SS706P: AFFF Area 3 Building 706
- SS707P: AFFF Area 4 Building 700, Outfall 4
- SS015P: AFFF Area 5 Blue Angels Crash Site
- SS101P: AFFF Area 6 Fox Row/Taxiway Alpha, Outfalls 5 and 9
- SS316P: AFFF Area 8: Hulby Street

Since completion of the Phase I RI initial mobilization field activities in September 2023, one additional AFFF site, SS420P: Former Tank B Dike has been identified for inclusion in the Phase I RI. Investigation of SS420P: Former Tank B Dike will be included in the second field mobilization.

This Addendum presents the sampling design and rationale and planned sampling locations and methods for the second mobilization field activities for the nine AFFF sites (seven initial, one additional AFFF release area, and one potential AFFF release area) being investigated during the second mobilization of the Phase I RI. Field activities during the second mobilization will include: (1) initial synoptic water level measurement event, (2) source area surface soil sampling, and (3) a supplemental surface water/sediment sampling event.

The following worksheets have been updated to reflect the changes and/or additions to the UFP-QAPP. This Addendum contains modifications to selected worksheets found in the UFP-QAPP (EA Engineering, Science, and Technology, Inc., PBC [EA] 2023). A summary of the changes to the UFP-QAPP worksheets is provided below and is followed by the added worksheet content on subsequent pages. Remaining worksheets are included in the UFP-QAPP in their original format with their original content.

WORKSHEETS #1 AND #2 – TITLE AND APPROVAL PAGE

Worksheet #1 presents the title and approval page for this Addendum.

WORKSHEETS #9 – PROJECT PLANNING SESSION SUMMARY

Worksheet #9 presents the summary of the April 2026 planning meeting for UFP-QAPP Addendum No. 2 development.

WORKSHEET #10 – CONCEPTUAL SITE MODEL

Worksheet #10 is amended to include the CSM information for SS420P: Tank B Dike and the Blue Angels Crash Site, including site background, previous investigation results, and potential PFAS migration pathways.

WORKSHEET #15 – PROJECT SCREENING LEVELS AND LABORATORY SPECIFIC DETECTION/QUANTIFICATION LIMITS

Worksheet #15 is updated to reflect the use of EPA Method 1633 (final versus draft method) for PFAS analysis of soil, sediment, surface water, and groundwater media collected during the RI field investigations. In addition, the Worksheet #15 tables have been updated to reflect the use of the most recent Assistant Secretary of Defense (ASD) Department of Defense (DoD) Memorandum on Investigating PFAS within the DoD Cleanup Program Screening Levels.

WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

Worksheet #17 is amended to add the second mobilization sampling design and rationale and planned sampling locations and methods for each of the nine AFFF sites being investigated.

WORKSHEET #18 – SAMPLING LOCATIONS AND METHODS

Worksheet #18 **Table 18-1** is amended to present the proposed sampling locations, estimated depth, and associated analytes for the second mobilization of RI field activities.

WORKSHEET #19 AND #30 – SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

Worksheet #19 and #30 has been updated to reflect use of EPA Method 1633 (final) and associated holding times.

WORKSHEET #20 – FIELD QUALITY CONTROL SUMMARY

Worksheet #20 has been updated to include sample quantities for the second mobilization.

WORKSHEET #23 – ANALYTICAL STANDARD OPERATING PROCEDURES

Worksheet #23 has been updated to reflect the use of EPA Method 1633 (final versus draft method) and provide the analytical laboratory (Pace Analytical) SOPs.

WORKSHEET #26 & #27 – SAMPLE HANDLING, CUSTODY, AND DISPOSAL

Worksheet #26 & #27 has been updated to include sample identification for the second mobilization samples.

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UFP-QAPP WORKSHEETS #1 & #2: Title and Approval Page

Contractor Name: EA Engineering, Science, and Technology, Inc., PBC

Contract Number: W912DR-19-D-0005

Work Assignment Number: Task Order W912DR22F0247

Document Title: Uniform Federal Policy Quality Assurance Project Plan Addendum No. 2, Phase I Remedial Investigation of Per- And Polyfluoroalkyl Substances, Niagara Falls Air Reserve Station


Project Lead: U.S. Army Corps of Engineers – Baltimore District

Preparation Date: June 2026


Project Lead Signature/Date: GUARRIELLO.GINA.ELI ZABETH.1613801975 Digitally signed by GUARRIELLO.GINA.ELIZABETH.1613801975 Date: 2026.06.03 13:30:02 -04'00' 6/3/2026
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Printed Name/Title: Tom Heins / USACE Project Manager

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Printed Name/Title: Lindsay Mairs / USAF AFCEC Base RPM

Investigative Organization Signature/Date:  6/3/2026
Printed Name/Title: Robert Casey, PMP / EA Project Manager

Other Approval Signature/Date:  6/3/2026
Printed Name/Title: Donald Conan, PE, PG / EA Senior Technical Reviewer

Other Approval Signature/Date:  6/3/2026
Printed Name/Title: Samantha Saalfield, PhD / EA Project Chemist

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UFP-QAPP WORKSHEET #9: PROJECT PLANNING SESSION SUMMARY

This worksheet is used to document project planning sessions and is used to provide a concise record of participants, key decisions or agreements reached, and action items. If a planning session occurs after this UFP-QAPP has been finalized, and the session results in a change to this UFP-QAPP, this worksheet will be amended accordingly.

PROJECT PLANNING MEETING NO. 2 – UFP-QAPP ADDENDUM NO. 2

Title: NFARS Phase I RI of PFAS

Meeting Location: Microsoft Teams meeting

Date of Session: 2 April 2026

Participants:

Attendees	Organization/TO Role
Lindsay Mairs	AFCEC-Restoration Program Manager
Kurt Lee	AFCEC CTZE
Tom Heins	USACE – New York District – Project Manager
Gina Guarriello	USACE – Baltimore District – Project Manager
Bob Casey	EA – Project Manager
Patrick Gannon	EA – Deputy Project Manager

The purpose of the meeting was to review the conceptual surface soil sampling plan for the second mobilization field investigation and discuss schedule and timing of submittal of the UFP QAPP Addendum No. 2. Meeting minutes and associated figures were provided to participants and are provided in **Appendix A**.

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UFP-QAPP WORKSHEET #10: Conceptual Site Model

SS420P: Former Tank B Dike and the off installation Blue Angels Crash Site have been identified for inclusion in this Phase I RI based on sampling performed for construction projects at NFARS in 2020 at SS420P. This worksheet presents information for SS420P: Former Tank B Dike including site background, previous investigation results, PFAS contaminants of potential concern, and migration pathways, and is intended to be used in conjunction with Worksheet #10 of the UFP-QAPP (EA 2023).

PREVIOUS INVESTIGATIONS AT SS420P: FORMER TANK B DIKE

SS420P: Former Tank B Dike is located within the east POL yard east of McGuire Street between Utzig Street to the north and Kinross Street to the south (**Figure 10-1a**). The area formerly functioned as a containment for a 300,000-gallon aboveground jet fuel storage tank. The storage tank was removed in October 2006 (CH2MHill 2008). The concrete-lined containment basin was subsequently used by the NFARS Fire Department as an AFFF spray testing area (Aerostar SES LLC 2016). All spray testing activities were confined to the basin.

SS420P: Former Tank B Dike was identified in the 2016 Preliminary Assessment (PA) as an approximately 0.29-acre site used for spray testing of AFFF by the fire department (Aerostar SES LLC 2016). The PA noted that no spills had been reported at SS420P: Former Tank B Dike and that AFFF was contained within the concrete-lined basin. A site visit was conducted in February 2016, and grass was observed growing in the concrete joints of the basin; however, the basin described as being in generally good condition. The PA recommended that the site be closed out with no additional investigation, and no subsequent sampling for PFAS has been conducted at the Site. However, two investigations performed in 2020 for construction projects in the vicinity of the Site included soil and groundwater sampling for PFAS. These investigations are presented in the subsections below.

June 2020 POL Trench Soil and Groundwater Sampling (Nue-Velle 2020)

A soil and groundwater investigation were conducted by NEU-VELLE on 22 June 2020 to evaluate the presence of petroleum contamination and PFOS/PFOA at the location of the East POL Yard construction project. Project work was located within the concrete roadway immediately southeast of SS420P: Former Tank B Dike (**Figure 10-1a**). Investigation activities included the following:

- Advancement of one soil boring to a depth of approximately 4 feet (ft) below ground surface (bgs) and collection of one composite soil sample and one field duplicate sample from the entire interval of the boring (0-4 ft bgs)
- Collection of one groundwater grab sample from standing water within the excavation hole and one field duplicate sample from the excavation area adjacent to (within 2 linear ft of) the soil boring; due to collapse of the soil boring, groundwater could not be collected from the boring location.

- Offsite laboratory analysis of PFOS/PFOA by United States Environmental Protection Agency (USEPA) Method 537M.
- Comparison of soil and groundwater analytical results to the USEPA Lifetime Health Advisory and Regional Screening Levels at the time of the investigation (1,260 micrograms per kilogram [$\mu\text{g}/\text{kg}$] for each analyte in soil and 70 nanograms per liter [ng/L] for groundwater).

Analytical results identified that 11 of 21 target analytes were detected in the composite soil sample at concentrations greater than laboratory reporting limit but below the USEPA guidance value of 1,260 $\mu\text{g}/\text{kg}$ for each analyte (**Table 10-9**). 17 of 21 target analytes were detected in groundwater at concentrations greater than laboratory reporting limit, with concentrations of 9 target analytes reported above the AFFF/USEPA guidance value of 70 ng/L for each analyte as presented in **Table 10-10**. These analytes included Perfluorobutanoic Acid (PFBA), perfluoropentanoic acid (PFPeA), perfluorobutanesulfonic acid (PFBS), perfluorohexanoic acid (PFHxA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), 1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2FTS), and perfluorooctanesulfonic acid (PFOS).

October 2020 NFARS Repair Hydrant Fuels Soil and Groundwater Testing (GHD 2020)

A soil and groundwater investigation was conducted by GHD from 19-20 October 2020 to identify environmental issues that could potentially impact the disposal of soil generated during an upcoming commercial construction project. Project work was located along McGuire Street immediately west of SS420P: Former Tank B Dike and along Utzig Drive to the north/northwest (**Figure 10-1a**). Investigation activities included the following:

- Advancement of direct-push soil borings to drilling refusal (assumed bedrock surface) on 19 October 2020, with three soil borings located north of Utzig Drive (SB-1 to SB-3, with borings advanced to depths of 13, 12, and 12.5 ft, respectively) and one boring located east of McGuire Street immediately west of the concrete-lined basin (SB-4 advanced to a depth of 11.7 ft bgs)
- Collection of one soil sample from each boring (SB-1 at 10-12 ft bgs, SB-2 at 8-10 ft bgs, SB-3 at 10-12 ft bgs, and SB-4 at 8-10 ft bgs)
- Installation of temporary monitoring wells at each boring location, with each well consisting of a 1-inch diameter polyvinyl chloride (PVC) riser and five feet of screen (MW-1 screened from 5.36-10.36 feet bgs, MW-2 screened from 5.02-10.02 feet bgs, MW-3 screened from 5.12-10.12 feet, and MW-4 screened from 4.99-9.99 feet bgs); each well was observed to be dry immediately following installation on 19 October 2020
- Groundwater gauging and collection of groundwater from MW-1 on 20 October 2020; MW-2 and MW-3 were dry, and MW-4 contained less than one-tenth of a foot of water and was not sampled

- Offsite laboratory analysis of PFAS by USEPA Modified Method 537.1
- Comparison of soil analytical results to the Guidance Values for Anticipated Site Use in the NYSDEC's Sampling, Analysis, and Assessment of PFAS guidance document issued in October 2020 (NYSDEC 2020)
- Comparison of groundwater analytical results to the NYS maximum contaminant levels (MCLs) of 10 ng/L each for PFOA and PFOS and the USEPA's Lifetime Health Advisory Level of 70 ng/L for the combined concentrations of these two compounds.

Analytical results identified that 7 of 21 target analytes were detected in soil samples at concentrations greater than laboratory reporting limit (**Table 10-11**). PFOS in soil from SB-2 (8-10 ft bgs) (8.3 µg/kg) was the only analyte detected above NYSDEC guidance values (exceeding the 0.88 µg/kg guidance value for unrestricted use but below the 8.8 µg/kg guidance value for residential use).

7 of the 21 target analytes were detected in the groundwater collected from MW-1 (**Table 10-12**). The combined concentration of PFOA (5.8 ng/L) and PFOS (16 ng/L) did not exceed the USEPA's Lifetime Health Advisory Level of 70 ng/L. However, PFOS was detected above the NYS MCL of 10 ng/L.

SS420P: Former Tank B Dike - Previous Investigation Results Screening

In 2019, DoD adopted screening levels for PFAS in soil and groundwater, as described in a memorandum from the Assistant Secretary of Defense (ASD) titled *Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program* and signed into use on 15 October 2019 (ASD 2019). Subsequent updates, the most recent being 21 January 2025, have been issued to account for revised risk screening levels, EPA's addition of compounds to the EPA Regional Screening Level (RSL) and Regional Management Level lists, and updates to EPA RSLs.

The June and October 2020 construction project soil and groundwater analytical results were re-screened during preparation of this QAPP Addendum to identify PFAS detected at concentrations above the most recent DoD Screening Levels for PFAS as presented in the table below. Of the 21 PFAS target analytes evaluated in the June and October 2020 investigations, 8 are included in the ASD compound list as presented in the table below.

DoD Screening Levels¹ for PFAS Investigations

PFAS Compound	CAS #	Residential Screening Levels Based on EPA RSL dated November 2024 ^{2,3}		Industrial/Commercial Screening Levels from EPA RSL Tables Dated November 2024
		Soil (µg/kg or ppb)	Tap Water ⁴ (ng/L or ppt)	Soil (µg/kg or ppb)
Perfluorobutanoic Acid (PFBA)	375-22-4	7,800	1,800	120,000
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1,900	600	25,000
Perfluorohexanoic Acid (PFHxA)	307-24-4	3,200	990	41,000
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	130	10 ⁽⁷⁾	1,600
Perfluorononanoic Acid (PFNA)	375-95-1	19	5.9	250
Perfluorooctanoic Acid (PFOA)	335-67-1	0.070 ⁽⁶⁾	4.0 ⁽⁵⁾	0.078
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.63	4.0 ⁽⁵⁾	16
Perfluoropropanoic acid (PFPrA) ⁽⁸⁾	422-64-0	3,900	980	49,000
Perfluorodecanoic acid (PFDA)	335-76-2	0.06 ⁽⁶⁾	0.52 ⁽⁶⁾	0.16
Hexafluoropropylene oxide dimer acid (HFPO-DA; aka "Gen-X") ⁽⁸⁾	13252-13-6	23	1.5	3.5
Bis(trifluoromethylsulfonly)amine (TFSI) ⁽⁸⁾	82113-65-3	2,300	590	23,000

- 1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Table 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eie/eeer/ecc/pfas/pfas101/rsl.html>
- 2) The PFAS screening levels in this table are provided with a level of precision to two significant figures, consistent with the EPA's RSL Tables.
- 3) The DoD PFAS screening levels assume multiple PFAS are present and therefore use a hazard quotient (HQ) = 0.1.
- 4) Screening levels for tap water and groundwater that is used for drinking water.
- 5) Certain PFAS RSLs have EPA-approved analytical methods, but with values that are below the MDL. For PFAS with RSLs below the MDL that do not have an MCL, DoD uses the method's pooled MDL to establish consistent and measurable values.
- 6) Certain PFAS RSLs have EPA-approved analytical methods, but with values that are below the MDL. For PFAS with RSLs below the MDL that do not have an MCL, DoD uses the method's pooled MDL to establish consistent and measurable values.
- 7) Certain PFAS RSLs have EPA-approved analytical methods and with RSLs higher than the established MCL. For PFAS with RSLs above the MCL, DoD uses the MCL as the screening level.
- 8) Substance is not a site-related COPC but will be analyzed for presence / absence.

Tables 10-9 to 10-12 present the 2020 PFAS soil and groundwater analytical results as compared to the most recent DoD screening levels.

June 2020 POL Trench Soil and Groundwater Sampling Screening

PFOS and PFOA concentrations in the June 2020 composite soil sample were reported above both the DoD screening levels and the EPA industrial/commercial screening levels. No other PFAS concentrations in the composite soil sample exceeded screening levels.

PFAS analytes detected in the June 2020 groundwater sample collected at the East POL Yard trench excavation at concentrations exceeding the DoD tap water screening level for PFOS (4.0 ng/L), PFOA (4.0 ng/L), PFNA (5.9 ng/L), PFHxS (10 ng/L), and PFDA (0.52 ng/L) as follows:

- PFOS: 2,700 ng/L in the parent sample and 2,630 ng/L in the associated field duplicate
- PFOA: 73.1 ng/L in the parent sample and 71 ng/L in the associated field duplicate
- PFNA: 12.2 ng/L in both the parent sample and associated field duplicate
- PFHxS: 1,160 ng/L in both the parent sample and associated field duplicate
- PFDA: 9.84 ng/L in both the parent samples and associated field duplicate.

October 2020 NFARS Repair Hydrant Fuels Soil and Groundwater Testing Screening

PFOS and PFOA concentrations in soil boring SB-2 from the October 2020 investigation were reported above both the DoD screening levels and the EPA industrial/commercial screening levels for PFOA and only the DoD screening level for PFOS. No other PFAS concentrations in the other soil boring samples exceeded screening levels.

PFOS, PFOA, and PFDA were detected in the October 2020 groundwater sample collected from MW-1 at concentrations exceeding the DoD tap water screening levels. GW Drum was sampled as additional collected groundwater that was containerized and sampled as waste, PFOS was detected exceeding DoD tap water screening levels. No other PFAS concentrations in the groundwater exceeded screening levels.

PFAS CONTAMINANTS OF POTENTIAL CONCERN: SS420P Former Tank B Dike

PFAS Contaminants of Potential Concern (COPCs) for SS420P: Former Tank B Dike are those PFAS that were reported at concentrations above the most recent DoD screening levels. COPCs in each media at each site are as follows:

- Soil: PFOS and PFOA
- Groundwater: PFOS, PFOA, and PFDA

PFAS MIGRATION PATHWAYS: SS420P Former Tank B Dike

Based on soil boring logs presented in the October 2020 NFARS Repair Hydrant Fuels Soil and Groundwater Testing Report (GHD 2020), overburden material at and in the vicinity of SS420P:

Former Tank B Dike consists of fill material (gravel mixtures and clayey sand) to depths of 1.5 to 4 ft bgs overlying native silty clay. Drilling refusal and the assumed bedrock surface was encountered at depths ranging from 11.7 at SB-4 immediately west of the Site to 13 ft bgs at SB-1 north of Utzig Drive and northwest of the Site.

Groundwater was encountered at a shallow depth (less than 4 ft bgs) in the June 2020 excavation area within the roadway immediately east of the site (Nue-Velle 2020). Groundwater was encountered during drilling activities in October 2020 at SB-1 and MW-1 only, at a depth of approximately 12 ft bgs during drilling activities and 6.2 ft bgs during groundwater sampling. This groundwater was likely perched water on top of the bedrock surface. Groundwater was not encountered during drilling at SB-2, SB-3, and SB-4 and temporary wells at these locations were dry (MW-2 and MW-3) or contained less than one-tenth of a foot of water (MW04).

Regional groundwater flow based on historic data from former Installation Restoration (IRP) Site 2, POL Bulk JP-4 Tank C leak, located in the POL storage Yard east of SS420P: Former Tank B Dike is assumed to be south-southwest in overburden and south and southeast in shallow bedrock. A downward vertical gradient was historically observed between overburden and shallow bedrock water-bearing zones in wells associated with IRP Site 2. No streams or drainage ditches are located close to the Site (Ecology and Environment, Inc. 2000).

Table 10-9 - June 2020 Soil Analytical Results

AFFF AOI					SS420P: Former Tank B Dike	
Location ID					NFAB-SOIL	
Sample Name					NFAB-SOIL 202789-01	NFAB-SOIL-FIELD DUP 202789-02
Sample Date					22 June 2020	22 June 2020
Analyte	CAS #	DoD Screening Levels ¹	EPA Industrial Soil RSL ²	Unit		
PFAS (EPA 537.1)						
Perfluorobutanoic Acid (PFBA)	375-22-4	7,800	120,000	µg/kg	0.099 J	0.18 J
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NSL	NSL	µg/kg	0.615 J	0.875 J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1,900	25,000	µg/kg	0.826 J	1.47 J
Perfluorohexanoic Acid (PFHxA)	307-24-4	3,200	41,000	µg/kg	1.02 J	1.45 J
Perfluoroheptanoic Acid (PFHpA)	375-85-9	NSL	NSL	µg/kg	0.451 J	0.596 J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	130	1,600	µg/kg	20.8	30.4
Perfluorooctanoic Acid (PFOA)	335-67-1	0.070	0.078	µg/kg	0.927 J	1.26 J
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	NSL	NSL	µg/kg	3.48	4.85
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NSL	NSL	µg/kg	2.65	4.15
Perfluorononanoic Acid (PFNA)	375-95-1	19	250	µg/kg	<2.10 U	<2.10 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.63	8.2	µg/kg	281	369
Perfluorodecanoic Acid (PFDA)	335-76-2	0.06	0.16	µg/kg	<2.10 U	<2.10 U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	NSL	NSL	µg/kg	<2.10 U	<2.10 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	31506-32-8	NSL	NSL	µg/kg	<2.10 U	<2.10 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NSL	25,000	µg/kg	<2.10 U	<2.10 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NSL	NSL	µg/kg	<2.10 U	<2.10 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NSL	NSL	µg/kg	1.18 J	1.97 J
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSA)	4151-50-2	NSL	NSL	µg/kg	<2.10 U	<2.10 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NSL	4,100	µg/kg	<2.10 U	<2.10 U
Perfluorotridecanoic Acid (PFTTrDA)	72629-94-8	NSL	NSL	µg/kg	<2.10 U	<2.10 U
Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	NSL	82,000	µg/kg	<2.10 U	<2.10 U

1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Attachment 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eie/eer/ecc/pfas/pfas101/rsl.html>

2) USEPA Regional Screening Level (RSL) for Industrial Soil, (TR=1E-06, HQ=0.1) November 2024.

Notes:

Detected results are **bolded**.

Values exceeding the DoD Screening Levels are shaded gray.

Values exceeding the USEPA Industrial Soil RSL are in red.

J = Estimated value.

U = Not detected above the limit of detection.

µg/kg = Micrograms per kilogram.

NSL = No Screening Level available.

Table 10-10 - June 2020 Groundwater Analytical Results

AFFF AOI				SS420P: Former Tank B Dike	
Location ID				NFAB-GW	
Sample Name				NFAB-GW 202789-03	NFAB-GW-FIELD DUP 202789-04
Sample Date				22 June 2020	22 June 2020
Analyte	CAS #	DoD Screening Level ¹	Unit		
PFAS (EPA 537.1)					
Perfluorobutanoic Acid (PFBA)	375-22-4	1,800	ng/L	98	97.8
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NSL	ng/L	418	416
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	600	ng/L	99	101
Perfluorohexanoic Acid (PFHxA)	307-24-4	990	ng/L	342	344
Perfluoroheptanoic Acid (PFHpA)	375-85-9	NSL	ng/L	83.2	80.7
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	10	ng/L	1,160	1,160
Perfluorooctanoic Acid (PFOA)	335-67-1	4.0	ng/L	73.1	71
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	NSL	ng/L	188	188
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NSL	ng/L	65.4	61.9
Perfluorononanoic Acid (PFNA)	375-95-1	5.9	ng/L	12.2	12.2
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	4.0	ng/L	2,700	2,630
Perfluorodecanoic Acid (PFDA)	335-76-2	0.52	ng/L	9.84	9.98
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	NSL	ng/L	29.1	30.7
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	31506-32-8	NSL	ng/L	< 1.83 U	< 1.93 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NSL	ng/L	1.60 J	1.58
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NSL	ng/L	2.35	2.17
Perfluorooctanesulfonamide (FOSA)	754-91-6	NSL	ng/L	15	15.7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSA)	4151-50-2	NSL	ng/L	< 1.83 U	< 1.93 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NSL	ng/L	0.784 J	0.51
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NSL	ng/L	< 1.83 U	< 1.93 U
Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	NSL	ng/L	< 1.83 U	< 1.93 U

1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Attachment 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eie/ee/ecc/pfas/pfas101/rs1.html>

Notes:

Detected results are **bolded**.

Values exceeding the DoD Screening Level are shaded gray.

J = Estimated value.

U = Not detected above the limit of detection.

ng/L = Nanograms per liter.

NSL = No Screening Level available.

Table 10-11 - October 2020 Soil Analytical Results

AFFF AOI					SS420P: Former Tank B Dike				
Location ID					SB-1	SB-2	SB-3		SB-4
Sample Name					SO-11219169-101920-SD-001	SO-11219169-101920-SD-003	SO-11219169-101920-SD-004	SO-11219169-101920-SD-005	SO-11219169-101920-SD-006
Sample Depth (ft bgs)					10-12	8-10	10-12	10-12	8-10
Sample Date					10/19/2020	10/19/2020	10/19/2020	10/19/2020	10/19/2020
Analyte	CAS #	DoD Screening Levels ¹	EPA Industrial Soil RSL ¹	Unit					
PFAS (EPA 537.1)									
Perfluorobutanoic Acid (PFBA)	375-22-4	7,800	120,000	µg/kg	0.033 J	0.049 J	0.050 J	0.034 J	0.069 J
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NSL	NSL	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	0.10 J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1,900	25,000	µg/kg	0.22 U	0.14 J	<0.22 U	0.032 J	0.082 J
Perfluorohexanoic Acid (PFHxA)	307-24-4	3,200	41,000	µg/kg	0.22 U	0.061 J	<0.22 U	<0.21 U	0.071 J
Perfluoroheptanoic Acid (PFHpA)	375-85-9	NSL	NSL	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	130	1,600	µg/kg	0.23	2.7	0.29	0.32	0.065 J
Perfluorooctanoic Acid (PFOA)	335-67-1	0.070	0.078	µg/kg	0.22 U	0.096 J	<0.22 U	<0.21 U	<0.25 U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	NSL	NSL	µg/kg	2.2 U	<2.1 U	<2.2 U	<2.1 U	<2.5 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NSL	NSL	µg/kg	0.22 U	0.12 J	<0.22 U	<0.21 U	<0.25 U
Perfluorononanoic Acid (PFNA)	375-95-1	19	250	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.63	8.2	µg/kg	0.26 J	8.3	<0.54 U	0.50 J	<0.63 U
Perfluorodecanoic Acid (PFDA)	335-76-2	0.06	0.16	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
1H,1H,2H,2H-Perfluorodecane sulfonic Acid (8:2FTS)	39108-34-4	NSL	NSL	µg/kg	2.2 U	<2.1 U	<2.2 U	<2.1 U	<2.5 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	31506-32-8	NSL	NSL	µg/kg	2.2 U	<2.1 U	<2.2 U	<2.1 U	<2.5 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NSL	25,000	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorodecane sulfonic Acid (PFDS)	335-77-3	NSL	NSL	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NSL	NSL	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSA)	4151-50-2	NSL	NSL	µg/kg	2.2 U	<2.1 U	<2.2 U	<2.1 U	<2.5 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NSL	4,100	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorotridecanoic Acid (PFTDA)	72629-94-8	NSL	NSL	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U
Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	NSL	82,000	µg/kg	0.22 U	<0.21 U	<0.22 U	<0.21 U	<0.25 U

1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods.

ASD 2025, Attachment 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eic/eer/ecc/pfas/pfas101/rsl.html>

2) USEPA Regional Screening Level (RSL) for Industrial Soil, (TR=1E-06, HQ=0.1) November 2024.

Notes:

Detected results are **bolded**.

Values exceeding the DoD Screening Level are shaded gray.

Values exceeding the USEPA Industrial Soil RSL are in red.

J = Estimated value.

U = Not detected above the limit of detection.

µg/kg = Micrograms per kilogram.

NSL = No Screening Level available.

Table 10-12 - October 2020 Groundwater Analytical Results

AFFF AOI				SS420P: Former Tank B Dike	
Location ID				MW-1	GW Drum
Sample Name				W-11219169-102020-SD-002	W-11219169-101920-SD-001
Sample Date				10/20/2020	10/19/2020
Analyte	CAS #	DoD Screening Level ¹	Unit		
PFAS (EPA 537.1)					
Perfluorobutanoic Acid (PFBA)	375-22-4	1,800	ng/L	8.5	<25 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NSL	ng/L	12	3.2 J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	600	ng/L	3.1	<10 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	990	ng/L	52	<10 U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	NSL	ng/L	15	<10 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	10	ng/L	6	<10 U
Perfluorooctanoic Acid (PFOA)	335-67-1	4.0	ng/L	5.8	<10 U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	NSL	ng/L	190	<25 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NSL	ng/L	<1.8 U	<10 U
Perfluorononanoic Acid (PFNA)	375-95-1	5.9	ng/L	1.5 J	<10 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	4.0	ng/L	16	7.7 J
Perfluorodecanoic Acid (PFDA)	335-76-2	0.52	ng/L	1.1 J	<10 U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	NSL	ng/L	1.6 J	<10 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	31506-32-8	NSL	ng/L	1.2 J	<2,500 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NSL	ng/L	<1.8 U	<10 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NSL	ng/L	<1.8 U	<10 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NSL	ng/L	<1.8 U	<1,000 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSA)	4151-50-2	NSL	ng/L	<4.4 U	<2,500 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NSL	ng/L	<1.8 U	<1,000 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NSL	ng/L	<1.8 U	<1,000 U
Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	NSL	ng/L	<1.8 U	<1,000 U

1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Attachment 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eie/eer/ecc/pfas/pfas101/rsl.html>

Notes:

Detected results are **bolded**.

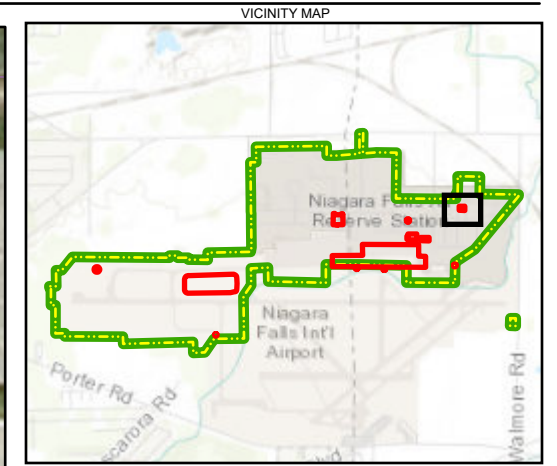
Values exceeding the DoD Screening Level are shaded gray.

J = Estimated value.

U = Not detected above the limit of detection.

ng/L = Nanograms per liter.

NSL = No Screening Level available.



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
- PFOS Concentration ($\mu\text{g}/\text{kg}$)**
- Surface Soil - Detection 100x Above SL
 - Existing Monitoring Well
 - Groundwater Grab Sample
 - Historical MILCON Sample Location

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 10-1a
SS420P Tank B Dike
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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UFP-QAPP WORKSHEET #15: Project Screening Levels and Laboratory-Specific Detection/Quantitation Limits

This worksheet has been updated to present analytical methods, analytes, project screening values, and achievable laboratory limits including LOQs, LODs, and MDLs for PFAS by EPA Method 1633. The purpose of this worksheet is to determine if laboratory limits will meet project PSLs (i.e., screening values). Matrix effects or necessary dilutions may affect the laboratory limits reported for project samples.

The MDL is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level of confidence. Although a result at or above the MDL indicates that the analyte is present, the absence of a result at or above the MDL is inconclusive (i.e., one cannot confidently state whether the analyte is present or absent), because the false negative rate at the MDL is 50 percent. The MDL is used to determine the LOD for each analyte and matrix as well as for preparatory and cleanup methods routinely used on samples.

The LOD is the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a 99% confidence level. If a sample has a true concentration at the LOD, there is a minimum probability of 99% of reporting a detection (a measured value greater than or equal to the MDL) and a 1% chance of reporting a non-detect (a false negative). Due to the false negative rate at the LOD (1%), the laboratory will report non-detectable values as less than the LOD.

The LOQ is the lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias. Quantitative concentration results within specified limits of precision and bias can only be achieved at or above the LOQ; however, the analytical laboratory may identify analytes between the MDL and the LOQ. In these instances, the laboratory will report concentration values between the MDL and the LOQ as estimated (J) values.

It is noted that Pace laboratories current achievable MDL (**Table 15-1**) for perfluorooctanoic acid (PFOA) and perfluorodecanoic acid (PFDA) using EPA Method 1633 for non-aqueous samples is greater than the current DoD screening levels.

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Table 15-1. Reference Limits and Evaluation Table for PFAS – Soil/Sediment

Matrix: Soil/Sediment

Analytical Group: PFAS

Method: EPA Method 1633

Laboratory: Pace Analytical Services, LLC, Minneapolis, Minnesota

Laboratory Analyte	Acronym	CASRN	DoD SL ¹ (µg/kg)	Laboratory Limits (µg/kg)		
				LOQ	LOD	DL
DoD PFAS Screening Levels						
Perfluorobutanoic acid	PFBA	375-22-4	7,800	0.80	0.40	0.25
Perfluorobutanesulfonic acid	PFBS	375-73-5	1,900	0.20	0.09	0.08
Perfluorohexanoic acid	PFHxA	307-24-4	3,200	0.20	0.10	0.04
Perfluorohexanesulfonic acid	PFHxS	355-46-4	130	0.20	0.09	0.07
Perfluorononanoic acid	PFNA	375-95-1	19	0.20	0.10	0.10
Perfluorooctanoic acid	PFOA	335-67-1	0.070	0.20	0.15	0.11
Perfluorooctanesulfonic acid	PFOS	1763-23-1	0.63	0.20	0.14	0.12
Perfluoropropanoic acid ⁽²⁾	PFPrA	422-64-0	3,900	0.80	0.72	0.67
Perfluorodecanoic acid	PFDA	335-76-2	0.06	0.20	0.15	0.11
Bis(trifluoromethylsulfonyl)amine ⁽²⁾	TFSI	82113-65-3	2,300	0.40	0.20	0.08
Hexafluoropropylene oxide dimer acid ⁽²⁾	HFPO-DA	13252-13-6	23	0.80	0.40	0.21
Other Reported PFAS						
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OudS	763051-92-9	--	0.80	0.37	0.21
1H,1H,2H,2H-perfluorohexanesulfonic acid (4:2)	4:2 FTS	757124-72-4	--	0.80	0.37	0.30
1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	6:2 FTS	27619-97-2	--	0.80	0.57	0.52
1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	8:2 FTS	39108-34-4	--	0.80	0.38	0.25
2-(N-ethylperfluoro-1-octanesulfonamido) ethanol	NEtFOSE	1691-99-2	--	2.0	1.0	0.67
2-(N-methylperfluoro-1-octanesulfonamido) ethanol	NMeFOSE	24448-09-7	--	2.0	1.0	0.64
2H,2H,3H,3H-perfluorohexanoic acid (3:3)	3:3 FTCA	356-02-5	--	1.0	0.75	0.54
2H,2H,3H,3H-perfluorooctanoic acid (5:3)	5:3 FTCA	914637-49-3	--	5.0	2.5	1.67
2H,2H,3H,3H-perfluorodecanoic acid (7:3)	7:3 FTCA	812-70-4	--	5.0	2.5	1.81
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	--	0.80	0.37	0.21
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	--	0.80	0.38	0.18
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2	--	0.20	0.10	0.08
N-ethylperfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	--	0.20	0.10	0.09
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	--	0.40	0.20	0.16
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8	--	0.20	0.10	0.06
N-methylperfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	--	0.20	0.15	0.15
Perfluorodecanesulfonic acid	PFDS	335-77-3	--	0.20	0.10	0.04
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	--	0.20	0.10	0.07
Perfluorododecanoic acid	PFDoA	307-55-1	--	0.20	0.10	0.10
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	--	0.20	0.10	0.08
Perfluoroheptanoic acid	PFHpA	375-85-9	--	0.20	0.10	0.07
Perfluorononanesulfonic acid	PFNS	68259-12-1	--	0.20	0.10	0.08
Perfluorooctanesulfonamide	PFOSA	754-91-6	--	0.20	0.10	0.08
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	--	0.20	0.09	0.05
Perfluoropentanoic acid	PFPeA	2706-90-3	--	0.40	0.20	0.15
Perfluorotetradecanoic acid	PFTeDA	376-06-7	--	0.20	0.10	0.10
Perfluorotridecanoic acid	PFTriDA	72629-94-8	--	0.20	0.10	0.06
Perfluoroundecanoic acid	PFUnA	2058-94-8	--	0.20	0.10	0.10
Perfluoro(2-ethoxyethane) sulphonic acid	PFEESA	113507-82-7	--	0.40	0.18	0.08
Perfluoro(4-methoxybutanoic) acid	PFMBA	863090-89-5	--	0.40	0.20	0.14
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	--	0.40	0.20	0.13

1) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Table 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eic/eer/ecc/pfas/pfas101/rsl.html>

2) Substance is not a site-related COPC but will be analyzed for presence / absence

Table 15-2. Reference Limits and Evaluation Table for PFAS – Groundwater/Surface Water

Matrix: Groundwater/Surface Water/Porewater

Analytical Group: PFAS

Method: EPA Method 1633

Laboratory: Pace Analytical Services, LLC, Minneapolis, Minnesota

Analyte	Acronym	CASRN	DoD SL ¹ (ng/L)	Laboratory Limits (ng/L)		
				LOQ	LOD	DL
DoD PFAS Screening Levels						
Perfluorobutanoic acid	PFBA	375-22-4	1,800	6.4	3.2	2.50
Perfluorobutanesulfonic acid	PFBS	375-73-5	600	1.6	1.4	1.21
Perfluorohexanoic acid	PFHxA	307-24-4	990	1.6	0.8	0.24
Perfluorohexanesulfonic acid	PFHxS	355-46-4	10	1.6	0.73	0.71
Perfluorononanoic acid	PFNA	375-95-1	5.9	1.6	0.8	0.61
Perfluorooctanoic acid	PFOA	335-67-1	4.0	1.6	0.8	0.73
Perfluorooctanesulfonic acid	PFOS	1763-23-1	4.0	1.6	0.74	0.55
Perfluoropropanoic acid ⁽²⁾	PFPrA	422-64-0	980	6.4	3.2	2.50
Perfluorodecanoic acid	PFDA	335-76-2	0.52	1.6	0.8	0.49
Bis(trifluoromethylsulfonyl)amine ⁽²⁾	TFSI	82113-65-3	590	3.2	1.6	0.51
Hexafluoropropylene oxide dimer acid ⁽²⁾	HFPO-DA	13252-13-6	1.5	6.4	3.2	1.15
Other Reported PFAS						
11-Chloroicosafuoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OudS	763051-92-9	--	6.4	3.0	0.95
1H,1H,2H,2H-perfluorohexanesulfonic acid (4:2)	4:2 FTS	757124-72-4	--	6.4	3.0	1.68
1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	6:2 FTS	27619-97-2	--	6.4	3.0	2.07
1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	8:2 FTS	39108-34-4	--	6.4	3.1	2.47
2-(N-ethylperfluoro-1-octanesulfonamido) ethanol	NEtFOSE	1691-99-2	--	16	8	3.02
2-(N-methylperfluoro-1-octanesulfonamido) ethanol	NMeFOSE	24448-09-7	--	16	8	3.30
2H,2H,3H,3H-perfluorohexanoic acid (3:3)	3:3 FTCA	356-02-5	--	8.0	4.0	1.51
2H,2H,3H,3H-perfluorooctanoic acid (5:3)	5:3 FTCA	914637-49-3	--	40	20	6.65
2H,2H,3H,3H-perfluorodecanoic acid (7:3)	7:3 FTCA	812-70-4	--	40	20	8.09
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	--	6.4	3.0	1.06
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	--	6.4	3.0	1.02
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2	--	1.6	0.80	0.44
N-ethylperfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	--	1.6	1.20	0.93
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	--	3.2	1.6	0.79
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8	--	1.6	0.80	0.30
N-methylperfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	--	1.6	0.80	0.30
Perfluorodecanesulfonic acid	PFDS	335-77-3	--	1.6	0.77	0.41
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	--	1.6	0.77	0.36
Perfluorododecanoic acid	PFDoA	307-55-1	--	1.6	0.8	0.19
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	--	1.6	0.76	0.58
Perfluoroheptanoic acid	PFHpA	375-85-9	--	1.6	0.8	0.32
Perfluorononanesulfonic acid	PFNS	68259-12-1	--	1.6	0.77	0.47
Perfluorooctanesulfonamide	PFOSA	754-91-6	--	1.6	0.80	0.29
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	--	1.6	0.75	0.44
Perfluoropentanoic acid	PFPeA	2706-90-3	--	3.2	1.6	0.44
Perfluorotetradecanoic acid	PFTeDA	376-06-7	--	1.6	0.8	0.43
Perfluorotridecanoic acid	PFTrDA	72629-94-8	--	1.6	0.8	0.61
Perfluoroundecanoic acid	PFUnA	2058-94-8	--	1.6	1.2	0.82
Perfluoro(2-ethoxyethane) sulphonic acid	PFEESA	113507-82-7	--	3.2	1.4	0.30
Perfluoro(4-methoxybutanoic) acid	PFMBA	863090-89-5	--	3.2	1.6	0.53
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	--	3.2	1.6	0.72

3) The DoD PFAS screening levels are based on EPA's RSL tables dated November 2024 except where the EPA RSLs were below the MDLs of EPA-approved analytical methods. ASD 2025, Table 1: RSLs Included in DoD Investigations of PFAS, available at <https://www.acq.osd.mil/eic/ceer/ecc/pfas/pfas101/rsl.html>

4) Substance is not a site-related COPC but will be analyzed for presence / absence.

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UFP-QAPP WORKSHEET #17: Sampling Design and Rationale

The worksheet presents the proposed additional sampling and analytical tasks for the second mobilization of Phase I RI fieldwork and is intended to be used in conjunction with Worksheet #17 of the UFP-QAPP (EA 2023). Field activities proposed for the second mobilization were informed from a review of surface soil, surface water, and sediment PFAS results and includes the items noted in the bullets presented below.

- Initial basewide synoptic water level measurement event
- Initial source area surface soil sampling at AFFF sites that were not sampled during the first mobilization – SS850P: AFFF Area 2 Hanger 850, SS706P: AFFF Area 3 Building 706, SS316P: AFFF Area 8 Hulby Street, and SS420P: AFFF Area 9 Former Tank B Dike
- Supplemental surface soil sampling to further define lateral PFAS concentrations at sites: FT007P: AFFF Area 1 Former Fire Training Area, SS015P: AFFF Area 5 Blue Angels Crash Site, SS101P: AFFF Area 6 Fox Row/Taxiway Alpha, and SS700P: AFFF Area 4 Building 700
- Supplemental surface water and sediment sampling at one location at FT007P and to include re-sampling of surface water locations not sampled under the initial mobilization (due to lack of water); additional surface water and sediment sampling at locations downstream of the airport off-installation.
- GPS survey of sample locations.

Field tasks will be completed following the procedures presented in Worksheet #14 and #16 in the UFP-QAPP (EA 2023).

Initial mobilization analytical results indicate that PFOS was both the most prevalent PFAS present in each of the environmental media sampled and reported at the highest concentrations. PFAS signatures where PFOS presents as the most prevalent substance are common at primary AFFF release and source areas, as expected at NFARS. In addition, PFOS has higher retention properties specifically in surface soil where adsorption within the air-water interface with soil pores is a major factor. Therefore, the figures and data presented on figures have been developed using PFOS concentrations to depict and evaluate overall PFAS impacts, including guiding the second mobilization sample design and rationale. AFFF site-related proposed sampling locations are presented on the following figures:

- FT007P: AFFF Area 1 Former Fire Training Area (Site 9) and Outfall 7 - Proposed Second Mobilization Sampling Locations on **Figure 17-1a and Figure 17-1b**
- SS015P: AFFF Area 5 Blue Angels Crash Site - Proposed Second Mobilization Sampling Locations on **Figure 17-2a**

- SS101P: AFFF Area 6 Fox Row/ Taxiway Alpha, Outfalls 5 and 9 – Proposed Second Mobilization Sampling Locations on **Figure 17-3a and Figure 17-3b**
- SS700P: AFFF Area 4 Building 700, Outfall 4 – Proposed Second Mobilization Sampling Locations on **Figure 17-4a and Figure 17-4b**
- SS850P: AFFF Area 2 Hanger 850 – Proposed Second Mobilization Sampling Locations on **Figure 17-5a**
- SS706P: AFFF Area 3 Building 706 – Proposed Second Mobilization Sampling Locations on **Figure 17-6a**
- SS316P: AFFF Area 8 Hulby Street – Proposed Second Mobilization Sampling Locations on **Figure 17-7a**
- SS420P: AFFF Area 9 Former Tank B Dike – Proposed Second Mobilization Sampling Locations on **Figure 17-8a**
- Proposed Second Mobilization Surface Water and Sediment Sampling Locations Site-wide on **Figure 17-9a**

BASEWIDE GAUGING EVENT

The initial basewide synoptic gauging will be conducted to obtain additional data to enhance the understanding of groundwater flow directions and interactions between groundwater and surface water and determine regional groundwater flow surrounding each AFFF site. The baseline synoptic groundwater gauging event will be completed at 123 existing monitoring wells installed as part of historical investigations at the base. The existing monitoring well network is presented in **Figure 17-6** of the UFP-QAPP (EA 2023).

FT007P: AFFF AREA 1 FORMER FIRE TRAINING AREA

Both historical (2018 and 2019) and initial surface soil sampling investigations at FT007P have not characterized the concentration extents of PFAS at this AFFF site. Current PFAS analytical data suggests that the highest concentrations observed at the site are within and immediately surrounding the former FTA area with concentrations ranging from 1,600 µg/kg to 4,000 µg/kg equivalent to approximately 2,500 to 6,500 times greater than DoD SLs. Concentrations were observed to decrease to the north and west of the former FTA, while east and south of the former FTA remained elevated. This distribution is consistent with the CSM, where it is expected that prevailing wind direction (West to East) would transport former AFFF foams aerial to the east and the former drainage pathway from the FTA to the northern intermittent stream which then flows west and then south to Outfall No. 7 at the southern base boundary.

Supplemental Surface Soil Sampling

Additional surface soil sampling is being conducted at FT007P: AFFF Area 1 - Former Fire Training Area (Site 9) to further characterize lateral concentration extents of PFAS in surface soil. Surface soil sampling will continue to be collected in a gridded fashion, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 18 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-1a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid west of former FTA	Surface Soil	5	Identify decreasing trend and/or non-impacted surface soil west of the former FTA
30 x 30 ft. grid northeast of former FTA	Surface Soil	2	Identify decreasing trend and/or non-impacted surface soil northwest of former FTA
300 x 300 ft. grid east of former FTA	Surface Soil	6	Evaluate a larger aerial extent west of former FTA to identify decreasing trend and/or non-impacted surface soil
300 x 300 ft. grid south of former FTA	Surface Soil	5	Evaluate a larger aerial extent south of former FTA to identify decreasing trend and/or non-impacted surface soil

Surface Water and Sediment Sampling

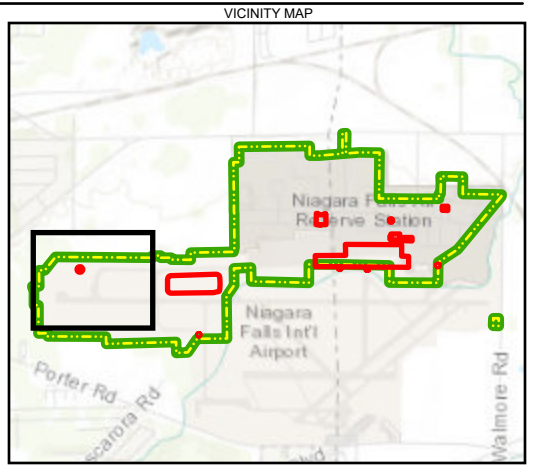
Supplemental co-located surface water at two locations and surface water/sediment grab sampling will be conducted at one location to assess an additional drainage feature associated with FT007P while also evaluating potential for temporal changes in PFAS concentrations. The number of

surface water and sediment to be collected at each AFFF site is presented in the table below. Sampling locations are presented on **Figures 17-9b** of this UFP-QAPP Addendum.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
01-SW/SD-01	Surface Water	1	Second attempt at this location due to insufficient water during the initial mobilization; support evaluation of potential PFAS migrating onto the installation from the north
01-SW/SD04	Surface Water	1	Second attempt at this location due to insufficient water during the initial mobilization; support evaluation of PFAS concentrations downstream of discharge location from former FTA; assess concentration gradient
01-SW/SD09	Surface Water and Sediment	1 (each)	Assess an additional surface water drainage feature not previously sampled during the initial mobilization

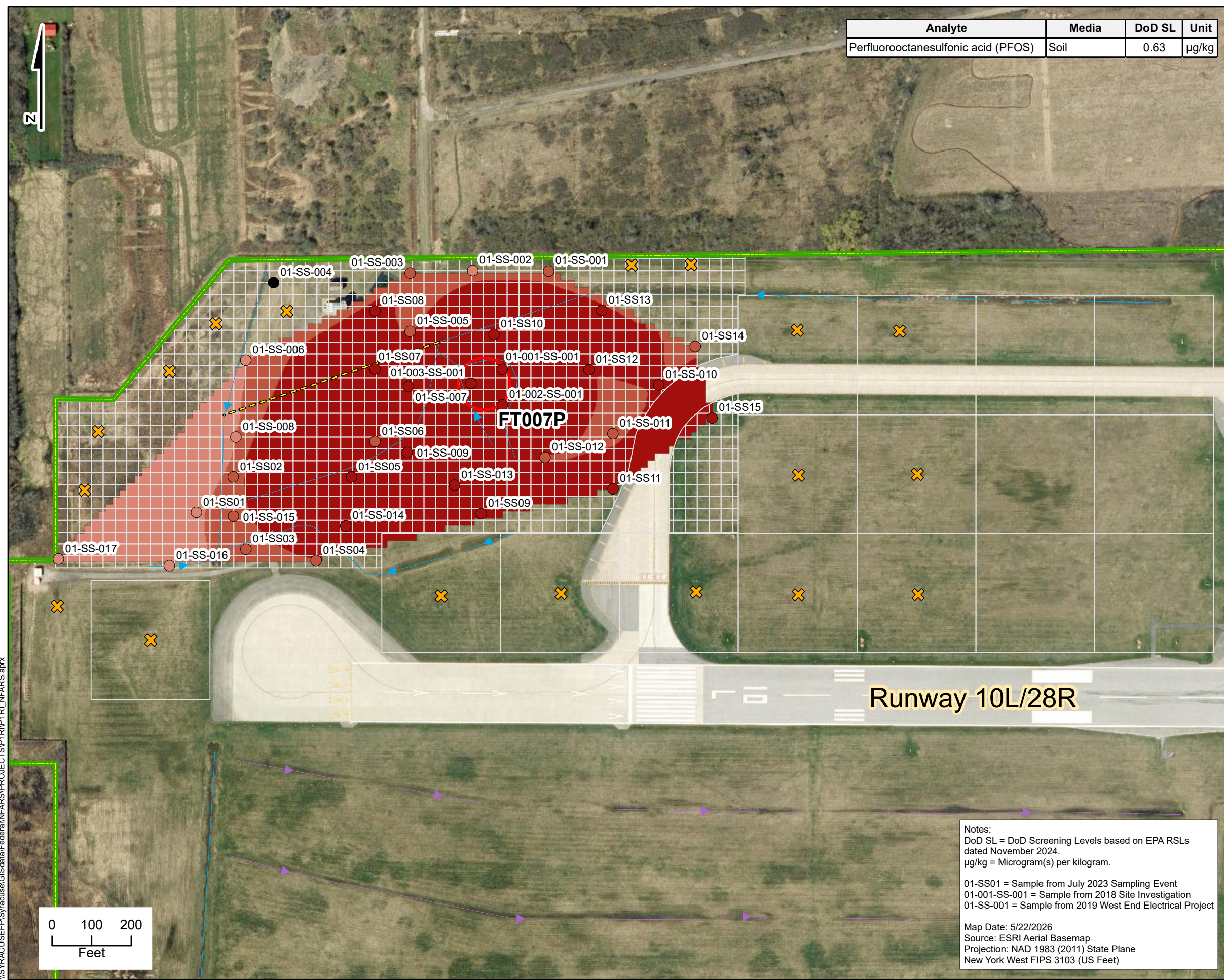
Surface water samples will be collected before co-located sediment samples to avoid suspending solids in the sample. Surface water samples will be collected during periods of flow, with samples collected from the middle of the channel at mid-depth. Water quality parameters (pH, specific conductance, temperature, ORP, DO, and turbidity) will be collected for each surface water sample, and each surface water and sediment sample will be analyzed for PFAS by EPA Method 1633.

Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



Legend

- NFARS Boundary
 - Approximate AFFF Release Area
 - Surface Water/Stream
 - Drainage Ditch/Pathway
 - Former Drainage Feature
 - 30x30' Sampling Grid
 - 300x300' Sampling Grid
- PFOS Concentration (µg/kg)**
- Surface Soil - Non-Detect
 - Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location



Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

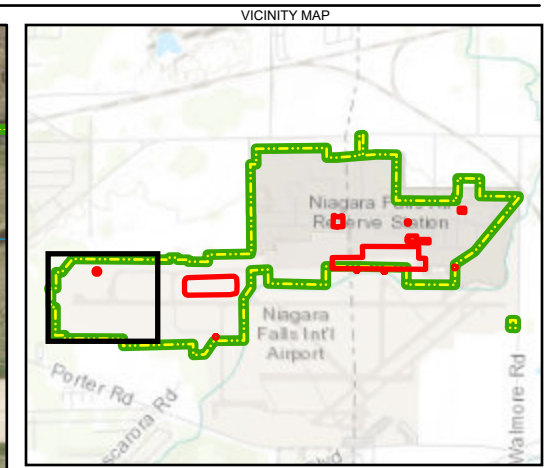
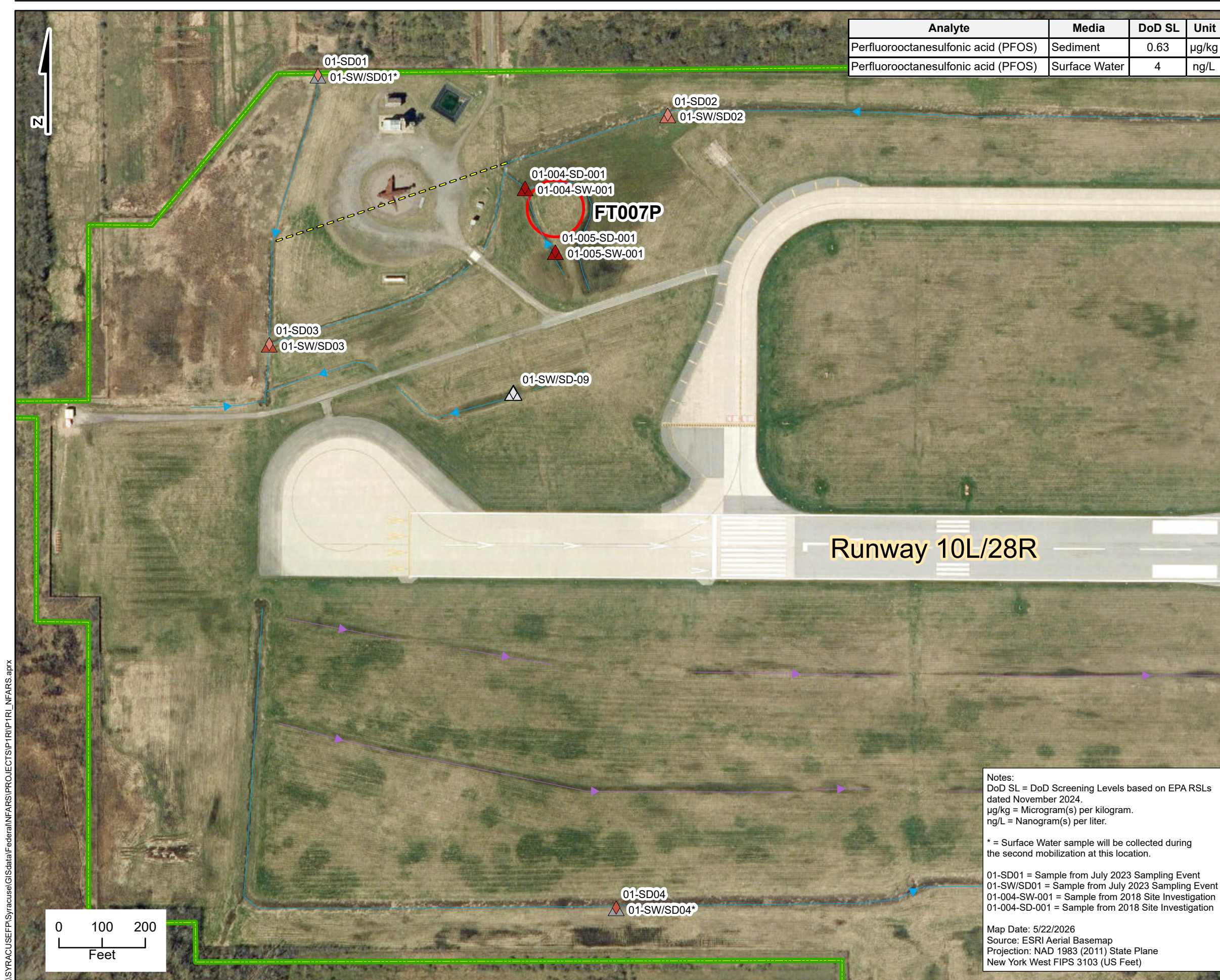
01-SS01 = Sample from July 2023 Sampling Event
 01-001-SS-001 = Sample from 2018 Site Investigation
 01-SS-001 = Sample from 2019 West End Electrical Project

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-1a
Proposed Second Mobilization Surface
Soil Sampling Locations at FT007P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - Surface Water/Stream
 - Drainage Ditch/Pathway
 - Former Drainage Feature

- PFOS Concentration (µg/kg)**
- Sediment - Detection 1x Above SL
 - Sediment - Detection 10x Above SL
 - Sediment - Detection 100x Above SL
- PFOS Concentration (ng/L)**
- Surface Water - Not Sampled
 - Surface Water - Detection 1x Above SL
 - Surface Water - Detection 10x Above SL
 - Surface Water - Detection 100x Above SL
 - Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

* = Surface Water sample will be collected during the second mobilization at this location.

01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 01-004-SW-001 = Sample from 2018 Site Investigation
 01-004-SD-001 = Sample from 2018 Site Investigation

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-1b
Proposed Second Mobilization Surface Water Sampling Locations at FT007P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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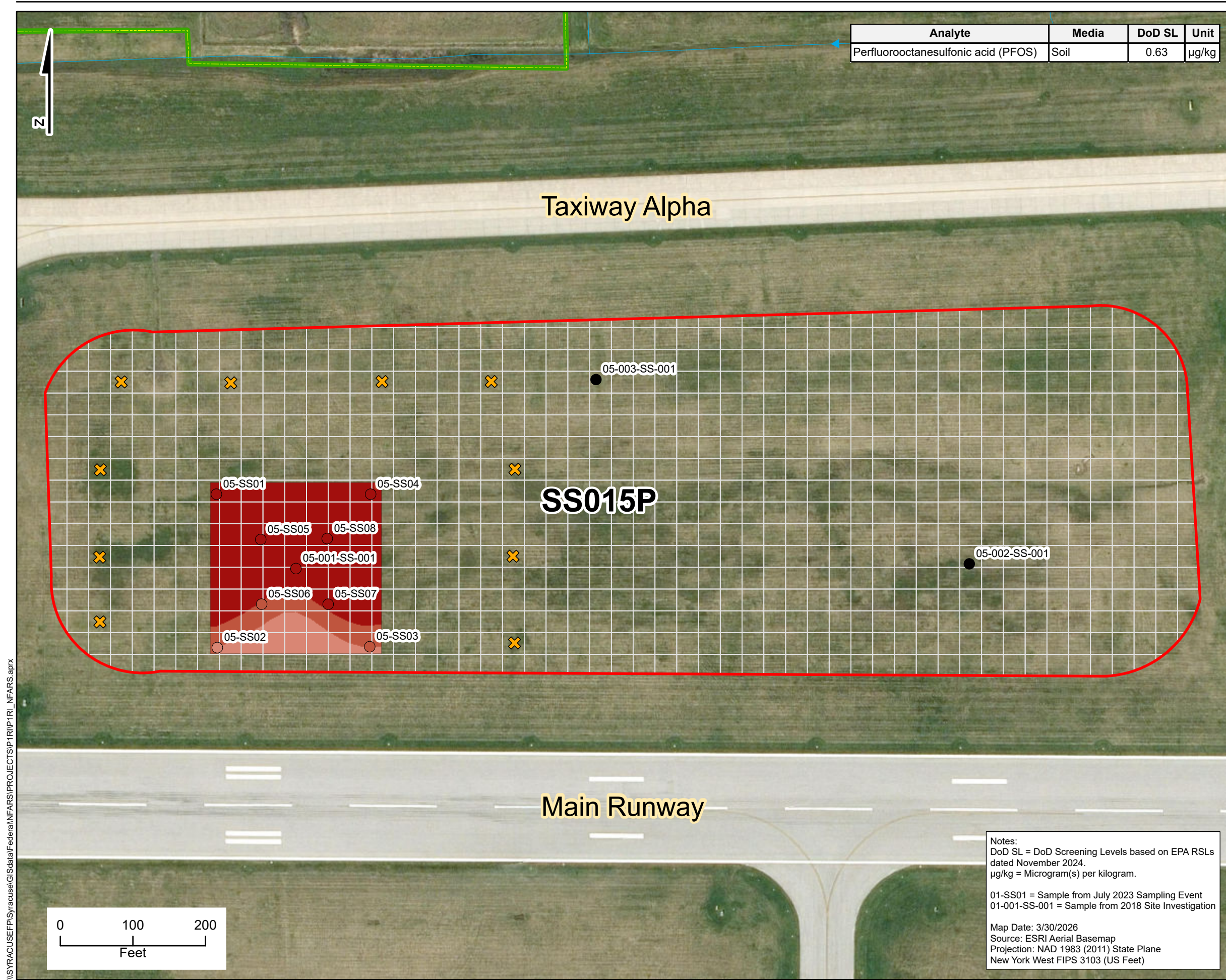
SS015P: AFFF AREA 5 BLUE ANGELS CRASH SITE

The SI and initial surface soil sampling investigations at SS015P identified highest concentrations of PFAS on the western end of the former crash site between the two NFARS runways. Current PFAS analytical data suggests that the highest PFOS concentrations observed at the site are located north of the western SI surface soil location. Lower PFOS concentrations were observed to the south. Because the exact location of the crash site and AFFF usage to extinguish the fire are unknown determining the primary source area is being investigated in a stepwise approach. Data indicates that additional sampling at the western, northern, and eastern extents would be useful in characterizing concentration extents at the site.

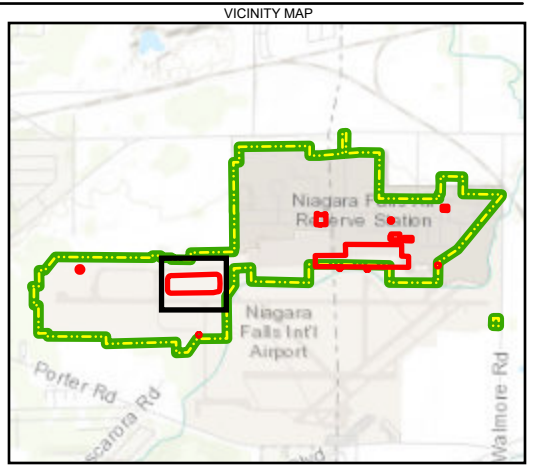
Supplemental Surface Soil Sampling

Additional surface soil sampling is being conducted at SS015P: AFFF Area 5 – Blue Angels Crash Site to further define the lateral extents of PFAS in surface soil to further characterize lateral concentration extents of PFAS in surface soil. Surface soil sampling will continue to be collected in a gridded fashion, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 10 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-2a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid west, north and east	Surface Soil	10	Identify decreasing trend and/or non-impacted surface soil west, north, and east current highest PFOS concentrations



Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Surface Water/Stream
 - Drainage Ditch/Pathway

- PFOS Concentration (µg/kg)**
- Surface Soil - Non-Detect
 - Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

01-SS01 = Sample from July 2023 Sampling Event
 01-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-2a
Proposed Second Mobilization Surface
Soil Sampling Locations at SS015P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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SS101P: AFFF AREA 6 FOX ROW/ TAXIWAY ALPHA, OUTFALLS 5 AND 9

Current PFAS analytical data indicates that the highest PFOS concentrations observed in surface soil were located at the most eastern end (06-SS11 and 06-SS12) of Taxiway Alpha where AFFF foam may have been used to extinguish the JP-4 tank roll-over and within the northern grassed area along Taxiway Alpha where surface soil sample 06-SS04 was collected.

Supplemental Surface Soil Sampling

Additional surface soil sampling is being conducted at SS101P: AFFF Area 6 – Fox Row / Taxiway Alpha, Outfalls No. 5 and 9 to further characterize concentration extents of PFAS in surface soil. Surface soil sampling will continue to be collected in a gridded fashion, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 21 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-3a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid north of Taxiway Alpha	Surface Soil	9	Identify decreasing trend and/or non-impacted surface soil on northern side of runway
South and west of Taxiway Alpha	Surface Soil	10	Identify decreasing trend and/or non-impacted surface soil south of runway within grassed areas where surficial water would drain to Cayuga Creek
30 x 30 ft. grid east	Surface Soil	2	Identify decreasing trend and/or non-impacted surface soil east and south of highest PFOS concentrations
Note: Area 4 SS700P is located just east of the eastern end of Area 6 SS101P and additional proposed surface soil at SS700P will be used in tandem to assess potentially multiple sources areas of PFAS concentrations at the sites sharing a similar site boundary.			

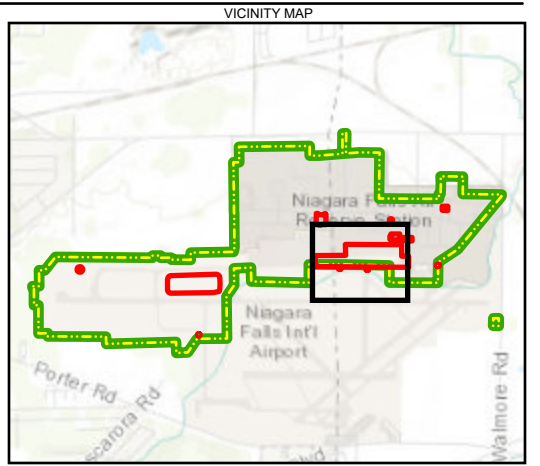
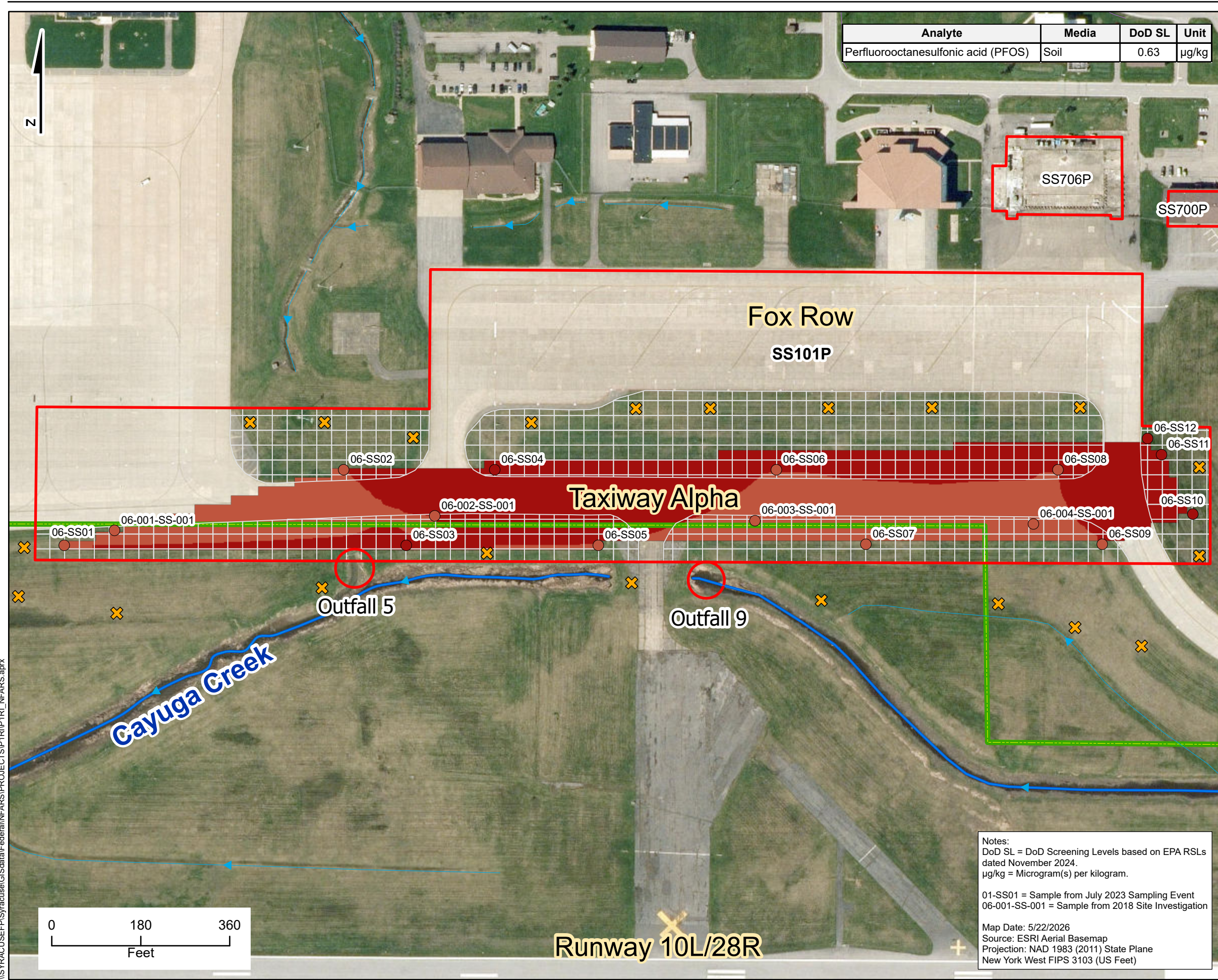
Surface Water and Sediment Sampling

Supplemental co-located surface water sampling will be conducted at previously attempted location upgradient of Outfalls No. 9 and 5 and to evaluate potential for seasonal changes in PFAS concentrations. The number of surface water samples to be collected at each AFFF site is presented below. Sampling locations are presented on **Figures 17-3b** of this UFP-QAPP Addendum.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
06-SW/SD-03	Surface Water	1	Second attempt at this location due to insufficient water during the

			initial mobilization; support evaluation of potential PFAS concentrations upgradient of Outfalls No. 9 and No. 5
--	--	--	--

Surface water samples will be collected during periods of flow, with samples collected from the middle of the channel at mid-depth. Water quality parameters (pH, specific conductance, temperature, ORP, DO, and turbidity) will be collected for each surface water sample, and each surface water sample will be analyzed for PFAS by EPA Method 1633.



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Outfall Location
- 30x30' Sampling Grid
- Surface Water/Stream

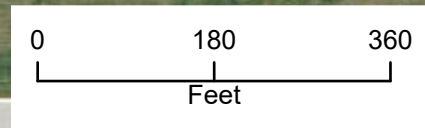
PFOS Concentration (µg/kg)

- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL

PFOS Concentration (µg/kg)

- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL
- Proposed Surface Soil Sampling Location

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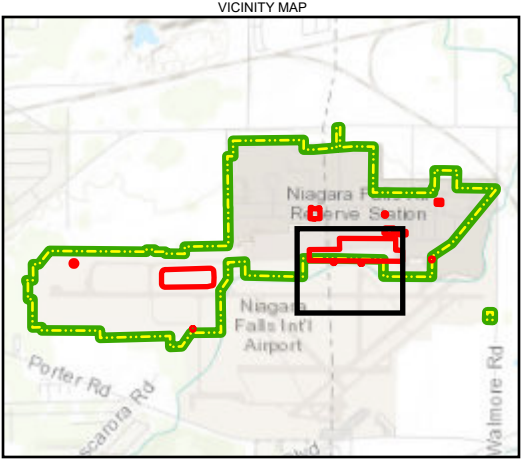
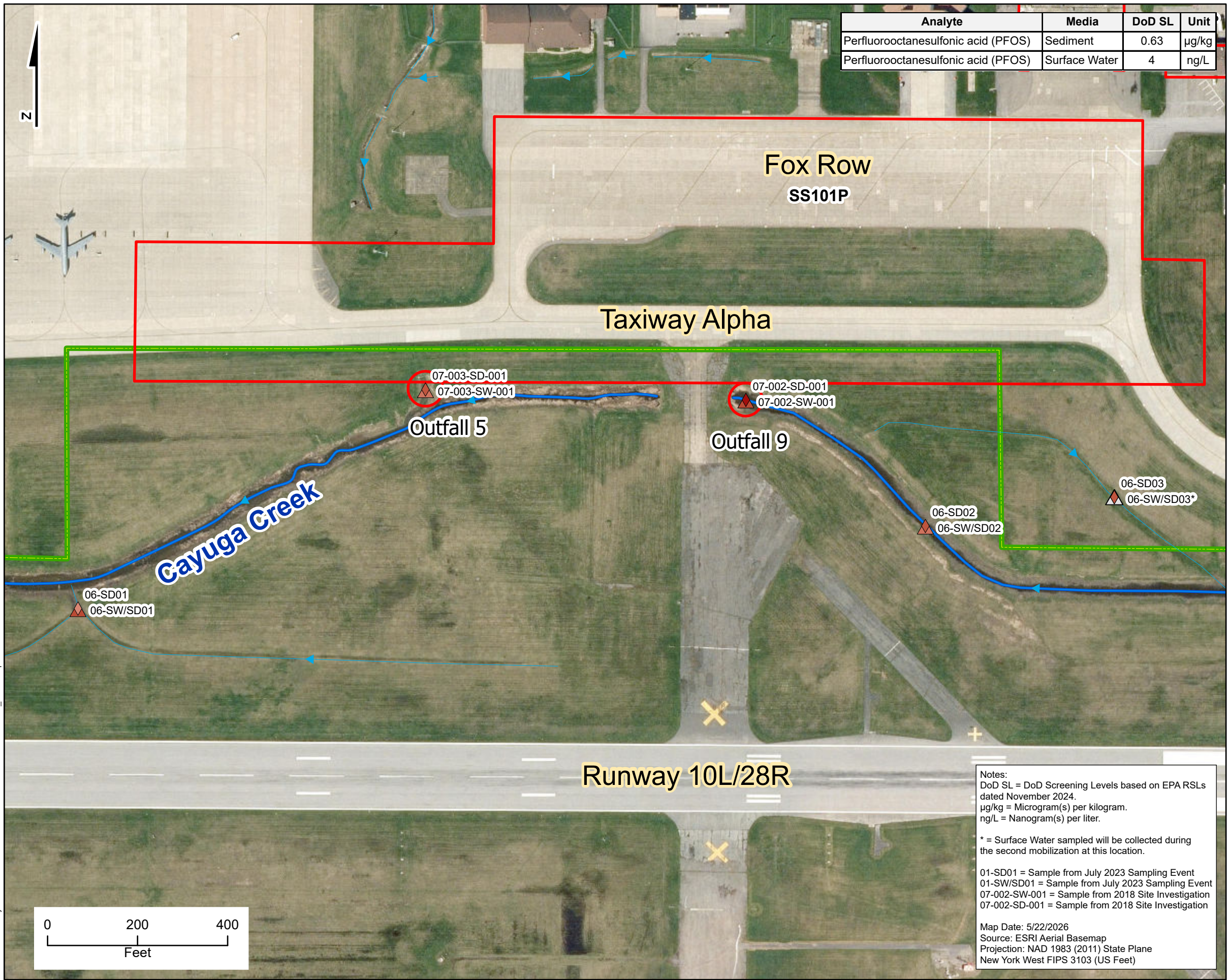
Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

01-SS01 = Sample from July 2023 Sampling Event
 06-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane New York West FIPS 3103 (US Feet)

Figure 17-3a
Proposed Second Mobilization Surface Soil Sampling Locations at SS101P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY





Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Outfall Location
- Surface Water/Stream

PFOS Concentration (µg/kg)

- Sediment - Detection 1x Above SL
- Sediment - Detection 10x Above SL
- Sediment - Detection 100x Above SL

PFOS Concentration (ng/L)

- Surface Water - Detection 1x Above SL
- Surface Water - Detection 10x Above SL
- Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

* = Surface Water sampled will be collected during the second mobilization at this location.

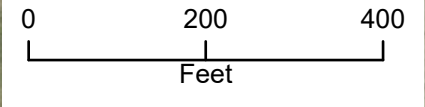
01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-002-SW-001 = Sample from 2018 Site Investigation
 07-002-SD-001 = Sample from 2018 Site Investigation

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-3b
Proposed Second Mobilization Surface Water Sampling Locations at SS101P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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SS700P: AFFF AREA 4 BUILDING 700, OUTFALL 4

Building 700 is the former fire station where historical spray testing was known to occur with the grass areas south and southeast of the building. Initial phase surface soil sampling indicated that the highest concentrations of PFOS were located within these areas south and southeast of the building, with concentrations decreasing in the eastern direction. It is expected that surficial drainage and aerial transport would mobilize potential contaminants further to the east and southeast toward the drainage features.

Supplemental Surface Soil Sampling

Additional surface soil sampling is being conducted at SS700P: AFFF Area 4 Building 700 and Outfall 4 to further characterize lateral concentration extents of PFAS in surface soil. Surface soil sampling will continue to be collected in a gridded fashion, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 13 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-4a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid north and northeast of Building 700	Surface Soil	2	Identify decreasing trend and/or non-impacted surface soil north and northeast where spray testing may not have occurred
100 x 100 ft. grid east and southeast of current impacts within the 30 x 30 ft grid	Surface Soil	11	Identify decreasing trend and/or non-impacted surface soil east and southeast of Building 700

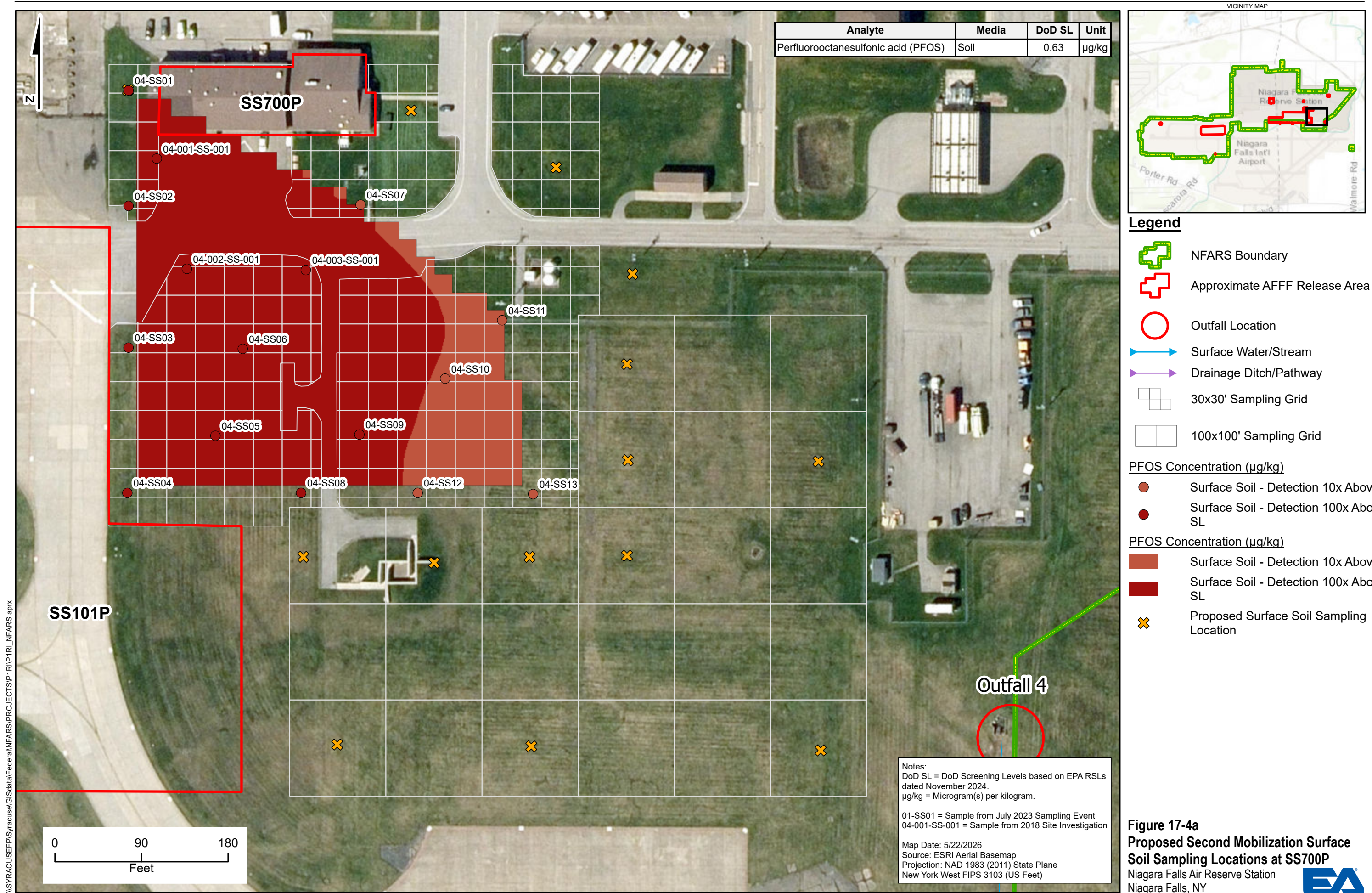
Surface Water and Sediment Sampling

Supplemental co-located surface water sampling will be conducted at previously attempted location downgradient of Outfalls No. 4 and to evaluate potential for seasonal changes in PFAS concentrations. The number of surface water samples to be collected at each AFFF site is presented below. Sampling locations are presented on **Figures 17-4b** of this UFP-QAPP Addendum.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
04-SW/SD-01	Surface Water	1	Second attempt at this location due to insufficient water during the initial mobilization; support evaluation of potential PFAS

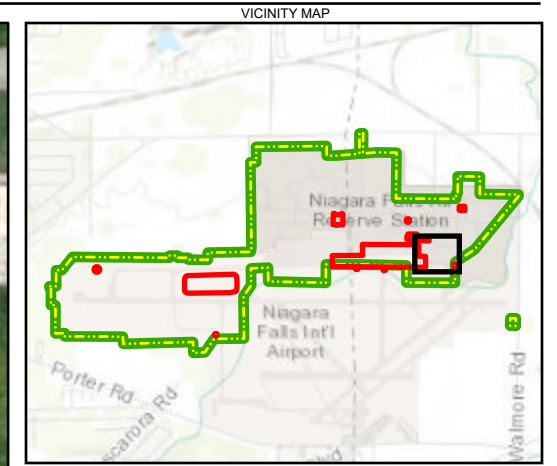
			concentrations downgradient of Outfall No. 4
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Surface water samples will be collected during periods of flow, with samples collected from the middle of the channel at mid-depth. Water quality parameters (pH, specific conductance, temperature, ORP, DO, and turbidity) will be collected for each surface water sample, and each surface water sample will be analyzed for PFAS by EPA Method 1633.



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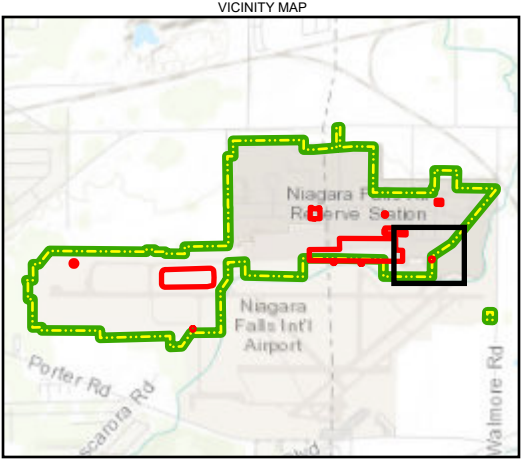
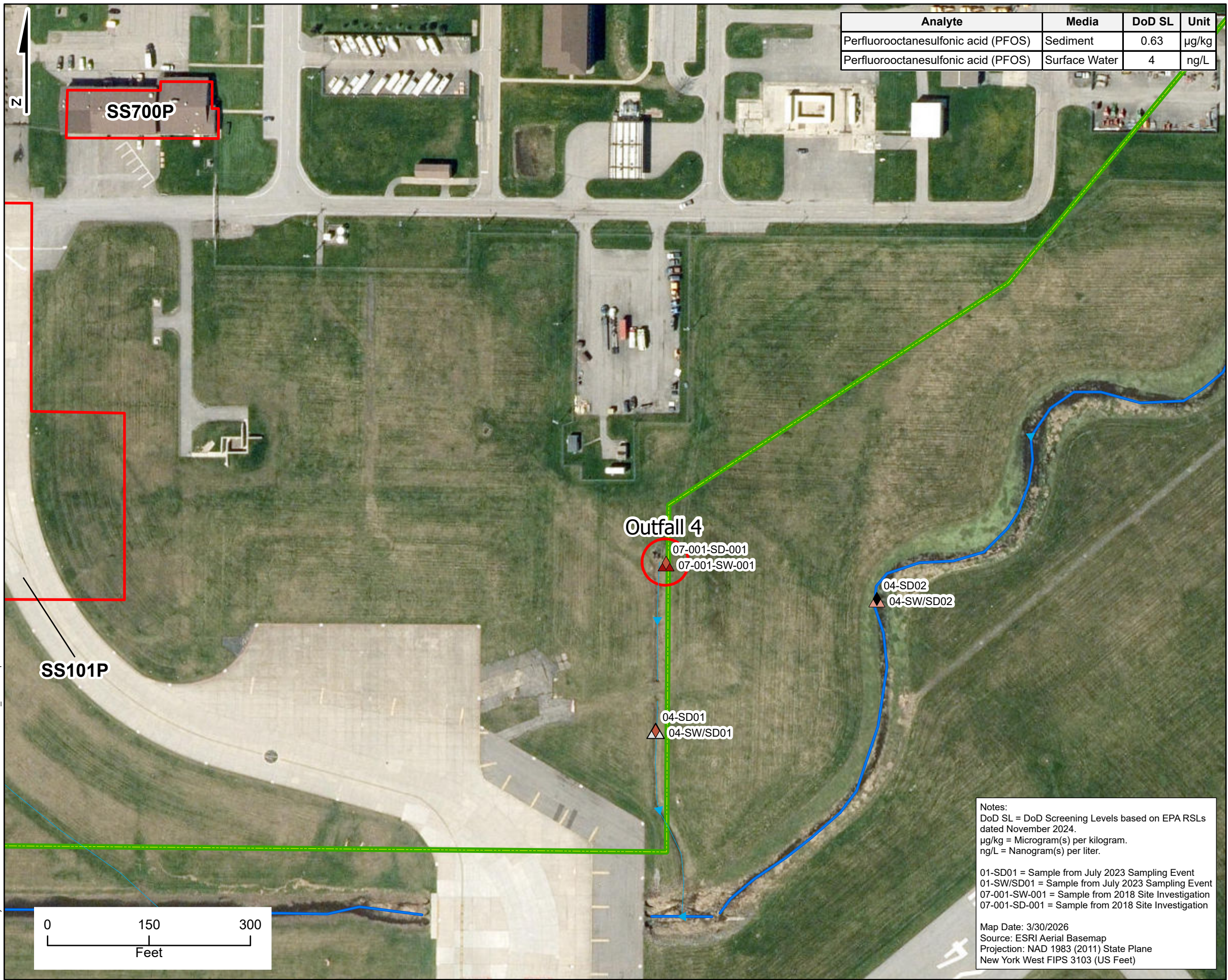
Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 01-SS01 = Sample from July 2023 Sampling Event
 04-001-SS-001 = Sample from 2018 Site Investigation
 Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)








- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - Outfall Location
 - Surface Water/Stream
 - Drainage Ditch/Pathway
 - 30x30' Sampling Grid
 - 100x100' Sampling Grid
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location






Figure 17-4a
Proposed Second Mobilization Surface Soil Sampling Locations at SS700P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY





Legend

-  NFARS Boundary
-  Approximate AFFF Release Area
-  Outfall Location
-  Surface Water/Stream
-  Drainage Ditch/Pathway

- PFOS Concentration (µg/kg)**
-  Sediment - Non-Detect
 -  Sediment - Detection 10x Above SL
- PFOS Concentration (ng/L)**
-  Surface Water - Detection Below SL
 -  Surface Water - Detection 100x Above SL
 -  Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-001-SW-001 = Sample from 2018 Site Investigation
 07-001-SD-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-4b
Proposed Second Mobilization Surface
Water Sampling Locations at SS700P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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SS850P: AFFF AREA 2 HANGAR 850

Hangar 850 is an aircraft maintenance hangar south of Wagner Drive with ramp access to Delta Row. Hangar 850 had an AFFF fire suppression system in a mechanical room on the northwest side of the building.

Hangar 850 has had multiple releases of AFFF, the largest release was approximately 48,000 gallons of AFFF concentrate and water mixed that was mostly contained inside of the hangar, though a small amount was observed to have discharged into the sanitary and storm sewers. Several other smaller spills have occurred at Hangar 850 including: 1) 10 gallons release from the mechanical room door; 2) approximately 2,100 gallons of AFFF concentrate were released into the hangar due to system overpressure; 3) approximately 5,000 gallons of 0.5% AFFF were released with a small amount of residual foam noted on the apron south of the hangar. Hangar 850 is approximately 1,500 feet to the north of Cayuga Creek with the aircraft apron between. Contaminants released from Hangar 850 onto the apron would drain to the south and west, reaching either Cayuga Creek or the stormwater system east of the apron.

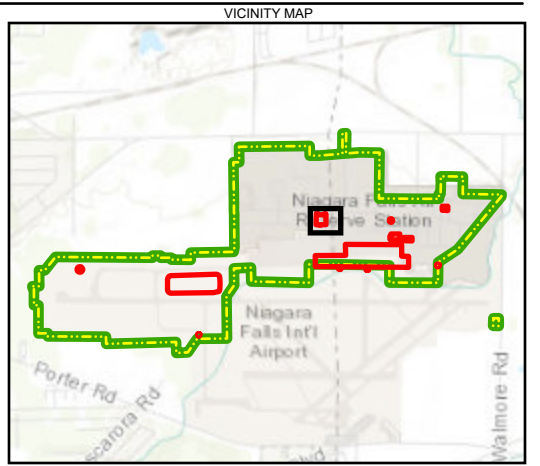
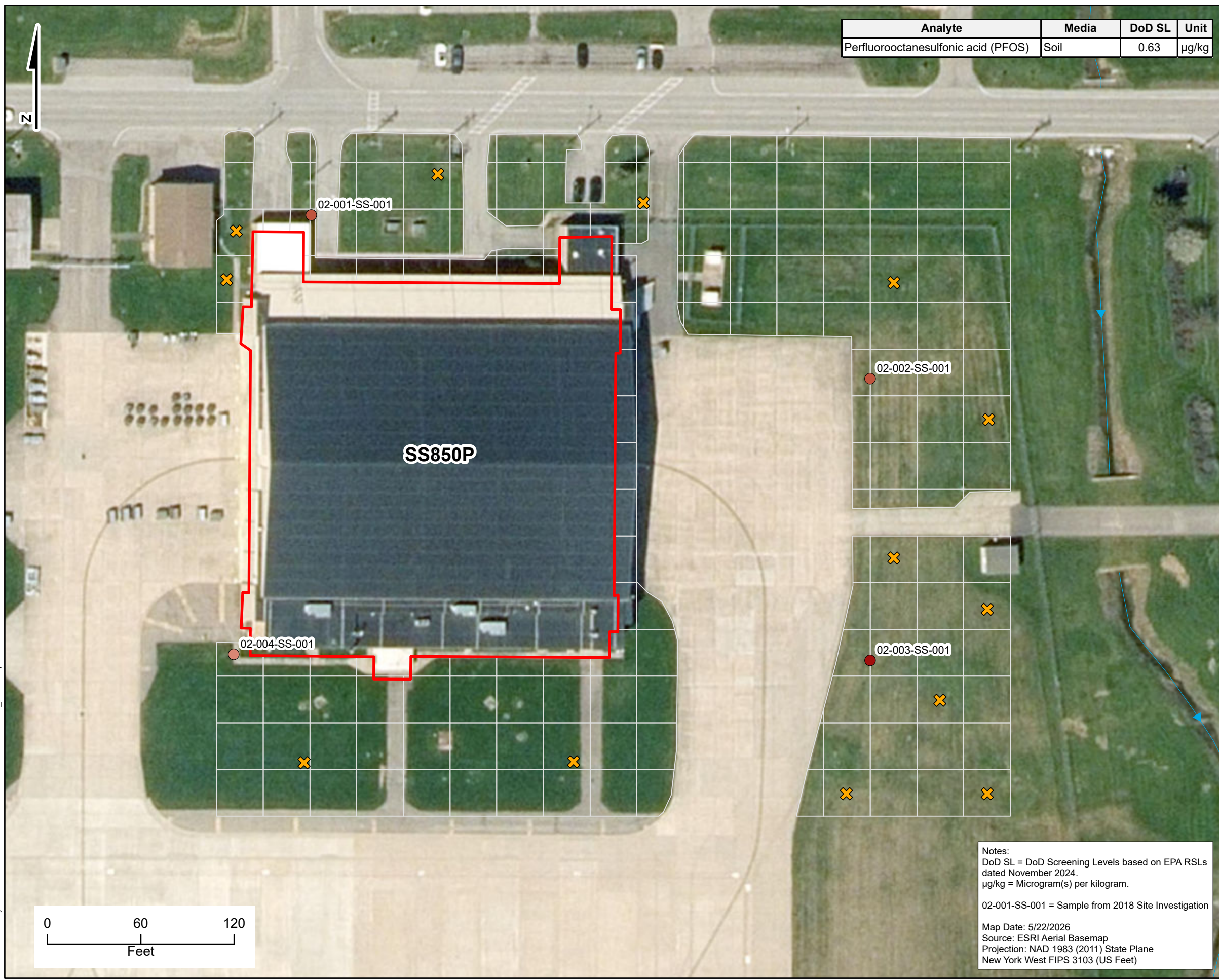
SI surface soil results reported the highest concentrations of PFOS along the eastern edge of the apron on the east side of the hangar, with lower concentrations in surface soil east of the northwest mechanical room and the lowest concentrations observed at the southwest corner of the hangar just off the concrete walkway. In addition, groundwater concentrations of PFAS (PFOA only) were reported above current DoD SLs in the area east of the hangar off the apron suggesting a minor or smaller potential source area may exist at the site.










Surface Soil Sampling

Surface soil sampling is being conducted at SS850P: AFFF Area 2 – Hangar 850 to further characterize lateral concentration extents of PFAS in surface soil. Surface soil sampling will be collected in a gridded fashion along the eastern edge of the east side apron, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 13 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-5a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid north, west, and south of building 850	Surface Soil	13	Identify decreasing trend and/or non-impacted surface soil east of the eastern apron

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- Legend**
-  NFARS Boundary
 -  Approximate AFFF Release Area
 -  30x30' Sampling Grid
 -  Surface Water/Stream
 -  Drainage Ditch/Pathway
- PFOS Concentration (µg/kg)**
-  Surface Soil - Detection 1x Above SL
 -  Surface Soil - Detection 10x Above SL
 -  Surface Soil - Detection 100x Above SL
 -  Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

02-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-5a
Proposed Second Mobilization Surface Soil Sampling Locations at SS850P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



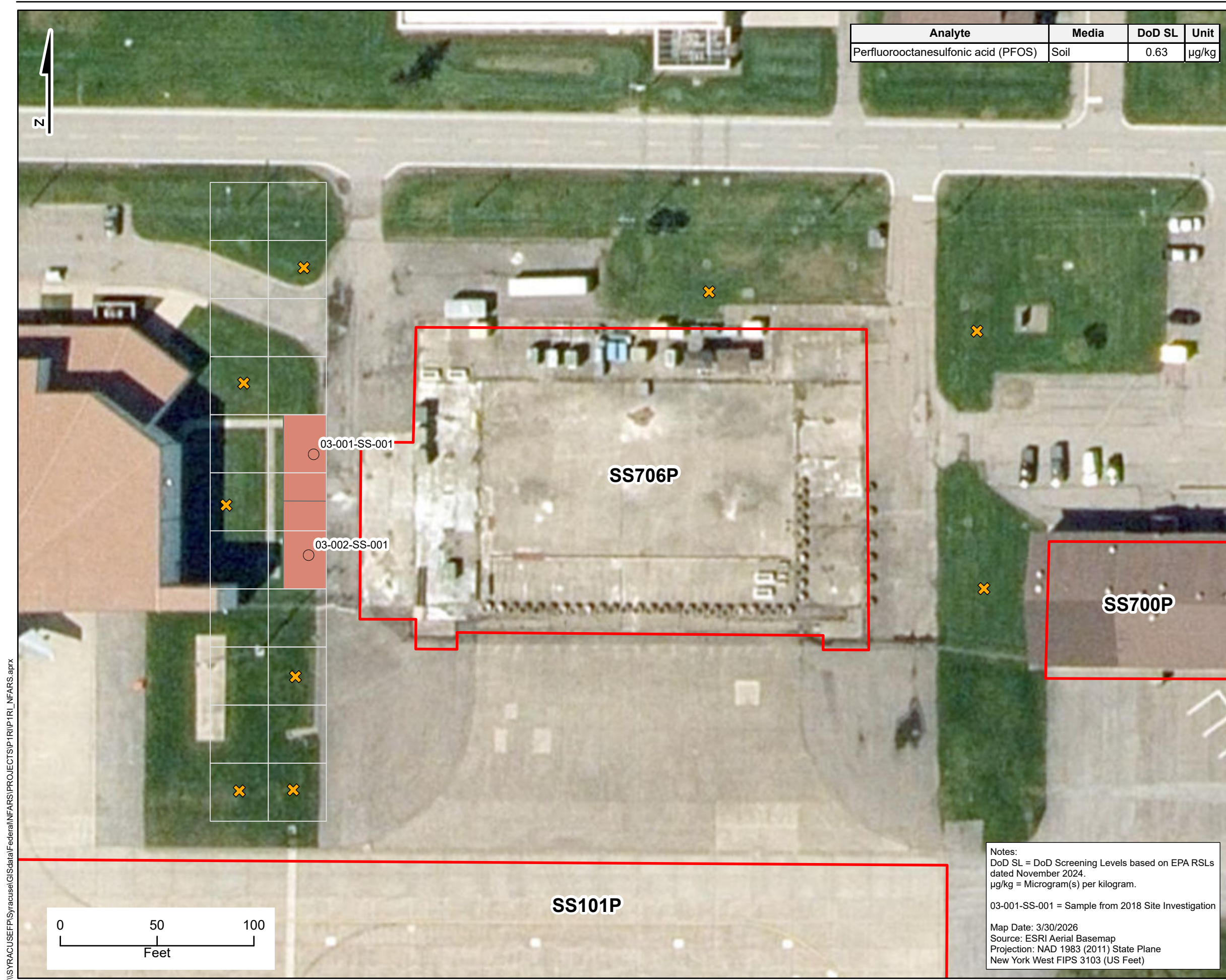
SS706P: AFFF AREA 3 BUILDING 706

The former Building 706 is a former aircraft maintenance hangar that has been demolished. Most of the area surrounding former Building 706 is paved. Surface water flows into surrounding drainage features or onto the aircraft apron and into grass areas to the east and south. According to spill records, only one release of AFFF occurred at former Building 706 where 216 gallons of AFFF concentrate mixed with approximately 798 gallons of water spilled on the west side of the building. PFOS detections did exceed DoD SLs in the grass area west of Building 706.

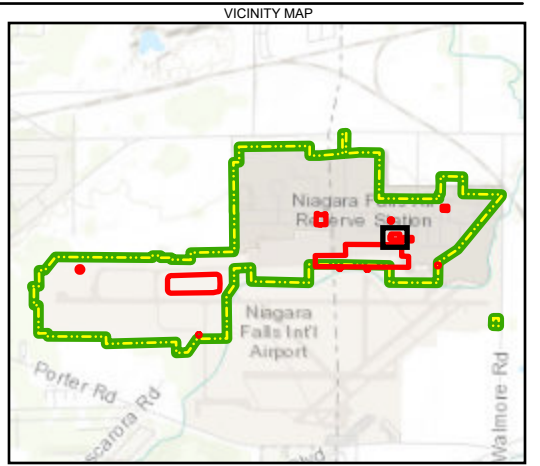
Surface Soil Sampling

Surface soil sampling is being conducted at SS706P: AFFF Area 3 – Building 706 to further characterize concentration extents of PFAS in surface soil. Surface soil sampling will be collected in a gridded fashion along the western side of the building as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 9 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-6a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid east of former Building 706, 1 north and 2 to the east	Surface Soil	9	Identify decreasing trend and/or non-impacted surface soil west of Building 706



Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Drainage Ditch/Pathway
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

03-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane New York West FIPS 3103 (US Feet)

Figure 17-6a
Proposed Second Mobilization Surface Soil Sampling Locations at SS706P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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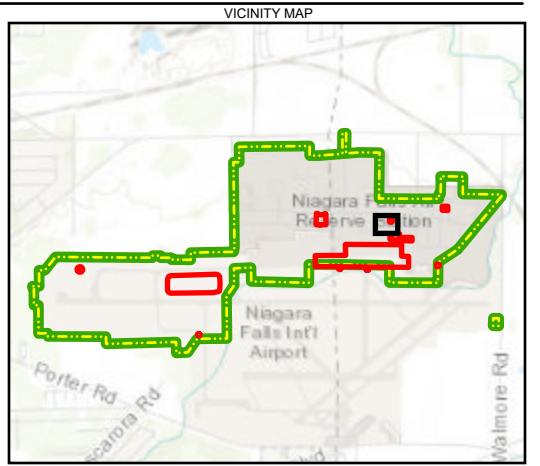
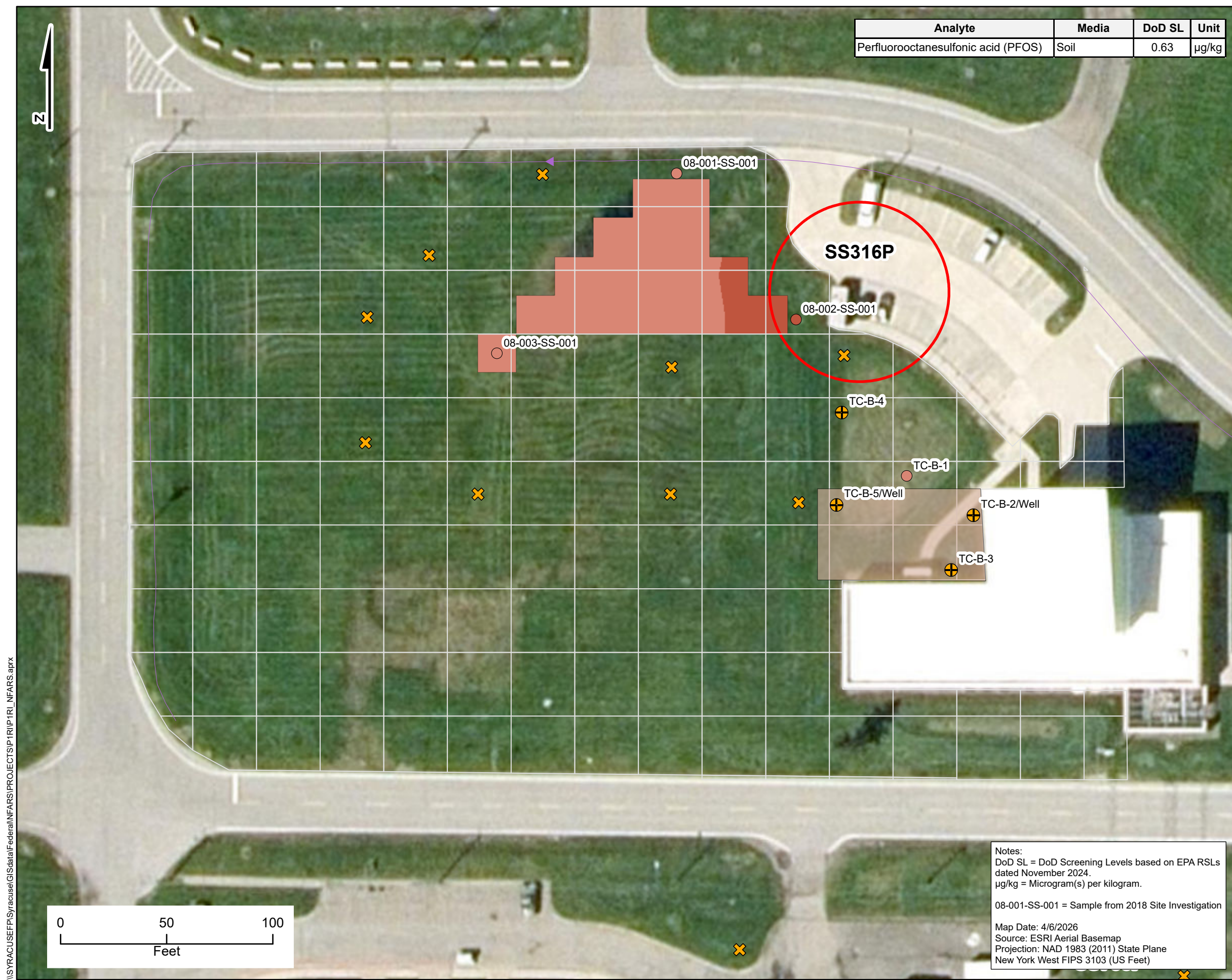
SS316P: AFFF AREA 8 HULBY STREET

An AFFF spill was reported to have occurred on the southern side of the street across from Building 316. The open field directly across from the building has historically been used for emergency training exercises. The spill area was likely unpaved at the time and would have allowed AFFF to infiltrate into the subsurface. Initial SI PFOS data indicates higher concentrations along the eastern portion of the open field, with concentrations decreasing further west.

Surface Soil Sampling

Surface soil sampling is being conducted at SS316P: AFFF Area 8 – Hulby Street to further characterize concentration extents of PFAS in surface soil. Surface soil sampling will be collected in a gridded fashion, moving from areas of higher concentration surface soil to areas where lower concentrations or potentially no impacts exist as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 9 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-7a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid northwest	Surface Soil	3	Identify decreasing trend and/or non-impacted surface soil northwest SI PFOS detections
30 x 30 ft. grid south	Surface Soil	6	Identify decreasing trend and/or non-impacted surface soil south of SI PFOS detections



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- 30x30' Sampling Grid
- Drainage Ditch/Pathway
- Area Currently under Construction

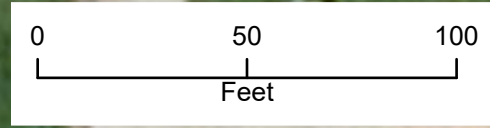
PFOS Concentration (µg/kg)

- Surface Soil - Detection 1x Above SL
- Surface Soil - Detection 10x Above SL

PFOS Concentration (µg/kg)

- Surface Soil - Detection 1x Above SL
- Surface Soil - Detection 10x Above SL
- Historical MILCON Sample Location
- Proposed Surface Soil Sampling Location

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Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

08-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 4/6/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-7a
Proposed Second Mobilization Surface Soil Sampling Locations at SS316P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



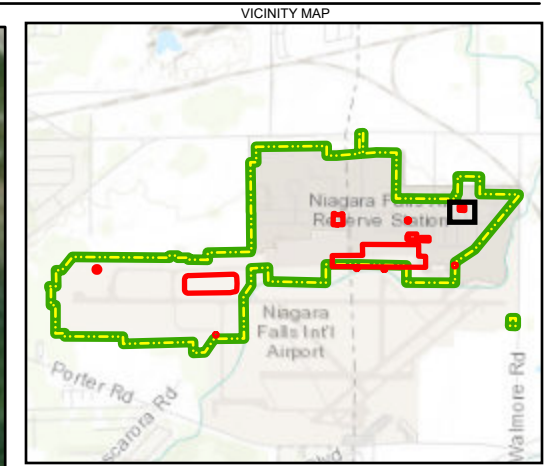
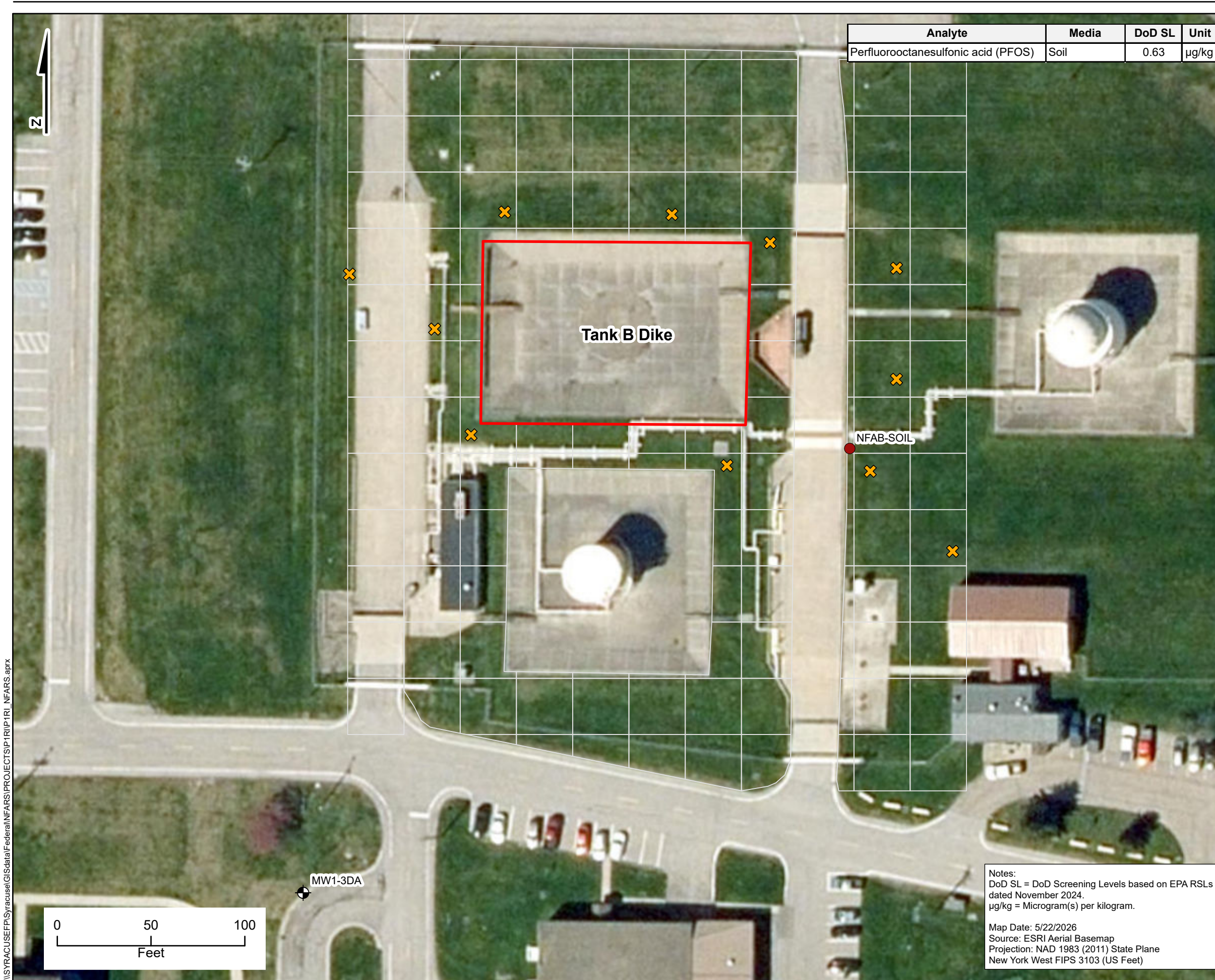
SS420P: AFFF AREA 9 FORMER TANK B DIKE

SS420P: AFFF Area 9 - Former Tank B Dike was identified in the 2016 Preliminary Assessment (PA) as an approximately 0.29-acre site used for spray testing of AFFF by the fire department (Aerostar SES LLC 2016). The PA noted that no spills had been reported at SS420P: Former Tank B Dike and that AFFF was contained within the concrete-lined basin. Former Tank B Dike was identified for investigation based on MILCON investigative work conducted to evaluate potential disposal needs for site soil and groundwater that would be potentially encountered and/or generated during construction activities. PFAS was detected in surface soil during POL activities at the site. This will be the initial evaluation under the RI at Former Tank B Dike.

Surface Soil Sampling

Surface soil sampling is being conducted at SS420P: AFFF Area 9 - Former Tank B Dike to characterize lateral concentration extents of PFAS in surface soil. Surface soil sampling will be collected in a gridded fashion in the areas surrounding the former tank dike as described in the table below. Surface soil samples will be analyzed for PFAS by EPA Method 1633. Up to 11 surface soil samples will be collected from depths of 0-0.5 ft bgs as detailed in the table below and presented on **Figure 17-1a**.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
30 x 30 ft. grid surrounding the former dike	Surface Soil	11	Identify PFAS concentrations in area immediately surrounding the former tank dike



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- 30x30' Sampling Grid
- Surface Water/Stream
- Drainage Ditch/Pathway

PFOS Concentration (µg/kg)

- Surface Soil - Detection 100x Above SL
- Existing Monitoring Well
- Proposed Surface Soil Sampling Location

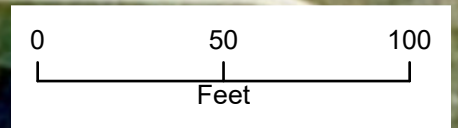
Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-8a
Proposed Second Mobilization Surface
Soil Sampling Locations at SS420P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)



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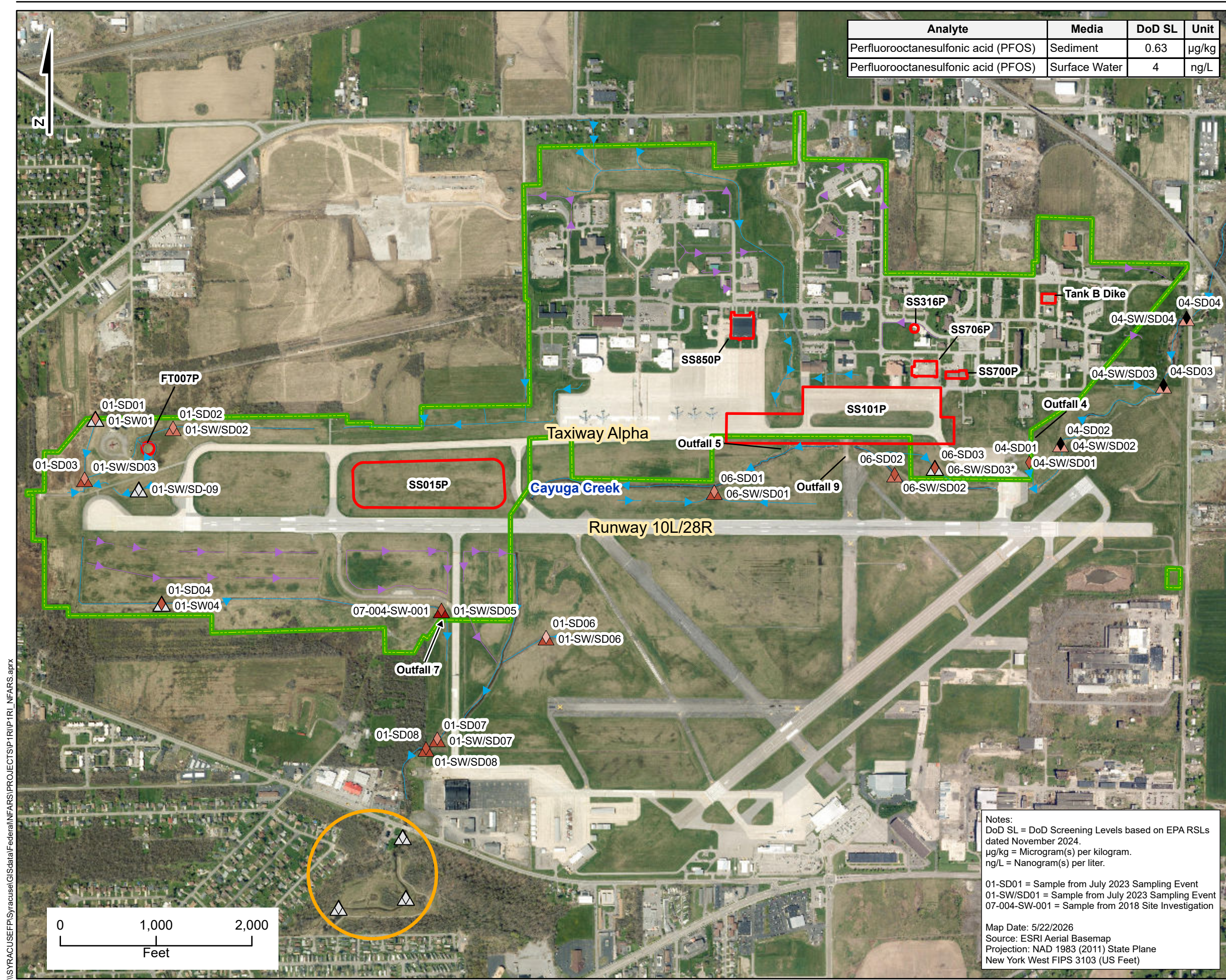
OFF INSTALLATION SURFACE WATER AND SEDIMENT SAMPLING

Three supplemental off installation sediment and surface water samples are proposed to evaluate PFAS concentrations further downgradient of 01-SW/SD-08. For the purpose of this Phase I RI, these surface water and sediment samples are being coded and associated with AFFF Area 1 Former FTA. These locations are located south of Porter Road on two separate parcels owned by the Town of Niagara where Cayuga Creek discharges from the airport's southern boundary as depicted on **Figure 17-9a**. These sample locations have been assigned to FT007P: AFFF Area 1 Former Fire Training Area and are presented in Table 18-1 under this site.

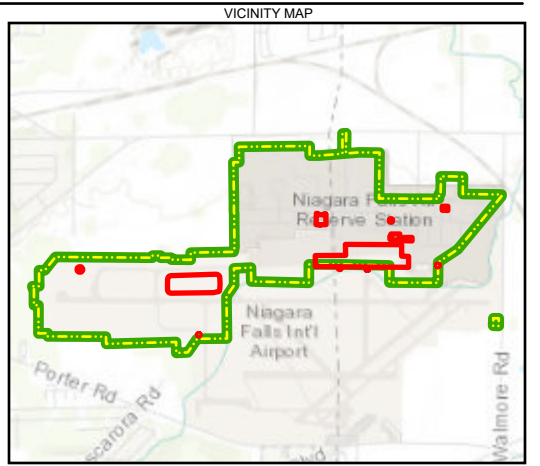
Surface water samples will be collected before co-located sediment samples to avoid suspending solids in the sample. Surface water samples will be collected during periods of flow, with samples collected from the middle of the channel at mid-depth. Water quality parameters (pH, specific conductance, temperature, ORP, DO, and turbidity) will be collected for each surface water sample, and each surface water and sediment sample will be analyzed for PFAS by EPA Method 1633.

In addition to collection of the sediment and surface water samples, a field reconnaissance of areas along the southern reaches of Cayuga Creek will be conducted to identify additional tributaries to the creek at locations south of the installation and airport.

Sample Locations	Type of Sample	No. of Samples	Design Rationale
01-SW/SD10	Surface Water and Sediment	1	Assess potential PFAS concentrations within Cayuga Creek downgradient of NFARS and the Niagara Falls International Airport
01-SW/SD11	Surface Water and Sediment	1	Assess potential PFAS concentrations within Cayuga Creek downgradient of NFARS and Niagara Falls International Airport
01-SW/SD12	Surface Water and Sediment	1	Assess potential PFAS concentrations within Cayuga Creek downgradient of NFARS and Niagara Falls International Airport



Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Sediment	0.63	µg/kg
Perfluorooctanesulfonic acid (PFOS)	Surface Water	4	ng/L



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Off-installation SW/SED Investigation Area
- Surface Water/Stream
- Drainage Ditch/Pathway

- PFOS Concentration (µg/kg)**
- Sediment - Non-Detect
 - Sediment - Detection Below SL
 - Sediment - Detection 1x Above SL
 - Sediment - Detection 10x Above SL

- PFOS Concentration (ng/L)**
- Surface Water - Detection Below SL
 - Surface Water - Detection 1x Above SL
 - Surface Water - Detection 10x Above SL
 - Surface Water - Detection 100x Above SL
 - Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-004-SW-001 = Sample from 2018 Site Investigation

Map Date: 5/22/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-19a
Proposed Second Mobilization Surface Water and Sediment Sampling Locations Site-Wide
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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UFP-QAPP WORKSHEET #18: Sampling Locations and Methods

This Worksheet updates **Table 18-1** from the UFP-QAPP (EA 2023) to include the proposed sampling locations for each media, estimated depth, and associated analytes for the second mobilization phase of RI fieldwork. Field activities during the second mobilization will include: (1) initial synoptic water level measurement event, (2) initial and supplemental surface soil sampling, and (3) a second surface water/sediment sampling event. Existing monitoring wells and synoptic gauging locations are presented in **Table 18-2** and shown on **Figure 17-6** of the original UFP-QAPP (EA 2023).

Surface soil and surface water/sediment locations are shown on **Figures 17-1a/b through 17-9a** of this UFP-QAPP Addendum. **Table 18-1** summarizes the proposed second phase mobilization sample locations presented in Worksheet #17 of this UFP-QAPP Addendum.

Table 18-1 Summary of Proposed PFAS Sample Identifications and Methods

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7				
NIGRA01-P1RI-SS18-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS19-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS20-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS21-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS22-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS23-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS24-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS25-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS26-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS27-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS28-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS29-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS30-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS31-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS32-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS33-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SS34-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA01-P1RI-SS35-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW01-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW04-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW09-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SD09-MMDDYY	Sediment	0-0.5	Grab; EA-SOP-021, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW10-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SD10-MMDDYY	Sediment	0-0.5	Grab; EA-SOP-021, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW11-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SD11-MMDDYY	Sediment	0-0.5	Grab; EA-SOP-021, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SW12-MMDDYY	Surface water	Surface	Grab; EA-SOP-007, EA-SOP-073	PFAS by EPA Method 1633
NIGRA01-P1RI-SD12-MMDDYY	Sediment	0-0.5	Grab; EA-SOP-021, EA-SOP-073	PFAS by EPA Method 1633
SS015P: AFFF Area 5 Blue Angels Crash Site				
NIGRA05-P1RI-SS09-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS10-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS11-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS12-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS13-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS14-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA05-P1RI-SS15-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS16-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS17-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA05-P1RI-SS18-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS101P: AFFF Area 6 Fox Row/Taxiway Alpha, Outfalls 5 and 9				
NIGRA06-P1RI-SS13-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS14-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS15-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS16-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS17-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS18-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS19-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS20-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS21-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS22-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS23-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS24-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS25-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA06-P1RI-SS26-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS27-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS28-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS29-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS30-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS31-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS32-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SS33-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA06-P1RI-SW03-MMDDYY	Surface Water	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS700P: AFFF Area 4 Building 700, Outfall 4				
NIGRA04-P1RI-SS14-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS15-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS16-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS17-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS18-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS19-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS20-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA04-P1RI-SS21-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS22-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS23-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS24-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS25-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SS26-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA04-P1RI-SW01-MMDDYY	Surface Water	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS850P: AFFF Area 2 Hanger 850				
NIGRA02-P1RI-SS01-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS02-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS03-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS04-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS05-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS06-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS07-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS08-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS09-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS10-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA02-P1RI-SS11-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS12-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA02-P1RI-SS13-MMDDYY	Surface soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS706P: AFFF Area 3 Building 706				
NIGRA03-P1RI-SS01-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS02-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS03-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS04-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS05-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS06-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS07-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS08-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA03-P1RI-SS09-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS316P: AFFF Area 8 Hulby Street				
NIGRA08-P1RI-SS01-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS02-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS03-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS04-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS05-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

Sample Identifier	Matrix	Depth (ft bgs)	Sampling Method / SOP ¹	Analyte/ Analytical Group
NIGRA08-P1RI-SS06-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS07-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS08-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA08-P1RI-SS09-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
SS420P: AFFF Area 9 Former Tank B Dike				
NIGRA09-P1RI-SS01-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS02-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS03-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS04-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS05-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS06-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS07-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS08-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS09-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS10-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633
NIGRA09-P1RI-SS11-MMDDYY	Surface Soil	0-0.5	Grab; EA-SOP-025, EA-SOP-073	PFAS by EPA Method 1633

1) Field SOPs are provided Appendix B of the UFP-QAPP (EA 2023).

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UFP-QAPP WORKSHEETS #19 & #30: SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES**Analytical Laboratory:**

Pace Analytical Services, LLC, Minneapolis, Minnesota (PFAS)

1700 Elm Street SE

Minneapolis, MN 55414

Accreditation: DoD ELAP QSM Version 6

Accreditation: National Environmental Laboratory Accreditation Program (NELAP)

Sample Delivery Method: Overnight Shipping

Analytical Group	Matrix	Analytical and Preparation Method	Accreditation Expiration Date	Container(s) (number, size, and type)	Preservation	Max. Holding Time (Preparation/ Analysis)
PFAS	Soil/Solids	EPA Method 1633	31 October 2027	Polypropylene (PP) with PP linerless cap 1 x 90 milliliter (mL)	Cool, 0-6°C ¹	90 days / 90 days
PFAS	Aqueous	EPA Method 1633	31 October 2027	HDPE with PP linerless cap 2 x 500 mL 1 x 125 mL	Cool, 0-6°C ¹ Freeze, ≤-20C ²	28 days / 90 days 90 days / 90 days

Notes:

- 1) Maintain all samples for PFAS analysis protected from light at 0 - 6 °C from the time of collection until shipped to the laboratory. Samples must be shipped as soon as practical with sufficient ice to maintain the sample temperature below 6 °C during transport and be received by the laboratory within 48 hours of collection. The laboratory must confirm that the sample temperature is 0 - 6 °C upon receipt.
- 2) If requested by client, preparation holding time can be extended to 90 days if stored ≤-20C at time of receipt. Must be requested in writing prior to sample receipt and additional fees may apply.
- 3) Samples analyzed for NMeFOSE, NEtFOSE, NMeFOSAA, NEtFOSAA, and NFDHA have shorter extraction holding times, and extracts analyzed for 9Cl-PF3OUdS and 11Cl-PF3ONS have shorter analytical holding times. However, these are not analytes of concern for this project. Per the White Paper titled "Recommendation to Address Shorter Holding Times for Specific PFAS When Using EPA Method 1633 for PFAS Investigations", dated 27 March 2025, data for these analytes will be qualified as estimated (J/UJ) if extracted/analyzed outside the shortened hold times.

Analytical Laboratory:

Pace Analytical – Sheridan Laboratory, Sheridan, Wyoming (pH, grain size, TOC, porosity, permeability, Cation Exchange Capacity [CEC], Anion Exchange Capacity [AEC])

1673 Terra Avenue

Sheridan, WY 82801

Accreditation: DoD Environmental Laboratory Accreditation Program (ELAP) QSM Version 6

Accreditation: National Environmental Laboratory Accreditation Program (NELAP)

Sample Delivery Method: Overnight Shipping

Analytical Group	Matrix	Analytical and Preparation Method	Accreditation Expiration Date	Container(s) (number, size, and type)	Preservation	Max. Holding Time (Preparation/ Analysis)
pH	Solids	EPA SW-846 Method 9045D	ELAP-8/31/2024 NELAP-6/30/2023	Polyethylene or Glass 1 x 2-oz jar	None	NA / As soon as possible ¹
Grainsize Sieve	Solids	ASTM D422	None	1 gallon Ziploc baggie	None	None
Grain Size/Hydrometer	Solids	ASTM D422	None	1 gallon Ziploc baggie		None
TOC	Solids	EPA SW-846 Method 9060A	ELAP: 8/31/2024 NELAP: 6/30/2023	Polyethylene or Glass 1 x 2-ounce (oz) jar	Cool, 0-6°C	NA / 28 days from collection to analysis
Permeability	Solids	ASTM D5084-16	None	Shelby tube	None	6 months
Cation Exchange Capacity	Solids	EPA SW-846 Method 9081	None	1 gallon Ziploc baggie	None	NA / 6 months
Anion Exchange Capacity	Solids	New Zealand P Retention	None	1 gallon Ziploc baggie	None	NA / 6 months

Notes:

- 1) pH determination is intended to be an in situ parameter. Pace Gulf Coast's facilities are located in Baton Rouge, Louisiana. Pace Gulf Coast commits to analyzing any pH samples received at its facility in an "as soon as possible" manner. Resulting data is qualified to reflect the variance to the method's assumptions.

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UFP-QAPP WORKSHEET #20: Field QC Summary

This table presents PFAS sample quantities for the second mobilization phase surface soil, surface water, and sediment sampling.

Matrix	Analyte/Analytical Group	Concentration Level	Field Samples	Field Duplicates	Field Blank	Equipment Blank	Total # Samples to Lab ¹
Surface Soil	PFAS	Low/Medium/High	102	10%	1 per day	1 per day ²	TBD
Surface Water	PFAS	Low/Medium/High	8	10%	1 per day	1 per day ²	TBD
Sediment	PFAS	Low/Medium/High	4	10%	1 per day	1 per day ²	TBD

Notes:

1. Number of samples collected will vary based the number of days to conduct field activities. Frequencies listed for QC samples will be collected during field activities.
2. Equipment blanks will be collected with samples involving reusable equipment. No equipment blanks will be collected with samples that are collected with dedicated/disposable equipment.

UFP-QAPP WORKSHEET #23: Analytical Standard Operating Procedures

The analytical SOPs summarized below are provided in **Appendix B**. Methods represent those currently certified by the laboratory and may undergo revision during periodic UFP-QAPP review. UFP-QAPP revisions will be submitted for approval.

Lab SOP No.	Title, Revision Date and/or Number	Definitive or Screening Data	Matrix/ Analytical Group	Instrument/ Equipment	Modified for Project Work? (Y/N)
Pace Analytical					
ENV-SOP-WCOL-0166	PFAS by Method 1633, 09/30/2025	Definitive	Aqueous and Solid/PFAS	Agilent 1290 Infinity II High Pressure LC	N

UFP-QAPP WORKSHEET #26 & #27: Sample Handling, Custody, and Disposal

The worksheet presents the identification protocol for samples collected during the second phase mobilization of RI fieldwork and is intended to be used in conjunction with Worksheet #26 & #27 of the UFP-QAPP (EA 2023).

Sample Identification

The identification protocol for samples collected during the second phase of RI fieldwork is as follows:

- Each sample location will begin with the five-digit ERPIMS facility identification code (NIGRA) and AFFF area number
 - NIGRA02 for FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7
 - NIGRA02 for SS850P: AFFF Area 2 Hanger 850
 - NIGRA03 for SS706P: AFFF Area 3 Building 706
 - NIGRA04 for SS700P: AFFF Area 4 Building 700, Outfall 4
 - NIGRA05 for SS015P: AFFF Area 5 Blue Angels Crash Site
 - NIGRA06 for SS101P: AFFF Area 6 Fox Row/Taxiway Alpha, Outfalls 5 and 9
 - NIGRA08 for SS316P: AFFF Area 8 Hulby Street
 - NIGRA09 for SS420P: AFFF Area 9 Former Tank B Dike
- At each location, an event code P1RI for Phase I RI will be added to the sample identification
- At each location, a media identifier will be added to the sample identification
 - SS = surface soil sample (less than 6 inches bgs)
 - SD = sediment sample
 - SW = surface water sample
- At each location, a numerical identifier (01, 02, 03, etc.) will be added to the sample identification, sequentially numbered based on the last numerical identifier used during the initial mobilization.
- Following the media and numerical identifier, the date (MMDDYY) and depth (if applicable) will be added.

Example sample identifiers are as follows:

- For the fourth surface soil collected on 15 March 2026 from SS316P: AFFF Area 8 Hulby Street, the sample identifier would be NIGRA08-P1RI-SS04-031526

- For the first additional surface soil collected on 15 March 2026 from FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7 (17 surface soil samples collected during the initial mobilization), the sample identifier would be NIGRA02-P1RI-SS18-MMDDYY
- For the surface water and sediment samples collected on 15 March 2026 from FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7 consistent with SW/SD-01 from the initial mobilization, the sample identifiers would be NIGRA02-P1RI-SW01-031526 and NIGRA02-P1RI-SD01-031526
- For the first additional surface water and sediment sample collected on 15 June 2024 downstream of FT007P: AFFF Area 1 Former Fire Training Area (Site 9), Outfall 7 (8 initial sample locations identified in the UFP-QAPP [EA 2023]), the sample identifiers would be NIGRA02-P1RI-SW09-061524 and NIGRA02-P1RI-SD08-061524

QA/QC samples (duplicates, field blanks, and equipment blanks) will be labeled using the following naming convention:

- Each sample will begin with the five-digit ERPIMS facility identification code (NIGRA)
- An event code P1RI for Phase I RI will be added to the sample identification
- A media identifier will be added to the sample identification
 - SS = surface soil sample (less than 6 inches bgs)
 - SD = sediment sample
 - SW = surface water sample
- A QA/QC sample type code will be added to the sample identification. A numerical identifier (01, 02, 03, etc.) will be added to the sample identification if more than one QA/QC sample is collected each day
 - DUP for field duplicates
 - FB for field blanks
 - EQB for equipment blanks
- The date (MMDDYY) will be added to the sample identification

Example QA/QC sample identifiers are as follows:

- For two surface soil duplicates collected 15 March 2026, the sample identifiers would be NIGRA-P1RI-SSDUP01-031526 and NIGRA-P1RI-SSDUP02-031526
- For the surface soil, surface water, and sediment field blanks collected on 15 March 2026, the sample identifiers would be NIGRA-P1RI-SSFB-031526, NIGRA-P1RI-SBFB-031526, NIGRA-P1RI-SWFB-031526, NIGRA-P1RI-SDFB-031526, and NIGRA-P1RI-GWFB-031526.
- For the surface soil, surface water, and sediment equipment blanks collected on 15 March 2026, the sample identifiers would be NIGRA-P1RI-SSEQB-031526, NIGRA-P1RI-SBEQB-031526, NIGRA-P1RI-SWEQB-031526, NIGRA-P1RI-SDEQB-031526, and NIGRA-P1RI-GWEQB-031526.

REFERENCES

- Aerostar SES LLC. 2016. *Final Preliminary Assessment Report for Perfluorinated Compounds at Niagara Falls Air Reserve Station Niagara County, New York*. August.
- Burns & McDonnell. 2024. *Memorandum, Field Investigation Summary Report, Combine Operations Facility, Niagara Falls Air Reserve Station, NY*. March.
- CH2MHill. 2008. *Environmental Cleanup Plan (Project Activities Work Plan, Environmental Sampling and Analysis Plan, and Environmental Health and Safety Plan), Cleanup and Sampling at Tank B Site (AST 2514 Tank B)*. September.
- EA Engineering, Science, and Technology Inc., PBC. (EA). 2023. *Uniform Federal Policy-Quality Assurance Project Plan for Phase I Remedial Investigation of Per-and Polyfluoroalkyl Substances, Niagara Falls Air Reserve Station, Niagara Falls, New York*. October.
- Ecology and Environment, Inc. 2000. *No Further Response Action Planned Decision Document, IRP Site 2, POL Bulk JP-4 Tank C Leak, Niagara Falls Air Reserve Station*. July.
- HD. 2020. *Soil and Groundwater Sampling Summary Letter Report, Niagara Falls Air Reserve Station, 10405 Lockport Road, Niagara Falls, New York*. November.
- Nue-Velle. 2020. *POL Trench Soil and Groundwater Sampling Report*. July.
- Terracon. 2023. *PFAS Sampling Report, Boom Operator Weapons System Trainer Building B321 Addition, 10675 Hulby Street, Niagara Falls Air Reserve Station, Niagara Falls, New York*. August.

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Appendix A

Project Planning Meeting – UFP-QAPP Addendum No. 2

**Niagara Falls Air Reserve Station
Phase I PFAS RI
Niagara Falls, New York
Contract No. W912DR19D0005
Task Order No. W912DR22F0247**

Progress Meeting No. 9 Minutes

Bi-Weekly Project Progress Meeting

The following is the agenda for the Niagara Falls Air Reserve Station (NFARS) Phase I PFAS RI Progress Meeting. The meeting will be held via teleconference on **Thursday, 19 March 2026 at 11:00AM Eastern** to provide the USACE, USAF and project stakeholders with updated information regarding the progress of work by EA Engineering, Science, and Technology, Inc., PBC. The meeting will be held virtually via Microsoft Teams invitation.

Meeting Attendees

Name		Role	Phone	Email
USACE Baltimore District				
Gina Guarriello	X	Project Manager	410-962-4454	gina.e.guarriello@usace.army.mil
Genna Huston Rohleder		Geologist	410-962-2004	Genna.M.HustonRohleder@usace.army.mil
Marissa Lucento		Risk Assessor		Marissa.A.Lucento@usace.army.mil
Elizabeth Eyer Moore		Geologist		Elizabeth.AEyer@usace.army.mil
Kiera White		Chemist	410-962-2004	Kiera.m.hearn@usace.army.mil
USACE New York District				
Tom Heins	X	PM	917-936-6273	Thomas.R.Heins@usace.army.mil
AFCEC				
Lindsay Mairs	X	Remedial Project Manager	716-236-3125	Lindsay.mairs@us.af.mil
Kurt Lee	X	CTZE		Kurt.lee.3@us.af.mil
EA Engineering				
Bob Casey	X	Project Manager	315-430-7429	rcasey@eaest.com
Patrick Gannon	X	Deputy Project Manager	315-565-6565	pgannon@eaest.com
Joe Von Uderitz		Project Geologist	315-565-6567	jvonuderitz@eaest.com
Vincent Farruggia		Geologist/Task Lead	315-431-4610	vfarruggia@eaest.com

1. MINUTES

Draft minutes for **Progress Meetings** will be distributed for review/comment within one week of the meeting date/time. The approved meeting minutes serve as the official record of the meeting. Project meetings are recorded and transcribed to facilitate meeting minutes.

2. AGENDA ITEMS

- Review and discuss revised QAPP Addendum No. 2 figure series based on DRAFT version RTCs and prior to submitting the DRAFT-FINAL RLSO and RTC matrix
 - **Discussion Summary**
 - The meeting centered on technical figure review for the NFARS project. Screen shares showed multiple plan-view figures with sampling grids, release area boundaries, surface water / stream features, and proposed surface soil sampling points. The team worked through site-specific layouts and compared proposed sampling coverage across several areas.
 - SS700P – R. Casey and K. Lee agreed to use a northern SS locations to fill the western outside edge of area moving it south to better cover the area.
 - SS316 Hulby Street – T. Hein noted the area currently under construction and suggested moving samples west of construction area.
 - R. Casey detailed that the RLSO, RTC matrix, updated figures and tables will be sent early next week for back-check. He will also prepare a DRAFT-FINAL clean version to send along as well so that if back-check is confirmed USACE can send clean version along to CX for review.
- EA is developing soil boring and groundwater grab QAPP addendum No. 3 figure set, currently in EA internal draft formats

3. DELIVERABLE TRACKING

FINAL DOCUMENTS
FINAL PMP – 11.2022
FINAL UFP QAPP / APP – 09.2023
FINAL Event 1 Trip Report – 11.2023
FINAL UFP-QAPP Addendum No. 1 – 12.2023
FINAL Event 1 Data Report – 04.2024
FINAL PMP Revision 02 – 09.2025

DRAFT DOCUMENTS	NOTES / STATUS
DRAFT UFP-QAPP Add. No. 2 – 01.21.2026	Govt. comment received 3/10/2026, RTCs developed

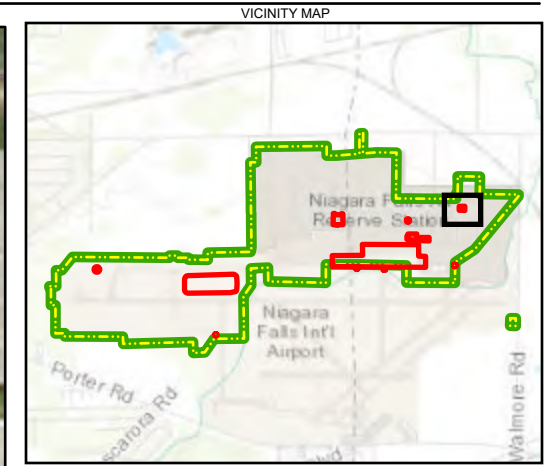
4. SCHEDULE

Task Name	Duration	Start	Finish
Development of UFP-QAPP Addendum 1	185 days	Wed 8/27/25	Wed 5/13/26
OPTION: New RI Sites Assigned	433 days	Mon 10/28/24	Thu 6/25/26
Second Mobilization	253 days	Tue 3/10/26	Fri 2/26/27
Source Area Surface Soil Sampling	5 days	Wed 5/27/26	Wed 6/3/26
Submit Trip Report documenting field activities	1 day	Wed 6/3/26	Thu 6/4/26
PDT Review and Approval of Trip Report	5 days	Thu 6/4/26	Thu 6/11/26
PAYMENT MILESTONE: PDT Approval of Trip Report	0 days	Thu 6/11/26	Thu 6/11/26
Data Analysis and Validation	21 days	Wed 6/3/26	Thu 7/2/26
Prepare and Submit Draft Data Report	5 days	Thu 7/2/26	Thu 7/9/26
PDT Review of Draft Data Report	5 days	Thu 7/9/26	Thu 7/16/26
Comment Resolution	3 days	Thu 7/16/26	Tue 7/21/26
PAYMENT MILESTONE: PDT Approval of Data Report	0 days	Tue 7/21/26	Tue 7/21/26
PDT Meeting to present results of second mobilization	1 day	Thu 7/2/26	Fri 7/3/26
Development of UFP-QAPP Addendum 3	15 days	Tue 6/9/26	Tue 6/30/26
Third Mobilization	253 days	Tue 3/10/26	Fri 2/26/27
Source Area Soil Boring and Groundwater Grab	15 days	Thu 7/9/26	Thu 7/30/26
Submit Trip Report documenting field activities	1 day	Thu 7/30/26	Fri 7/31/26
PDT Review and Approval of Trip Report	5 days	Fri 7/31/26	Fri 8/7/26
PAYMENT MILESTONE: PDT Approval of Trip Report	0 days	Fri 8/7/26	Fri 8/7/26
Data Analysis and Validation	21 days	Thu 7/30/26	Fri 8/28/26
Prepare and Submit Draft Data Report	5 days	Fri 8/28/26	Fri 9/4/26
PDT Review of Draft Data Report	5 days	Fri 9/4/26	Fri 9/11/26
Comment Resolution	3 days	Fri 9/11/26	Wed 9/16/26
PAYMENT MILESTONE: PDT Approval of Data Report	0 days	Wed 9/16/26	Wed 9/16/26
PDT Meeting to present results of third mobilization	1 day	Fri 8/28/26	Mon 8/31/26
Development of UFP-QAPP Addendum 4	15 days	Mon 8/31/26	Mon 9/21/26
OPTION: Additional Groundwater Grab and Soil Boring Sampling	120 days	Mon 8/31/26	Mon 2/15/27
Fourth Mobilization	186 days	Wed 10/21/26	Thu 7/8/27
Monitoring Well and Lysimeter Install and initial sampling	44 days	Wed 10/21/26	Tue 12/22/26
Submit Trip Report documenting field activities	1 day	Fri 12/25/26	Mon 12/28/26
PDT Review and Approval of Trip Report	10 days	Mon 12/28/26	Mon 1/11/27
PAYMENT MILESTONE: PDT Approval of Trip Report	0 days	Mon 1/11/27	Mon 1/11/27
Data Analysis and Validation	21 days	Tue 12/22/26	Wed 1/20/27
Prepare and Submit Draft Data Report	5 days	Wed 1/20/27	Wed 1/27/27
PDT Review of Draft Data Report	10 days	Wed 1/27/27	Wed 2/10/27
Comment Resolution	5 days	Wed 2/10/27	Wed 2/17/27
PAYMENT MILESTONE: PDT Approval of Data Report	0 days	Wed 2/17/27	Wed 2/17/27
Groundwater and Lysimeter Sampling Event 2	10 days	Tue 4/27/27	Tue 5/11/27
Submit Trip Report documenting field activities	1 day	Tue 5/18/27	Wed 5/19/27
PDT Review and Approval of Trip Report	10 days	Wed 5/19/27	Wed 6/2/27
PAYMENT MILESTONE: PDT Approval of Trip Report	0 days	Wed 6/2/27	Wed 6/2/27
Data Analysis and Validation	21 days	Tue 5/11/27	Wed 6/9/27

Prepare and Submit Draft Data Report	5 days	Wed 6/9/27	Wed 6/16/27
PDT Review of Draft Data Report	10 days	Wed 6/16/27	Wed 6/30/27
Comment Resolution	5 days	Wed 6/30/27	Wed 7/7/27
PAYMENT MILESTONE: PDT Approval of Data Report	0 days	Wed 7/7/27	Wed 7/7/27
PDT Meeting to present results of fourth mobilization	1 day	Wed 7/7/27	Thu 7/8/27

Attachments:

- 1) QAPP Addendum No. 2 Figure 17 Series
- 2) RTC Matrix



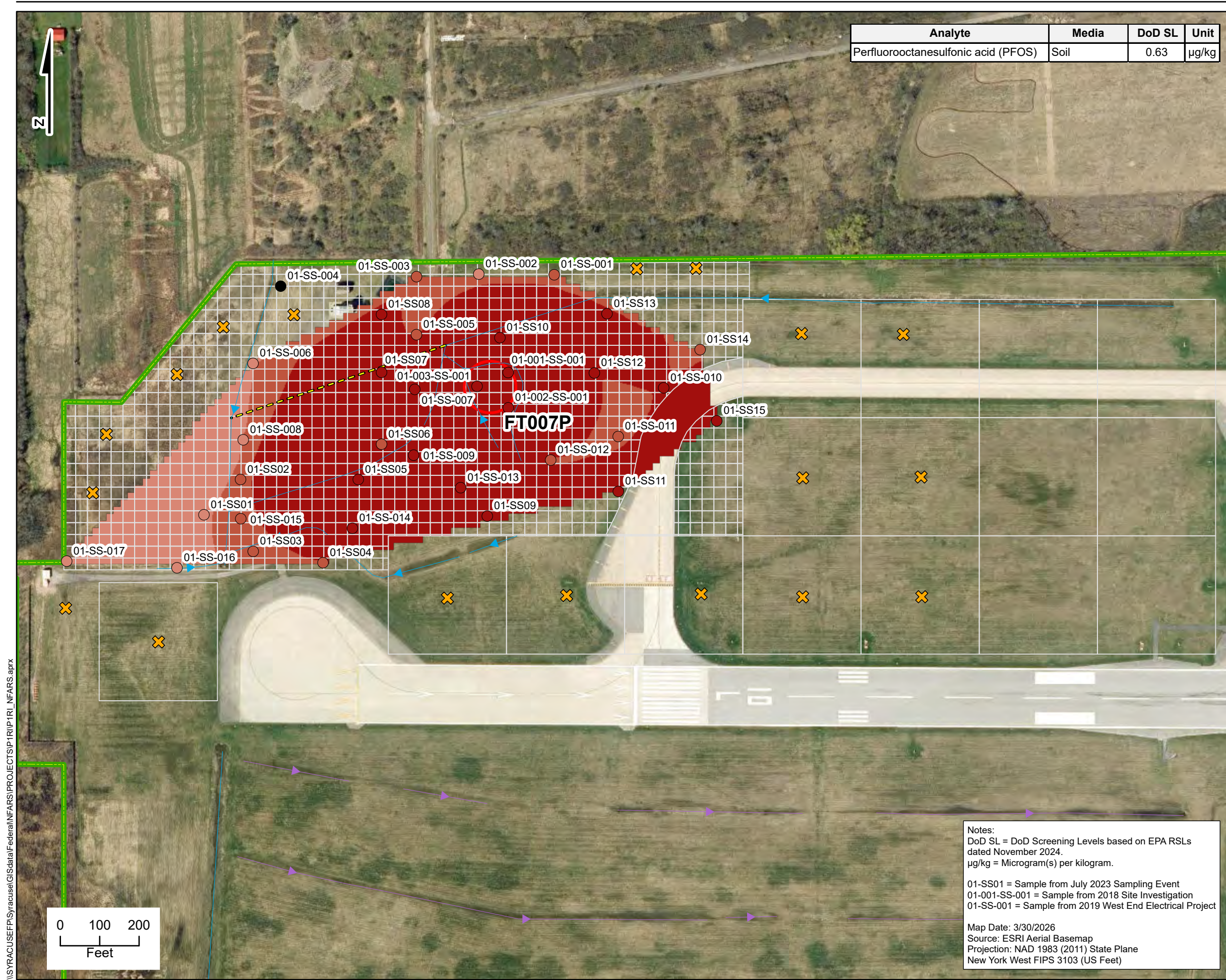
- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
- PFOS Concentration ($\mu\text{g}/\text{kg}$)**
- Surface Soil - Detection 100x Above SL
 - Existing Monitoring Well
 - Historical MILCON Sample Location

Map Date: 4/2/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

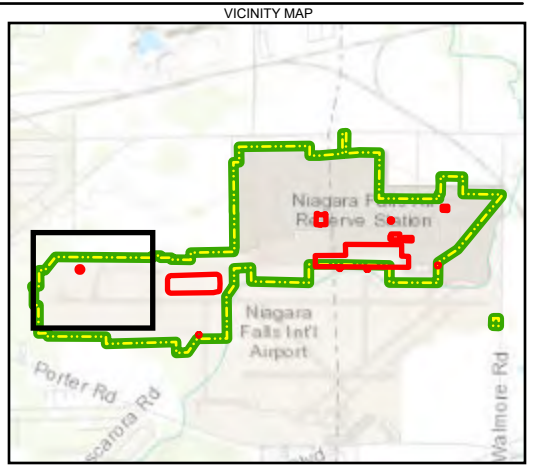
Figure 10-1a
SS420P Tank B Dike
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Surface Water/Stream
- Drainage Ditch/Pathway
- Former Drainage Feature
- 30x30' Sampling Grid
- 300x300' Sampling Grid

- PFOS Concentration (µg/kg)**
- Surface Soil - Non-Detect
 - Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

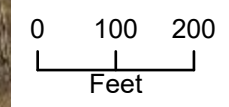
01-SS01 = Sample from July 2023 Sampling Event
 01-001-SS-001 = Sample from 2018 Site Investigation
 01-SS-001 = Sample from 2019 West End Electrical Project

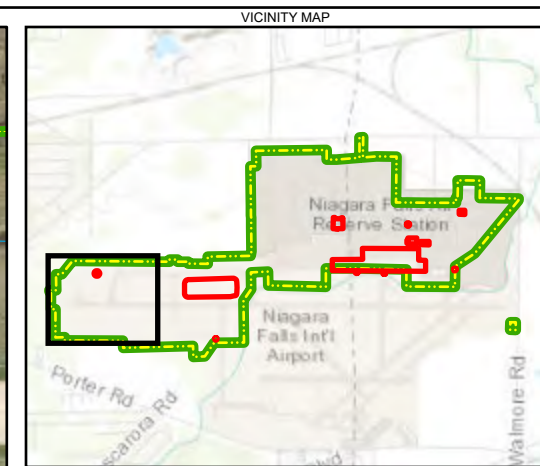
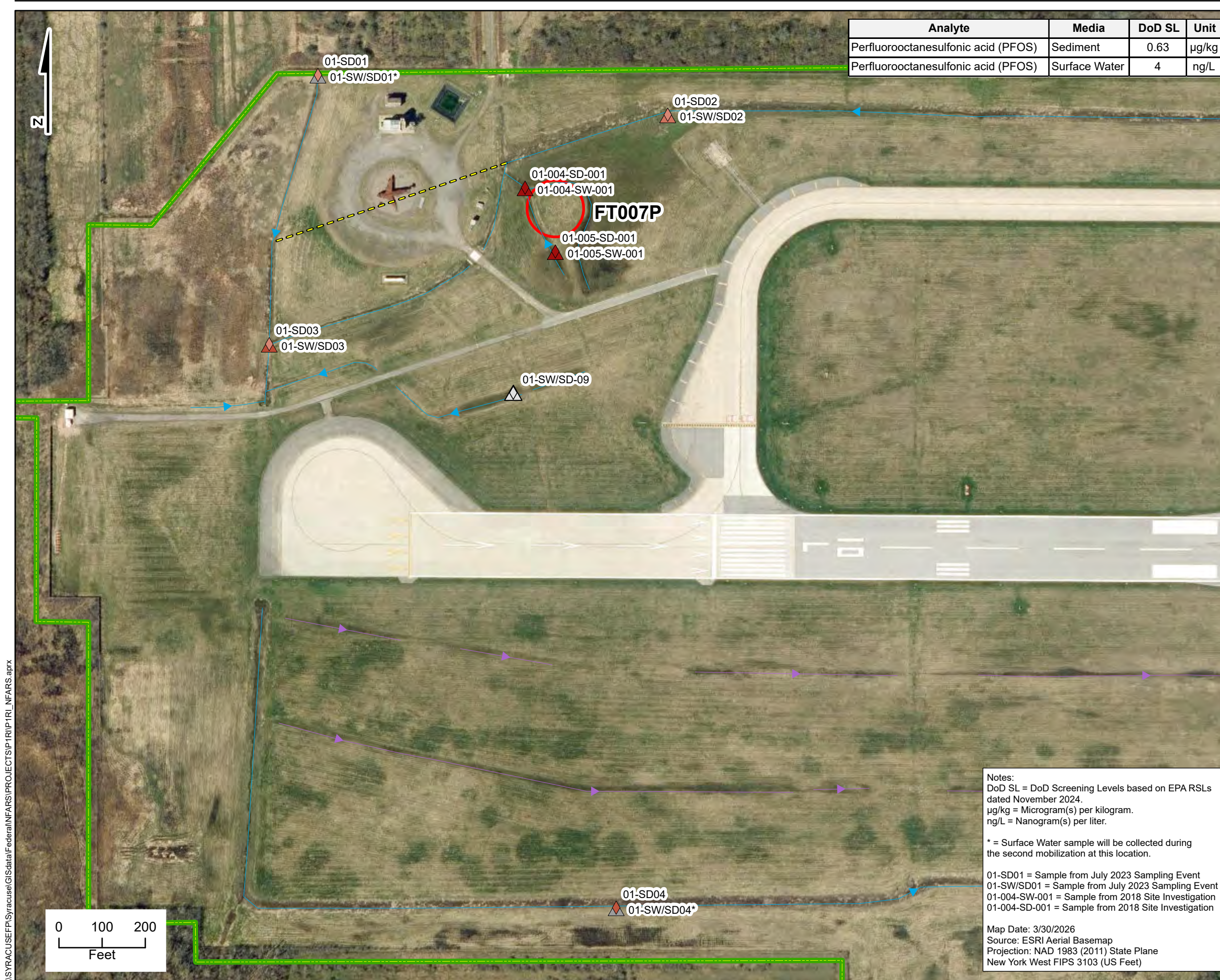
Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-1a
Proposed Second Mobilization Surface
Soil Sampling Locations at FT007P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Surface Water/Stream
- Drainage Ditch/Pathway
- Former Drainage Feature

PFOS Concentration (µg/kg)

- Sediment - Detection 1x Above SL
- Sediment - Detection 10x Above SL
- Sediment - Detection 100x Above SL

PFOS Concentration (ng/L)

- Surface Water - Not Sampled
- Surface Water - Detection 1x Above SL
- Surface Water - Detection 10x Above SL
- Surface Water - Detection 100x Above SL
- Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

* = Surface Water sample will be collected during the second mobilization at this location.

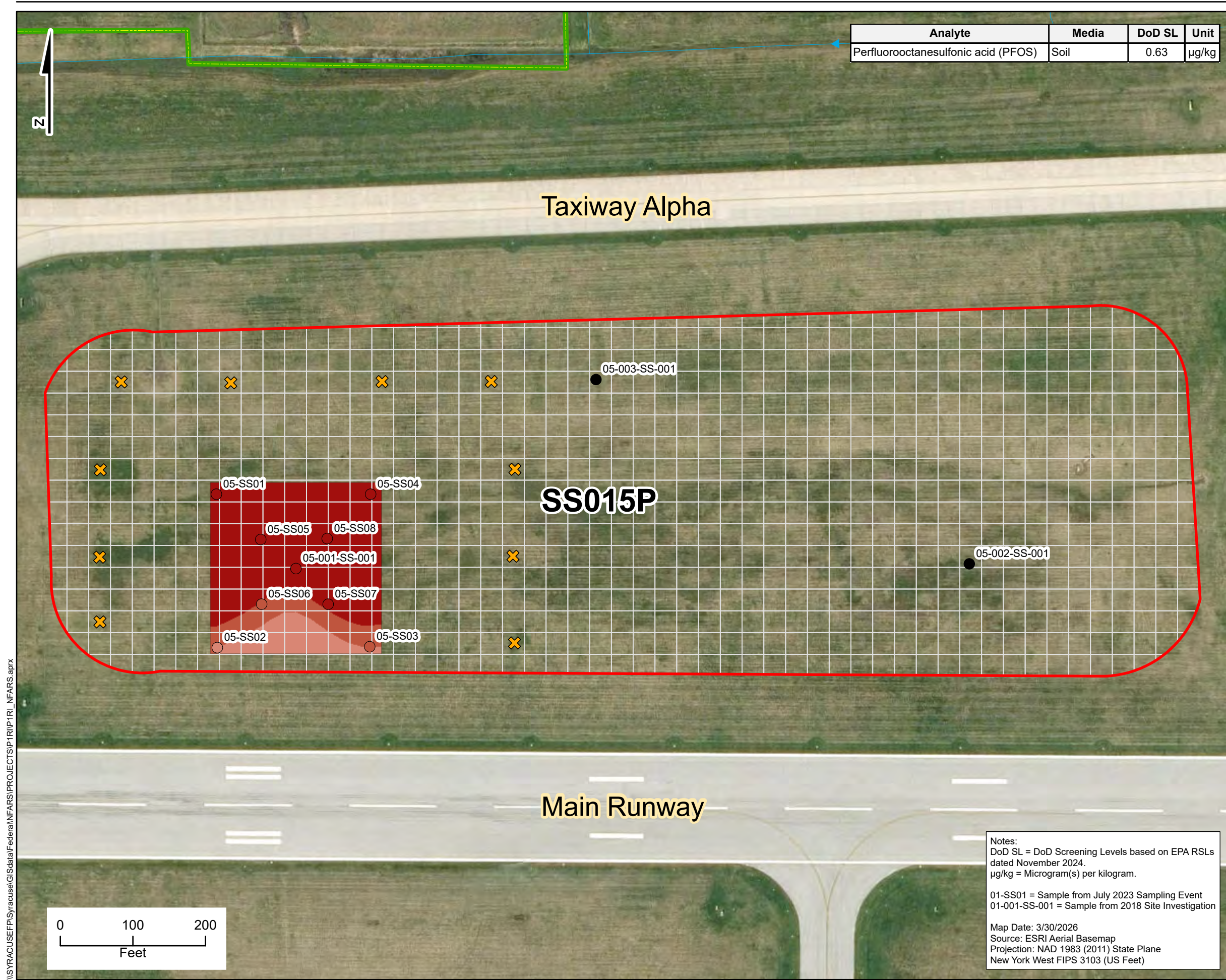
01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 01-004-SW-001 = Sample from 2018 Site Investigation
 01-004-SD-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

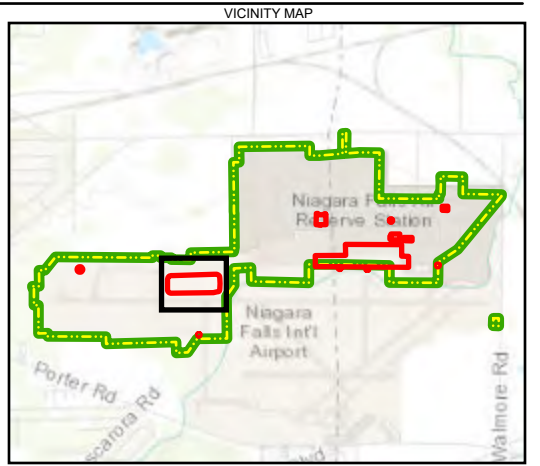
Figure 17-1b
Proposed Second Mobilization Surface Water Sampling Locations at FT007P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- 30x30' Sampling Grid
- Surface Water/Stream
- Drainage Ditch/Pathway

PFOS Concentration (µg/kg)

- Surface Soil - Non-Detect
- Surface Soil - Detection 1x Above SL
- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL

PFOS Concentration (µg/kg)

- Surface Soil - Detection 1x Above SL
- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL
- Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

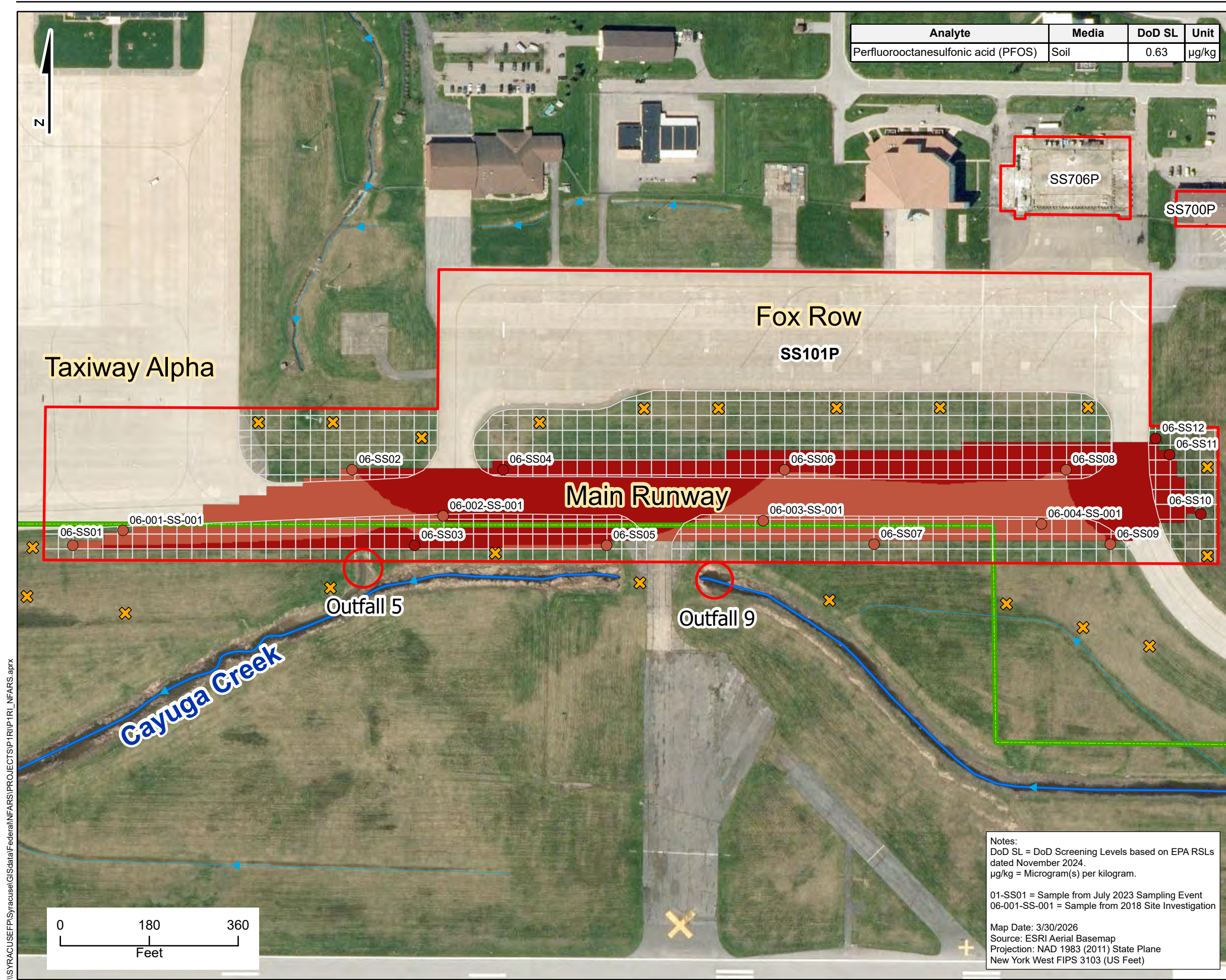
01-SS01 = Sample from July 2023 Sampling Event
 01-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

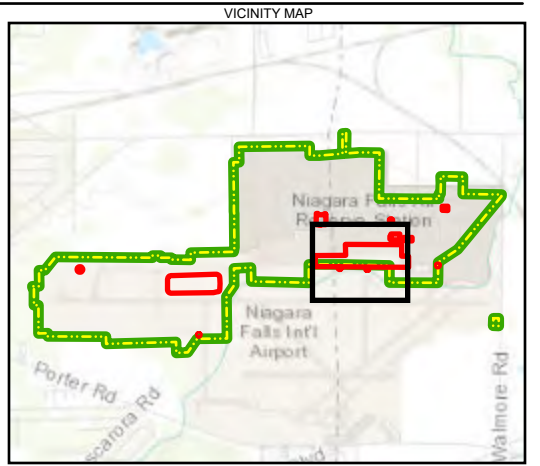
Figure 17-2a
Proposed Second Mobilization Surface
Soil Sampling Locations at SS015P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Outfall Location
- 30x30' Sampling Grid
- Surface Water/Stream

PFOS Concentration (µg/kg)

- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL

PFOS Concentration (µg/kg)

- Surface Soil - Detection 10x Above SL
- Surface Soil - Detection 100x Above SL
- Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

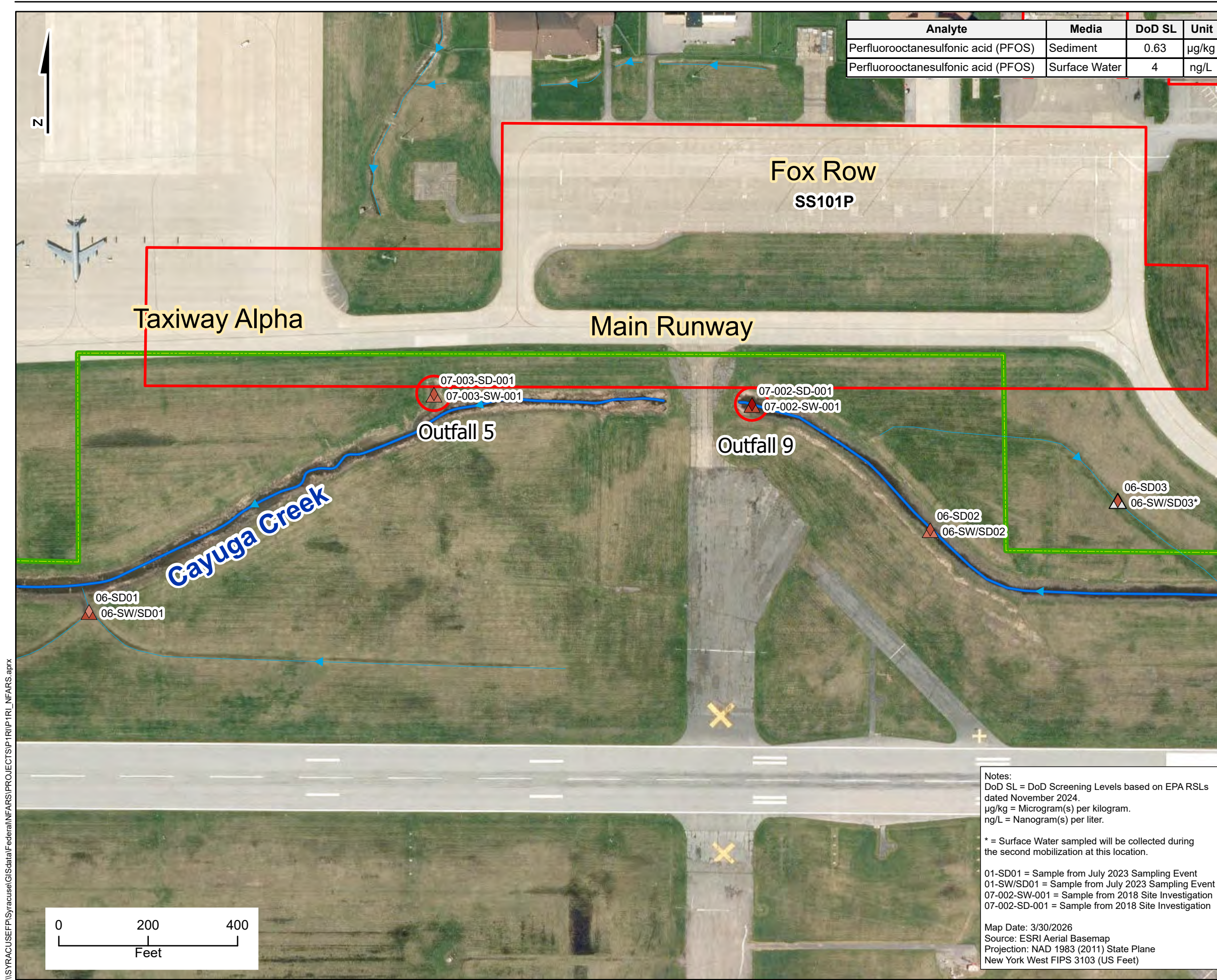
01-SS01 = Sample from July 2023 Sampling Event
 06-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

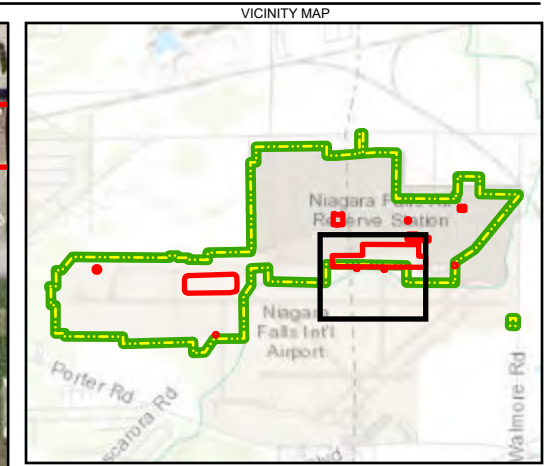
Figure 17-3a
Proposed Second Mobilization Surface
Soil Sampling Locations at SS101P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Sediment	0.63	µg/kg
Perfluorooctanesulfonic acid (PFOS)	Surface Water	4	ng/L



- Legend**
- ▬ NFARS Boundary
 - ▬ Approximate AFFF Release Area
 - Outfall Location
 - Surface Water/Stream

- PFOS Concentration (µg/kg)**
- ◆ Sediment - Detection 1x Above SL
 - ◆ Sediment - Detection 10x Above SL
 - ◆ Sediment - Detection 100x Above SL

- PFOS Concentration (ng/L)**
- ▲ Surface Water - Detection 1x Above SL
 - ▲ Surface Water - Detection 10x Above SL
 - ▲ Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

* = Surface Water sampled will be collected during the second mobilization at this location.

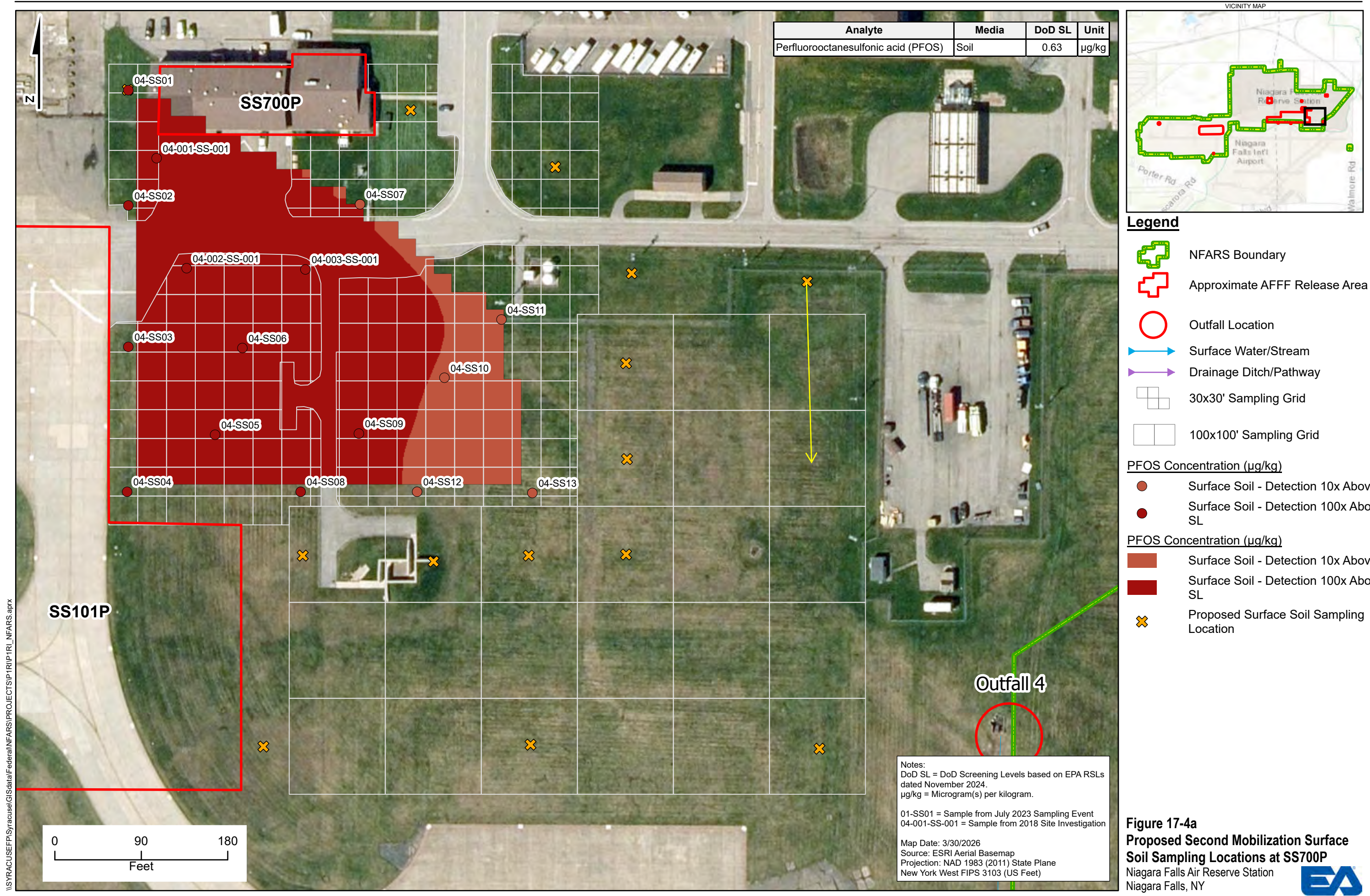
01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-002-SW-001 = Sample from 2018 Site Investigation
 07-002-SD-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

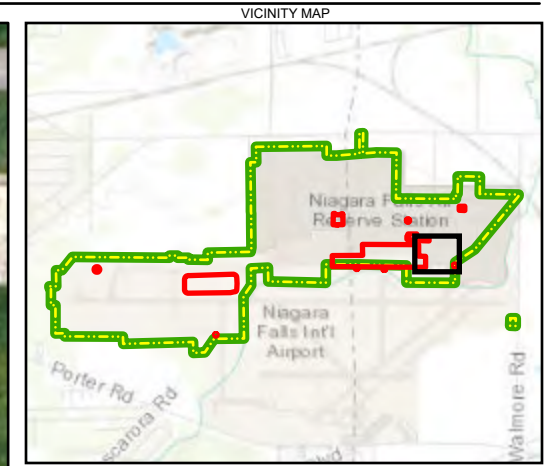
Figure 17-3b
Proposed Second Mobilization Surface Water Sampling Locations at SS101P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - Outfall Location
 - Surface Water/Stream
 - Drainage Ditch/Pathway
 - 30x30' Sampling Grid
 - 100x100' Sampling Grid
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location

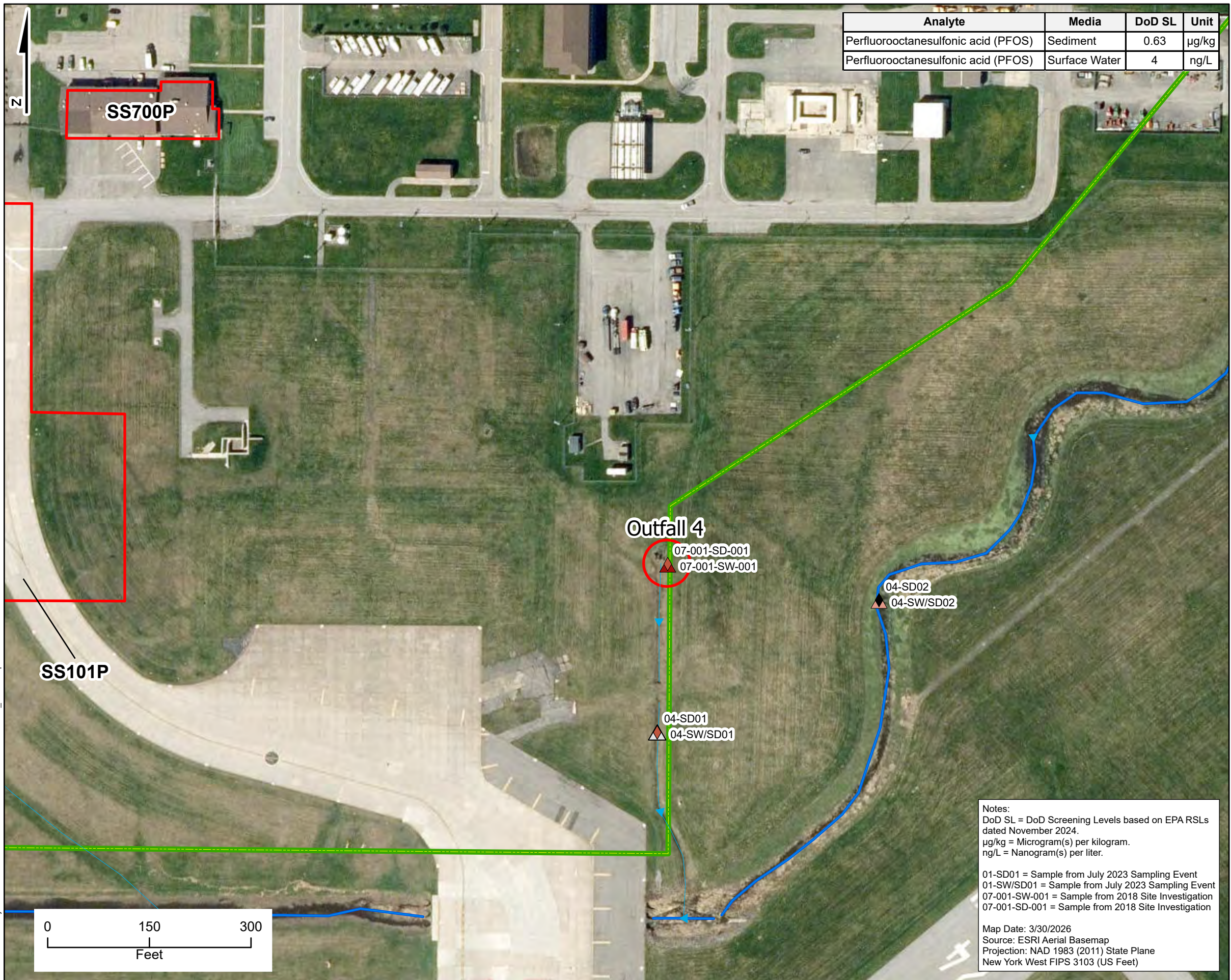
Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

01-SS01 = Sample from July 2023 Sampling Event
 04-001-SS-001 = Sample from 2018 Site Investigation

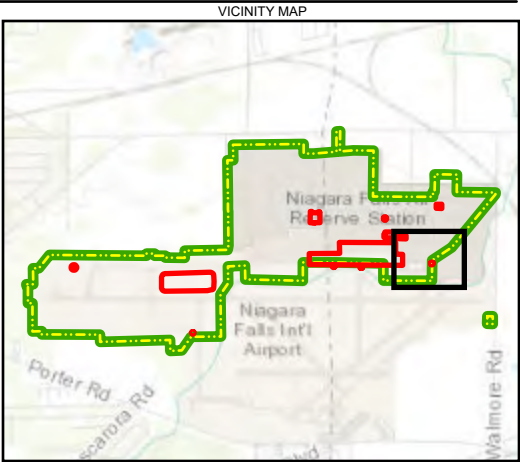
Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-4a
Proposed Second Mobilization Surface Soil Sampling Locations at SS700P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY





Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Sediment	0.63	µg/kg
Perfluorooctanesulfonic acid (PFOS)	Surface Water	4	ng/L



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Outfall Location
- Surface Water/Stream
- Drainage Ditch/Pathway

PFOS Concentration (µg/kg)

- Sediment - Non-Detect
- Sediment - Detection 10x Above SL

PFOS Concentration (ng/L)

- Surface Water - Detection Below SL
- Surface Water - Detection 100x Above SL
- Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-001-SW-001 = Sample from 2018 Site Investigation
 07-001-SD-001 = Sample from 2018 Site Investigation

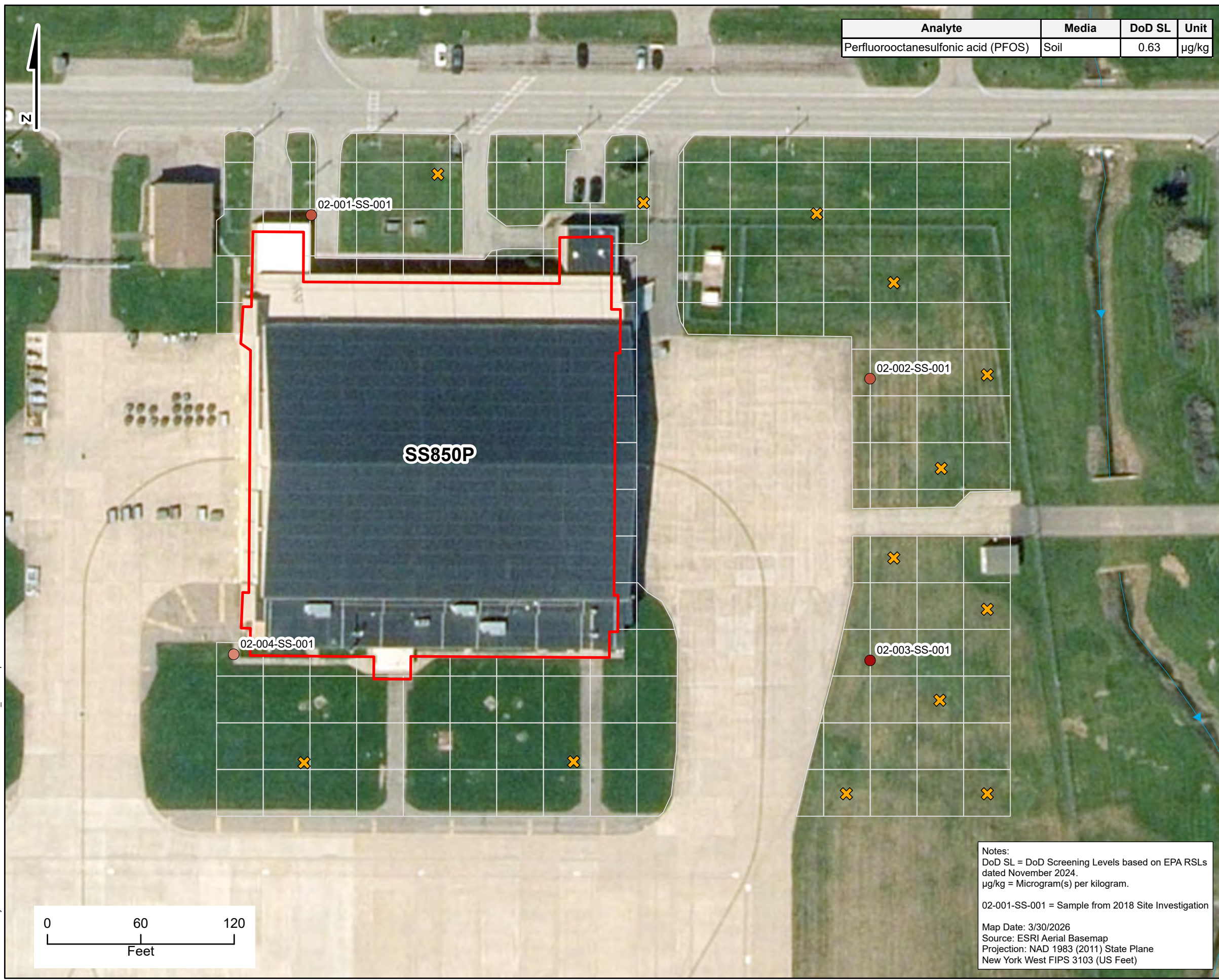
Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-4b
Proposed Second Mobilization Surface
Water Sampling Locations at SS700P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY

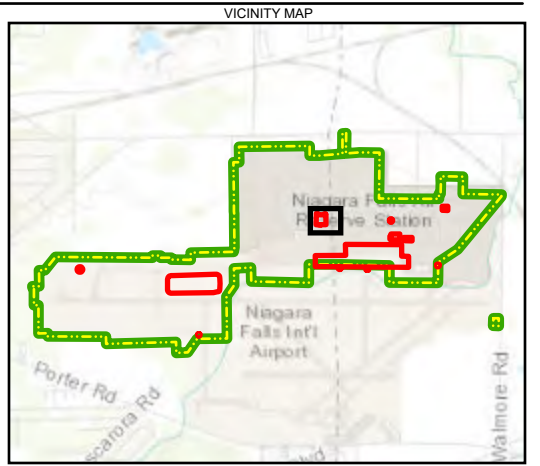


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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Surface Water/Stream
 - Drainage Ditch/Pathway

- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

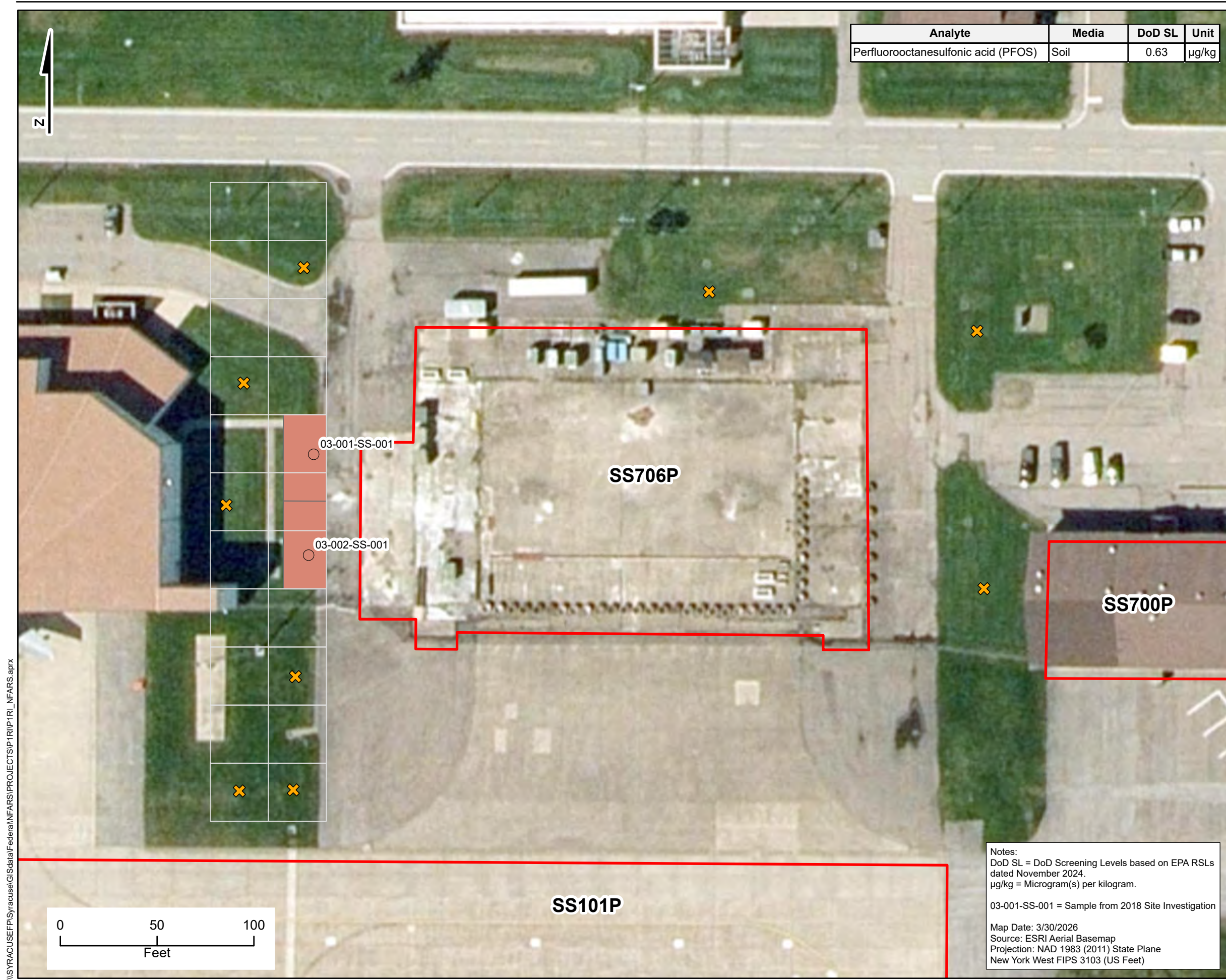
02-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

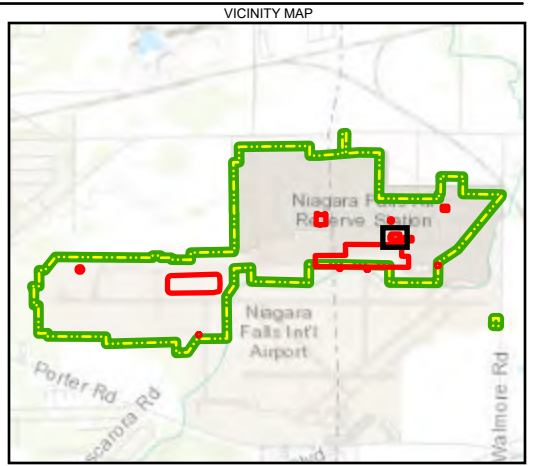
Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-5a
Proposed Second Mobilization Surface Soil Sampling Locations at SS850P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY





Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Drainage Ditch/Pathway
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 1x Above SL
 - Proposed Surface Soil Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

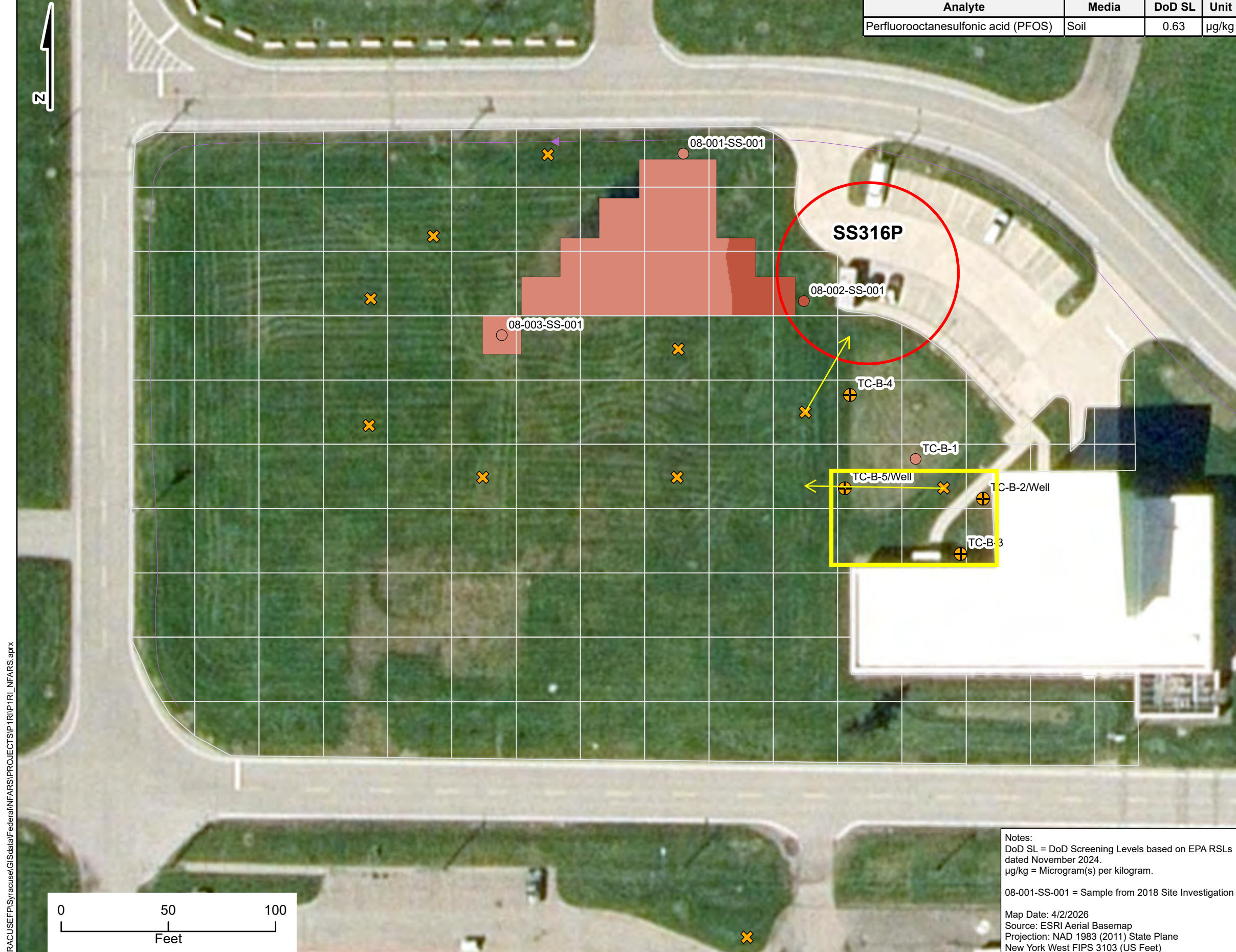
03-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane New York West FIPS 3103 (US Feet)

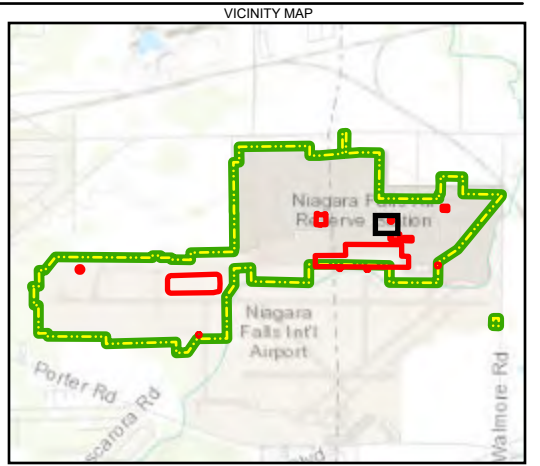
Figure 17-6a
Proposed Second Mobilization Surface Soil Sampling Locations at SS706P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Soil	0.63	µg/kg



- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Drainage Ditch/Pathway

- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 1x Above SL
 - Surface Soil - Detection 10x Above SL
 - Historical MILCON Sample Location
 - Proposed Surface Soil Sampling Location

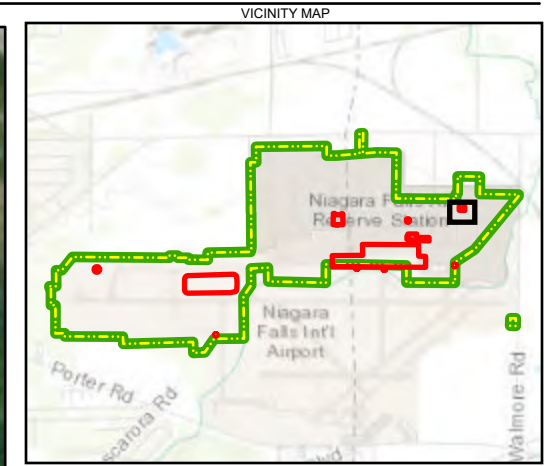
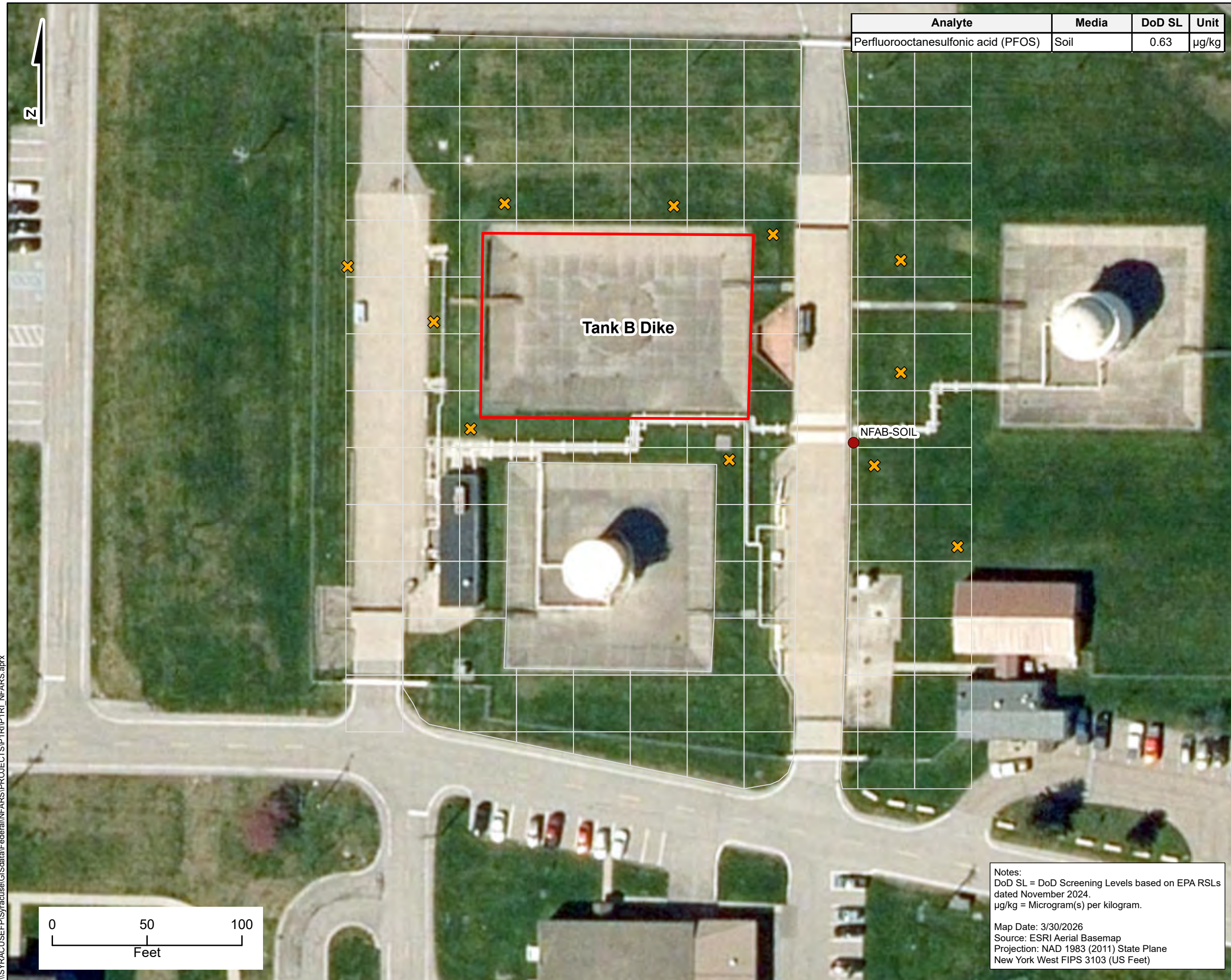
Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 08-001-SS-001 = Sample from 2018 Site Investigation

Map Date: 4/2/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane New York West FIPS 3103 (US Feet)

Figure 17-7a
Proposed Second Mobilization Surface Soil Sampling Locations at SS316P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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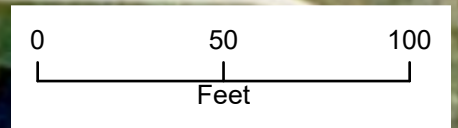
- Legend**
- NFARS Boundary
 - Approximate AFFF Release Area
 - 30x30' Sampling Grid
 - Surface Water/Stream
 - Drainage Ditch/Pathway
- PFOS Concentration (µg/kg)**
- Surface Soil - Detection 100x Above SL
 - Proposed Surface Soil Sampling Location

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-8a
Proposed Second Mobilization Surface
Soil Sampling Locations at SS420P
 Niagara Falls Air Reserve Station
 Niagara Falls, NY

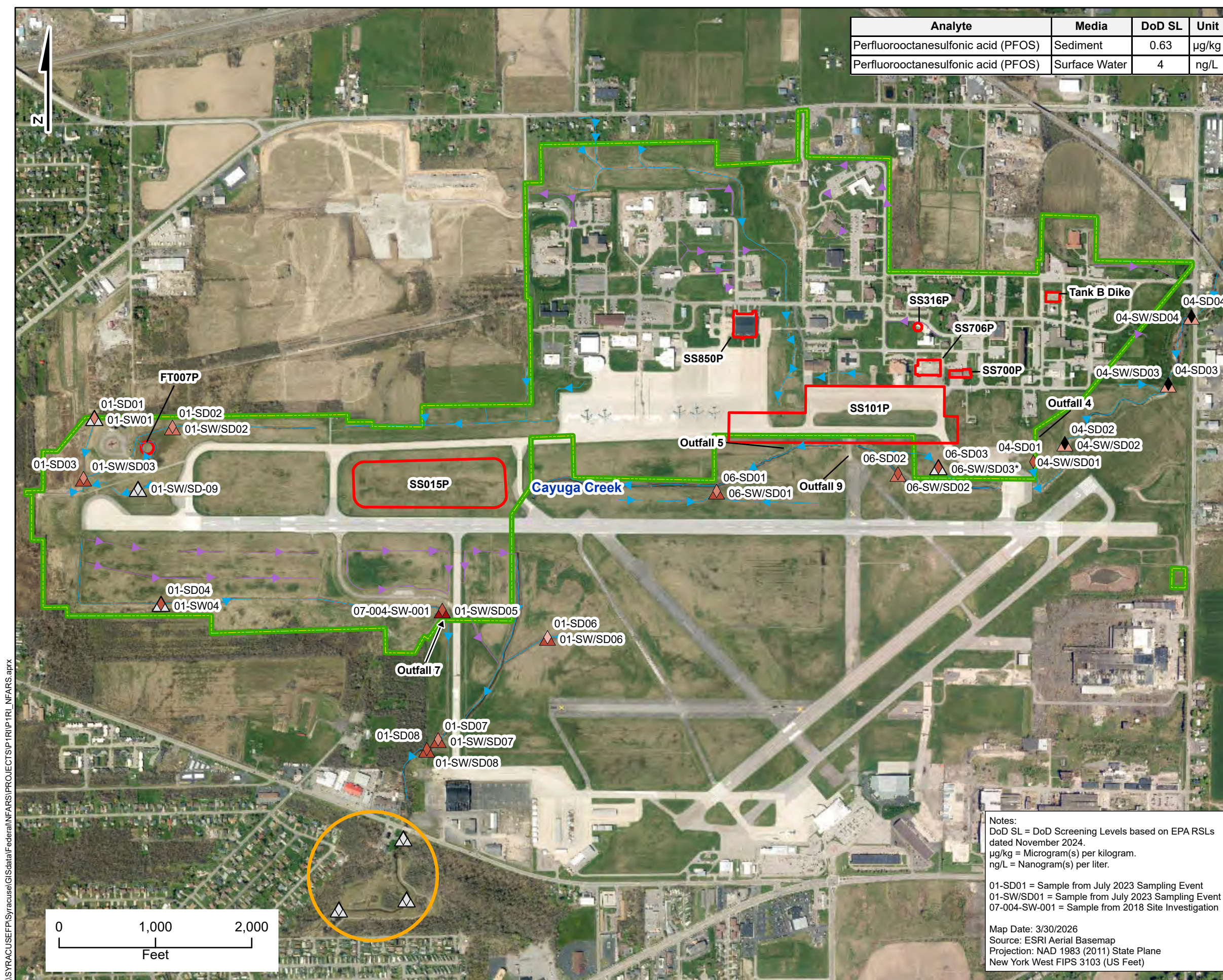


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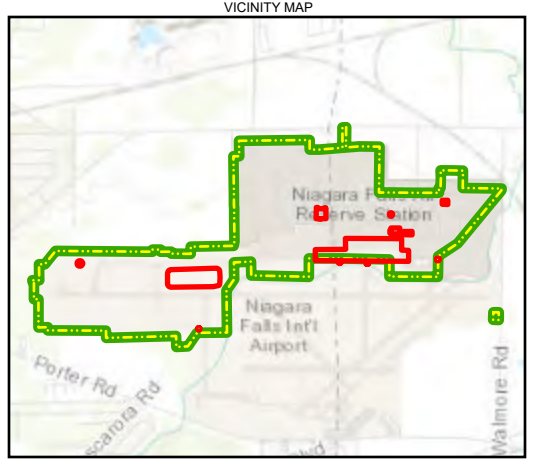


Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)



Analyte	Media	DoD SL	Unit
Perfluorooctanesulfonic acid (PFOS)	Sediment	0.63	µg/kg
Perfluorooctanesulfonic acid (PFOS)	Surface Water	4	ng/L



Legend

- NFARS Boundary
- Approximate AFFF Release Area
- Off-installation SW/SED Investigation Area
- Surface Water/Stream
- Drainage Ditch/Pathway

PFOS Concentration (µg/kg)

- Sediment - Non-Detect
- Sediment - Detection Below SL
- Sediment - Detection 1x Above SL
- Sediment - Detection 10x Above SL

PFOS Concentration (ng/L)

- Surface Water - Detection Below SL
- Surface Water - Detection 1x Above SL
- Surface Water - Detection 10x Above SL
- Surface Water - Detection 100x Above SL
- Proposed Supplemental Surface Water/Sediment Sampling Location

Notes:
 DoD SL = DoD Screening Levels based on EPA RSLs dated November 2024.
 µg/kg = Microgram(s) per kilogram.
 ng/L = Nanogram(s) per liter.

01-SD01 = Sample from July 2023 Sampling Event
 01-SW/SD01 = Sample from July 2023 Sampling Event
 07-004-SW-001 = Sample from 2018 Site Investigation

Map Date: 3/30/2026
 Source: ESRI Aerial Basemap
 Projection: NAD 1983 (2011) State Plane
 New York West FIPS 3103 (US Feet)

Figure 17-9a
Proposed Second Mobilization Surface Water and Sediment Sampling Locations Site-Wide
 Niagara Falls Air Reserve Station
 Niagara Falls, NY



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Appendix B

Laboratory Standard Operating Procedures and Certifications



QAPP Worksheet #15A — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

Matrix: Soil/Solids

Analytical Group: PFAS

Analytical SOP: ENV-SOP-WCOL-0166

Analytical Method: EPA 1633

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) µg/kg	Limit of Detection (LOD) µg/kg	Detection Limit (DL) µg/kg	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
Perfluoroalkyl carboxylic acids (PFCA)								
Pentafluoropropanoic acid	PFPrA	422-64-0	0.80	0.72	0.67		70-140%	≤30%
Perfluorobutanoic acid	PFBA	375-22-4	0.80	0.40	0.25		70-140%	≤30%
Perfluoropentanoic acid	PFPeA	2706-90-3	0.40	0.20	0.15		60-150%	≤30%
Perfluorohexanoic acid	PFHxA	307-24-4	0.20	0.10	0.04		65-140%	≤30%
Perfluoroheptanoic acid	PFHpA	375-85-9	0.20	0.10	0.07		65-145%	≤30%
Perfluorooctanoic acid	PFOA	335-67-1	0.20	0.15	0.11		70-150%	≤30%
Perfluorononanoic acid	PFNA	375-95-1	0.20	0.10	0.10		70-155%	≤30%
Perfluorodecanoic acid	PFDA	335-76-2	0.20	0.15	0.11		70-155%	≤30%
Perfluoroundecanoic acid	PFUnA	2058-94-8	0.20	0.10	0.10		70-155%	≤30%
Perfluorododecanoic acid	PFDoA	307-55-1	0.20	0.10	0.10		70-150%	≤30%
Perfluorotridecanoic acid	PFTTrDA	72629-94-8	0.20	0.10	0.06		65-150%	≤30%
Perfluorotetradecanoic acid	PFTeDA	376-06-7	0.20	0.10	0.10		65-150%	≤30%
Perfluoroalkyl sulfonic acids (PFSA)								
Perfluorobutanesulfonic acid	PFBS	375-73-5	0.20	0.09	0.08		65-145%	≤30%

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) µg/kg	Limit of Detection (LOD) µg/kg	Detection Limit (DL) µg/kg	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	0.20	0.09	0.05		55-160%	≤30%
Perfluorohexanesulfonic acid	PFHxS	355-46-4	0.20	0.09	0.07		60-150%	≤30%
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	0.20	0.10	0.08		65-155%	≤30%
Perfluorooctanesulfonic acid	PFOS	1763-23-1	0.20	0.14	0.12		65-160%	≤30%
Perfluorononanesulfonic acid	PFNS	68259-12-1	0.20	0.10	0.08		55-140%	≤30%
Perfluorodecanesulfonic acid	PFDS	335-77-3	0.20	0.10	0.04		40-155%	≤30%
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	0.20	0.10	0.07		25-160%	≤30%
Fluorotelomer sulfonic acids (FTSA)								
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2FTS	757124-72-4	0.80	0.37	0.30		60-150%	≤30%
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2	0.80	0.57	0.52		55-200%	≤30%
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4	0.80	0.38	0.25		70-150%	≤30%
Fluorooctane sulfonamides (FOSA)								
Perfluorooctanesulfonamide	PFOSA	754-91-6	0.20	0.10	0.08		70-140%	≤30%
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	0.20	0.10	0.06		70-155%	≤30%
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	0.20	0.10	0.08		70-140%	≤30%
Perfluorooctane sulfonamidoacetic acids (FOSAA)								
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	0.20	0.15	0.15		65-155%	≤30%

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) µg/kg	Limit of Detection (LOD) µg/kg	Detection Limit (DL) µg/kg	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	0.20	0.10	0.09		65-165%	≤30%
Perfluorooctane sulfonamide ethanols (FOSE)								
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7	2.0	1.0	0.64		70-140%	≤30%
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2	2.0	1.0	0.67		70-135%	≤30%
Per- and polyfluoroether carboxylic acids								
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	0.80	0.40	0.21		70-145%	≤30%
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	0.80	0.38	0.18		70-160%	≤30%
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	0.40	0.20	0.13		30-140%	≤30%
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	0.40	0.20	0.14		60-150%	≤30%
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	0.40	0.20	0.16		60-155%	≤30%
Ether sulfonic acids								
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	0.80	0.37	0.21		70-150%	≤30%
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	0.80	0.38	0.21		45-160%	≤30%
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	0.40	0.18	0.08		70-140%	≤30%
Fluorotelomer carboxylic acids (FTCA)								
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5	1.0	0.75	0.54		45-130%	≤30%



Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) $\mu\text{g}/\text{kg}$	Limit of Detection (LOD) $\mu\text{g}/\text{kg}$	Detection Limit (DL) $\mu\text{g}/\text{kg}$	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-3	5.0	2.5	1.67		60-130%	$\leq 30\%$
3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4	5.0	2.5	1.81		60-150%	$\leq 30\%$
Other								
Bis(trifluoromethane)sulfonimide	HQ-115/ TFSI	82113-65-3	0.40	0.20	0.08		70-140%	$\leq 30\%$

NOTE: Laboratory DLs are subject to change.



QAPP Worksheet #15B — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

Matrix: Non-Potable Water

Analytical Group: PFAS

Analytical SOP: ENV-SOP-WCOL-0166

Analytical Method: EPA 1633

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) ng/L	Limit of Detection (LOD) ng/L	Detection Limit (DL) ng/L	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
Perfluoroalkyl carboxylic acids (PFCA)								
Pentafluoropropanoic acid	PFPrA	422-64-0	6.4	3.2	2.50		70-140%	≤30%
Perfluorobutanoic acid	PFBA	375-22-4	6.4	3.2	0.95		70-140%	≤30%
Perfluoropentanoic acid	PFPeA	2706-90-3	3.2	1.6	0.44		65-135%	≤30%
Perfluorohexanoic acid	PFHxA	307-24-4	1.6	0.8	0.24		70-145%	≤30%
Perfluoroheptanoic acid	PFHpA	375-85-9	1.6	0.8	0.32		70-150%	≤30%
Perfluorooctanoic acid	PFOA	335-67-1	1.6	0.8	0.73		70-150%	≤30%
Perfluorononanoic acid	PFNA	375-95-1	1.6	0.8	0.61		70-150%	≤30%
Perfluorodecanoic acid	PFDA	335-76-2	1.6	0.8	0.49		70-140%	≤30%
Perfluoroundecanoic acid	PFUnA	2058-94-8	1.6	1.2	0.82		70-145%	≤30%
Perfluorododecanoic acid	PFDoA	307-55-1	1.6	0.8	0.19		70-140%	≤30%
Perfluorotridecanoic acid	PFTTrDA	72629-94-8	1.6	0.8	0.61		65-140%	≤30%
Perfluorotetradecanoic acid	PFTeDA	376-06-7	1.6	0.8	0.43		60-140%	≤30%
Perfluoroalkyl sulfonic acids (PFSA)								
Perfluorobutanesulfonic acid	PFBS	375-73-5	1.6	1.4	1.21		60-145%	≤30%

Updated: October 2025

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) ng/L	Limit of Detection (LOD) ng/L	Detection Limit (DL) ng/L	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
Perfluoropentansulfonic acid	PFPeS	2706-91-4	1.6	0.75	0.44		65-140%	≤30%
Perfluorohexanesulfonic acid	PFHxS	355-46-4	1.6	0.73	0.71		65-145%	≤30%
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	1.6	0.76	0.58		70-150%	≤30%
Perfluorooctanesulfonic acid	PFOS	1763-23-1	1.6	0.74	0.55		55-150%	≤30%
Perfluorononanesulfonic acid	PFNS	68259-12-1	1.6	0.77	0.47		65-145%	≤30%
Perfluorodecanesulfonic acid	PFDS	335-77-3	1.6	0.77	0.41		60-145%	≤30%
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	1.6	0.77	0.36		50-145%	≤30%
Fluorotelomer sulfonic acids (FTSA)								
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2FTS	757124-72-4	6.4	3.0	1.68		70-145%	≤30%
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2	6.4	3.0	2.07		65-155%	≤30%
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4	6.4	3.1	2.47		60-150%	≤30%
Fluorooctane sulfonamides (FOSA)								
Perfluorooctanesulfonamide	PFOSA	754-91-6	1.6	0.80	0.29		70-145%	≤30%
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	1.6	0.80	0.30		60-150%	≤30%
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	1.6	0.80	0.44		65-145%	≤30%
Perfluorooctane sulfonamidoacetic acids (FOSAA)								
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	1.6	0.80	0.30		50-140%	≤30%

Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) ng/L	Limit of Detection (LOD) ng/L	Detection Limit (DL) ng/L	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	1.6	1.20	0.93		70-145%	≤30%
Perfluorooctane sulfonamide ethanols (FOSE)								
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7	16	8	3.30		70-145%	≤30%
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2	16	8	3.02		70-135%	≤30%
Per- and polyfluoroether carboxylic acids								
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	6.4	3.2	1.15		70-140%	≤30%
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	6.4	3.0	1.02		65-145%	≤30%
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	3.2	1.6	0.72		55-140%	≤30%
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	3.2	1.6	0.53		60-150%	≤30%
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	3.2	1.6	0.79		50-150%	≤30%
Ether sulfonic acids								
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	6.4	3.0	1.06		70-155%	≤30%
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	6.4	3.0	0.95		55-160%	≤30%
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	3.2	1.4	0.30		70-140%	≤30%
Fluorotelomer carboxylic acids (FTCA)								
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5	8.0	4.0	1.51		65-130%	≤30%



Analyte	Acronym	CAS Number	Limit of Quantitation (LOQ) ng/L	Limit of Detection (LOD) ng/L	Detection Limit (DL) ng/L	Screening Standard and Source	Accuracy Control Limit (%R)	Precision Control Limit RPD
2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-3	40	20	6.65		70-135%	≤30%
3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4	40	20	8.09		50-145%	≤30%
Other								
Bis(trifluoromethane)sulfonimide	TFSI	82113-65-3	3.2	1.6	0.51		70-140%	≤30%

NOTE: Laboratory DLs are subject to change.



QAPP Worksheet #19 and #30 — Sample Containers, Preservation, and Holding Times

Analytical Group	Matrix	Method/SOP	Accreditation Expiration Date	Container	Preservation Requirements	Preparation Holding Time	Analytical Holding Time
Per- and Polyfluoroalkyl Substances (PFAS)	Soil/Solids	EPA 1633/ ENV-SOP- WCOL-0166	11/18/2025	PP w/PP linerless cap 1 x 90 mL	Cool, 0-6C ¹	90 days	90 days
Per- and Polyfluoroalkyl Substances (PFAS)	Non-Potable Water	EPA 1633/ ENV-SOP- WCOL-0166	11/18/2025	HDPE w/PP linerless cap 2 x 250 mL	Cool, 0-6C ¹ Freeze, ≤-20C ²	28 days 90 days	90 days

- 1 Maintain all samples protected from light at 0 - 6 °C from the time of collection until shipped to the laboratory. Samples must be shipped as soon as practical with sufficient ice to maintain the sample temperature below 6 °C during transport and be received by the laboratory within 48 hours of collection. The laboratory must confirm that the sample temperature is 0 - 6 °C upon receipt.
- 2 If requested by client, preparation holding time can be extended to 90 days if stored ≤-20C at time of receipt. Must be requested in writing prior to sample receipt and additional fees may apply.



QAPP Worksheet #23 — Analytical SOPs

Lab SOP Number#	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument/ Equipment	Organization Performing Analysis	Modified for Project Work? (Y/N)
ENV-SOP-WCOL-0166	PFAS by Method 1633 and 1633A (250 mL Sample Volume), v01	Definitive	NPW and Solids/PFAS (DoD B-24)	Sciex 5500 Triple Quad LC-MS/MS	Pace West Columbia, SC	N



QAPP Worksheet #24 — Analytical Instrument Calibration

Instrument/ Equipment	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person(s) responsible for CA	SOP Reference
LC-MS/MS	Mass Calibration, Mass Calibration Verification	<p>Instrument must have a valid mass calibration prior to any sample analysis and updated on an as-needed basis (e.g., QC failures, ion masses fall outside of the ± 0.5 amu of the true value, major maintenance or the instrument is moved).</p> <p>Mass calibration is verified after each mass calibration, prior to initial calibration (ICAL).</p>	<p>Calibrate the mass scale of the MS with calibration compounds and procedures described by the manufacturer.</p> <p>Mass calibration range must bracket the ion masses of interest. The most recent mass calibration must be used for every acquisition in an analytical run.</p> <p>Mass Calibration Verification must meet manufacturer's acceptance criteria.</p>	<p>If the mass calibration fails, then recalibrate. If it fails again, consult manufacturer instructions on corrective maintenance.</p> <p>Flagging is not appropriate. Problem must be corrected.</p>	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166

Instrument/ Equipment	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person(s) responsible for CA	SOP Reference
LC-MS/MS	Bile Salt Check	Daily, prior to analysis of all matrix types (aqueous, solid, tissue, and AFFF).	<p>All EPA 1633 requirements for evaluation of the relationship of the retention time of the bile salt peak(s) to the retention time window of PFOS must be met for all matrix types. The retention time window of PFOS applies to the retention time of all isomers of PFOS.</p> <p>No samples shall be analyzed until acceptance criteria for the bile salt standard(s) has been met.</p> <p>The retention time of the bile salt(s) peak must fall out of the retention time window of PFOS by at least one minute.</p>	NA	Analyst	ENV-SOP- WCOL- 0166

Instrument/ Equipment	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person(s) responsible for CA	SOP Reference
LC-MS/MS	Initial Calibration (ICAL)	At instrument set-up, after major maintenance, and after ICV or CCV failure, prior to sample analysis.	<p>One of the following two approaches must be used to evaluate the linearity of the instrument calibration. Weighting (typically 1/x or 1/x²) is allowed for linear and non-linear regressions.</p> <p>Option 1: Calculate the relative standard deviation (RSD) of the RR or RF values of the initial calibration standards for each native compound and isotopically labeled compound. The RSD must be ≤ 20% to establish instrument linearity.</p> <p>Option 2: Calculate the relative standard error (RSE) of the initial calibration standards for each native compound and isotopically labeled compound. The RSE for all method analytes must be ≤ 20% to establish instrument linearity.</p> <p>Commercial PFAS standards available as salts are acceptable providing the measured mass is corrected to the neutral acid concentration. Results shall be reported as the neutral acid with appropriate CAS number.</p>	<p>Correct problem, then repeat ICAL.</p> <p>Flagging is not appropriate. No samples shall be analyzed until the ICAL has passed.</p>	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166

Instrument/ Equipment	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person(s) responsible for CA	SOP Reference
LC-MS/MS	Instrument blank (IBLK)	Immediately following the highest standard analyzed, daily prior to sample analysis, and after each bracketing CCV.	Concentration of each analyte must be $\leq \frac{1}{2}$ the LOQ. Instrument Blank must contain EIS to enable quantitation of contamination.	If acceptance criteria are not met after the highest calibration standard, calibration must be performed using a lower concentration for the highest standard until acceptance criteria is met. If sample concentrations exceed the highest allowed standard and the sample(s) following exceed this acceptance criteria ($> \frac{1}{2}$ LOQ), they must be reanalyzed.	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166
LC-MS/MS	Initial calibration verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	Analyte concentrations must be within $\pm 30\%$ of their true value.	Correct problem and verify second source standard; rerun second source verification. If that fails, correct problem and repeat ICAL.	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166
LC-MS/MS	Instrument Sensitivity Check (ISC)	Daily. At the beginning of each analytical sequence, prior to sample analysis.	Analyte concentrations must be at LOQ; concentrations must be within $\pm 30\%$ of their true values.	Correct problem, rerun ISC. If problem persists, repeat ICAL.	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166

Instrument/ Equipment	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person(s) responsible for CA	SOP Reference
LC-MS/MS	Continuing Calibration Verification (CCV)	Daily prior to sample analysis (ISC); after every 10 field samples; at end of analytical sequence.	All analytes must be within $\pm 30\%$ of their true value.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated samples since last successful CCV. Alternately, recalibrate if necessary; then reanalyze all samples since the last acceptable CCV.	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166
LC-MS/MS	LOD/LOQ verification	Quarterly	LOD meets method qualitative requirements; LOQ is recovered within LCS criteria.	Perform instrument maintenance and repeat failed LOD or LOQ study passing two consecutive tests or perform new DL study.	Analyst, supervisor, QA manager	ENV-SOP-WCOL-0166



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

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC-MS/MS	Clean ESI chamber.	NA	NA	Weekly or as needed	NA	NA	Analyst	ENV-SOP- WCOL-0166
LC-MS/MS	Replace delay column.	NA	Peak shape and resolution; LC pressure profiles	Biannually or as needed	NA	NA	Analyst	ENV-SOP- WCOL-0166
LC-MS/MS	Replace analytical column.	NA	Peak shape and resolution; ICAL or sensitivity problems	Biannually or as needed	NA	NA	Analyst	ENV-SOP- WCOL-0166
LC-MS/MS	Replace guard cartridge.	NA	Visible blockage and/or dirt on frit	Weekly or as needed	NA	NA	Analyst	ENV-SOP- WCOL-0166



QAPP Worksheet #28 — Analytical Quality Control and Corrective Action

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
AFFF samples	Each AFFF sample. Note: This does not include AFFF samples that are to be evaluated for MIL-PRF-14385 compliance. Those AFFF samples must be evaluated in compliance with DoD AFFF01, not EPA EPA 1633.	AFFF samples must be subsampled in duplicate for analysis in accordance with DoD AFFF01, Section 11.2.1 through 11.2.9. All AFFF samples must be prepared and analyzed in duplicate in the same manner as aqueous samples (e.g. SPE, EIS, carbon cleanup, etc.) per EPA EPA 1633.	NA.	NA.	A copy of the latest version of DoD AFFF01 can be found at https://denix.osd.mil/edqw/


QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Instrument Blank (IB)	At the beginning of the analytical sequence and after the analysis of high concentration samples and standards (e.g., customer samples, highest calibration standard, calibration verification standard).	No analytes detected > ½ LOQ.	<p>If acceptance criteria are not met after the highest calibration standard, calibration must be performed using a lower concentration for the highest standard until acceptance criteria is met.</p> <p>If field sample analyte concentrations exceed the highest calibration standard and the same analytes in the following field sample or in consecutive following field samples also exceed the IB acceptance criteria (i.e., > 1/2 LOQ), the affected samples shall be reanalyzed using a fresh aliquot of the sample extract.</p> <p>If the extract cannot be reanalyzed and reextraction is not possible, apply qualifier to affected results and explain in the case narrative.</p>	Flagging is only appropriate in cases where the extract cannot be reanalyzed, and re-extraction is not possible.	

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
<p>Extracted Internal Standard (EIS) Compounds</p>	<p>Every field sample, QC sample, and standard.</p>	<p>Isotopically labeled analogs of analytes must be used when they are commercially available.</p> <p>Where Method 1633 does not provide EIS recovery acceptance criteria for the sample matrix under evaluation, a laboratory shall use laboratory-developed recovery acceptance criteria no wider than any acceptance criteria provided by the customer. Preliminary laboratory-developed acceptance criteria of 20-150% shall be used until laboratory acceptance criteria are developed in accordance with Method 1633.</p> <p>Where Method 1633 does not provide EIS recovery acceptance criteria for the sample matrix under evaluation, the lower limit of the laboratory-developed acceptance criteria cannot be < 20%.</p>	<p>Follow the requirements listed in Method 1633, Section 15.3.2 for all samples matrices. If EIS recoveries still fall outside of the acceptance range, the client must be contacted for additional measures to be taken.</p>	<p>Apply qualifiers to affected analyte results and explain in the case narrative.</p>	

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Method Blank (MB)	One per preparatory batch.	No analytes detected > ½ LOQ.	Correct the problem. If required, reprepare and analyze MB and all QC samples and affected field samples processed with the contaminated blank if sufficient sample material is available.	If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative.	
Matrix Duplicate (MD) Method 1633 equivalent to the MD is the Laboratory Duplicate	Each AFFF sample prepared using an aliquot of the field sample must be prepared in duplicate. For all other matrices, one per preparatory batch.	RPD of all analytes ≤ 30% between sample and MD. RPD does not apply if both results are below the LOQ.	If an assignable cause isolated to only the MD is identified, reanalyze the MD or reprepare and analyze the MD if sufficient sample material is available, as indicated by the cause.	Otherwise, apply qualifier to affected analyte results in the parent sample and explain in the case narrative.	

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Laboratory Control Sample (LCS) and Low-Level Laboratory Control Standard (LLLCS)	<p>One set per preparatory batch.</p> <p>Shall contain all EIS, NIS, and all analytes to be reported.</p>	<p>Where Method 1633 does not provide LCS and LLLCS recovery acceptance criteria for the sample matrix under evaluation, a laboratory shall use laboratory-developed recovery acceptance criteria no wider than any acceptance criteria provided by the customer. Preliminary acceptance criteria of 40-150% shall be used until acceptance criteria are developed by the laboratory in accordance with Method 1633.</p> <p>Where Method 1633 does not provide LCS and LLLCS recovery acceptance criteria for the sample matrix under evaluation, the laboratory-developed acceptance criteria shall not be < 40%.</p>	<p>Correct problem.</p> <p>If required, reprepare and analyze the LCS and/or LLLCS and all affected QC samples and field samples in the associated preparatory batch for failed analytes if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative.</p>	<p>If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative.</p> <p>Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	<p>EPA 1633 equivalent to the LCS is the Ongoing Precision and Recovery Standard (OPR).</p> <p>EPA 1633 equivalent to the LLLCS is Low-Level Ongoing Precision and Recovery Standard (LLOPR).</p>

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Management Approval:

Katherine Zollner Approved on 9/25/2025 4:25:51 PM
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1.0 SCOPE & APPLICATION

This standard operating procedure (SOP) specifies the laboratory procedure used by PAS-West Columbia for the determination of the per- and Polyfluoroalkyl substances (PFAS) in various matrices using LC-MS/MS by EPA Test Method 1633 and 1633A.

1.1 Applicable Matrices

The matrices that can be tested using this SOP include:

Aqueous Matrices	Solid Matrices	Other Matrices
Non-Potable Water	Soil/Sediment	Biphasic (Aqueous/Solid)
Landfill Leachate	Biosolid	
TCLP / SPLP Leachate		
Aqueous Film Forming Foam (AFFF)		
Fluorine-Free Foam (F3)		

1.2 Routine Analyte List and Limits of Detection & Quantitation

This SOP uses abbreviations for the analyte name. A cross-reference of analyte name to CAS# and abbreviation is provided in Appendix A, Table 1.

The routine analyte list and limit of quantitation (LOQ) that can be determined by this SOP for each matrix is provided in Appendix A, Table 2.

Detection limits for each analyte are kept on file by the laboratory's Quality Department.

Unless otherwise specified, nominal limits of detection and the LOQ used during testing are adjusted on a per-sample basis to account for actual sample quantities used, percent moisture, and dilution factors.

1.3 Statutory and Program Specific Requirements


When statutory or regulatory program requirements for EPA Method 1633/1633A differ from the procedures outlined in the main body of this SOP, the program specific requirements are called out in the relevant section of the SOP or are provided in appendices to the SOP. These requirements take precedence over the main SOP and must be adhered to when performing work under that jurisdiction, unless otherwise specified on a project-specific basis.

2.0 SUMMARY OF METHOD

Samples are prepared and extracted using solid phase extraction (SPE). Extracts are cleaned using carbon cleanup prior to analysis by LC-MS/MS in the multiple reaction monitoring (MRM) mode. Sample concentrations are determined by isotope dilution or extracted internal standard quantification using isotopically labeled compounds added to the samples before extraction.

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This test procedure is based on USEPA Method 1633 and 1633A, January 2024, and includes allowable modifications from the reference method to improve performance.

Refer to Section 14 for a detailed list of modifications and their rationale. Supporting documentation to demonstrate equivalency and comparability, when required, is maintained by the laboratory's Quality Department.

3.0 INTERFERENCES

Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and elevated baselines causing misinterpretation of chromatograms. This SOP includes procedures for equipment cleaning to mitigate these interferences.

Interferences co-extracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the native PFAS. Because low levels of PFAS are measured by this method, elimination of interferences using proper cleanup techniques is essential and these steps are incorporated into the procedural sections of this SOP.

The most frequently encountered interferences are fluoropolymers; however, bile salts (e.g., Taurodeoxycholic Acid [TDCA]) may be present in various matrices, including fish and wastewaters, and can interfere in the chromatography. For this reason, the laboratory procedure includes analysis of a standard (bile interference check) containing TDCA is required when establishing the initial chromatographic conditions and with each analytical sequence.


4.0 DEFINITIONS

Refer to the Laboratory Quality Manual [ENV-MAN-WCOL-0001] for a glossary of common lab terms and definitions.

- **PAS:** Acronym for Pace® Analytical Services, LLC
- **Nonconformance Memo (NCM):** A form used to document a non-conforming event. An analyst must document a non-conformance memo when a non-conforming event occurs. A non-conforming event may include the reporting of analytical data outside method or SOP criteria, or when there is a deviation from a written policy or procedure. Information in an NCM may be used by project managers to flag data in the report narrative, or by the quality department to track trends and initial corrective actions, where applicable. Additional information on the NCM policy and procedure is located in the *Complaints and Nonconformances* SOP [QA SOP ENV-SOP-WCOL-0073].
- **Articles of Commerce:** Solid consumer and related product materials.
- **Extracted Internal Standard (EIS) quantification:** The response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities.
- **Isotope dilution (ID) quantitation:** A means of determining a naturally occurring (native) compound by reference to the same compound in which one or more atoms has been isotopically enriched. The labeled PFAS are spiked into each sample and allow identification and correction of the concentration of the native compounds in the analytical process.

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- **Isotopically labeled compound:** An analog of a target analyte in the method which has been synthesized with one or more atoms in the structure replaced by a stable (non-radioactive) isotope of that atom. Common stable isotopes used are ¹³C (Carbon-13) or Deuterium (D or ²H). These labeled compounds do not occur in nature, so they can be used for isotope dilution quantitation or other method-specific purposes.

5.0 HEALTH & SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure.

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001).
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handling these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

6.1 Sample Collection & Bottle Kits


PAS does offer sample collection services for this test method. The customer's sampling contractor should collect samples in accordance with a sampling plan and collection procedures appropriate to meet regulatory requirements and data quality objectives for the project.

Refer to Appendix A, Table 3 for sample collection, preservation, and holding time requirements for each matrix.

PAS will provide containers for sample collection per customer request. Refer to laboratory SOP ENV-SOP-WCOL-0006 Sample Container Shipping for general instruction on bottle kit

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preparation and refer to Appendix A, Table 3 for sample collection, preservation, and holding time requirements for each matrix.

PFAS Bottle Kit Specifications:

- If the request includes containers for surface wipes, provide a copy of the Pace® PFAS Wipe Sampling Guide in each sampling kit.
- Kits for aqueous sample kits should include the instruction to fill the container to the gradation marked on the container, or to the shoulder of the container if no gradations are provided.
- If matrix spikes are requested (or required by program), provide additional containers for the collection of MS/MSD and remind the customer to designate the sample for use on the chain-of-custody (COC).

For example, if an MS/MSD is requested on an aqueous matrix, the customer must collect and provide six (6) 250 mL containers, two (2) each for the MS, MSD, and parent sample, plus one (1) 60 mL container for prescreening.

- **AFFF Concentrate:** Customers should notify PAS at the time of request for quote or sampling containers if the matrix of any sample is an AFFF concentrate. Due to the specific handling requirements needed for this matrix, pre-notification ensures that the laboratory is prepared to handle the sample properly to prevent the sample from contaminating the work area and/or other test samples.
- **DoD Projects:** Testing may only be done by DoD accredited laboratories. Ensure sample kits include additional containers to collect sample material for laboratory duplicates and/or matrix spikes as required by DoD QSM or as specified in the Project QAPP (Quality Assurance Project Plan).

6.2 Sample Receipt, Storage and Disposal

Laboratory sample receiving personnel check thermal preservation and compliance with the PAS Sample Acceptance Policy on receipt following the procedures specified in SOP ENV-SOP-WCOL-0007 Sample Receiving. Refer to the Laboratory Quality Manual for the PAS Sample Acceptance Policy.

Unless otherwise specified by contract, samples and extracts are retained for the timeframe specified in the Pace® standard terms and conditions then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES


See Appendix A for a complete list of equipment and supplies needed to perform this procedure.

Substitution of instrumentation, equipment, and supplies is permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these specifications, it may impact the procedure's performance, necessitating an update and/or revalidation of the procedure.

Plastic containers must be used for all standard, sample, and extraction preparations due to potential adsorption of analytes onto glass. Do not substitute glass for plastic containers.

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7.1 Suitability Checks

Verify the suitability of SPE cartridges, solvents, cryovials, and autosampler vials on a lot basis by analysis of a method blank; maintain records of the verification for readily available historical access. See Section 9.1.2.1.

8.0 REAGENTS & STANDARDS

See Appendix B for a complete list of standards and reagents needed to perform this procedure and for formulations of standard solutions prepared by the laboratory.

Substitution of reagents and standards from those listed in Appendix B are permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these exact same specifications for purity, composition, or concentration, any formulation in this SOP must be modified to match the material used. If the substitution is permanent, the SOP and formulations in this SOP must be updated.

All purchased standard solutions must be received with a Certification of Analysis (COA). The COA must be maintained on-site in laboratory possession; access to a COA via the vendor's website is generally not acceptable to external regulatory bodies because the COA must be traceable to each lot received. Refer to laboratory SOP ENV-SOP-WCOL-0083 Preparation and Documentation of Laboratory Standards and Reagents for instructions for receipt and traceability.

9.0 PROCEDURE

9.1 Equipment & Instrument Setup

9.1.1 Support Equipment

9.1.1.1 Top Loading & Analytical Balance

Prior to use on each day of use, verify the calibration verification check on the analytical and/or top loading balance has been performed with working reference weights that bracket the measurements of weights that will be taken.

Verify the balance calibration is within its annual calibration timeframe. If the calibration sticker is missing or the calibration has expired, do not use the balance and notify the quality department of the situation.

If an alternate balance is used: ensure the balance used has been checked for tolerances that bracket the entire range of weight measurements.


9.1.1.2 Drying Oven

Verify the oven is equipped with a calibrated thermometer prior to use.

If the thermometer is missing a calibration label or the calibration has expired, notify the quality department. Do not use the oven until it is equipped with a calibrated thermometer appropriate for the temperature ranges required for the test and the gradients required to record temperatures of use.

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If the thermometer used is assigned a correction factor (CF), record the original observation and the temperature corrected for the CF. If the logbook or electronic log does not have a location to record both temperatures, notify the quality department of the gap in traceability.

9.1.1.3 Mechanical Pipettes

Prior to use, check the calibration label of the pipette(s) to verify the accuracy check has not expired. If expired or the calibration label is missing, notify the quality department. Do not use the pipette until its calibration status has been verified.

If a different pipette is used, ensure its calibration has been verified at the volume of use before using the pipette.

9.1.1.4 Refrigerators / Freezers

Ensure samples and extracts, and reagents and standards, if stored refrigerated or frozen, are stored separately and the temperature of the units are monitored daily, including weekends and holidays. Refer to the laboratory's SOP, however named, for monitoring procedures and recording of temperature measurements.

9.1.2 Extraction Equipment

9.1.2.1 Suitability Checks

Verify the suitability of SPE cartridges and other disposable plasticware by lot prior to use.

SPE cartridge lots are tested to check for contamination and recovery. Cartridges are prepared in duplicate, with one as a MB and one as an LCS. Verification records are maintained electronically in the PFAS Component Lot Testing Form.

These supplies are acceptable for use if no target analytes are detected above the detection limit (DL AKA MDL).

9.1.2.2 Cleaning Procedures

Rinse all glassware prior to use with methanolic ammonium hydroxide (1%) and methanol solvent. Air dry after the solvent rinse.


9.1.2.3 SPE Manifold Setup & Use

Inspect sample manifold ports and transfer tubing (if used) prior to use for signs of wear and/or discoloration. Replace manifold ports and transfer tubing as needed.

Clean all parts of the SPE manifold including the chamber prior to use and between samples with methanolic ammonium hydroxide (1%). Air dry before use.

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9.1.3 Analytical Instrumentation

9.1.3.1 Instrument Operating Conditions

Set the instrument operating conditions to the following specifications:

LC Gradient					MS Parameters	
Step	Total Time (min)	Flow Rate (µL/min)	A (%)	B (%)	Parameter	Setting/Value
1	0.00	400	80	20	Sample Loop	100 µL or 20 µL
2	6.00		5	95	Injection Volume	3 µL
3	6.50		5	95	Column Oven Temperature	40° C
4	6.51		80	20	MRM Scan Window	120 sec
5	8.50		80	20	Curtain Gas (CUR)	30.0
					Collision Gas (CAD)	9
					Ion Spray Voltage (IS)	-4500 V
					Source Temperature (TEM)	450° C
					Ion Source Gas 1 (GS1)	40.0
					Ion Source Gas 2 (GS2)	60.0

A: 5% Acetonitrile w/ 10mM Ammonium Acetate / B: Acetonitrile

9.1.3.2 Mass Calibration & Mass Calibration Verification

Perform mass calibration and mass calibration verification following the instrument manufacturer instructions prior to first use and at least annually thereafter to check instrument sensitivity and selectivity. Repeat following major instrument maintenance, movement of the instrument, or when other quality control (QC) failures suggest the need.

Ensure the procedures used for mass calibration and mass calibration verification evaluate an ion range that encompasses the ion range (Q1 and Q2 m/z) of the analytes of interest in this method. If the manufacturer's instructions include options for evaluation of mass resolution, the tightest resolution requirements (typically called unit resolution) must be met.

9.2 Calibration Design


Unless otherwise specified, instrument calibration procedures must comply with the PAS Corporate Policy for *Acceptable Calibration Practices for Instrument Testing* (POL ENV-POL-CORQ-0005). Refer to this policy as needed to learn more about policies and requirements for calibration and calibration verification.

9.2.1 Calibration Model

This SOP includes two (2) calibration models. Each option uses isotopically labeled compounds added to the samples prior to extraction. Option 1 is required for any analytes for which there is a stable isotope analogue.

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Option 1: Isotope Dilution Quantification (ID): the response of the target compound is compared to the response of its isotopically labeled analog. Twenty-five (25) target compounds are quantified in this way.

Option 2: Extracted Internal Standard quantification (EIS): the response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities; seventeen (17) target compounds are quantified in this way.

9.2.2 Calibration Design

The design of the curve specified in this SOP includes analysis of nine (9) calibration standards; however, not all standards must be included in the final curve.

More than the minimum number of calibration points specified in the published reference method are analyzed to extend the calibration range and to permit exclusion of the lowest or highest standards when needed; the calibration set is designed to leave enough standards remaining to meet the minimum number required for the curve fit, and to ensure that eliminating standards at the low or high end of the calibration does not alter the established LOQ.

- When linear calibration is used, the calibration curve must minimally include 6 calibration levels, with at least 5 within the quantitation range, and the lowest standard at or below the LOQ.
- When non-linear calibration (Quadratic) is used, the calibration curve must minimally include 7 calibration levels, with at least 6 within the quantitation range, and the lowest standard at or below the LOQ.

Weighting is allowed for linear and non-linear regressions, so long as the weighting is inversely proportional to concentration and is not forced through zero.

When considering the range of quantitation, ensure the LOQ routinely achieves a signal to noise ratio of 3:1, and meets the requirements for the confirmation ion and the ion ratio requirements specified in the published reference method. If a confirmation ion is not specified in the published method for the analyte, the signal to noise ratio must be minimally 10:1.

Each calibration sequence must also include the analysis of a second source standard (ICV); however, this standard is never included in the curve – it is used to evaluate accuracy and/or potential bias of calibration standard preparation and curve fit.

Refer to Appendix B for the formulations for each working calibration standard.


Acceptance criteria for the curve are provided later in this SOP.

9.2.3 Calibration Frequency

Calibrate the instrument at initial setup, when calibration verification (ICV, ISC, CCV) results indicate the calibration is no longer valid, when changes made to the operating conditions may affect calibration performance, after major instrument maintenance, or

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after any other event that may affect instrument performance, such as moving the instrument.

9.2.4 Calibration Sequence

Prepare the calibration standards and the ICV following the instructions in Appendix B.

Prepare an instrument blank (IBLK) by adding 4925 µL of the IBLK Mix and 50 µL of EIS and 25 µL NIS to a plastic centrifuge tube; vortex to mix.

Analyze calibration standards L1-L9 in order from lowest to highest concentration.

Analyze the instrument blank (IBLK) after the highest concentration calibration standard, followed by the ICV.

9.3 Calibration Evaluation

Evaluate the calibration for linearity, accuracy, sensitivity, and carryover. If any criteria are not met, troubleshoot to identify and correct the problem, then repeat calibration. All criteria must be met before analysis of test samples.

Suggested Actions:

- Perform instrument maintenance and reanalyze the calibration sequence.
- Remake the standards and analyze a new calibration sequence.
- Reduce the range of calibration by excluding the highest concentration calibration standards or the first calibration standard. Since CAL L1 is not routinely included in the curve and CAL 2 is the LOQ, no other standards at the low end may be removed. Removal of standards in the interior of the curve is not permitted unless an obvious error with the standard is observed.

9.3.1 Linearity Evaluation

Use one of the following options to evaluate the linearity of the calibration curve. When using a weighted regression, assess linearity with option 2 below.


- Linear Calibration: calculate the relative standard deviation (RSD) of the Relative Response (RR) or Response Factor (RF) values of the initial calibration standards for each target analyte and isotopically labeled compound. The RSD must be $\leq 20\%$.
- Non-Linear Quadratic (2nd Order Fit): calculate the relative standard error (RSE) for each native compound and EIS compound for all the initial calibration standards that were analyzed. The RSE for all target and EIS compounds must be $\leq 20\%$. See Section 10.4.6 for the equation to calculate RSE. Maintain a record of the calculation and evaluation with the curve for historical recordkeeping and reference.

9.3.2 Initial Calibration Verification (ICV)

To verify the accuracy of the calibration, check the recovery of the ICV. Refer to Table 7 for acceptance criteria.

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When criteria are not met, it is likely there is a problem with the quality or preparation of the calibration standards and/or the ICV; correct the problem prior to sample analysis.

Suggested actions include:

- 1) Remake and reanalyze the ICV
- 2) Remake calibration standards and repeat the calibration sequence.
- 3) If instrument maintenance is performed: in addition to reanalyzing the ICV, the calibration sequence may need to be reanalyzed if the conditions under which the acceptability of the calibration curve was evaluated have changed.

9.3.3 Instrument Sensitivity Check (ISC)

DoD: Check instrument sensitivity at the beginning of each analytical sequence at the lowest calibration standard used to validate the LOQ. (currently CAL L2).

Non-DoD: Check instrument sensitivity daily at the beginning of each analytical sequence using the lowest calibration standard used to validate the LOQ (currently CAL L2).

The signal-to-noise ratio of all analytes in the ISC must be $\geq 3:1$ for the quantification ions and the confirmation ions, or $\geq 10:1$ if the analyte only has a quantification ion. Refer to table 7 for acceptance criteria. If the requirements cannot be met, the problem should be corrected before analyses can proceed.

If an individual target compound recovery in an ISC is above the upper control limit and all associated samples are ND for that compound, the data for those samples may be reported. In such cases, a narrative statement must be included in the report indicating the specific compound result that was biased high in the ISC, and that samples were ND for that compound and thus reportable.

See Appendix A, Table 6 for ion associations for each target analyte.

9.3.4 Bile Salts Interference Check

Verify the bile salt peak (TDCA) is detected >1 min outside RT window for PFOS. TDCA is added to multiple calibration standards to facilitate this evaluation.

9.3.5 Initial & Continuing Calibration Blanks (ICB & CCB)

Calibration blanks are used to assess carryover and/or contamination in the instrument system and are included in the initial calibration sequence and each daily analytical sequence thereafter.


In analytical sequences that include calibration, analyze the ICB following the highest concentration ICAL standard before the ICV. In sequences without calibration, analyze a CCB each day prior to sample analysis after the opening CCV.

Refer to table 7 for acceptance criteria.

- If contamination is suspected, troubleshoot to identify and eliminate the source.

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- If the failure is due to carryover from a prior standard, either reduce the upper range of the calibration or increase column flush time to reduce potential for carryover.

9.3.6 Continuing Calibration Verification (CCV)

DoD - Verify the calibration at the beginning of each analytical sequence with an ISC standard. Then, verify after every ten environmental samples, up to a maximum of 20 environmental samples, using a mid-level calibration standard, typically CAL L6.

Non-DOD - Verify the calibration at the beginning of each analytical sequence with an ISC standard. Then, verify after every ten environmental samples (for up to 24 hours from ISC), using a mid-level calibration standard, typically CAL L6.

The ISC will serve as the opening CCV for an analytical sequence. Do not include quality control (MB, LCS), instrument performance check standards (CCV), sample-specific matrix spikes, MS/MSD, field duplicates (FD), or trip blanks in the count of environmental samples.

Use ICAL Level 6 as the CCV and analyze it under the same conditions as the calibration standards.

Refer to table 7 for acceptance criteria. See Appendix A, Table 6 for ion associations for each target analyte.

If criteria are not met, take corrective action and reanalyze any extracts that were analyzed between the last passing CCV and the one that failed, unless the CCV result is above the upper limit and all associated samples are not detected (ND), in which case, reanalysis is not required.


Alternately, immediately analyze two CCVs for confirmation. If both confirmation CCV analyses meet the recovery criteria, proceed with analysis; however, samples that were analyzed after the last passing CCV and before the 2 passing confirmation CCVs must be re-analyzed. If either of the 2 confirmation CCV analyses fails to meet the acceptance criteria, recalibrate the instrument.

A typical DOD analytical sequence is as follows:

1. Instrument Blank
2. Instrument Sensitivity Check (currently CAL L2).
3. Instrument Blank
4. Method Blank
5. LL-LCS (LLOPR)
6. LCS(OPR)
7. Up to 10 environmental samples
8. Calibration Verification Standard (Currently CAL L6).
9. Instrument Blank

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10. Up to 10 environmental samples
11. Calibration Verification Standard (Currently CAL L6). The lab has the option to use an ISC (CAL L2) standard here and use it as the opening CCV for the next analytical sequence.
12. Instrument Blank

A typical **non-DoD** analytical sequence is as follows:

1. Instrument Sensitivity Check (currently CAL L2).
2. Instrument Blank
3. Method Blank
4. LL-LCS (LLOPR)
5. LCS(OPR)
6. Up to 10 environmental samples
7. Calibration Verification Standard (Currently CAL L6).
8. Instrument Blank
9. Up to 10 environmental samples
10. Calibration Verification Standard (Currently CAL L6).
11. Instrument Blank

This pattern can be repeated for up to 24 hours from the injection time of the opening ISC.

****Note** – Bile Salt (TDCA) is included in CAL L2 and L6 and all available isomers are included in all ICAL standards therefore, a separate Qualitative ID standard and a separate Bile salt interference check standard is not run.


9.4 Sample Preparation: General Requirements

9.4.1 Contamination Prevention

To reduce potential contamination or bias, do not use any fluoropolymer articles or task wipes during sample preparation or extraction procedures. Use only HDPE or polypropylene containers; reagents and solvents used for cleaning purposes may be stored in glass containers.

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9.4.2 Pre-Screening Procedures

Samples may be pre-screened at the discretion of the laboratory prior to sample preparation and/or analysis. Results of the screen may be used to determine if reduced volume extraction is needed or to target dilution of extracts prior to analysis.

Refer to Appendix C for instructions to prepare screening extracts when screening has been scheduled.

9.4.3 Homogenization, Subsampling, and/or Pre-Preparation Requirements

Different matrices require or may require homogenization, subsampling or pre-preparation as specified in the following subsections before sample preparation and extraction.

9.4.3.1 Aqueous: Non-Potable Water and Landfill Leachate

The sample volume used for preparation and extraction may be subsampled from the original container received when it is known that the sample requires a dilution of >10X or when EIS criteria cannot be met due to matrix interference. When subsampling is required to manage high concentrations, no less than 250 µL of aqueous or leachate samples may be subsampled - if greater dilution is required, serial dilution must be employed. When subsampling is required to manage challenging matrices, no less than 1 mL of samples may be subsampled.

Subsampling must be performed with customer knowledge to confirm the protocol used by the laboratory meets their project-specific requirements.

Refer to Appendix D for subsampling instructions.

9.4.3.2 Aqueous: TCLP or SPLP Leachates


The TCLP or SPLP leachates are generated using the laboratory's routine protocol for leachate generation. The leachate solutions provided by the work area performing this step are used as samples for PFAS extraction and analysis. TCLP/SPLP leachates are prepared following the Landfill Leachate protocol, with nominally 50 mL of sample extracted.

9.4.3.3 Aqueous: AFFF or F3

Samples composed of AFFF, F3, or other matrices KNOWN to require a large dilution prior to extraction will be subsampled consistently, with approximately 0.01 g of material aliquoted for each discrete sample preparation/analysis; each AFFF or F3 concentrate sample must be prepared in duplicate. After creating and documenting the subsample aliquot in a 250 mL HDPE PFAS sample bottle, add approximately 60 mL of reagent water, cap the vessel, and shake vigorously by hand for 20-30 seconds. After adding the reagent water and agitating, allow at least 3 hours for the subsample aliquot to fully dissolve in the water. If dissolution is incomplete after 3 hours, agitate again and wait another 3 hours; consider applying continuous agitation (orbital shaker) if full dissolution of the aliquot into water requires extended time. Following the extended dissolution time, prepared AFFF/F3 samples should be extracted and analyzed following

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the routine protocols for aqueous sample processing. Aqueous reporting limits will be used, with values adjusted to account for the actual sample aliquot, assuming 1 g/mL; this constitutes a 25,000X nominal adjustment factor for AFFF/F3 reporting limits, relative to nominal aqueous reporting limits.

Pace STRONGLY DISCOURAGES clients from sending AFFF concentrate material for analysis; this protocol is designed for “as-prepared” AFFF materials (i.e. pre-diluted to application concentration) and newer generation ‘Fluorine Free Foam’ (F3) concentrates. If F3 material (concentrate or as-prepared) or AFFF “as-prepared” material is received, follow the normal routines described in the paragraph above. If an AFFF concentrate material (usually of a thick gel-like consistency) is received for analysis, the above protocol may not be enough of a dilution to protect lab systems; in these cases, the lab shall prepare a serial dilution prior to extraction. First, the protocol above is followed (0.02 g of material fully dissolved into 60 mL water). Then a 6 mL aliquot of the initial aqueous solution is diluted into water, with a final volume of 60 mL (i.e., dilute 6 mL of sample solution into 54 mL of water). This serial dilution constitutes a 250,000X nominal adjustment factor for the AFFF concentrate reporting limits, relative to nominal aqueous reporting limits.

Handling of AFFF concentrate should ideally be done in an isolated area outside of the PFAS processing area to prevent gross lab contamination.

9.4.3.4 Solid: Soils and Sediments

If a reduced mass extraction is scheduled, use at least 0.2 g (dry weight) for all solid matrices to ensure the amount used for sample preparation is representative of the total mass of sample collected.

9.4.3.5 Solid: Biosolid

If a reduced mass extraction is scheduled, use at least 0.02 g (dry weight) for all biosolid matrices to ensure the amount used for sample preparation is representative of the total mass of sample collected.

9.4.3.6 Biphasic

If the sample is biphasic and the customer has requested phase separation: centrifuge the sample to separate the phases following the procedure specified in Appendix F, then prepare and extract each phase separately.


9.4.3.7 Articles of Commerce

Articles of commerce typically need to be milled to a fine powder using the protocol specified in Appendix H before sample preparation. This step may not be required when the material is known to be sufficiently homogenous and more than 95% of the material will pass through a 250 µm sieve.

Perform this step as needed and when specified on a project basis.

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9.5 Percent Solids Determination

9.5.1 Aqueous Matrices

A percent solids determination is not conducted for aqueous matrices. Instead, the laboratory visually assesses the sample matrix during sample preparation and employs alternative strategies to mitigate the effect of any solids present.

9.5.2 Solid Matrices

Percent solids must be determined on all solid and biosolid samples prior to preparation and analysis to determine the sample mass used for extraction in accordance with SOP ENV-SOP-WCOL-0137 Percent Solid and Percent Moisture in Solid and Semi-solids. Percent solids are logged in for both 1633 and percent solids analysis and determined by the same personnel that normally generate this data daily. The percent solids analysis will follow the Method SM2540G protocol.

Percent solids are not determined for tissue, surface wipes or the solid phase of a biphasic sample. These matrices are always reported on a wet weight basis.

9.6 Sample Preparation: Procedure

9.6.1 Aqueous Matrices

Do not filter samples at any point prior to sample preparation.

Unless a reduced volume extraction is necessary, use the following amounts for sample preparation and analysis:

Routine Extraction Volume for Aqueous Matrices¹


Non-Potable Water (NPW)	Landfill Leachate	TCLP/SPLP Leachate	AFFF or F3
250 mL	50 mL	50 mL	0.01 g into 60mL

¹Nominal amount on which LOQ in Table 2 is derived. When different sample volumes are used, detection limits and the LOQ are adjusted for the actual amount used.

- For NPW: Use the entire volume from one (1) of the 250 mL containers provided.
- Landfill Leachates: Use entire volume from one (1) of the 125 mL containers provided or subsample 125mL from original container(s).
- TCLP/SPLP Leachate: Subsample 100 mL of the filtered leachate generated by pouring the leachate from the container into a 250 mL HDPE PFAS sample bottle. Use the gradations on the bottle as a measuring guide.
- AFFF or F3: Subsample 0.01 g of the material received into a 250 mL HDPE PFAS sample bottle and dilute in 60 mL of reagent water, or PFAS Free Water; see Section 9.4.3.3 for the complete pre-extraction preparation protocol.

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Create separate preparation batches for aqueous matrices that use different initial volumes because the volume used for the MB and LCS/LLCS must match the amount used for samples.

9.6.1.1 Preparation Steps:


- 1) Remove the sample container from storage. Pull additional containers for each MS/MSD and for the laboratory duplicate, when a duplicate is requested or required, and an additional container has been provided to perform the analysis.

DoD Accredited Laboratories: If the matrix is AFFF or F3, a duplicate must be performed with each sample. Confirm that there is enough sample available to take the duplicate from the same container.

- 2) Invert the sample container 3-4 times to homogenize the sample and then allow the sample to settle.
- 3) Visually inspect each settled sample for settled or suspended solids. Consider any visible indications of particulate matter including settled solids collected on the bottom of the container, cloudiness and/or dark color of the sample, suspended solids within the sample, increased viscosity, etc. If uncertain, seek a second opinion from another analyst, team lead, or supervisor; these matrix characteristics may require reduced-volume extraction.
 - a. If potential interferences other than settled solids are observed, take action to mitigate the impact on data quality. Examples of other sample characteristics that could necessitate precautionary measures with a field sample (i.e., prepare from reduced volume) include presence of standing foam in the sample after shaking, thick/viscous matrix, samples from known highly contaminated sites/projects, client notes indicating potential high concentrations, and knowledge of potential hazards to safety, equipment performance, or process integrity due to sample composition. In such cases, confer with a team lead or supervisor to determine the best approach. Use the largest volume possible (i.e., the smallest reduction possible) when performing a reduced-volume extraction to manage challenging matrix characteristics; use no less than 1 mL of sample.
 - b. If none of these conditions are observed or if the solids observed are less than ½ cm in depth, proceed to Step 4.
 - c. If settled solids are observed at a depth greater than ½ cm or appear to be more than 5% of the total volume of the sample, the sample may be pre-diluted prior to centrifugation. The analyst performing procedure must visually determine the level of upfront dilution that is needed before beginning centrifugation procedure. If an upfront dilution does not need to be made, continue to Appendix E.
 - d.
 - a. Recap the container and shake to homogenize; uncap the container.
 - b. Perform a 5x (or higher) dilution on the homogenized sample in a new PFAS free HDPE container. If uncertain if a 5x dilution is sufficient, seek

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a second opinion from another analyst, supervisor, or operations director if a higher initial dilution should be performed.

- c. Skip the remainder of Section 9.6.1 and follow the preparation and extraction specified in Appendix E
- 4) Check the pH of each container using a pH indicator strip to verify the pH is 6.5 ± 0.5 . If necessary, adjust the pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). Do not insert the strip into the sample container: use a disposable pipet to transfer a small amount of sample onto the pH indicator strip instead.
- 5) Prepare a method blank (MB), laboratory control sample (LCS), and low-level laboratory control sample (LLCS) by measuring the volume of blank matrix specified into a 500 mL HPDE container. For TCLP / SPLP, prepare 2 MB.
 - NPW: Use 250 mL of reagent water, or PFAS Free Water.
 - Landfill Leachate: Use 50 mL of reagent water, or PFAS Free Water.
 - TCLP / SPLP Leachate: Use 50 mL of TCLP or SPLP blank solution for the LCS, LLCS and Leachate MB. Prepare another MB using 50 mL of reagent water.
 - AFFF / F3: Use 60mL of reagent water, or PFAS Free Water. Samples can be batched with NPW; if batched together, prepare batch QC following NPW routines.
- 6) Quantitatively add 64 μ L of the PDS-10X standard mix to LLCS and 80 μ L of 1633PDS mix to the LCS.
- 7) Add 40 μ L of EIS solution to each container (all samples and QC).
- 8) If the batch includes matrix spikes, add 80 μ L of 1633PDS mix to each matrix spike.
- 9) Cap each container and invert to mix.
- 10)
- 11) Weigh the container + sample on the top-loading balance and record the weight measurement in the preparation record to the nearest 0.1 g. This measurement will be used later to calculate the actual volume of sample extracted. Proceed to Section 9.7 for extraction and extract cleanup.

9.6.2 Solid Matrices (Non-Tissue)

Unless a reduced mass extraction is necessary, use the following amounts for sample preparation and analysis:


Routine Target Mass for Solid Matrices¹

Soil/Sediment	Biosolid	Surface Wipe
2 g dry weight	0.2g dry weight	1 wipe

¹Nominal amount on which LOQ in Table 2 is derived. When different sample mass is used, detection limits and the LOQ are adjusted for actual amount used.

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Do not combine biosolids in the same preparation batch as soils/sediments or articles of commerce due to the difference in amount of material used.

Skip Steps 2-4 if the sample matrix is a surface wipe or article of commerce.

1. Remove the sample from storage.
2. Using a wooden tongue depressor, mix each sample in its original jar by stirring from the bottom of the container to the top and in a circular motion along the sides of the jar, breaking particles up by pressing against the side of the container (to <1 mm). The homogenized sample will be even in color and have no separate layers.
 - a. If it is not practical to mix the sample within its container, transfer the sample to a weigh boat and/or spare 90mL HDPE widemouth container. Store the homogenized material in its original container.
3. Check the LIMS to obtain the percent solids result for each sample in the batch.
 - a. If the test results are not available, check to see if a percent solids analysis is included in the work order; if not, notify the Project Manager (PM) they will need to add the test to the log-in.
 - b. If test results are not available because the department performing the test has not completed the determination, notify your supervisor or contact the leader of the department performing the test to obtain the status. Preparation may not begin until this information is available.
 - c. If the percent solids result is <50%, notify the PM and request that the matrix in the work order be changed to biosolid; prepare the sample as a biosolid.
 - d. If the percent solids result is <5%, notify the PM and request the matrix be changed to landfill leachate; prepare the sample as a landfill leachate.
 - e. If none of these scenarios apply, proceed to Step 4.
4. Determine the target mass for extraction for soils/sediments and biosolids by dividing the target weight for sample preparation by the percent solids in decimal form.
 - a. For example, if a soil sample is 90% percent solids, the mass used for extraction must be within the range of 2.0-2.4 g.
 - b. Convert 90% percent solids to decimal form by dividing 90 by 100. ($90/100 = 0.9$)
 - c. Divide 2 g (target mass) by the percent solids in decimal form ($2/0.9=2.2222\dots$)
 - d. Round 2.2222 to the same significance of measurement as the top loading balance¹ (2.2).
 - e. Add ± 0.2 g to the target result of 2.2 g to obtain the target weight range of 2.0 to 2.4 g.
 - f. ¹For biosolids, use an analytical balance and convert the result to the significance of the analytical balance (0.01 g)

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5. Place a 50 mL polypropylene centrifuge tube on the balance and tare the balance.
 - a. Measure the target weight of sample into the tube so that the weight is within the range determined in the prior step. Record the amount used to the nearest 0.1 g (top loading) or 0.01 g (analytical).
 - b. **NOTE:** *Surface* wipes should have been received in a 50 mL centrifuge tube. If the wipe was received in a different container, transfer the wipe to a 50 mL centrifuge tube using clean forceps.
 - c. If matrix spikes or a laboratory duplicate were requested or are required, prepare separate containers for each.
 - d. If the sample is extremely dry, wet the sample with 1.0 g of reagent water, which is the same amount always used to wet the clean matrix used for the MB and LCS.
6. Prepare the MB, LCS and LLLCS using Ottawa Sand wetted with reagent water by adding the clean matrix and water to a 50 mL polypropylene centrifuge tube.
 - a. Soil/sediment: Use 2 g of Ottawa Sand and 1 g of reagent water
 - b. Biosolid: Use 0.2 g of sand and 0.1 g of reagent water
 - c. Surface Wipe: Use a new ghost wipe from a pre-tested lot
 - d. Articles of Commerce: Can be batched with soil/sediment; if batched separately, prepare batch QC following soil/sediment routines.
7. Quantitatively add 64 µL of the PDS-10X standard mix to LLLCS and 80 µL of 1633PDS mix to the LCS.
8. If the batch includes matrix spikes, add 80 µL of 1633PDS mix to each matrix spike sample.
9. Add 40 µL of EIS solution to each container (all samples and QC)
10. Using a vortex mixer, vortex the tube to disperse the spike solution and allow to equilibrate for approximately 30 minutes. Alternatively, shake by hand.
11. First Extraction: Add 15 mL of 0.3% methanolic ammonium hydroxide to each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Next, centrifuge each tube for 10 minutes at 3000 rpm (~2000 RCF) then transfer the supernatant to a clean, labeled 125 mL HDPE sample bottle.
12. Second Extraction: Add 15 mL of 0.3% methanolic ammonium hydroxide to the remaining solid sample in each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Centrifuge each tube at 3000 rpm (~2000 RCF) for 10 minutes and decant the supernatant from the second extraction into the same container with the supernatant from the first extraction.
13. Adjust the extraction solution to 100 mL volume using reagent water. A validated comparison bottle may be used to make this adjustment.

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14. Check the pH of each sample solution using a pH indicator strip to verify the pH is 5.0+/- 1.0. If necessary, adjust the pH with acetic acid or ammonium hydroxide (or with 3% aqueous ammonium hydroxide). Do not insert the strip into the sample container: use a disposable pipette to transfer a small amount of sample onto the pH indicator strip instead.
15. Proceed to Section 9.7 for extraction and extract cleanup.

9.7 SPE Extraction & Carbon Cleanup

Use the same procedure for all matrices.

1. Prepare an SPE cartridge for each sample and QC by packing clean silanized glass wool into the bottom of a WAX SPE (or stacked WAX/GCB) cartridge barrel, to a height of ~1 cm. Ensure the glass wool is not densely packed to allow for proper sample flow.
2. Set up the vacuum manifold with one prepared WAX SPE cartridge, with a reservoir adaptor and reservoir stacked on each cartridge, ensuring all connections are tight. If using plastic transfer lines instead of reservoirs, ensure the connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample. Label each reservoir or cartridge tube with the associated sample ID.
3. Pre-condition the cartridges with 15 mL of 1% methanolic ammonium hydroxide followed by 5 mL of 0.3M formic acid. Perform each rinse separately. Do not allow the WAX SPE to go dry. Discard the wash solvents.
4. Pour the sample into the reservoir taking care to avoid splashing while loading; or, if using transfer lines, begin opening the stopcocks on the vacuum manifold. Do not pipette the sample in this step. Adjust the vacuum/stopcocks to pass each sample through the cartridge at a rate of approximately 5-10 mL/min; discard the eluate. Retain the empty sample bottle for solvent rinsing.

If the SPE cartridge becomes clogged during sample transfer, refer to Appendix G for troubleshooting steps and mitigation strategies.


5. Rinse the walls of the reservoir twice with 5 mL reagent water, followed by 5 mL of 1:1 Methanol:0.1M Formic acid. Pass each rinse through the cartridge using vacuum. If using sample transfer lines for loading, add the 3 rinses to the original sample container and load each rinse through the transfer lines to the cartridge, one reagent at a time. Discard the rinse solutions.
6. Dry the cartridges by pulling air through them for ~ 5 minutes.
7. While the WAX cartridges are drying, condition the carbon cartridges (GCB) by rinsing with two aliquots of 5 mL of MeOH. Perform this step on a separate vacuum manifold or on the unused ports of the same manifold as the WAX cartridges.

Insert the narrow end of a 5 mL or 10 mL plastic pipette tip into the top of the GCB cartridge and use it like a reservoir for the rinse solvent. Apply a light vacuum to pull the rinse solvent through the cartridge; discard the rinsates. Do not allow the GCB cartridges to go completely dry during/after this step. Remove the pipette tip from the GCB cartridge and discard.

8. When the WAX cartridges are sufficiently dry, remove each WAX cartridge and reservoir out of its manifold port and stack it on a conditioned GCB cartridge by inserting the outlet of

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the WAX cartridge into the inlet of the GCB cartridge. Place the dual cartridge-reservoir stack back in the same manifold port that the WAX cartridge originally occupied. This cartridge stacking should be done one cartridge at a time to avoid mixing up manifold locations.

If using transfer lines: follow the same cartridge stacking process but ensure that the transfer line connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample bottle after stacking the two cartridges.

- Place a clean collection tube in the manifold rack for each cartridge so that the extract delivery needles are not touching the walls of the tubes. Resume vacuum and ensure a proper seal is achieved. DO NOT add NIS to these collection tubes.
- Rinse the inside of each sample container using 5 mL of 1% methanolic ammonium hydroxide. Then pour the rinse from each sample container to transfer the rinse to the associated SPE reservoir to wash the walls of the reservoir. If using sample transfer lines, transfer the container rinse from each sample container to its associated cartridge using vacuum. Whether using reservoirs or transfer lines, allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.
- Aqueous samples: air dry the empty sample container after the rinse is transferred. Weigh the empty container with the cap on and subtract that from the weight of the bottle with sample, determined in Section 9.6.1, step 4.
- Add 25 μL of concentrated acetic acid and 20 μL of NIS mix to each collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extract and store the extract at 0 - 6°C in complete darkness.
- Proceed to Section 9.8 for analysis.

9.8 Analysis


Analyze the extracts by LC-MS/MS in multiple reaction monitoring (MRM) mode, with unit mass resolution. Allow the extracts to warm to room temperature prior to aliquoting into autosampler vials and loading on the instrument.

On each day of analysis:

- Flush the column with 100% Acetonitrile for at least 30 minutes to clear any accumulated impurities and interferences from the sample pathway and to equilibrate the system. Open the purge valve(s) on the pumps for the first ~1 minute of flush time and/or use the "purge" function available as part of the pump functionality and purge the autosampler injector flow path using the "purge" function, if available.
- Equilibrate the column by flushing the column for ~15 mins with 50:50 Mobile Phase A: Mobile Phase B followed by ~15 minutes of 98:2 Mobile Phase A: Mobile Phase B.
- Verify system pressure is stable.
- Bring standards and samples to room temperature, vortex to homogenize, then transfer a portion to an autosampler vial in preparation for analysis.

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- Following any initial priming injections on days when a calibration is not needed, an ISC and an instrument blank (IBLK) will be analyzed to demonstrate system suitability and the absence of system contamination prior to sample analysis.
- After acceptable ISC and IBLK results are confirmed, load and submit extracted samples for analysis, typically starting with batch QC with field samples following. A CCV and CCB must be analyzed after every 10 (or fewer) field samples.

Arrange standards and samples in an autosampler to run in sequence as follows:

Order of Sequence with ICAL	Order of Sequence w/o ICAL
Cal L1-9 in order of lowest to highest	Opening ISC/CCV
IBLK	IBLK
ICV	MB
Follow same sequence as w/o ICAL, starting at ISC	LLCS
	LCS
	Samples (10 or fewer)
	CCV
	CCB
	Samples (10 or fewer)
	Closing CCV

¹The closing CCV analysis may be used as the opening solution for the next analytical sequence when criteria for the opening CCV are also met.

10.0 DATA ANALYSIS & CALCULATIONS

Data is reduced using the acquisition software provided by the instrument manufacturer.

10.1 Retention Time (RT) Window

Establish RT Windows for all analytes, EIS and NIS with each ICAL event and at the beginning of each analytical sequence thereafter. Analytical conditions must be set to allow a separation of at least 1 minute between TDCA and the retention time window of PFOS. If this is not achieved the problem must be corrected. The RT window used must be of sufficient width to detect earlier-eluting branched isomers.

- In sequences that include an initial calibration curve (ICAL) use the midpoint standard of the curve to set the RT for analytes, EIS and NIS.
- In sequences that do not include ICAL, use the beginning CCV retention times to set the RT for analytes, EIS and NIS.


10.2 Qualitative Identification

The presence of target analytes, EIS, and NIS compounds are qualitatively confirmed when the criteria in Sections 10.2.1. through 10.2.5. are met.

If identification criteria are not met and, based on analyst discretion, the analyte may be present, the presence of a target analyte may be reported. In such cases, data will be reported with a qualifier alerting the data user that qualitative identification could not be confirmed because the

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detection did not meet the method-required criteria but based on analyst discretion, the compound may be present and should be considered an estimated value.

If the criteria listed below are not met for the standards, the laboratory must stop analysis of samples and correct the issue.

10.2.1 Integration

The response of all isomers in the quantitative standards should be used to define integration parameters and ion ratios.

In samples, the total integrated response should include the branched isomer peaks that have been identified in the quantitative standard, if present. For compounds with identified branched and linear isomer peaks, the reported concentration is the sum of all isomers. If standards (either quantitative or qualitative) containing a mix of isomers are not available for purchase for a particular compound, only the linear isomer can be identified and quantitated in samples.

10.2.1.1 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To ensure that all manual integrations are justified and proper, all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration*. Refer to this SOP for guidance on manual integration techniques and required procedures.

10.2.2 Retention Time (RT)

The RTs for the target analytes, EIS, and NIS compounds must fall within ± 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial daily CCV, whichever was used to establish the RT window position for the analytical batch. All branched isomer peaks identified in the calibration standards also must fall within 0.4 minutes of the retention times set for the analytical batch.

For all target analytes with exact corresponding isotopically labeled analogs, target analytes must elute within ± 0.1 minutes of the associated EIS compound.

10.2.3 Signal-to-Noise Ratio (S/N)


Peak responses of the quantitation and confirmation ions must be at least three times the background noise level (S/N 3:1); if there is no confirmation ion, S/N must be $>10:1$.

If the S/N ratio is not met in a standard or QC sample due to high background noise, correct the problem (e.g., perform instrument maintenance).

If the S/N ratio is not met in a blank or sample, then detection of the analyte cannot be confirmed; the analyte is "not detected".

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10.2.4 Ion Ratio Criteria

For any compound that meets S/N and RT criteria, the ratio of the total (branched and linear isomer) quantification ion response to the total (branched and linear isomer) confirmation ion response – referred to as the Ion Ratio – must fall within $\pm 50\%$ of the ratio observed in the mid-point ICAL standard.

The ion ratio requirement does not apply for PFPrA, PFBA, PFPeA NMeFOSE, NEtFOSE, PFMPA, or PFMBA because suitable secondary transitions are unavailable (not detectable or inadequate S/N). PFPeA, PFPrA, PFBA, PFMPA, and PFMBA have marginally performing secondary transitions built into the instrument acquisition method to aid in qualitative identification of the analyte; ion ratio requirements do not apply to these compounds.

10.2.5 Detection Limit

The calculated concentration (see Section 10.4) of the target analyte must be greater than the adjusted detection limit (DL) to be reported. Quantified results below the DL cannot be confirmed and will be reported as “not detected.”

10.3 Quantitative Analysis

Test results are quantified by automated data reduction software using the equations in Section 10.4.

10.4 Calculations

All data is reduced by automated software; no manual calculations are performed for this test.

10.4.1 Target Analyte Concentration


Concentrations of the target analytes are determined with respect to the extracted internal standard (EIS) which is added to the sample prior to extraction (see Appendix A, Table 6). Other equations may be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$\text{Concentration (ng/L or ng/g)} = \frac{\text{Area}_N M_{EIS}}{\text{Area}_{EIS} (\overline{RR} \text{ or } \overline{RF})} \times DF \times \frac{V_f}{V_i}$$

Area_N	The measured area of the quantitation ion for the unlabeled PFAS target analyte
Area_{EIS}	The measured area of the quantitation ion for the EIS compound
M_{EIS}	The expected concentration of the EIS in the extract (ng/L)
RR	Average response ratio used to quantify target compounds by the isotope dilution method
RF	Average response factor used to quantify target compounds by the extracted internal standard method
DF	Extract Dilution Factor; if no extract dilution was performed, $DF=1$
V_f	Final extract volume (L)
V_i	Initial sample volume (L) or weight (g)

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10.4.2 EIS Concentration

The EIS compounds are quantitated with respect to an NIS, as shown in Appendix A Table 6, using the response factors from the most recent initial calibration. Other equations may be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$\text{Concentration (ng/L or ng/g)} = \frac{\text{Area}_{EIS} M_{NIS}}{\text{Area}_{NIS} \overline{RF}_S} \times DF \times \frac{V_f}{V_i}$$

Area_{EIS}	The measured area of the quantitation ion for the EIS compound
Area_{NIS}	The measured area of the quantitation ion for the associated NIS compound
M_{NIS}	The expected concentration of the NIS in the extract (ng/L)
\overline{RF}_S	Average response factor used to quantify the EIS compound by the non-extracted internal standard method
DF	Dilution Factor; if no extract dilution was performed, $DF=1$.
V_f	Final extract volume (L)
V_i	Initial sample volume (L) or weight (g)

10.4.3 ICAL Relative Response (RR)

Used to calculate the response ratio (RR) for each target analyte calibrated by isotope dilution quantitation.

$$RR = \frac{\text{Area}_t M_{EIS}}{\text{Area}_{EIS} M_t}$$

Area_t	Measured area of the quantitation ion for the target analyte
Area_{EIS}	Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards
M_{EIS}	Concentration of the isotopically labeled PFAS used as the EIS in the calibration standards (ng/L)
M_t	Concentration of the target analyte in the calibration standard (ng/L)

10.4.4 ICAL Response Factor (RF): Target Analyte


Used to calculate the response factor (RF) for each target analyte calibrated by extracted internal standard quantitation.

$$RF = \frac{\text{Area}_t M_{EIS}}{\text{Area}_{EIS} M_t}$$

Area_t	Measured area of the quantitation ion for the target analyte
Area_{EIS}	Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards
M_{EIS}	Concentration of the isotopically labeled PFAS used as the EIS in the calibration standards (ng/L)
M_t	Concentration of the target analyte in the calibration standard (ng/L)

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10.4.5 ICAL Response Factor (RF): EIS

$$RF_S = \frac{Area_{EIS}M_{NIS}}{Area_{NIS}M_{EIS}}$$

$Area_{EIS}$	Measured area of the quantitation ion for the EIS compound in the calibration standard
$Area_{NIS}$	Measured area of the quantitation ion for the NIS compound in the calibration standard
M_{NIS}	Concentration of the NIS compound in the calibration standard (ng/L)
M_{EIS}	Concentration of the EIS compound in the calibration standard (ng/L)

10.4.6 ICAL Relative Standard Error (RSE)

Used to assess linearity of quadratic curve fits.

$$RSE = 100 \times \sqrt{\frac{\sum_{i=1}^n \left[\frac{x'_i - x_i}{x_i} \right]^2}{n - p}}$$

x_i	Nominal concentration (true value) of each calibration standard
x'_i	Measured concentration of each calibration standard
n	Number of standard levels in the curve
p	Type of curve (2 = linear, 3 = quadratic)

10.4.7 Other Calculations

For common calculations such as percent recovery and relative percent difference, refer to the QA Manual ENV-MAN-WCOL-0001 Quality Manual.


10.5 Reporting Specifications

Unless otherwise specified on a project basis, report final test results as follows:

Matrix	Units	Comment
Aqueous: All Matrices	ng/L	If alternate protocols are used to manage matrix characteristics or high concentrations, narrate sample data accordingly.
Soils/Sediments & Biosolids	ng/g dry weight	Test results are adjusted for percent moisture. Include the test information from percent solids determination in the test report.
Biphasic: Solid phase	ng/g wet weight basis	
Surface Wipe	ng/wipe	
Article of Commerce	ng/g as received	Indicate if cryomilling was performed before preparation.

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Adjust the DL and LOQ for sample volume or mass and any dilution factor before using it as the threshold value for reporting quantitative test results. Unless otherwise specified, test results between the DL and the LOQ, when reported, are qualified as estimated.

The recovery of associated EIS compounds for each target analyte must be included for each sample in the test report, regardless of the type of deliverable provided.

If the sample was diluted, include the DF in the test report to identify the factor by which the final test results were adjusted. Results for any analyte found in a sample or extract that has been diluted will be reported at the least dilute level for which the measured concentration is within the calibration range (e.g., above the LOQ for the analyte and below the highest calibration standard) and in which isotopically labeled compound recoveries are within their respective QC acceptance criteria. This may require reporting results for some analytes in the same sample from different analyses.

For compounds with identified branched and linear isomer peaks, the reported concentration is the sum of all isomers. If standards (either quantitative or qualitative) containing a mix of isomers are not available for purchase for a particular compound, only the linear isomer can be identified and quantitated in samples.

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Method Performance Validation

The performance of this SOP was verified in accordance with the PAS corporate SOP for Method Validation and Instrument Verification. Records of verification are kept by the Quality Department in accordance with the PAS policy for Record Management (ENV-POL-0013).

Detection limits (DL or MDL, including LOD for DoD) and limits of quantitation (LOQ) were established in accordance with SOP ENV-SOP-CORQ-0011 Method Validation and Instrument Verification during initial method setup.


These limits are continuously verified and updated in accordance with USEPA procedures for determining method detection limits, as well as the requirements specified in the TNI Standard and DoD/DOE QSM, as applicable. Customers should be informed that the laboratory is obligated to update these limits when verification checks reveal a change in sensitivity or method performance, regardless of customer approval.

11.1.1 Initial Precision and Recovery (IPR)

To verify the performance of the laboratory's SOP against the specifications of the test method, a demonstration of capability (DOC) must be conducted for each matrix following the procedure outlined in Section 9.2.1 of EPA Method 1633/1633A. Refer to the method published in January 2024 by the USEPA Office of Water (Document EPA 821-R-24-001) for detailed instructions. In summary, the lab must follow the SOP protocol to extract and analyze four (4) samples prepared as LCS, along with at least one MB, for each matrix to be tested. The average percent recovery and RSD of the target analyte results are tabulated and compared to method acceptance criteria.

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The results of the IPR must be within the accuracy and precision limits specified in Appendix A, Table 10. There are no IPR mean or RSD criteria for EIS compounds; %REC of each IPR sample must meet the criteria in Appendix A, Table 9.

11.2 Analyst Demonstration of Capability (DOC)

Before conducting unsupervised (independent) work on any client samples, analytical personnel (including sample preparation) must demonstrate their ability to achieve accurate and precise test results using the procedures specified in this SOP (IDOC) and redemonstrate this capability on an annual basis thereafter (ODOC).

Refer to the laboratory's Quality Manual and to laboratory SOP ENV-SOP-WCOL-0077 Demonstration of IDOC CDOC for more information about the requirements and procedure for IDOC and CDOC.

The average recovery of the target analytes in the DOC samples must be within the accuracy limits for LCS specified in Appendix A, Table 8 and the RSD must be within the precision limits for IPR specified in Appendix A, Table 10. There are no mean or RSD criteria for EIS compounds in the DOC; %REC of each DOC sample must meet the criteria in Appendix A, Table 9.

The IPR study may also suffice as IDOC for the analyst who performed the study.

11.3 Matrix Impact (MS/MSD)

Matrix spikes are used to assess potential impact of matrix interference on the accuracy or precision of the procedure on samples of the same or similar matrix – samples of similar matrix are usually classified as samples of the same matrix type collected from the same sampling site.

According to EPA Method 1633/1633A, matrix spikes (MS/MSD) generally are not required for methods that employ isotopic dilution because the recovery of the EIS compounds spiked into every sample reflects the effect the matrix has on recovery of target compounds.

Therefore, matrix spikes are not required for compliance monitoring. However, the EPA method acknowledges that some projects or programs may be interested in this information.

Customers interested in using information from matrix spikes to understand potential matrix impact on their samples must request MS/MSD, provide additional sample material to the laboratory to perform the test, and identify which sample to use on the chain-of-custody (COC).

If no customer has requested MS/MSD on any sample in the preparation batch, an MS/MSD is not performed.


NOTE for DoD Projects: Some DoD QSM versions require 1 MS/MSD pair per preparation batch. Customers performing work that requires compliance with a version of the QSM that requires MS/MSD must provide additional sample material for the laboratory to perform this test.

11.4 Sampling Impact (Field Duplicate)

A field duplicate (FD) refers to the testing of a replicate container of sample collected with all other samples from a sampling event and used to measure precision of the field sampling technique.

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Customers requiring a field duplicate must request this analysis and provide a separate container for analysis. The FD must be logged in as a routine environmental sample; it may not be subsampled from the same container of any other sample.

11.5 Quality Control (QC)

The laboratory prepares and analyzes the following QC at the frequency specified in the table below. Refer to Appendix A, Table 7 and Appendix H for acceptance criteria and requirements for corrective action(s) and/or data qualification.

Item ¹	Acronym	Frequency
Mass Calibration		Annually and as needed
Mass Calibration Verification		After mass calibration
Initial Calibration	ICAL	Initially at instrument setup, then as needed
Initial Calibration Verification	ICV	With each ICAL, prior to sample analysis
Instrument Blank	IBLK/ICB	Daily prior to analysis and after high concentration standards
Instrument Sensitivity Check	ISC	DoD – At the beginning of each analytical sequence (20 environmental samples maximum.) Non-DoD - Daily at the beginning of a (maximum) 24 hr analytical sequence.
Continuing Calibration Verification	CCV	At the beginning (ISC) and every 10 samples, up to a maximum of 20 samples for DoD, up to a maximum of 24 hours for non-DoD.
Continuing Calibration Blank	CCB	After each bracketing CCV, and prior to the ISC for DoD.
RT Window	RTW	During ICAL and at the beginning of each analytical sequence
Bile Check	TDCA	At least once per analytical sequence.
Method Blank	MB	1 per batch of 20 or fewer samples
Laboratory Control Samples	LCS & LLLCS	1 pair per batch of 20 or fewer samples
Laboratory Duplicate	DUP	See Section 11.5.1

¹Extracted (EIS) and Non-extracted Internal Standards (NIS) are included in each QC item.

11.5.1 Laboratory Duplicate (AKA Matrix Duplicate)


A laboratory duplicate is a duplicate preparation and analysis of a sample whose aliquot was taken from the same container as the parent sample and used to measure precision.

EPA Method 1633/1633A does not require laboratory duplicates for NPDES compliance monitoring, but the method acknowledges that a duplicate may be needed on a project-specific basis. Some accreditation programs, such as DoD ELAP, require a duplicate for each sample of certain matrices, such as AFFF or F3.

To support project needs, the laboratory will perform a duplicate when the customer has requested this measure, designated which sample from their sampling event to use as the duplicate on the chain-of-custody (COC), and have provided sufficient additional sample material for the test.

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However, customers should be advised that when the duplicate is taken from a different container, which is necessary for certain matrices, the duplicate effectively becomes a field duplicate and the results for precision are inclusive of potential bias from sampling error.

Instructions for DUP to Laboratory Personnel by Matrix:

- **NPW:** Laboratory duplicates must be prepared from a separate container because the entire sample is consumed during routine preparation and extraction and subsampling is only allowed for primary dilutions of samples expected to have high concentrations of target analytes, or to manage sample matrix characteristics.

If a duplicate is requested and no sample has been designated for use, confer with the PM to determine which sample to use and verify that more than two (2) 500 mL containers were received. If two or less containers were received; there is insufficient sample volume available to perform the duplicate – notify the PM of the sampling nonconformity. If more than two (2) 500 mL containers were received, use one (1) for the parent sample and one (1) for the duplicate.

Do not perform reduced volume extraction to provide a DUP.

- **Surface Wipes:** The entire sample is consumed during preparation and extraction. Given the nature of the matrix and collection technique, this sample matrix is not suitable for analysis of a laboratory duplicate.
 - If a duplicate is requested, notify the PM that the matrix is not suitable for this determination and cancel the request.
- **AFFF/F3, Soil/Sediment, Biosolid, Articles of Commerce, and Tissue:** A laboratory duplicate is performed when requested by the customer and when there is enough material to take the duplicate aliquot from the same container. Note that DoD QSM 5.4/6.0 requires a laboratory duplicate on a sample basis for AFFF and F3 matrices. Thus, for DoD project work, customers must provide sufficient mass for each sample to meet this program requirement.

11.5.2 Extracted Internal Standards (EIS)

To assess method performance on the sample matrix, the laboratory must spike all samples and QC with the EIS solution. Analyze each sample according to the procedures in this SOP. Compute the percent recovery of the EIS compound concentration using the NIS quantitation method; see Appendix A, Table 9 for acceptance criteria.

If the recovery of any EIS compound is outside of the acceptance limits in the original, undiluted analysis, prepare and analyze a limited extract dilution and/or a re-extraction using a reduced sample amount.


Prior to calculating EIS percent recovery, the calculated concentration of the EIS are always adjusted to account for any extract dilutions prepared for analysis.

11.5.3 Non-extracted Internal Standard (NIS)

To assess method performance, the laboratory must spike all sample extracts with the NIS solution prior to analysis. Percent recovery of the NIS compound is calculated by

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comparing the measured response in each analysis to the average response of the same compound measured in the ICAL.

Calculate the ratio of the NIS peak areas from the QC and field samples relative to the mean area of the corresponding NIS in the most recent initial calibration to check for possible bad injections of NIS solution or loss of instrument sensitivity. If the NIS areas are low for all the field samples and QC samples in the analytical batch, it suggests a loss of instrument sensitivity, while low areas in only some field or QC samples suggests a possible bad injection. See Appendix A, Table 9 for acceptance criteria.

11.5.4 Sample Dilutions

Samples with quantified target analytes exceeding the upper calibration range must be diluted and reanalyzed to bring the result within the calibration range. However, if it is known that the analytes are not compounds of concern for the project, test results may be reported over the calibration range, if they are qualified to disclose the situation and documented client consent for reporting this way is obtained.

If the extract dilution required is greater than 10X, repeat sample preparation using a reduced sample amount, guided by the magnitude of the original over-range results.

The response of the EIS in the diluted extract must meet the S/N and RT requirements for qualitative identification and must be within the limits specified in Appendix A, Table 9. If EIS criteria are not met, then the compound cannot be measured reliably in the diluted extract, and sample preparation and analysis must be repeated with a smaller subsample.

The amount used for re-extraction should be consistent with the dilution applied to the original extract. For example, if a 10X dilution was needed for an aqueous sample, 50 mL of sample should be subsampled for re-prep and extraction. (Divide the original amount of sample prepared by 10 – this is the sample amount.)

12.0 DATA REVIEW & CORRECTIVE ACTION

12.1 Data Review


Review all data and test results before releasing the test report to ensure that the analytical record is complete and properly documented, criteria were met, appropriate corrective actions were taken for QC failures or other nonconformances, and test results are properly qualified when necessary.

Initial review, known as primary review, is done by the individual who performed the task.

Review of the data and test results done by someone other than the person who performed the task is known as secondary review, and it is done by a qualified peer or supervisor. Secondary review is done to ensure any errors missed during primary review are caught and corrected before the test report is delivered. Secondary review is also done to ensure that SOPs were followed, calibration and instrument performance met specifications, QC criteria were satisfied, and/or proper corrective actions were implemented, qualitative identification and quantitative measurements are accurate, any manual integrations are justified, documented, and approved per the PAS Corporate SOP for manual integration, calculations are accurate, and the analytical record is complete and traceable, with final test results properly qualified.

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In addition to primary and secondary review, a completeness check is performed by project management personnel to confirm that the test report is complete and ready for release.

Refer to laboratory SOP ENV-SOP-WCOL-0075 Data Review for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results fall outside the acceptance criteria. For a complete summary of QC parameters, acceptance criteria, and recommended corrective actions associated with this test method, refer to Appendix A, Table 7 and Appendix H. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when instrumental carryover contamination is suspected. Samples analyzed after a sample with a detection above the working calibration range must be checked for carryover and reanalyzed if carryover is suspected. If field sample analyte concentrations exceed the highest calibration standard and the same analytes in the following field sample or in consecutive following field samples also exceed the MB acceptance criteria, the affected samples should be reanalyzed using a fresh aliquot of the sample extract.

If corrective actions are not taken or are unsuccessful, the decision and outcome must be documented in the analytical record and test results qualified to alert the end data user of the nonconformity.

13.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Refer to laboratory SOP ENV-SOP-WCOL-0019 Hazardous and Non-Hazardous Laboratory Waste Management for waste handling and management practices pertaining to the waste streams created at this facility.

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.


The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 MODIFICATIONS

The procedures in this SOP have been modified from the reference method to improve overall performance. Supporting documentation to demonstrate equivalency and comparability, when required, is maintained by the Quality Department.

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Modification	Section of Reference Method Modified	Justification for Modification	Validation of Modification
Changed EIS quantitation association for PFMPA, 7:3FTCA, ADONA, 9Cl-PF3ONS, & 11Cl-PF3OUdS	Section 20, Table 10	Improved performance (allowable modification), more appropriate correlation	MDL, IPR, PT
Updated product ion used for measurement of 13C4-PFOA from m/z 172 to m/z 372	Section 20, Table 10	Match ion transition used for EIS 13C8-PFOA and native PFOA	MDL, IPR, PT
Increased the size of the SPE sorbent bed to 250 mg and tube size to 20 mL	Section 6.7.1	Improved performance (allowable modification); wider cartridge improves sample loading, reduces chances of clogs	MDL, IPR, PT
Increased flow rate to allow up to 10 mL/min	Section 12.1.4	Comparable and validated performance	MDL, IPR, PT
Omit TSS determination for aqueous samples; utilize centrifugation to minimize clogging of SPE	Section 11.1 & 11.2.4	Allowable modifications per method	Not applicable.
Solid matrix extraction: eliminated 3 rd liquid-solid extraction step and omitted concentration step	Section 11.3.4, 11.3.6, and 11.3.9	Improved performance & reduced sample processing time	MDL, IPR, PT
Use pre-packed GCB cartridges; omit syringe filtration	All references to carbon cleanup	Improved performance, reduced sample processing time, & ease of use	MDL, IPR, PT
Lowered pH of aqueous samples to 5.5 ± 0.5 and solid samples to 4.0 ± 0.5 prior to extraction and cleanup	Section 9.6.1.1 step 10 (aqueous); Section 9.6.2 step 14 (solids)	Improved performance of 13C3-PFPrA	MDL, IPR, PT
Added option for WAX/GCB stacked media with same 250 mg bed mass	Section 6.7.1	Improved performance (allowable modification). Improves efficiency or extraction, reduces variability between extraction.	MDL, IPR

15.0 RESPONSIBILITIES

PAS employees that perform any part of this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.

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PAS supervisors and managers, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP in the work area(s) they oversee.

PAS employees are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local QM and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual changes to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015, *Document Management* and ENV-SOP-CORQ-0016, *SOP for Creation of SOP and SWI*.

16.0 ATTACHMENTS

Appendix A: Tables

- Table 1: Analyte Name / Abbreviation / CAS Number Cross-Reference Table
- Table 2: Routine Analyte List and LOQ by Matrix
- Table 3: Sample Collection, Preservation, and Holding Time Requirements
- Table 4: Required Instruments, Equipment, and Supplies
- Table 5: Prepared Concentration of Working Calibration Standards
- Table 6: Identification and Quantitation Ions by Analyte, EIS, and NIS
- Table 7: QC Acceptance Criteria, Corrective Action and Data Qualification Requirements
- Table 8: LCS/LLCS Acceptance Limits
- Table 9: EIS and NIS Acceptance Limits
- Table 10: IPR Limits for Method Validation

Appendix B: Reference Materials – Reagents, Standards & Formulations

Appendix C: Sample Screening Protocol

Appendix D: Subsampling Procedure for Aqueous Matrices

Appendix E: Aqueous Sample Preparation – Settled Solids Depth > ½ cm

Appendix F: Biphasic Sample Separation Procedure


Appendix G: SPE Clog Mitigation Procedure

Appendix H: Surface Wipe PFAS Analysis by 1633

Appendix I: TCLP/SPLP by 1633

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17.0 REFERENCES


Note: Where references exclude a date or edition, the latest edition of the referenced document adopted/recognized by the laboratory's accreditation bodies applies. Refer to the *Laboratory Quality Manual* [ENV-MAN-WCOL-0001] for details.

- EPA. Method 1633, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. January 2024.
- EPA. Method 1633, Revision A, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. December 2024.
- DoD-EDQW and DOE-DQW. DoD/DOE Quality Systems Manual (QSM) for Environmental Laboratories, Version 6.0, 2021 – Table B-24)
- Standard Method for the Examination of Water and Wastewater, 23rd Edition, 2017 – Total, Fixed, and Volatile Solids in Solid and Semisolid Samples, Method SM2540G.
- ENV-POL-CORQ-0005, *Acceptable Calibration Practices*, current version.
- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *Standard Operating Procedures and Standard Work Instructions*, current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manual*, current version.
- ENV-MAN-WCOL-0001, *Quality Manual*, current version.
- ENV-SOP-WCOL-0006, *Sample Container Shipping*, current version
- ENV-SOP-WCOL-0007, *Sample Receiving*, current version
- ENV-SOP-WCOL-0083, *Preparation and Documentation of Laboratory Standard and Reagent*, current version
- ENV-SOP-WCOL-0137, *Percent Solid and Percent Moisture in Solid and Semi-solid*, current version
- ENV-SOP-WCOL-0077, *Demonstration of IDOC CDOC*, current version
- ENV-SOP-WCOL-0075, *Data Review*, current version
- ENV-SOP-WCOL-0019, *Hazardous and Non-Hazardous Lab Waste Management*, current version

18.0 REVISION HISTORY

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Revisions Made from Prior Version


Section	Description of Change
NA	This is the first version of this SOP

Document Succession: This version replaces the following document(s):

Document Number	Version	Document Title	Effective Date:
NA	NA	NA	NA

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Appendix A: Tables

Table 1: Analyte Name / Abbreviation / CAS Number Cross-Reference Table

Analyte Name	Abbreviation	CAS #
Perfluoropropanoic acid	PFPrA	422-64-0
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2
Bis (trifluoromethylsulfonyl)amine	TFSI	82113-65-3
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6

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Analyte Name	Abbreviation	CAS #
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7
3-Perfluoropropyl propanoic acid (FPrPA)	3:3 FTCA	356-02-5
2H,2H,3H,3H-Perfluorooctanoic acid (FPePA)	5:3 FTCA	914637-49-3
3-Perfluoroheptyl propanoic acid (FHpPA)	7:3 FTCA	812-70-4
Extracted Internal Standards (EIS)		
Perfluoro-n-[13C3] propanoic acid	13C3-PFPrA	NA
Perfluoro-n-[13C4] butanoic acid	13C4-PFBA	NA
Perfluoro-n-[13C5] pentanoic acid	13C5-PFPeA	NA
Perfluoro-n-[1,2,3,4,6-13C5] hexanoic acid	13C5-PFHxA	NA
Perfluoro-n-[1,2,3,4-13C4] heptanoic acid	13C4-PFHpA	NA
Perfluoro-n-[13C8] octanoic acid	13C8-PFOA	NA
Perfluoro-n-[13C9] nonanoic acid	13C9-PFNA	NA
Perfluoro-n-[1,2,3,4,5,6-13C6] decanoic acid	13C6-PFDA	NA
Perfluoro-n-[1,2,3,4,5,6,7-13C7] undecanoic acid	13C7-PFUnA	NA
Perfluoro-n-[1,2-13C2] dodecanoic acid	13C2-PFDoA	NA
Perfluoro-n-[1,2-13C2] tetradecanoic acid	13C2-PFTeDA	NA
Perfluoro-1-[2,3,4-13C3] butanesulfonic acid	13C3-PFBS	NA
Perfluoro-1-[1,2,3-13C3] hexanesulfonic acid	13C3-PFHxS	NA
Perfluoro-1-[13C8] octanesulfonic acid	13C8-PFOS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] hexanesulfonic acid	13C2-4:2FTS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] octanesulfonic acid	13C2-6:2FTS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] decanesulfonic acid	13C2-8:2FTS	NA
Perfluoro-1-[13C8] octanesulfonamide	13C8-PFOSA	NA
N-methyl-D3-perfluoro-1-octanesulfonamide	D3-NMeFOSA	NA
N-ethyl-D5-perfluoro-1-octanesulfonamide	D5-NEtFOSA	NA
N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid	D3-NMeFOSAA	NA

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Analyte Name	Abbreviation	CAS #
N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid	D5-NEtFOSAA	NA
N-methyl-D7-perfluorooctanesulfonamidoethanol	D7-NMeFOSE	NA
N-ethyl-D9-perfluorooctanesulfonamidoethanol	D9-NEtFOSE	NA
Tetrafluoro-2-heptafluoropropoxy-13C3-propanoic acid	13C3-HFPO-DA	NA
NIS		
Perfluoro-n-[2,3,4-13C3] butanoic acid	13C3-PFBA	NA
Perfluoro-n-[1,2-13C2]hexanoic acid	13C2-PFHxA	NA
Perfluoro-n-[1,2,3,4-13C4]octanoic acid	13C4-PFOA	NA
Perfluoro-n-[1,2,3,4,5-13C5] nonanoic acid	13C5-PFNA	NA
Perfluoro-n-[1,2-13C2]decanoic acid	13C2-PFDA	NA
Perfluoro-1-hexane[18O2]sulfonic acid	18O2-PFHxS	NA
Perfluoro-n-[1,2,3,4-13C4] octanesulfonic acid	13C4-PFOS	NA

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Table 2: Routine Analyte List and LOQ¹ by Matrix

Abbreviation	CAS #	Aqueous (NPW) (ng/L)	Leachate (Landfill/TCLP/SPLP) (ng/L)	Solids (Soil/Sediment) (ng/g)	Biosolid (ng/g)	Surface Wipe (ng/wipe)
PFPrA	422-64-0	6.4	32	0.8	8	1.6
PFBA	375-22-4	6.4	32	0.8	8	1.6
PFPeA	2706-90-3	3.2	16	0.4	4	0.8
PFHxA	307-24-4	1.6	8	0.2	2	0.4
PFHpA	375-85-9	1.6	8	0.2	2	0.4
PFOA	335-67-1	1.6	8	0.2	2	0.4
PFNA	375-95-1	1.6	8	0.2	2	0.4
PFDA	335-76-2	1.6	8	0.2	2	0.4
PFUnA	2058-94-8	1.6	8	0.2	2	0.4
PFDoA	307-55-1	1.6	8	0.2	2	0.4
PFTTrDA	72629-94-8	1.6	8	0.2	2	0.4
PFTeDA	376-06-7	1.6	8	0.2	2	0.4
PFBS	375-73-5	1.6	8	0.2	2	0.4
PFPeS	2706-91-4	1.6	8	0.2	2	0.4
PFHxS	355-46-4	1.6	8	0.2	2	0.4
PFHpS	375-92-8	1.6	8	0.2	2	0.4
PFOS	1763-23-1	1.6	8	0.2	2	0.4
PFNS	68259-12-1	1.6	8	0.2	2	0.4
PFDS	335-77-3	1.6	8	0.2	2	0.4
PFDoS	79780-39-5	1.6	8	0.2	2	0.4
4:2 FTS	757124-72-4	6.4	32	0.8	8	1.6
6:2 FTS	27619-97-2	6.4	32	0.8	8	1.6
8:2 FTS	39108-34-4	6.4	32	0.8	8	1.6
PFOSA	754-91-6	1.6	8	0.2	2	0.4
NMeFOSA	31506-32-8	1.6	8	0.2	2	0.4
NEtFOSA	4151-50-2	1.6	8	0.2	2	0.4
TFSI	82113-65-3	3.2	16	0.4	4	0.8
NMeFOSAA	2355-31-9	1.6	8	0.2	2	0.4
NEtFOSAA	2991-50-6	1.6	8	0.2	2	0.4
NMeFOSE	24448-09-7	16	80	2.0	20	4
NEtFOSE	1691-99-2	16	80	2.0	20	4

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Abbreviation	CAS #	Aqueous (NPW) (ng/L)	Leachate (Landfill/TCLP/SPLP) (ng/L)	Solids (Soil/Sediment) (ng/g)	Biosolid (ng/g)	Surface Wipe (ng/wipe)
HFPO-DA	13252-13-6	6.4	32	0.8	8	1.6
ADONA	919005-14-4	6.4	32	0.8	8	1.6
PFMPA	377-73-1	3.2	16	0.4	4	0.8
PFMBA	863090-89-5	3.2	16	0.4	4	0.8
NFDHA	151772-58-6	3.2	16	0.4	4	0.8
9CI-PF3ONS	756426-58-1	6.4	32	0.8	8	1.6
11CI-PF3OUdS	763051-92-9	6.4	32	0.8	8	1.6
PFEESA	113507-82-7	3.2	16	0.4	4	0.8
3:3 FTCA	356-02-5	8	40	1.0	10	2
5:3 FTCA	914637-49-3	40	200	5.0	50	10
7:3 FTCA	812-70-4	40	200	5.0	50	10

¹LOQ effective on SOP effective date; values are subject to change. If you are an external party using this SOP for reference, please contact the laboratory for the most up-to-date information.

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	Effective Date: 09/30/2025

Management Approval:

Katherine Zollner Approved on 9/25/2025 4:25:51 PM
 Kyle Collins Approved on 9/29/2025 12:18:57 PM
 Erin Boyd Approved on 9/30/2025 7:56:59 AM

Table 3: Sample Collection, Preservation¹ and Holding Time Requirements

Matrix	Container Sample	per	Minimum Sample Size ²	Preservation	Holding Time Collection to Prep	Holding Time Prep to Analysis
Aqueous: Non-potable Water (NPW)	Linerless HDPE	2 x 250 mL + 1 x 60 mL ³	250 mL	Option 1: 0-6°C Option 2: Frozen	Option 1: 28 Days Option 2: 90 Days	28 Days
Aqueous: Landfill Leachate	Linerless HDPE	2 x 60 mL	50 mL	Option 1: 0-6°C Option 2: Frozen	Option 1: 28 Days Option 2: 90 Days	28 Days
Aqueous: TCLP or SPLP	See TCLP / SPLP SOP(s): Leachates are generated using methods for TCLP and/or SPLP and then processed per this SOP for PFAS					
Solid: Soil / Sediment	Linerless Polypropylene	1 x 3 oz/90 mL wide mouth container	2 g	Option 1: 0-6°C Option 2: Frozen	Option 1: 90 Days Option 2: 90 Days	28 Days
Solid: Biosolid	Linerless HDPE	1x 125 mL	0.2 g	Option 1: 0-6°C Option 2: Frozen	Option 1: 90 Days Option 2: 90 Days	28 Days
Solid: Surface Wipe	Polypropylene Centrifuge Tube	1 x 50 mL, shipped with individually packaged pre-soaked ghost wipe	1 Wipe	0-6°C	90 days	28 days
Solid: Articles of Commerce	PFAS Free Container (HDPE bottle, resealable zip-top bag)		0.8 g	0-6°C	365 Days	28 Days
Aqueous: AFFF/F3	Linerless HDPE	1 x 60 mL or 1 x 90 mL	0.01 g	0-6°C	28 Days	28 Days

¹: Preservation at time of collection and on receipt at laboratory. Unless otherwise specified, samples are stored after receipt in the laboratory under the same conditions as preservation until time of preparation or analysis.

²: Nominal amount of sample required for each discrete test. Solid and biosolid sample amounts reflect dry weight.

³: Used for pre-screening analyses.

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Table 4: Required Instruments, Equipment, and Supplies

Item	Specification	Vendor	Model	Catalog #
HPLC	High Pressure LC	Agilent	1290 Infinity II	Call Agilent
MS/MS	QQQ Mass Spec	Sciex	QTrap 5500	Call Sciex
Analytical Column	2.1 x 50 mm (1.7µm)	Waters	Acquity UPLC BEH	186002350
Guard Cartridge/Column	2.1 x 5 mm, 1.8 µm	Agilent	Zorbax Eclipse Plus C18	821725-901
	4 x 3.0 mm	Phenomenex	SecurityGuard Guard Cartridge Kit	KJ0-4282
Trap / Delay Colum	4.6 x 30 mm	Phenomenex	Luna Delay Column	00A-4252-Y0
Oven	Stable Temperature of 110±5°C	Varied	Varied	Varied
Analytical Balance	Measurement to 0.0001g	Varied	Varied	Varied
Top Loading Balance	Measurement to 0.01g	Varied	Varied	Varied
Ultrasonic Mixer (Sonicator)		Varied	Varied	Varied
Vortex Mixer	Single Tube	Varied	Varied	Varied
Mixing Table	Variable Speed	VWR	3500 Orbital Shaker	See Catalog
Centrifuge	3000 RPM (~2000 RCF)	VWR	Beckman Allegra 6	See Catalog
		Sigma- Aldrich	Hettich Rotanta 460	
Centrifuge Bottles	Sterile, Polypropylene, Conical, 500mL	Fisher Scientific	Corning™ Polypropylene Centrifuge Tubes, Sterile	07-200-621
Vacuum Manifold	Designed for SPE Cartridges	Sigma-Aldrich	Visiprep™ SPE	57265
Manifold Liners	Compatible with SPE manifold	Millipore Sigma	Disposable Liners for Visiprep DL	57059
		Restek	Quick Replace Liners, PTPE or Resprep QR Vacuum Manifolds	28310
Vacuum Pump	Vacuum of ~10-15 inches of mercury	MilliporeSigma	WP6111560 115V,60 HZ, 3.5A	See Catalog
Vacuum Tubing	1/4"ID, 5/8" OD, 3/16" Wall	Fisher Scientific	Nalgene PVC	8702-0065
SPE Cartridges	Designed for PFAS	Phenomenex (locally approved)	Strata-X-AW 33uM Polymeric Weak Anion-PFAS 250mg/20m Tubes	8B-S541-FEG (formerly CSO-9216)

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Item	Specification	Vendor	Model	Catalog #
SPE Cartridges	Designed for PFAS	Phenomenex (locally approved)	Strata-X-AW 33uM Polymeric Weak Anion-PFAS 250mg/100mg GCB; 20m Tubes	CS0-9220
SPE Reservoirs	60mL, polypropylene	Phenomenex	Empty SPE Tubes 60cc	AH0-7189
	12mL, polypropylene	Phenomenex	Empty SPE Tubes 12cc	AH0-7003
Adapter Caps	To fit 12, 20, 60mL SPE tubes	MilliporeSigma	Cartridge Adapter	57267
Adjustable-volume Mechanical Pipettes	10uL to 10mL	Various	Various	Various
Disposable Pipette Tips	HDPE or Polypropylene: volume of 10uL to 5mL	Various	Various	Various
Solvent Evaporator	Nitrogen Evaporation	Biotage	Automated: TurboVap®LV	Automated: TurboVap®LV
Carbon Cartridges	Graphitized Carbon Black Solid Phase Extraction Absorbent	Phenomenex	Strata GCB, 25mg/1mL Pass Through Cartridge	8B-S528-CAJ
Glass Wool	Silanized	Supelco	65997-17-3	20411
Water System	MilliQ PFAS Free Water	Millipore	ZRQSV800	ZRQSV800
pH Indicator Strips	0-6 pH, 0.5 Sensitivity	Supelco	MQuant	HC441704
	5-10 pH, 0.5 Sensitivity	Supelco	MQuant	HC441390
Bottles	HDPE or Polypropylene with linerless caps of same material	QEC (Pace Approved)	90 mL	6214-003PPGBC-P
			125 mL	6213-U004BC-P
			250 mL	6212-Q008BC-P
			500 mL	6212-Q016/BC-150 PACE
Tubes	HDPE or Polypropylene with linerless caps of same material	Fisher Scientific	Falcon™ 15 mL conical	05-527-90
			Falcon™ 50 mL conical	14-432-22
Containers	Narrow Mouth HDPE	Thermo	4 mL	2002-9125
			8 mL	2002-9025
			15 mL	2002-9050
	Polyethylene	Grainger	Cryogenic Vial 2 mL	6EMV1

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

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Item	Specification	Vendor	Model	Catalog #
	Microcentrifuge Tube	Fisher	1.5 mL	05-408-129
Screw Top Vials	Polypropylene vial	Agilent	250 µL	5190-2243
Screw Top Cap	9mm clear propylene, thin polypropylene-silicone septa	Agilent	Screw Style Cap	5191-8151
Surface Wipe	Pre-wetted with methanol	Environmental Express (locally approved)	Ghost Wipes for Methamphetamine testing	SC5000
Sand	20-30 Mesh	Fisher	Ottawa	S23-3

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Management Approval:

Katherine Zollner Approved on 9/25/2025 4:25:51 PM

Kyle Collins Approved on 9/29/2025 12:18:57 PM


Erin Boyd Approved on 9/30/2025 7:56:59 AM

Table 5: Prepared Concentration of Working Calibration Standards (ng/mL)¹

Compound	L1	L2 ²	L3	L4	L5	L6 ³	L7	L8	L9
Perfluoroalkyl carboxylic acids									
PFPrA	0.2	0.4	0.8	2	10	20	50	100	200
PFBA	0.2	0.4	0.8	2	10	20	50	100	200
PFPeA	0.1	0.2	0.4	1	5	10	25	50	100
PFHxA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFHpA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFOA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFNA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFDA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFUnA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFDaA	0.06	0.1	0.2	0.5	2.5	5	12.5	25	50
PFTTrDA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
PFTeDA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
Perfluoroalkyl sulfonic acids									
PFBS	0.044	0.089	0.178	0.444	2.22	4.44	11.1	22.2	44.4
PFPeS	0.047	0.094	0.188	0.470	2.35	4.70	11.8	23.5	47.0
PFHxS	0.046	0.091	0.182	0.456	2.28	4.56	11.4	22.8	45.6
PFHpS	0.048	0.095	0.190	0.476	2.38	4.76	11.9	23.8	47.6
PFOS	0.046	0.093	0.186	0.464	2.32	4.64	11.6	23.2	46.4
PFNS	0.048	0.096	0.192	0.480	2.40	4.80	12.0	24.0	48.0
PFDS	0.048	0.096	0.193	0.482	2.41	4.82	12.1	24.1	48.2
PFDoS	0.048	0.097	0.194	0.484	2.42	4.84	12.1	24.2	48.4
Fluorotelomer sulfonic acids									
4:2FTS	0.188	0.375	0.750	1.87	9.37	18.7	46.9	93.7	187
6:2FTS	0.190	0.380	0.761	1.90	9.51	19.0	47.6	95.1	190
8:2FTS	0.192	0.384	0.768	1.92	9.6	19.2	48	96	192
Perfluorooctane sulfonamides									
PFOSA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
NMeFOSA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
NEtFOSA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
Perfluoromethane sulfonamide									
TFSI	0.0979	0.196	0.392	0.979	4.90	9.79	24.5	49.0	97.9
Perfluorooctane sulfonamidoacetic acids									
NMeFOSAA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Compound	L1	L2 ²	L3	L4	L5	L6 ³	L7	L8	L9
NEtFOSAA	0.05	0.1	0.2	0.5	2.5	5	12.5	25	50
Perfluorooctane sulfonamide ethanols									
NMeFOSE	0.5	1	2	5	25	50	125	250	500
NEtFOSE	0.5	1	2	5	25	50	125	250	500
Per- and polyfluoroether carboxylic acids									
HFPO-DA	0.2	0.4	0.8	2	10	20	50	100	200
ADONA	0.189	0.378	0.756	1.89	9.45	18.9	47.25	94.5	189
PFMPA	0.1	0.2	0.4	1	5	10	25	50	100
PFMBA	0.1	0.2	0.4	1	5	10	25	50	100
NFDHA	0.1	0.2	0.4	1	5	10	25	50	100
Ether sulfonic acids									
9Cl-PF3ONS	0.187	0.373	0.746	1.87	9.33	18.7	46.7	93.3	187
11Cl-PF3OUdS	0.189	0.377	0.754	1.89	9.43	18.9	47.2	94.3	189
PFEESA	0.089	0.178	0.357	0.892	4.46	8.92	22.3	44.6	89.2
Fluorotelomer Carboxylic Acids									
3:3FTCA	0.25	0.5	1	2.5	12.5	25	62.5	125	250
5:3FTCA	1.25	2.5	5	12.5	62.5	125	313	625	1250
7:3FTCA	1.25	2.5	5	12.5	62.5	125	313	625	1250
TOP Assay Control Surrogates (EIS)									
13C2,D4-4:2FTS	5	5	5	5	5	5	5	5	5
13C2-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extracted Internal Standards (EIS)									
13C3-PFPrA	10	10	10	10	10	10	10	10	10
13C4-PFBA	10	10	10	10	10	10	10	10	10
13C5-PFPeA	5	5	5	5	5	5	5	5	5
13C5-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C9-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C6-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C7-PFUnA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C3-PFBS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C3-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C2-4:2FTS	5	5	5	5	5	5	5	5	5
13C2-6:2FTS	5	5	5	5	5	5	5	5	5

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Compound	L1	L2 ²	L3	L4	L5	L6 ³	L7	L8	L9
13C2-8:2FTS	5	5	5	5	5	5	5	5	5
13C8-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D5-NEtFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOA	5	5	5	5	5	5	5	5	5
D5-NEtFOA	5	5	5	5	5	5	5	5	5
D7-NMeFOSE	25	25	25	25	25	25	25	25	25
D9-NEtFOSE	25	25	25	25	25	25	25	25	25
13C3-HFPODA	10	10	10	10	10	10	10	10	10
Non-Extracted Internal Standards (NIS)									
13C3-PFBA	5	5	5	5	5	5	5	5	5
13C2-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C5-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
18O2-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

¹ Concentration of each target analyte, EIS, and NIS in each calibration level when the formulations specified in Appendix B are used to prepare the working standards.

² L2 is the set LOQ.

³ L6 is used as the CCV.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services



	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Table 6: Identification and Quantification Ions by Analyte, EIS, NIS

Abbreviation	CAS #	Ion Mass			Quantification Reference
		Parent	Quantification	Confirmation	
PFPrA	422-64-0	163	119	69*	13C3-PFPrA
PFBA	375-22-4	213	169	69*	13C4-PFBA
PFPeA	2706-90-3	263	219	69*	13C5-PFPeA
PFHxA	307-24-4	313	269	119	13C5-PFHxA
PFHpA	375-85-9	363	319	169	13C4-PFHpA
PFOA	335-67-1	413	369	169	13C8-PFOA
PFNA	375-95-1	463	419	219	13C9-PFNA
PFDA	335-76-2	513	469	219	13C6-PFDA
PFUnA	2058-94-8	563	519	269	13C7-PFUnA
PFDoA	307-55-1	613	569	319	13C2-PFDoA
PFTTrDA	72629-94-8	663	619	169	13C2-PFDoA
PFTTeDA	376-06-7	713	669	169	13C2-PFTTeDA
PFBS	375-73-5	299	80	99	13C3-PFBS
PFPeS	2706-91-4	349	80	99	13C3-PFHxS
PFHxS	355-46-4	399	80	99	13C3-PFHxS
PFHpS	375-92-8	449	80	99	13C8-PFOS
PFOS	1763-23-1	499	80	99	13C8-PFOS
PFNS	68259-12-1	549	80	99	13C8-PFOS
PFDS	335-77-3	599	80	99	13C8-PFOS
PFDoS	79780-39-5	699	80	99	13C8-PFOS
4:2 FTS	757124-72-4	327	307	81	13C2-4:2FTS
6:2 FTS	27619-97-2	427	407	81	13C2-6:2FTS
8:2 FTS	39108-34-4	527	507	81	13C2-8:2FTS
PFOSA	754-91-6	498	78	478	13C8-PFOSA
NMeFOSA	31506-32-8	512	219	169	D3-NMeFOSA
NEtFOSA	4151-50-2	526	219	169	D5-NEtFOSA
TFSI	82113-65-3	280	78	147	13C3-HFPODA
NMeFOSAA	2355-31-9	570	419	483	D3-NMeFOSAA
NEtFOSAA	2991-50-6	584	419	526	D5-NEtFOSAA
NMeFOSE	24448-09-7	616	59	NA	D7-NMeFOSE
NEtFOSE	1691-99-2	630	59	NA	D9-NEtFOSE
HFPO-DA	13252-13-6	285	169	185	13C3-HFPODA
ADONA	919005-14-4	377	251	85	13C4-PFHpA
PFMPA	377-73-1	229	85	185*	13C4-PFBA
PFMBA	863090-89-5	279	85	235*	13C5-PFPeA
NFDHA	151772-58-6	295	201	85	13C5-PFHxA
9Cl-PF3ONS	756426-58-1	531	351	533→353	13C8-PFOS
11Cl-PF3OUdS	763051-92-9	631	451	633→453	13C8-PFOS
PFEESA	113507-82-7	315	135	83	13C5-PFHxA
3:3FTCA	356-02-5	241	177	117	13C5-PFPeA
5:3FTCA	914637-49-3	341	237	217	13C5-PFHxA
7:3FTCA	812-70-4	441	317	337	13C9-PFNA

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Abbreviation	CAS #	Ion Mass			Quantification Reference
		Parent	Quantification	Confirmation	
Extracted Internal Standards (EIS)					
13C3-PFPrA	NA	166	121	NA	13C3-PFBA
13C4-PFBA	NA	217	172	NA	13C3-PFBA
13C5-PFPeA	NA	268	223	NA	13C2-PFHxA
13C5-PFHxA	NA	318	273	NA	13C2-PFHxA
13C4-PFHpA	NA	367	322	NA	13C2-PFHxA
13C8-PFOA	NA	421	376	NA	13C4-PFOA
13C9-PFNA	NA	472	427	NA	13C5-PFNA
13C6-PFDA	NA	519	474	NA	13C2-PFDA
13C7-PFUnA	NA	570	525	NA	13C2-PFDA
13C2-PFDoA	NA	615	570	NA	13C2-PFDA
13C2-PFTeDA	NA	715	670	NA	13C2-PFDA
13C3-PFBS	NA	302	80	NA	18O2-PFHxS
13C3-PFHxS	NA	402	80	NA	18O2-PFHxS
13C8-PFOS	NA	507	80	NA	13C4-PFOS
13C2-4:2FTS	NA	329	81	NA	18O2-PFHxS
13C2-6:2FTS	NA	429	81	NA	18O2-PFHxS
13C2-8:2FTS	NA	529	81	NA	18O2-PFHxS
13C8-PFOA	NA	506	78	NA	13C4-PFOS
D3-NMeFOSA	NA	515	219	NA	13C4-PFOS
D5-NEtFOSA	NA	531	219	NA	13C4-PFOS
D3-NMeFOSAA	NA	573	419	NA	13C4-PFOS
D5-NEtFOSAA	NA	589	419	NA	13C4-PFOS
D7-NMeFOSE	NA	623	59	NA	13C4-PFOS
D9-NEtFOSE	NA	639	59	NA	13C4-PFOS
13C3-HFPO-DA	NA	287	169	NA	13C2-PFHxA
Non-Extracted Internal Standards (NIS)					
13C3-PFBA	NA	216	172	NA	NA
13C2-PFHxA	NA	315	270	NA	NA
13C4-PFOA	NA	417	372	NA	NA
13C5-PFNA	NA	468	423	NA	NA
13C2-PFDA	NA	515	470	NA	NA
18O2-PFHxS	NA	403	84	NA	NA
13C4-PFOS	NA	503	80	NA	NA

* PFPeA, PFPrA, PFBA, PFMPA, and PFMBAs have marginally performing secondary transitions built into the instrument acquisition method to aid in qualitative identification of the analyte; ion ratio requirements do not apply to these compounds. Method 1633 indicates that no suitable secondary transition exists.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services



	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Table 7: QC Acceptance Criteria, Corrective Action and Data Qualification Requirements

QC Item	Acceptance Criteria	Corrective Action	Qualification
Mass Calibration	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Mass Calibration Verification	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Initial Calibration (ICAL)	Must meet linearity requirement specified in Section 9.3.1 for type of curve fit used.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Initial Calibration Verification (ICV)	All analytes must be within $\pm 30\%$ of their true values. (%R)	Identify and correct source of problem, re-analyze. If repeat failure, repeat ICAL.	If corrective action is not taken, qualify or disclose nonconformity for data user to assess impact on project samples.
Calibration Blank (ICB)	Non-DoD: No targets detected greater than MDL. DoD: No targets detected greater than $\frac{1}{2}$ LOQ	Identify and correct source of contamination or performance issue. Alternately, re-calibrate using a lower concentration standard for the highest point.	None. Do not proceed with analysis.
RT Window Position	Set position using the mid-point of the ICAL on the day ICAL is performed; otherwise, the opening CCV is used. RT Window is ± 60 secs from RT position.	N/A	N/A
Instrument Sensitivity Check (ISC)	All native and isotopically labelled compounds within $\pm 30\%$ recovery.	Identify and correct source of problem and reanalyze ISC. If problem persists, repeat ICAL.	None. Do not proceed with analysis.
Bile Salts Check	Bile Salt peak detected >1 min outside RT window for PFOS.	Identify and correct source of problem, then reevaluate Bile Salts separation from PFOS.	None. Do not proceed with analysis.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

QC Item	Acceptance Criteria	Corrective Action	Qualification
Continuing Calibration Verification (CCV)	All native and isotopically labelled compounds within $\pm 30\%$ recovery.	See Section 9.3.6 for required corrective actions based on circumstance.	Qualify test results associated with CCV failure.
Instrument Blank (IBLK) / Continuing Calibration Blanks (CCB)	Non-DoD: No targets detected greater than MDL. DoD: No targets detected $> \frac{1}{2}$ LOQ	Identify and correct source of contamination or performance issue. Reanalyze IBLK.	No samples shall be analyzed until opening IBLK has met acceptance criteria, unless the samples to be analyzed will not report the compound(s) detected in the IBLK.
Extracted Internal Standards (EIS)	See Table 9.	If batch QC is acceptable, reanalyze to confirm failure. If confirmed, re-extract from reduced sample amount and reanalyze sample, if possible. If failure persists, no further action is needed.	Qualify outages
Non-extracted Internal Standards (NIS)	NIS areas in all samples must be within 50 – 200% of the average area of the corresponding NIS in the ICAL.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages
Method Blank (MB)	Non-DOD: no targets detected greater than the LOQ or 1/10 of the concentration detected in associated sample(s), whichever is greatest. DoD: No targets detected $> \frac{1}{2}$ LOQ Wisconsin: No targets detected $>$ MDL	If IBLK is acceptable, reanalyze MB to confirm. If confirmed, re-extract and reanalyze associated impacted samples if sufficient amount remains and samples are within holding time; otherwise qualify associated test results.	Qualify outages
LCS/LLLCS	%R: See Table 8	If the most recent ISC/CCV is acceptable, reanalyze LCS to confirm. If low-failure results are	Qualify outages

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

QC Item	Acceptance Criteria	Corrective Action	Qualification
		confirmed, re-extract and reanalyze associated samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with low-failure LCS. If high-failure results are confirmed and sample(s) is ND for failing compound, narrate and report sample data.	
MS/MSD	%R: See Table 8 RPD ≤30%	Re-run for confirmation	Qualify outages
Laboratory Duplicate	RPD from parent sample ≤30%	Re-run for confirmation	Qualify outages.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services


	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Table 8: LCS/LLCS Acceptance Limits (%R)

Analyte	CAS #	Aqueous/Leachate	Solid: All Matrices
PFPPrA	422-64-0	70-140	70-140
PFBA	375-22-4	70-140	70-140
PFPeA	2706-90-3	65-135	60-150
PFHxA	307-24-4	70-145	65-140
PFHpA	375-85-9	70-150	65-145
PFOA	335-67-1	70-150	70-150
PFNA	375-95-1	70-150	70-155
PFDA	335-76-2	70-140	70-155
PFUnA	2058-94-8	70-145	70-155
PFDoA	307-55-1	70-140	70-150
PFTTrDA	72629-94-8	65-140	65-150
PFTeDA	376-06-7	60-140	65-150
PFBS	375-73-5	60-145	65-145
PFPeS	2706-91-4	65-140	55-160
PFHxS	355-46-4	65-145	60-150
PFHpS	375-92-8	70-150	65-155
PFOS	1763-23-1	55-150	65-160
PFNS	68259-12-1	65-145	55-140
PFDS	335-77-3	60-145	40-155
PFDoS	79780-39-5	50-145	25-160
4:2 FTS	757124-72-4	70-145	60-150
6:2 FTS	27619-97-2	65-155	55-200
8:2 FTS	39108-34-4	60-150	70-150
PFOSA	754-91-6	70-145	70-140
NMeFOSA	31506-32-8	60-150	70-155
NEtFOSA	4151-50-2	65-145	70-140
TFSI	82113-65-3	70-140	70-140
NMeFOSAA	2355-31-9	50-140	65-155
NEtFOSAA	2991-50-6	70-145	65-165
NMeFOSE	24448-09-7	70-145	70-140
NEtFOSE	1691-99-2	70-135	70-135
HFPO-DA	13252-13-6	70-140	70-145
ADONA	919005-14-4	65-145	70-160
PFMPA	377-73-1	55-140	30-140
PFMBA	863090-89-5	60-150	60-150
NFDHA	151772-58-6	50-150	60-155
9CI-PF3ONS	756426-58-1	70-155	70-150
11CI-PF3OUdS	763051-92-9	55-160	45-160
PFEESA	113507-82-7	70-140	70-140
3:3 FTCA	356-02-5	65-130	45-130
5:3 FTCA	914637-49-3	70-135	60-130
7:3 FTCA	812-70-4	50-145	60-150

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Table 9: EIS and NIS Acceptance Limits (%R)

Labeled Compound	Aqueous	Leachate	Solid:	Biosolid
13C3-PFPrA	5-130	5-130	8-130	5-130
13C4-PFBA	5-130	5-130	8-130	5-130
13C5-PFPeA	40-130	40-130	35-130	35-130
13C5-PFHxA	40-130	40-130	40-130	40-130
13C4-PFHpA	40-130	40-130	40-130	40-130
13C8-PFOA	40-130	40-130	40-130	40-130
13C9-PFNA	40-130	40-130	40-130	40-145
13C6-PFDA	40-130	40-130	40-130	40-130
13C7-PFUnA	30-130	40-130	40-130	40-130
13C2-PFDoA	10-130	35-130	40-130	40-130
13C2-PFTeDA	10-130	25-130	20-130	10-160
13C3-PFBS	40-135	40-130	40-135	40-150
13C3-PFHxS	40-130	40-130	40-130	40-140
13C8-PFOS	40-130	40-130	40-130	40-130
13C2-4:2FTS	40-200	40-220	40-165	40-300
13C2-6:2FTS	40-200	40-170	40-215	40-300
13C2-8:2FTS	40-300	40-145	40-275	40-300
13C8-PFOSA	40-130	40-130	40-130	20-140
D3-NMeFOSA	10-130	40-130	10-130	20-130
D5-NEtFOSA	10-130	35-130	10-130	20-130
D3-NMeFOSAA	40-170	35-130	40-135	30-150
D5-NEtFOSAA	25-135	30-130	40-150	20-140
D7-NMeFOSE	10-130	20-130	20-130	25-130
D9-NEtFOSE	10-130	20-130	15-130	20-130
13C3-HFPODA	40-130	40-130	40-130	40-130
13C3-PFBA	50-200	50-200	50-200	50-200
13C2-PFHxA	50-200	50-200	50-200	50-200
13C4-PFOA	50-200	50-200	50-200	50-200
13C5-PFNA	50-200	50-200	50-200	50-200
13C2-PFDA	50-200	50-200	50-200	50-200
18O2-PFHxS	50-200	50-200	50-200	50-200
13C4-PFOS	50-200	50-200	50-200	50-200

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services



	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Table 10: IPR Limits for Method Verification

Analyte	CAS #	Aqueous/Leachate		Solid: All Matrices	
		%R	RPD	%R	RPD
PFPrA	422-64-0	70-140	20	70-140	20
PFBA	375-22-4	70-135	21	70-140	17
PFPeA	2706-90-3	70-135	23	70-140	26
PFHxA	307-24-4	70-135	24	70-135	23
PFHpA	375-85-9	70-135	28	70-140	21
PFOA	335-67-1	65-155	27	70-140	23
PFNA	375-95-1	70-140	28	65-145	24
PFDA	335-76-2	65-140	26	70-145	26
PFUnA	2058-94-8	70-135	29	70-145	26
PFDoA	307-55-1	70-130	21	70-145	25
PFTTrDA	72629-94-8	60-145	29	55-160	26
PFTeDA	376-06-7	70-145	27	70-145	24
PFBS	375-73-5	70-140	23	60-145	25
PFPeS	2706-91-4	70-135	25	65-140	29
PFHxS	355-46-4	70-135	27	65-145	28
PFHpS	375-92-8	70-140	30	70-140	27
PFOS	1763-23-1	70-140	29	70-135	27
PFNS	68259-12-1	70-135	29	70-140	27
PFDS	335-77-3	70-135	30	50-150	31
PFDoS	79780-39-5	45-135	35	40-140	40
4:2 FTS	757124-72-4	70-135	27	70-135	27
6:2 FTS	27619-97-2	70-135	32	60-160	50
8:2 FTS	39108-34-4	70-140	33	70-140	27
PFOSA	754-91-6	70-135	22	70-140	19
NMeFOSA	31506-32-8	70-135	30	65-145	26
NEtFOSA	4151-50-2	70-130	26	70-135	19
TFSI	82113-65-3	70-140	20	70-140	20
NMeFOSAA	2355-31-9	65-140	32	65-145	31
NEtFOSAA	2991-50-6	70-135	28	60-150	31
NMeFOSE	24448-09-7	70-135	29	70-140	19
NEtFOSE	1691-99-2	70-130	21	70-135	17
HFPO-DA	13252-13-6	70-135	23	70-140	25
ADONA	919005-14-4	70-135	23	70-155	26
PFMPA	377-73-1	60-140	23	70-140	25
PFMBA	863090-89-5	65-145	27	55-145	33
NFDHA	151772-58-6	65-140	37	45-145	27
9Cl-PF3ONS	756426-58-1	70-145	30	65-135	23
11Cl-PF3OUdS	763051-92-9	50-150	35	50-135	31
PFEESA	113507-82-7	70-135	25	70-140	20
3:3 FTCA	356-02-5	70-130	23	45-155	32
5:3 FTCA	914637-49-3	70-130	24	70-135	28
7:3 FTCA	812-70-4	55-130	34	70-145	39

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	ENV-SOP-WCOL-0166 v01_PFA5 by Method 1633 and 1633A (250 mL Sample Volume)
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Appendix B: Reference Materials – Reagents, Standards & Formulations

Purchased Reagents

Name	Grade	Vendor	Catalog	Storage
Acetic Acid	ACS	Fisher	A38C-12	Room Temperature
Acetonitrile ¹	UPLC	Fisher	A996-4	Room Temperature
Ammonium Acetate	LC/MS	Fisher	A637-500	Room Temperature, in dessicator
Aqueous Ammonium Acetate	5M	Fisher	AM9071	Room Temperature
Ammonium Hydroxide	Certified ACS+	Fisher	A470-250	Room Temperature
Formic Acid	>96% purity	Acros	147930010	Room Temperature
Methanol	HPLC, 99.9% purity	Fisher	A452-4	Room Temperature

¹ Verify Acetonitrile, Methanol, and Laboratory Generated Regent Water by lot/batch before use.

Purchased Standard Solutions¹

Name	Vendor	Catalog	Purpose
EPA 1633 Native PFAS Mix	Wellington Laboratories	EPA-1633STK	Primary Source Standard
PFPrA Native Stock (50 µg/mL)	Cambridge Isotope Laboratories	ULM-11323-A-S	Primary Source Standard
TFSI Native Stock (100 µg/mL)	AccuStandard	PFOS-030S	Primary Source Standard
WatR™ Pollution PFAS in Wastewater ²	ERA	404	Second Source Standard
Mass-labelled PFAS Extraction Standard Mix	Wellington Laboratories	MPFAC-HIF-ES	EIS
13C3-PFPrA Stock (50 µg/mL)	Cambridge Isotope Laboratories	CLM-11324-A-S	EIS
Mass-labelled PFAS Injection Standard Mix	Wellington Laboratories	MPFAC-HIF-IS	NIS
Neat Taurodeoxycholic Acid (TDCA)	Cayman Chemical	15935	Bile Salt Interference

¹ Unless other storage conditions are specified by the manufacturer, store the purchased standard solutions in the dark at 0-6°C, in tightly sealed screw-capped vials. Place a mark on the vial at the level of the solution after each use so that solvent loss by evaporation can be detected. Replace the solution if solvent loss has occurred. Properly discard or remove from the work area unused material on the expiration date to prevent inadvertent use of expired material.


²ERA item # 404 is not prepared with identical concentrations in each lot; therefore, the ICV formulation will need to be reviewed and potentially adjusted with each new lot of this mix. The formulation below was designed based on ERA item# 404, lot# P336-404.

Purchased standard solutions must be received with a Certificate of Analysis (COA), which must be retained on-site in the laboratory and be traceable to each corresponding lot received. Refer to laboratory SOP ENV-SOP-WCOL-0078 Document and Record Control for the procedures for standard receipt and traceability.

Substitution of reagents and standards from those listed in these tables is permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these exact same specifications for purity, composition, or concentration, any formulation in this SOP must be modified to match the material used. If the substitution is permanent, the SOP and formulations in this SOP must be updated.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

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Prepared Reagents & Standard Solution Formulations:

Plastic containers must be used for all standard, sample, and extraction preparations due to potential adsorption of analytes onto glass. Do not substitute glass for plastic containers.

¹⁸O-mass labeled perfluoroalkyl sulfonates may undergo isotopic exchange with water under certain conditions, which lowers the isotopic purity of the standards over time - monitor standards for degradation and replace as needed.


Modifications to these formulations are not permitted unless the formulation of the parent component changes, in which case the formulation must be adjusted accordingly.

Laboratory Prepared Reagent Formulation Table

Name	Component	Amount	Volume	Expires
Mobile Phase A: 2mM ammonium acetate in 95:5 water/acetonitrile	5 Ammonium Acetate	0.4 mL	1 L	60 Days
	Acetonitrile	50 mL		
	Reagent Water	949.6 mL		
Instrument Blank Mix (IBLK Mix): Methanol with 4% Water, 1% Ammonium Hydroxide, and 0.625% Acetic Acid	Methanol	94.4 mL	100 mL	30 Days
	Ammonium Hydroxide (30%)	3.3 mL		
	Acetic Acid	0.625 mL		
	Reagent Water	1.67 mL		
Ammonium Hydroxide (0.3%): Methanolic	Ammonium Hydroxide (30%)	1 mL	100 mL	30 Days
	Methanol	99 mL		
Ammonium Hydroxide (1%): Methanolic	Ammonium Hydroxide (30%)	3.3 mL	100 mL	30 Days
	Methanol	96.7 mL		
Formic Acid (0.1 M): Aqueous	Formic Acid	3.77 mL	1 L	2 Years
	Regent Water	996.33 mL		
Formic Acid (0.3 M): Aqueous	Formic Acid	11.31 mL	1 L	2 Years
	Regent Water	988.69 mL		
Formic Acid (5% v/v): Aqueous	Formic Acid	5 mL	100 mL	2 Years
	Regent Water	95 mL		
Formic Acid (50% v/v): Aqueous	Formic Acid	50 mL	100 mL	2 Years
	Regent Water	50 mL		
1:1 Methanol:0.1M Formic acid	Methanol	50 mL	100 mL	2 Years
	Formic Acid (0.1M)	50 mL		
Reagent Water (ASTM 1)	Laboratory Generated			2 Years

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

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Laboratory Prepared Intermediate Standard Solutions


Name	Component	Amount	Volume	Storage	Expires
TDCA Stock (2000 µg/mL)	Neat TDCA	10 mg	5 mL	<0°C	1 Year
	Methanol	5 mL			
1633PDS (Concentrations vary)	EPA-1633STK	5000 µL	10 mL	0-6°C	30 Days or with each new lot of parent standard
	PFPrA stock	100 µL			
	TFSI stock	25 µL			
	Methanol	4875 µL			
PDS-10X (Concentrations vary)	1633PDS	300 µL	3 mL	0-6°C	30 Days or with each new lot of parent standard
	Methanol	2.7 mL			
EIS Mix (Concentrations vary)	MPFAC-HIF-ES	5000 µL	10 mL	0-6°C	30 Days
	13C3-PFPrA stock	200 µL			
	Methanol	4800 µL			

Laboratory Prepared Working Standard Solutions

Name	Component	Amount	Volume	Storage	Expires
ICV	ERA-404 Mix	200 µL	4 mL	0-6°C	30 Days
	EIS Mix	40 µL			
	MPFAC-HIF-IS	20 µL			
	IBLK Mix	3740 µL			
CAL L1	PDS-10X	20 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	4905 µL			
CAL L2	PDS-10X	40 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	TDCA Stock (2000 µg/mL)	25 µL			
	IBLK Mix	4860 µL			
CAL L3	PDS-10X	80 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	4845 µL			

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Name	Component	Amount	Volume	Storage	Expires
CAL L4	PDS-10X	200 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	4725 µL			
CAL L5	1633PDS	100 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	4825 µL			
CAL L6	1633PDS	200 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	TDCA Stock (2000 ug/mL)	25 µL			
	IBLK Mix	4700 µL			
CAL L7	1633PDS	500 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	4425 µL			
CAL L8	1633PDS	1000 µL	5 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	IBLK Mix	3925 µL			
CAL L9	1633PDS	2000 µL	2 mL	0-6°C	30 Days
	EIS Mix	50 µL			
	MPFAC-HIF-IS	25 µL			
	TDCA Stock (2000 µg/mL)	25 µL			
	IBLK Mix	2900 µL			

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

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Appendix C: Sample Screening Protocol

Samples that are known or suspected to contain high concentrations of target analytes may be pre-screened to determine if a reduced volume or mass should be used for extraction or if an extract dilution should be performed prior to initial analysis. Other pre-screening procedures may be used.

This screen protocol may be used for all matrices included in this SOP, except surface wipes because there is insufficient representative sample to perform the screen procedure.

Aqueous Matrices (Non-Potable Water, Landfill Leachate, TCLP/SPLP Leachate)

Always take the aliquot for screening from the 60 mL container; do not take a subsample from the sample container to be used for sample preparation or analysis (except in the case of TCLP/SPLP).


- 1) Mix the sample to ensure it is homogenous. Measure 1 mL of sample into a 15 mL centrifuge tube.
- 2) Add 1 mL of methanol, 40 µL of EIS Mix and 20 µL MPFAC-HIF-IS to the sample and vortex to mix.
- 3) Filter 1 mL of the sample through 0.2-µm membrane filter into a microvial.
- 4) Analyze the screen extract and use the test result to determine if a reduced volume should be extracted or if the extract from the routine procedure should be diluted prior to analysis.

Soil/Sediment and Biosolid

- 1) Measure 0.5 g (± 0.1) of sample into a 50 mL polypropylene centrifuge tube.
- 2) Add 20 mL of 0.3% methanolic ammonium hydroxide to the sample. Vortex to mix for 10 min. Let the sample sit to settle and/or centrifuge to produce a clear extract.
- 3) Filter using a 0.2 µm filter vial:
 - a. Add 40 µL of EIS mix to a clean filter vial (chamber).
 - b. Add 400 µL of clear extract from step 2 to the vial. Carefully vortex to mix.
 - c. Use filter/plunger to filter the extract.
- 4) Transfer 30 µL of extract to a ~300 µL polypropylene microvial and dilute to 300 µL with 0.3% methanolic ammonium hydroxide. Add 1.5 µL of MPFAC-HIF-IS to the resulting solution.
- 5) Analyze the screen extract and use the test result to determine if a reduced volume should be extracted or if the extract from the routine procedure should be diluted prior to analysis.

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Appendix D: Subsampling Procedure for Aqueous Matrices

Due to the propensity of some target analytes to stratify within the sample matrix or to adhere to walls of the sample container, subsampling of aqueous samples may only be done on a project-specific basis, with client approval.

In this context, subsampling refers to the taking of an aliquot of sample from the container provided to the laboratory for extraction in lieu of using the entire sample volume collected. This is sometimes necessary when high concentrations of target analytes are expected in the sample or for other project-specific reasons.

Subsampling Procedure for Non-Potable Water (NPW), Landfill Leachate, TCLP/SPLP:

- 1) Determine the volume (mL) for extraction based on screen results or project specifications. The amount subsampled must be at least 125 μ L. If additional dilutions are needed, these must be made by serial dilution of the sample.
- 2) Place an uncapped, HDPE bottle onto the weigh pan of a top loading balance and tare the balance. Select an appropriately sized bottle for the volume of sample to be aliquoted. Regardless of volume subsampled, the sample aliquot should be diluted to at least 50 mL prior to SPE.
- 3) Gently invert the sample to mix 3-4 times then transfer the sample into the HDPE bottle until the target volume is achieved, assuming sample density of 1 g/mL.
 - If foam forms during inversion and more than 5 mL is required, pour the sample to transfer, but avoid the transfer of foam.
 - If foam forms and less than 5 mL is needed, use a pipette to draw sample from $\frac{1}{2}$ cm below the foam.
 - If no foam forms, the transfer may be done by pouring or by pipette.
- 4) Fill the bottle with reagent water.
- 5) Proceed to Section 9.6 and prepare the sample using the same stepwise procedure used for aqueous samples.

Subsampling Procedure for AFFF and F3 and Other Challenging Aqueous Matrices


The following protocol is designed for “as prepared” AFFF materials and newer generation F3 concentrates and other challenging matrices, such as viscous or cloudy matrices, or those with standing foam. Consult with technical specialist or supervisor to determine when to use this protocol.

If concentrated AFFF (thick gel-like matrix) was received, notify the supervisor to determine where to perform the subsampling procedure. Subsampling of the concentrate must be done in an isolated area to prevent the material from contaminating the work area and other samples.

- 1) Prepare 2 samples for all matrices designated AFFF or F3.
- 2) Place an uncapped 250mL HDPE bottle onto the weigh pan of a top loading balance and tare the balance.
- 3) Measure 0.01 g of sample into the HDPE bottle. Record the actual mass subsampled.
- 4) Add approximately 60 mL of reagent water to the bottle, cap the bottle.

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- 5) Shake by hand vigorously for 20-30 seconds.
- 6) Set the sample aside for at least 3 hours for complete dissolution.
- 7) Check the sample after 3 hours to verify dissolution is complete. If full dissolution has not occurred, place the sample bottle on an orbital shaker for 15 minutes, then allow the sample to settle for 3 hours.
- 8) If the sample is an AFFF concentrate gel, go to step 9; otherwise, proceed to Section 9.6 and prepare the sample using the same stepwise procedure used for aqueous samples.
- 9) Dilute the AFFF concentrate subsample solution by quantitatively measuring 6 mL of the 60 mL solution into a new 250 mL HDPE container and dilute to 60 mL with reagent water. The serial dilution, when the above protocol is followed without deviation, represents a 250,000X primary dilution. Proceed to Section 9.6 and extract the prepared sample using the same stepwise procedure used for aqueous samples.

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Appendix E: Aqueous Sample Preparation – Settled Solids Depth > ½ cm

As allowed by EPA Method 1633/1633A PAS uses alternate strategies in lieu of the total suspended solids (TSS) determination to mitigate solid materials or other interferences present in aqueous matrices.

Use this procedure in lieu of Section 9.6.1 (steps 1-9) when settled solids in the sample appear to be of a depth > ½ cm and less than 5% of the total volume or at the analysts' discretion if any significant amount of solids are present.

- 1) Label a 500 mL conical centrifuge bottle with the sample ID. Set the labeled tube in a rack and remove the cap.
- 2) Spike each sample with 40 µL of EIS Mix in its original sample container.
- 3) If the sample is a MS or MSD, add 80 µL of 1633PDS to each.


NOTE: The MS/MSD or laboratory duplicate must be processed the same way as the parent sample and vice versa.

- 4) Cap the container and vigorously shake to mix.
- 5) Pour the sample into the labeled centrifuge bottle, taking care to transfer all the solids present in the original sample bottle to the centrifuge bottle. Tightly cap the centrifuge bottle when done.
- 6) Place the tubes in the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes.
- 7) Decant the centrifuged sample back into its original container, taking care to avoid transfer of the settled solids.
- 8) Weigh the original sample container + decanted sample and record the weight measurement in the preparation log.
- 9) Extract the decanted sample using the procedure in Section 9.6.1, starting with step 10. If the SPE cartridge begins to clog during sample transfer, refer to Appendix G for troubleshooting steps and mitigation strategies.
- 10) When the SPE cartridges have been dried and the carbon cartridges added to the SPE stack, rinse the original sample bottle following the protocol in Step 10 of Section 9.7, but do not start elution.
- 11) Add 5mL of 1% methanolic ammonium hydroxide to each centrifuge bottle and swirl to rinse. If the condensed solids become re-suspended during this step, centrifuge the container to separate.
- 12) Using a pipet, transfer the rinsates from the original sample container and the centrifuge bottle to the associated sample's cartridge/reservoir stack. Elute the cartridge with both rinsate volumes; allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

If using sample transfer lines, add the rinsate from the centrifuge bottle to the original sample bottle for transfer to the cartridge and then elute as above.

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- 13) Add 5 mL of 1% methanolic ammonium hydroxide directly to the SPE reservoir of all batch QC samples (MB/LCS/LLCS) and elute with the normal 5 mL bottle rinse described in Step 10 of Section 9.7.
- 14) Concentrate the extract to ~3.5 mL using nitrogen blowdown at an approximate flow rate of 1.2 L/min. Adjust to final volume to 4 mL with 1% methanolic ammonium hydroxide using a validated comparison vial.
- 15) Weigh the empty sample bottle with cap and record the weight measurement. Subtract this weight from the initial container + sample weight from Step 8 to determine initial sample volume.
- 16) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each extract and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C until analysis.
- 17) Document in the preparation log which samples in the prep batch were centrifuged prior to SPE; these samples must be identified in the test report to alert the customer and data user of the deviation from routine protocol.
- 18) Record any other observations or anomalies observed during the centrifugation or extraction process, particularly if any issues were encountered during the sample loading step of the SPE process.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025


Appendix F: Biphasic Sample Separation Procedure

Use this procedure when the customer has requested separation of a biphasic sample into aqueous and solid phases.

- 1) Verify the log-in has been updated to specify sample preparation for each matrix. Be sure the log-in for the solid fraction does not include percent solids determination: the solid phase of a biphasic sample is reported on a wet weight basis.
- 2) Label a 500 mL conical centrifuge bottle with the sample ID. Set the labeled bottle in a rack and remove the cap.
- 3) Vigorously shake the sample in its original container then completely transfer the entire sample to the corresponding centrifuge bottle and cap the centrifuge bottle.
- 4) Place the centrifuge bottle(s) in the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes. Record the start and end time in the preparation log.
- 5) Transfer the liquid portion of sample back into the original sample container; avoid transferring solid material as much as possible.
- 6) Tare a top loading balance then weigh the original container + liquid sample and record this measurement to the nearest 0.1 g on the preparation log as initial weight for the aqueous phase.
- 7) Proceed to Section 9.6.1 to add the sample to a routine NPW preparation batch and complete the preparation process starting with Step 7.
- 8) Label a 50 mL centrifuge tube with the sample ID.
- 9) Place the tube on a top loading balance and tare the balance.
- 10) Using a wooden tongue depressor, transfer the solid material from the 500 mL centrifuge bottle to the 50 mL container.
- 11) Record the amount transferred to the nearest 0.1 g on the preparation log as initial weight, targeting 5 g for preparation.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

Appendix G: SPE Clog Mitigation Procedure

This appendix provides instructions on what to do when an SPE cartridge has become clogged.

Indications that an SPE cartridge may be or will become clogged include discoloration of the cartridge frit or absorbent bed, coloration or sedimentation on the bottom of the reservoir, and a slowing of the sample loading rate.

When these conditions are observed do not add any more sample volume to the reservoir of the clogging cartridge. The goal is to stop the process before the cartridge seizes up completely, so that a sample extract can still be collected from the cartridge.

- If there is >10 mL remaining in the reservoir, close the manifold port to stop sample loading. After all other samples have finished loading, carefully remove the cartridge-adaptor-reservoir assembly and transfer the remaining sample volume back into the original sample container.
- If there is <10 mL remaining, allow the sample to continue to load. If the sample has not finished after all other samples have passed through their cartridge, close all other ports except for the sample loading, then apply more vacuum pressure to pull the sample through. Do this step one at a time for each clogged SPE. If it is obvious that the cartridge has seized, do not attempt this step. Instead, remove the cartridge and return the remaining sample volume to its original container.

The extraction process may continue as follows; if QA acceptance criteria are not met for the resulting extract, the sample should be re-extracted with reduced volume.


- Replace the cartridge from the abandoned sample and finish the SPE elution process (Step 5 from Section 9.7) to collect what extract is available from the SPE. If the SPE clogs completely, abandon the elution process; the sample must be diluted and the extraction repeated.
- To obtain the volume of sample used for preparation and extraction, reweigh the empty container and subtract this weight from the original container+sample weight measurement.
- Record in the preparation log that SPE extraction could not be completed with full sample volume.

Alternatively,

- Option 1: Reprepare and re-extract the sample following the centrifuge procedure in Appendix E. This option may be appropriate when centrifugation was not originally performed on the sample that clogged.
- Option 2: Reprepare the sample using a reduced volume. No less than 1 mL of homogenized sample may be used for extraction in these cases.
- Option 3: With client approval, re-log the sample as a biosolid matrix and prepare following the biosolid matrix extraction protocols, targeting 0.25 g of sample. In this case, the sample results will generally not be corrected for dry weight.
- Option 4: With client approval, re-log and reprepare the sample as two separate phases (aqueous and solid). Attempt phase separation of the aqueous and solid phases of the sample following Appendix F and, if successful, prepare as two separate samples.
- Option 5: Test procedure is not applicable. This may be the only option when the matrix interference and/or the modification to the procedure become so extreme that the resulting test result is unreliable.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

In all cases, the protocol followed must be recorded, disclosed to the customer, and test results adjusted for actual amounts used.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025


Appendix H: Surface Wipe PFAS Analysis by 1633

Clients may submit wipe samples for PFAS analysis by 1633; wipes can be used as a proxy measurement of surface contamination in production facilities, labs, etc. The lab provides sampling kits for users which consist of a 50 mL centrifuge tube paired with a packaged ghost wipe for each surface to be sampled (ghost wipes: Environmental Express Part# SC5000). The wipe is used to swab a defined area of the surface or item of interest and is placed in the accompanying centrifuge tube, which is then capped, labeled, and shipped back to the lab for preparation and analysis.

Used wipe samples are prepared directly in the container in which they are received, following the protocols for solid matrices described in Sections 9.3.6 through 9.3.8; analysis follows normal 1633 routines. No correction will be made for percent solids, and results are reported as ng/wipe.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025


Appendix I: TCLP/SPLP by 1633

Clients may submit samples (solid or aqueous) for PFAS following TCLP or SPLP procedures. For solid samples, the TCLP and SPLP procedures are used to simulate the leaching of environmental contaminants over extended periods of time from a solid material into the environment. A subsample of the client's sample is weighed out and combined with a leaching solution and mechanically tumbled for a set period. Each leachate prep method (TCLP: Method 1311 or SPLP: Method 1312) employs a unique leaching solution dictated by the parent methods. After the sample has been tumbled/leached by the Wet Chem department, the leachate is filtered by the Wet Chem department and delivered to the PFAS sample holding area. The filtered leachate solutions are prepared by the PFAS prep analysts using the 1633 aqueous prep method, at a 1:5 dilution (50 mL of leachate solution).

- 1) Samples requested for PFAS by SPLP/TCLP analysis will be batched and leached by the normal SPLP/TCLP procedures used by the West Columbia Wet Chem department. Wet Chem will be the initial responsible party for samples analyzed for PFAS by SPLP/TCLP.
- 2) When the leaching process is complete, Wet Chem will collect approximately 500mL (at minimum 100mL) of the leachate solutions in clean HDPE containers.
- 3) After collecting the leachate solution, an Wet Chem analyst will filter approximately 500 mL (at minimum 100mL) of each leachate solution using a Flipmate apparatus, using normal protocols for Flipmate filtration.
- 4) After filtering the leachates, the Wet Chem analyst will deliver the filtrates to the PFAS department.
- 5) Samples to be analyzed for PFAS following TCLP/SPLP will appear on a separate PFAS prep worklist, the title of which will contain "SPLP" or "TCLP." From these worklists, PFAS analysts will select the samples to be extracted.
- 6) Pour ~100 mL of filtrate solution into a pre-labeled HDPE PFAS sample bottle, using the gradations marked on the bottle as a guide. Record the actual amount of filtrate by weighing the sample bottle. LOQs for samples prepared in this way will be ~5X higher than normal Aqueous matrix LOQs.
- 7) Following the instructions in step 7, use the leachate blank solution (typically has sample ID L0000000-01) to prepare three bottles for use as batch QC. Volume for the leachate blank, LLLCS, and LCS will be recorded as 50 mL.
- 8) Label and fill a clean 60 mL HDPE bottle with ~125 mL of pre-tested reagent water for use as a typical 1633 MB sample. Volume for the 1633 MB sample will be recorded as 50 mL.
- 9) After preparing the diluted filtrate, filtrate batch QC, and 1633 MB bottles, follow the normal extraction steps for aqueous matrices. Each sample will be spiked with EIS as normal. The filtrate LLLCS and LCS will be spiked with target analytes according to the routine aqueous protocol for LLLCS and LCS target spiking.

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Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

	ENV-SOP-WCOL-0166 v01_PFAS by Method 1633 and 1633A (250 mL Sample Volume)
	Effective Date: 09/30/2025

- 10) Leachate batch QC (MB/LLLCS/MS/MSD) are documented in LIMS as leachate blank (MB), and LLLCS (LCS).
- 11) Following the SPE process, the instrumental analyst will analyze the extracts by the 1633 method, as normal.
- 12) After processing, reviewing, generating reports for the data, and importing the data into LIMS, the TCLP/SPLP tumble date must be input into the analytical results from the leachate logs.

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Accredited Laboratory

A2LA has accredited

PACE ANALYTICAL SERVICES, LLC

Minneapolis, MN

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2017, the 2016 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 6.0 of the DoD Quality System Manual for Environmental Laboratories (QSM), accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 27th day of October 2025.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
for the Accreditation Council
Certificate Number 2926.01
Valid to October 31, 2027

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



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

PACE ANALYTICAL SERVICES, LLC.
 1700 Elm Street SE
 Minneapolis, MN 55414
 Liz Stacks Phone: 612-607-6352

ENVIRONMENTAL

Valid To: October 31, 2027

Certificate Number: 2926.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests on dietary supplements, food products, and animal feed stocks:

Chemical Tests – Non-environmental testing

<u>Test</u>	<u>Test Method(s)</u>
PCB Congeners	EPA 1668A/1668C
Dioxins and Furans	EPA 1613B EPA 8290/8290A

Environmental Tests

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2017, the 2016 TNI Environmental Testing Laboratory Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 6.0 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies: Gas Chromatography/Mass Spectrometry, High Resolution Gas Chromatography/Mass Spectrometry

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
<u>Extractable Organics</u>			
2,3,7,8-TCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
2,3,7,8-TCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,7,8-PeCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
2,3,4,7,8-PeCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,7,8-PeCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,4,7,8-HxCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
Extractable Organics			
1,2,3,6,7,8-HxCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
2,3,4,6,7,8-HxCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,7,8,9-HxCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,4,7,8-HxCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,6,7,8-HxCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,7,8,9-HxCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,4,6,7,8-HpCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,4,7,8,9-HpCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
1,2,3,4,6,7,8-HpCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
OCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
OCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total HpCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total HpCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total HxCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total HxCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total PeCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total PeCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total TCDD	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A
Total TCDF	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A	EPA 1613B EPA 8290/8290A

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
Extractable Organics - PCB Congeners				
2-Chlorobiphenyl	PCB-1	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3-Chlorobiphenyl	PCB-2	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4-Chlorobiphenyl	PCB-3	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'-Dichlorobiphenyl	PCB-4	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,6-Dichlorobiphenyl	PCB-10	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,5-Dichlorobiphenyl	PCB-9	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
2,4-Dichlorobiphenyl	PCB-7	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3'-Dichlorobiphenyl	PCB-6	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3-Dichlorobiphenyl	PCB-5	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4'-Dichlorobiphenyl	PCB-8	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,5-Dichlorobiphenyl	PCB-14	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3'-Dichlorobiphenyl	PCB-11	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(13/12)	PCB-(13/12)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4,4'-Dichlorobiphenyl	PCB-15	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6-Trichlorobiphenyl	PCB-19	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(30/18)	PCB-(30/18)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4-Trichlorobiphenyl	PCB-17	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',6-Trichlorobiphenyl	PCB-27	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,6-Trichlorobiphenyl	PCB-24	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3-Trichlorobiphenyl	PCB-16	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',6-Trichlorobiphenyl	PCB-32	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,5-Trichlorobiphenyl	PCB-34	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,5-Trichlorobiphenyl	PCB-23	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(26/29)	PCB-(26/29)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4-Trichlorobiphenyl	PCB-25	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',5-Trichlorobiphenyl	PCB-31	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(28/20)	PCB-(28/20)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(21/33)	PCB-(21/33)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4'-Trichlorobiphenyl	PCB-22	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5-Trichlorobiphenyl	PCB-36	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4',5-Trichlorobiphenyl	PCB-39	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,5-Trichlorobiphenyl	PCB-38	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4-Trichlorobiphenyl	PCB-35	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4'-Trichlorobiphenyl	PCB-37	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6,6'-Tetrachlorobiphenyl	PCB-54	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(50/53)	PCB-(50/53)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(45/51)	PCB-(45/51)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6'-Tetrachlorobiphenyl	PCB-46	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5,5'-Tetrachlorobiphenyl	PCB-52	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5',6-Tetrachlorobiphenyl	PCB-(73/43)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(69/49)	PCB-(69/49)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5-Tetrachlorobiphenyl	PCB-48	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(44/47/65)	PCB-(44/47/65)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(59/62/75)	PCB-(59/62/75)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4'-Tetrachlorobiphenyl	PCB-42	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(41/40/71)	PCB-(41/40/71)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',6-Tetrachlorobiphenyl	PCB-64	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5,5'-Tetrachlorobiphenyl	PCB-72	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5'-Tetrachlorobiphenyl	PCB-68	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5-Tetrachlorobiphenyl	PCB-57	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5'-Tetrachlorobiphenyl	PCB-58	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5-Tetrachlorobiphenyl	PCB-67	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',5-Tetrachlorobiphenyl	PCB-63	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
PCB-(61/70/74/76)	PCB-(61/70/74/76)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4'-Tetrachlorobiphenyl	PCB-66	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4-Tetrachlorobiphenyl	PCB-55	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4'-Tetrachlorobiphenyl	PCB-56	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4'-Tetrachlorobiphenyl	PCB-60	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5,5'-Tetrachlorobiphenyl	PCB-80	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5'-Tetrachlorobiphenyl	PCB-79	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5-Tetrachlorobiphenyl	PCB-78	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4',5-Tetrachlorobiphenyl	PCB-81	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4'-Tetrachlorobiphenyl	PCB-77	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6,6'-Pentachlorobiphenyl	PCB-104	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6,6'-Pentachlorobiphenyl	PCB-96	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5',6-Pentachlorobiphenyl	PCB-103	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6'-Pentachlorobiphenyl	PCB-94	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5',6-Pentachlorobiphenyl	PCB-95	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(100/93/102/98)	PCB- (100/93/102/98)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(88/91)	PCB-(88/91)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6-Pentachlorobiphenyl	PCB-84	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6'-Pentachlorobiphenyl	PCB-89	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5',6-Pentachlorobiphenyl	PCB-121	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,5'-Pentachlorobiphenyl	PCB-92	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(113/90/101)	PCB-(113/90/101)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5-Pentachlorobiphenyl	PCB-83	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5-Pentachlorobiphenyl	PCB-99	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,6-Pentachlorobiphenyl	PCB-112	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(108/119/86/97/125/87)	PCB- (108/119/86/97/125/87)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(117/116/85)	PCB-(117/116/85)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(110/115)	PCB-(110/115)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4-Pentachlorobiphenyl	PCB-82	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,5'-Pentachlorobiphenyl	PCB-111	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5,5'-Pentachlorobiphenyl	PCB-120	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
PCB-(107/124)	PCB-(107/124)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,6-Pentachlorobiphenyl	PCB-109	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5'-Pentachlorobiphenyl	PCB-123	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5-Pentachlorobiphenyl	PCB-106	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5-Pentachlorobiphenyl	PCB-118	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5'-Pentachlorobiphenyl	PCB-122	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',5-Pentachlorobiphenyl	PCB-114	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4'-Pentachlorobiphenyl	PCB-105	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5,5'-Pentachlorobiphenyl	PCB-127	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5-Pentachlorobiphenyl	PCB-126	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',6,6'-Hexachlorobiphenyl	PCB-155	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6,6'-Hexachlorobiphenyl	PCB-152	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',6,6'-Hexachlorobiphenyl	PCB-150	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6,6'-Hexachlorobiphenyl	PCB-136	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6,6'-Hexachlorobiphenyl	PCB-145	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6'-Hexachlorobiphenyl	PCB-148	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(151/135)	PCB-(151/135)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'4,4',5,6'-Hexachlorobiphenyl	PCB-154	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5',6'-Hexachlorobiphenyl	PCB-144	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(147/149)	PCB-(147/149)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(134/143)	PCB-(134/143)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(139/140)	PCB-(139/140)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'3,3',4,6-Hexachlorobiphenyl	PCB-131	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6-Hexachlorobiphenyl	PCB-142	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6'-Hexachlorobiphenyl	PCB-132	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5'-Hexachlorobiphenyl	PCB-133	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
2,3,3',5,5',6-Hexachlorobiphenyl	PCB-165	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,5'-Hexachlorobiphenyl	PCB-146	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5',6-Hexachlorobiphenyl	PCB-161	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(153/168)	PCB-(153/168)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,5'-Hexachlorobiphenyl	PCB-141	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5'-Hexachlorobiphenyl	PCB-130	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5-Hexachlorobiphenyl	PCB-137	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5',6-Hexachlorobiphenyl	PCB-164	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(138/163/129)	PCB-(138/163/129)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,6-Hexachlorobiphenyl	PCB-160	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',6-Hexachlorobiphenyl	PCB-158	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(128/166)	PCB-(128/166)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5'-Hexachlorobiphenyl	PCB-159	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,5'-Hexachlorobiphenyl	PCB-162	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(156/157)	PCB-(156/157)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5,5'-Hexachlorobiphenyl	PCB-169	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5,5'-Hexachlorobiphenyl	PCB-167	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6,6'-Heptachlorobiphenyl	PCB-188	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6,6'-Heptachlorobiphenyl	PCB-179	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6,6'-Heptachlorobiphenyl	PCB-184	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6,6'-Heptachlorobiphenyl	PCB-176	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6'-Heptachlorobiphenyl	PCB-186	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6,6'-Heptachlorobiphenyl	PCB-178	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6-Heptachlorobiphenyl	PCB-175	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6-Heptachlorobiphenyl	PCB-187	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,5',6-Heptachlorobiphenyl	PCB-182	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

<u>Parameter/Analyte</u>	<u>PCB</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>	<u>Tissue</u>
PCB-(183/185)	PCB-(183/185)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6'-Heptachlorobiphenyl	PCB-174	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6'-Heptachlorobiphenyl	PCB-177	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6'-Heptachlorobiphenyl	PCB-181	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(171/173)	PCB-(171/173)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5'-Heptachlorobiphenyl	PCB-172	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5,6'-Heptachlorobiphenyl	PCB-192	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(180/193)	PCB-(180/193)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,6'-Heptachlorobiphenyl	PCB-191	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5-Heptachlorobiphenyl	PCB-170	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,6'-Heptachlorobiphenyl	PCB-190	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5'-Heptachlorobiphenyl	PCB-189	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	PCB-202	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	PCB-201	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	PCB-204	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(197/200)	PCB-(197/200)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
PCB-(198/199)	PCB-(198/199)	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	PCB-196	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,5',6'-Octachlorobiphenyl	PCB-203	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	PCB-195	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	PCB-194	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5',6'-Octachlorobiphenyl	PCB-205	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	PCB-208	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	PCB-207	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	PCB-206	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Decachlorobiphenyl	PCB-209	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste
Per- and Polyfluoroalkyl Substances (PFAS)		
11-Chloroeicosfluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	EPA 1633A	EPA 1633A
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2 FTS)	EPA 1633A	EPA 1633A
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2 FTS)	EPA 1633A	EPA 1633A
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)	EPA 1633A	EPA 1633A
2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	EPA 1633A	EPA 1633A
3-Perfluoroheptyl propanoic acid (7:3 FTCA)	EPA 1633A	EPA 1633A
3-Perfluoropropyl propanoic acid (3:3 FCTA)	EPA 1633A	EPA 1633A
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	EPA 1633A	EPA 1633A
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	EPA 1633A	EPA 1633A
Hexafluoropropylene oxide dimer acid (GenX) (HFPO-DA)	EPA 1633A	EPA 1633A
N-ethyl perfluorooctanesulfonamide (NEtFOSA)	EPA 1633A	EPA 1633A
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	EPA 1633A	EPA 1633A
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)	EPA 1633A	EPA 1633A
N-methyl perfluorooctanesulfonamide (NMeFOSA)	EPA 1633A	EPA 1633A
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	EPA 1633A	EPA 1633A
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)	EPA 1633A	EPA 1633A
Nonafluoro-3,6-dioxaheptanoic acid (NFHDA)	EPA 1633A	EPA 1633A
Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	EPA 1633A	EPA 1633A
Perfluoro-3-methoxypropanoic acid (PFMPA)	EPA 1633A	EPA 1633A
Perfluoro-4-methoxybutanoic acid (PFMBA)	EPA 1633A	EPA 1633A
Perfluorobutanesulfonic acid (PFBS)	EPA 1633A	EPA 1633A
Perfluorobutanoic acid (PFBA)	EPA 1633A	EPA 1633A
Perfluorodecanesulfonic acid (PFDS)	EPA 1633A	EPA 1633A
Perfluorodecanoic acid (PFDA)	EPA 1633A	EPA 1633A
Perfluorododecanesulfonic acid (PFDoS)	EPA 1633A	EPA 1633A
Perfluorododecanoic acid (PFDoA)	EPA 1633A	EPA 1633A

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
<u>Per- and Polyfluoroalkyl Substances (PFAS)</u>		
Perfluoroheptanesulfonic acid (PFHpS)	EPA 1633A	EPA 1633A
Perfluoroheptanoic acid (PFHpA)	EPA 1633A	EPA 1633A
Perfluorohexanesulfonic acid (PFHxS)	EPA 1633A	EPA 1633A
Perfluorohexanoic acid (PFHxA)	EPA 1633A	EPA 1633A
Perfluorononanesulfonic acid (PFNS)	EPA 1633A	EPA 1633A
Perfluorononanoic acid (PFNA)	EPA 1633A	EPA 1633A
Perfluorooctanesulfonamide (PFOSA)	EPA 1633A	EPA 1633A
Perfluorooctanesulfonic acid (PFOS)	EPA 1633A	EPA 1633A
Perfluorooctanoic acid (PFOA)	EPA 1633A	EPA 1633A
Perfluoropentanoic acid (PFPeA)	EPA 1633A	EPA 1633A
Perfluoropentanesulfonic acid (PFPeS)	EPA 1633A	EPA 1633A
Perfluoropropionic acid (PFPrA)	EPA 1633A	EPA 1633A
Perfluorotetradecanoic acid (PFTeDA)	EPA 1633A	EPA 1633A
Perfluorotridecanoic acid (PFTrDA)	EPA 1633A	EPA 1633A
Perfluoroundecanoic acid (PFUnA)	EPA 1633A	EPA 1633A
Bis(trifluoromethane)sulfonamide (TFSI)	EPA 1633A	EPA 1633A

In addition, in recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2017, the 2016 TNI Environmental Testing Laboratory Standard), accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies: Gas Chromatography-Flame Ionization Detector, Gas Chromatography-Mass Spectrometry, Gas Chromatography-Photo Ionization Detector, Inductively Coupled Plasma-Mass Spectrometry, Inductively Coupled Plasma-Mass Spectrometry, Manual Cold Vapor Atomic Absorption, Colorimetric, Electrometric

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
<u>Metals</u>		
Aluminum	EPA 6010D	EPA 6010D
	EPA 6020B	EPA 6020B
Antimony	EPA 6010D	EPA 6010D
	EPA 6020B	EPA 6020B
Arsenic	EPA 6010D	EPA 6010D
	EPA 6020B	EPA 6020B



<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
Barium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Beryllium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Bismuth	EPA 6020B	EPA 6020B
Boron	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Cadmium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Calcium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Chromium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Cobalt	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Copper	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Iron	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Lead	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Lithium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Magnesium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Manganese	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Mercury	EPA 7470A	EPA 7471B
Molybdenum	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Nickel	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Phosphorus	EPA 6010D	EPA 6010D
Potassium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Selenium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Silica	EPA 6020B	EPA 6020B
Silicon	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Silver	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Sodium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Strontium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Thallium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Thorium	EPA 6020B	EPA 6020B

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
Tin	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Titanium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Uranium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Vanadium	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
Zinc	EPA 6010D EPA 6020B	EPA 6010D EPA 6020B
<u>Inorganic</u>		
Alkalinity	SM 2320B	-----
Ammonia	EPA 350.1	-----
Chemical Oxygen Demand – COD	EPA 410.4 SM 5220D	-----
Chloride	EPA 300.0 EPA 9056A	-----
Conductivity	EPA 120.1	-----
Cyanide	SM 4500 CN-E	-----
Fluoride	EPA 300.0 EPA 9056A	-----
Hardness	SM 2340B	-----
Nitrate	EPA 300.0 EPA 9056A	-----
Nitrate-Nitrate	EPA 353.2	-----
Nitrite	EPA 300.0 EPA 9056A	-----
Oil and Grease	EPA 1664B	EPA 9071B
Paint Filters	-----	EPA 9095B
pH	SM 4500 H+B	EPA 9045D
Settleable Solids	SM 2540F	-----
Sulfate	EPA 300.0 EPA 9056A	-----
Total Dissolved Solids	SM 2540C	-----
Total Petroleum Hydrocarbons - TPH	EPA 1664B	EPA 9071B
Total Phosphorus	SM 4500 P-F	-----
Total Suspended Solids	SM 2540D	-----
Turbidity	EPA 180.1	-----
<u>Organic</u>		
Diesel Range Organics - DRO	EPA 8015D	EPA 8015D
Gasoline Range Organics - GRO	EPA 8015D	EPA 8015D
4,4'-DDD	EPA 8081B	EPA 8081B
4,4'-DDE	EPA 8081B	EPA 8081B
4,4'-DDT	EPA 8081B	EPA 8081B
Aldrin	EPA 8081B	EPA 8081B
alpha-BHC	EPA 8081B	EPA 8081B
alpha-Chlordane	EPA 8081B	EPA 8081B
beta-BHC	EPA 8081B	EPA 8081B

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
gamma-BHC (Lindane)	EPA 8081B	EPA 8081B
gamma-Chordane	EPA 8081B	EPA 8081B
Chlordane (Technical)	EPA 8081B	EPA 8081B
Dieldrin	EPA 8081B	EPA 8081B
Endosulfan I	EPA 8081B	EPA 8081B
Endosulfan II	EPA 8081B	EPA 8081B
Endosulfan sulfate	EPA 8081B	EPA 8081B
Endrin	EPA 8081B	EPA 8081B
Endrin aldehyde	EPA 8081B	EPA 8081B
Endrin ketone	EPA 8081B	EPA 8081B
Heptachlor	EPA 8081B	EPA 8081B
Heptachlor epoxide	EPA 8081B	EPA 8081B
Methoxychlor	EPA 8081B	EPA 8081B
Toxaphene	EPA 8081B	EPA 8081B
PCB-1016 (Aroclor 1016)	EPA 8082A	EPA 8082A
PCB-1221 (Aroclor 1221)	EPA 8082A	EPA 8082A
PCB-1232 (Aroclor 1232)	EPA 8082A	EPA 8082A
PCB-1242 (Aroclor 1242)	EPA 8082A	EPA 8082A
PCB-1248 (Aroclor 1248)	EPA 8082A	EPA 8082A
PCB-1254 (Aroclor 1254)	EPA 8082A	EPA 8082A
PCB-1260 (Aroclor 1260)	EPA 8082A	EPA 8082A
PCB-1262 (Aroclor 1262)	EPA 8082A	EPA 8082A
PCB-1268 (Aroclor 1268)	EPA 8082A	EPA 8082A
1,2-Dibromo-3-chloropropane	EPA 8011	-----
1,2-Dibromoethane (EDB)	EPA 8011	-----
1,2,4-Trichlorobenzene	EPA 8270E	EPA 8270E
1,2-Dichlorobenzene	EPA 8270E	EPA 8270E
1,3-Dichlorobenzene	EPA 8270E	EPA 8270E
1,4-Dichlorobenzene	EPA 8270E	EPA 8270E
1,4-Dioxane	EPA 8270E SIM	-----
1-Methylnaphthalene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
1-Nitropyrene	EPA 8270E SIM	EPA 8270E SIM
2,4,5-Trichlorophenol	EPA 8270E	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E	EPA 8270E
2,4-Dichlorophenol	EPA 8270E	EPA 8270E
2,4-Dimethylphenol	EPA 8270E	EPA 8270E
2,4-Dinitrotoluene	EPA 8270E	EPA 8270E
2,4-Dinitrophenol	EPA 8270E	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E	EPA 8270E
2-Chloronaphthalene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
2-Chlorophenol	EPA 8270E	EPA 8270E
2-Methylnaphthalene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
2-Methylphenol(o-Cresol)	EPA 8270E	EPA 8270E

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
2-Nitroaniline	EPA 8270E	EPA 8270E
2-Nitrofluorene	EPA 8270E SIM	EPA 8270E SIM
2-Nitrophenol	EPA 8270E	EPA 8270E
3&4-Methylphenol	EPA 8270E	EPA 8270E
3,3'-Dichlorobenzidine	EPA 8270E	EPA 8270E
3-Methylcholanthrene	EPA 8270E SIM	EPA 8270E SIM
3-Nitroaniline	EPA 8270E	EPA 8270E
4,6-Dinitro-2-methylphenol	EPA 8270E	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E	EPA 8270E
4-Chloroaniline	EPA 8270E	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E	EPA 8270E
4-Nitroaniline	EPA 8270E	EPA 8270E
4-Nitrophenol	EPA 8270E	EPA 8270E
4-Nitropyrene	EPA 8270E SIM	EPA 8270E SIM
5-Methylchrysene	EPA 8270E SIM	EPA 8270E SIM
5-Nitroacenaphthene	EPA 8270E SIM	EPA 8270E SIM
6-Nitrochrysene	EPA 8270E SIM	EPA 8270E SIM
7,12-Dimethylbenz(a)anthracene	EPA 8270E SIM	EPA 8270E SIM
7H-Dibenzo(c,g)carbazole	EPA 8270E SIM	EPA 8270E SIM
Acenaphthene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Acenaphthylene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Anthracene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzo(a)anthracene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzo(a)pyrene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzo(b)fluoroanthene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzo(k)fluoroanthene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzo(e)pyrene	EPA 8270E SIM	EPA 8270E SIM
Benzo(g,h,i)perylene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Benzoic acid	EPA 8270E	EPA 8270E
Benzyl alcohol	EPA 8270E	EPA 8270E
bis(2-Chloroethoxy)methane	EPA 8270E SIM	EPA 8270E SIM
bis(2-Chloroethyl)ether	EPA 8270E SIM	EPA 8270E SIM
bis(2-Chloroisopropyl)ether	EPA 8270E SIM	EPA 8270E SIM
bis(2-Ethylhexyl)phthalate	EPA 8270E SIM	EPA 8270E SIM
Butylbenzylphthalate	EPA 8270E SIM	EPA 8270E SIM
Carbazole	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
Chrysene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Dibenz(a,h)acridine	EPA 8270E SIM	EPA 8270E SIM
Dibenz(a,h)anthracene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Dibenz(a,j)acridine	EPA 8270E SIM	EPA 8270E SIM
Dibenzo(a,e)pyrene	EPA 8270E SIM	EPA 8270E SIM
Dibenzo(a,h)pyrene	EPA 8270E SIM	EPA 8270E SIM
Dibenzo(a,i)pyrene	EPA 8270E SIM	EPA 8270E SIM
Dibenzo(a,l)pyrene	EPA 8270E SIM	EPA 8270E SIM
Dibenzofuran	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Diethylphthalate	EPA 8270E	EPA 8270E
Dimethylphthalate	EPA 8270E	EPA 8270E
di-n-Butylphthalate	EPA 8270E	EPA 8270E
di-n-Octylphthalate	EPA 8270E	EPA 8270E
Fluoranthene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Fluorene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Hexachloro-1,3-butadiene	EPA 8270E	EPA 8270E
Hexachlorobenzene	EPA 8270E	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E	EPA 8270E
Hexachloroethane	EPA 8270E	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Isophorone	EPA 8270E	EPA 8270E
Naphthalene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Nitrobenzene	EPA 8270E	EPA 8270E
n-Nitrosodimethylamine	EPA 8270E	EPA 8270E
n-Nitroso-di-n-propylamine	EPA 8270E	EPA 8270E
n-Nitrosodiphenylamine	EPA 8270E	EPA 8270E
Pentachlorophenol	EPA 8270E EPA 8270E SIM	EPA 8270E
Perylene	EPA 8270E SIM	EPA 8270E SIM
Phenanthrene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Phenol	EPA 8270E	EPA 8270E
Pyrene	EPA 8270E EPA 8270E SIM	EPA 8270E EPA 8270E SIM
Pyridine	EPA 8270E	EPA 8270E
Quinoline	EPA 8270E SIM	EPA 8270E SIM
1,1,1,2-Tetrachloroethane	EPA 8260D	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D	EPA 8260D
1,1,2,2-Tetrachloroethane	EPA 8260D	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D	EPA 8260D

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
1,1,2-Trichlorotrifluoroethane	EPA 8260D	EPA 8260D
1,1-Dichloroethane	EPA 8260D	EPA 8260D
1,1-Dichloroethene	EPA 8260D	EPA 8260D
1,1-Dichloropropene	EPA 8260D	EPA 8260D
1,2,3-Trichlorobenzene	EPA 8260D	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D EPA 8260D SIM	EPA 8260D
1,2,3-Trimethylbenzene	EPA 8260D	-----
1,2,4-Trichlorobenzene	EPA 8260D	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D EPA 8260D SIM	EPA 8260D
1,2-Dibromoethane (EDB)	EPA 8260D EPA 8260D SIM	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D	EPA 8260D
1,2-Dichloroethane	EPA 8260D EPA 8260D SIM	EPA 8260D
1,2-Dichloropropane	EPA 8260D	EPA 8260D
1,3,5-Trimethylbenzene	EPA 8260D	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D	EPA 8260D
1,3-Dichloropropane	EPA 8260D	EPA 8260D
1,4-Dichlorobenzene	EPA 8260D	EPA 8260D
1,4-Dioxane	EPA 8260D EPA 8260D SIM	EPA 8260D
2,2-Dichloropropane	EPA 8260D	EPA 8260D
2-Butanone (MEK)	EPA 8260D	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D	EPA 8260D
2-Chlorotoluene	EPA 8260D	EPA 8260D
2-Hexanone	EPA 8260D	EPA 8260D
2-Methylnaphthalene	EPA 8260D	EPA 8260D
4-Chlorotoluene	EPA 8260D	EPA 8260D
4-Methyl-2-pentanone (MIBK)	EPA 8260D	EPA 8260D
Acetone	EPA 8260D	EPA 8260D
Acrolein	EPA 8260D	EPA 8260D
Acrylonitrile	EPA 8260D	EPA 8260D
Allyl Chloride	EPA 8260D	EPA 8260D
Benzene	EPA 8260D EPA 8260D SIM	EPA 8260D
Bromobenzene	EPA 8260D	EPA 8260D
Bromochloromethane	EPA 8260D	EPA 8260D
Bromodichloromethane	EPA 8260D	EPA 8260D
Bromoform	EPA 8260D	EPA 8260D
Bromomethane	EPA 8260D	EPA 8260D
Carbon disulfide	EPA 8260D	EPA 8260D
Carbon tetrachloride	EPA 8260D EPA 8260D SIM	EPA 8260D
Chlorobenzene	EPA 8260D	EPA 8260D
Chloroethane	EPA 8260D	EPA 8260D

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
Chloroform	EPA 8260D	EPA 8260D
Chloromethane	EPA 8260D	EPA 8260D
cis-1,2-Dichloroethene	EPA 8260D	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D EPA 8260D SIM	EPA 8260D
Cyclohexane	EPA 8260D	EPA 8260D
Dibromochloromethane	EPA 8260D EPA 8260D SIM	EPA 8260D
Dibromomethane	EPA 8260D	EPA 8260D
Dichlorodifluoromethane	EPA 8260D	EPA 8260D
Dichlorofluoromethane	EPA 8260D	EPA 8260D
Diethyl ether (Ethyl ether)	EPA 8260D	EPA 8260D
Di-isopropyl ether	EPA 8260D	EPA 8260D
Ethylbenzene	EPA 8260D	EPA 8260D
Hexachloro-1,3-butadiene	EPA 8260D EPA 8260D SIM	EPA 8260D
Iodomethane	EPA 8260D	EPA 8260D
Isopropylbenzene (Cumene)	EPA 8260D	EPA 8260D
m&p-Xylene	EPA 8260D	EPA 8260D
Methyl-tert-butyl ether (MTBE)	EPA 8260D	EPA 8260D
Methylene Chloride	EPA 8260D	EPA 8260D
Naphthalene	EPA 8260D	EPA 8260D
n-Butylbenzene	EPA 8260D	EPA 8260D
n-Hexane	EPA 8260D	EPA 8260D
n-Propylbenzene	EPA 8260D	EPA 8260D
o-Xylene	EPA 8260D	EPA 8260D
p-Isopropyltoluene	EPA 8260D	EPA 8260D
sec-Butylbenzene	EPA 8260D	EPA 8260D
Styrene	EPA 8260D	EPA 8260D
tert-Butylbenzene	EPA 8260D	EPA 8260D
Tetrachloroethene	EPA 8260D	EPA 8260D
Tetrahydrofuran	EPA 8260D	EPA 8260D
Toluene	EPA 8260D	EPA 8260D
trans-1,2-Dichloroethene	EPA 8260D	EPA 8260D
trans-1,3-Dichloropropene	EPA 8260D EPA 8260D SIM	EPA 8260D
trans-1,4-Dichloro-2-butene	EPA 8260D	EPA 8260D
Trichloroethene	EPA 8260D EPA 8260D SIM	EPA 8260D
Trichlorofluoromethane	EPA 8260D	EPA 8260D
Vinyl acetate	EPA 8260D	EPA 8260D
Vinyl chloride	EPA 8260D EPA 8260D SIM	EPA 8260D
Xylene (Total)	EPA 8260D	EPA 8260D
Ethane	RSK-175	-----
Ethene	RSK-175	-----
Methane	RSK-175	-----
n-Propane	RSK-175	-----

<u>Parameter/Analyte</u>	<u>Nonpotable Water</u>	<u>Solid Hazardous Waste</u>
TCLP	EPA 1311	EPA 1311
SPLP	EPA 1312	EPA 1312
Waste Extraction Test (WET)	CCR Chapter 11, Article 5, Appendix II	CCR Chapter 11, Article 5, Appendix II

<u>Test Method(s)</u>	<u>Matrix</u>	<u>Extraction Method(s)</u>
8015D DRO, 8081B, 8082A, 8270E, 8270E SIM	Water	EPA 3510C
8270E SIM	Water	EPA 3511
8081B, 8082A, 8270E, 8270E SIM	Solid	EPA 3546
8260D, 8260D SIM	Water	EPA 5035
8260D	Solid	EPA 5035/5030B
8015D GRO	Solid	EPA 5030B
6010D, 6020B	Water	EPA 3010A, 3015A, 3020A
6010D, 6020B	Solid	EPA 3050B
6010D, 7470A, 8081B, 8260D, 8270E	Solid/Liquid	EPA 1311 TCLP
6010D, 6020B, 7470A, 8082A	Solid/Liquid	EPA 1312 SPLP
6010D	Solid/Liquid	CCR Chapter 11, Article 5, Appendix II

*Standard Methods (SM) refers to the current online edition.

<u>Parameter/Analyte</u>	<u>Potable Water</u>
2,3,7,8-TCDD	EPA 1613B

WYOMING STORAGE TANK

In addition, in recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2017 and to the Wyoming Storage Tank Remediation Laboratory Accreditation Program, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below on water and solids:

<u>Parameter</u>	<u>Analyte</u>	<u>Method(s)</u>	<u>NPW</u>	<u>SCM</u>
Extractable Organics	Diesel Range Organics C10-C32	EPA 8015C	X	X
Metals	Cadmium	EPA 6010D	X	X
Metals	Chromium	EPA 6010D	X	X
Metals	Lead	EPA 6010D	X	X
Purgeable Organics	Gasoline Range Organics C6-C10	EPA 8015C	X	X
Purgeable Organics	1,2-Dibromomethane	EPA 8011	X	-----