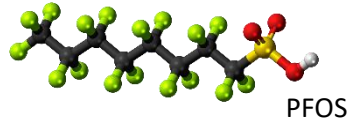


Testing the Geoprobe® Prepacked Well Screens For PFAS Contamination

Technical Bulletin No. 2020DI04

May 2020



Executive Summary

Geoprobe Systems® tested three sizes of Prepacked Well Screens to determine if the sand pack or other components in these systems would contribute detectable PFAS compounds to groundwater sampled with these devices. This bulletin describes procedures and components used to conduct these tests. Water samples collected during these tests were submitted to an independent laboratory for analysis of 36 PFAS compounds. Laboratory results found that water sampled through these systems were non-detect for all 36 PFAS compounds on the Wisconsin analyte list (Wisconsin DNR 2019).

Introduction

Over the last several years a large group of fluorinated organic compounds have emerged as a significant contaminant of concern on a national level. As a group these compounds have been named the polyfluorinated alkyl substances (PFAS). Two compounds of primary interest include perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). These compounds have been used in the manufacture of a wide array of industrial and commercial products. In 2016 the US EPA established a health advisory (HA) of 70 ng/l (parts per trillion) for PFOS and PFOA in drinking water (US EPA 2016A, 2016B, Federal Register May 25, 2016). This HA is for either compound alone or in combination. Subsequently, many states have begun establishing action levels for the PFAS compounds at levels equal to or below those set by the US EPA (California SWRCB 2019, Mass. DEP 2020, Michigan DEGLE 2019, Wisconsin DHS 2019). These very low action levels have led to concerns about the potential for cross contamination of both soil and groundwater samples by a wide array of commonly used materials during field sampling activities (Rodowa et al. 2020, Denly et al. 2019). Direct push installed prepacked screen wells (ASTM D6724, D6725) are used during PFAS groundwater investigations. As such, many consultants, regulators and site owners will need to be confident that Geoprobe's Prepacked Screen well systems will not result in detectable PFAS cross contamination of collected groundwater samples. To address this need Geoprobe has conducted PFAS rinsate tests on three different sized prepacked screens taken from new components in retail stock.

Objective

The objective is to evaluate the potential for PFAS cross contamination of groundwater samples by use of Prepacked Screened wells under normal operating conditions. This was accomplished by conducting rinsate tests on the bench. The tests included all Prepacked Screen well system components used in field

installation that have contact with the sampled groundwater. The equipment used, procedures followed, and analytical results are presented below.

Materials of Construction

This bulletin describes testing of three prepacked screen wells of different diameter for PFAS contaminants. Each of the wells include components in series that are used to provide representative groundwater samples from selected permeable zones in unconsolidated formations. Geoprobe Systems has made every effort to eliminate any materials from the prepacked screens which could contribute PFAS compounds to the sample stream. Materials of construction in contact with the sampled water stream in the prepacked screen wells include: silica sand, stainless steel, PVC screen and riser, PVC bottom plug, buna o-rings, (butadiene). The use of Teflon tape as a joint sealant on threaded fittings of the prepacked screens and PVC risers is not recommended when sampling for PFAS compounds.

Equipment and Setup

The equipment used in the rinsate tests of three different size prepacked screen wells (Table 1) includes all groundwater contact components used in field installation of these groundwater monitoring systems. Three sizes of prepacked screens (0.75, 1.5 and Slim 2.0-inch) were tested individually. For the 0.75-inch system a 10 ft tall standpipe constructed of 1.5-inch diameter clear PVC was assembled. For the 1.5-inch system and the Slim 2.0-inch system a 10 ft tall standpipe constructed of 3-inch diameter clear PVC was assembled. For each standpipe the white PVC bottom cap was equipped with a stainless steel valve that was used to sample and drain the standpipe (Photo 1). All components of both standpipes were first cleaned with Simple Green detergent and triple rinsed with DI water followed by a triple rinse with PFAS Free water prior to assembly. Between testing the 1.5" Prepack system and the Slim 2.0" system the 3-inch diameter clear PVC standpipe was cleaned and rinsed following the same procedure.

Due to height limitations inside the building the standpipes were initially laid horizontally so that the prepacked screen, bottom plug, and riser could be assembled and inserted into the standpipe. The standpipe with prepack well assembly inside was then set up vertically next to a balcony. The PVC bottom cap with valve for each standpipe was set up on a block so the valve could be used for sampling from or draining the standpipe (Figure 1).

PFAS Rinsate Procedure

After each prepack well assembly and standpipe was set up at the balcony as described above the following steps were performed to complete the PFAS rinsate test of each prepack well system.

- 1) PFAS Free water was gently poured into the top of the standpipe until the water was approximately 3 feet above the top of the prepacked screen. In this way about 3 feet of the PVC riser and threaded connection were submerged in the PFAS Free water.
- 2) The PFAS Free water-filled assembly was allowed to sit in place for 4 hours to allow for extraction of any PFAS compounds from the assembly.
- 3) After the 4-hour extraction time 3-liters of water was slowly drained from the 3" standpipe for either the 1.5" or Slim-2.0" prepack well assemblies. For the 0.75" Prepack assembly in the 1.5" standpipe 1-liter of water was slowly drained from the assembly. Water was drained from the

Table 1

Water Contact Prepack Screen Well Components Assembled for PFAS Rinsate Testing

(Units in Inches Unless Otherwise Specified)

Item No.	Material Number	Description
0.75" Prepack Well Assembly		
1	203095	Prepack 0.75 X 1.4 X 60 (assembly includes 20-40 silica sand, Inner slotted PVC screen, outer stainless steel mesh screen, PVC bushings, stainless steel clamps)
2	201823	PVC riser 0.75 X 60
3	202059	PVC bottom plug 0.75
4	214070	O-ring 0.75 PVC Riser (Buna O-ring)*
1.5" Prepack Well Assembly		
1	203079	Prepack 1.5 X 2.5 X 60 (assembly includes 20-40 silica sand, Inner slotted PVC screen, outer stainless steel mesh screen, PVC bushings, stainless steel clamps)
2	203080	PVC riser 1.5 X 60
3	203082	PVC bottom plug 1.5
4	102881	O-ring 1.5 PVC riser (Buna O-ring)*
2" Slim Prepack Well Assembly		
1	220282	Prepack 2.0 ID X 2.8 OD X 60 (assembly includes 20-40 silica sand, Inner slotted PVC screen, outer stainless steel mesh screen, PVC bushings, stainless steel clamps)
2	104378	PVC riser 2.0 X 60
3	104397	PVC bottom plug 2.0
4	?	No 2" O-ring in catalog ?*

**The Buna O-rings may be considered as non-sample contact as they are enclosed in the threaded joints but if the joints are not watertight there may be limited sample contact.*

valve on the bottom of each standpipe into a 5-gallon bucket. This procedure rinsed the valve with the extraction water and assured that water which had been in contact with the prepacked screen assembly during the 4-hour extraction would be sampled.

- 4) After draining water as in step 3 above two 250ml HDPE sample bottles were filled with water flowing out of the valve (Photo 1). The bottles were capped, labeled, and stored at approximately 4° C for shipment to Alpha Laboratory. The chain-of-custody form was completed and samples were sent by express shipping to the lab.



Photograph 1: Prepack screen PFAS rinsate test set up. A) Bench set up of both the 3" clear PVC and 1.5" clear PVC standpipes with prepack well assemblies in place, filled with PFAS free water. Duct tape used to hold standpipes on blocks to facilitate sampling from valve. B) Close up showing the slim 2" prepack screen with riser and the 0.75" prepack with riser in respective standpipes filled with PFAS free water. (C) Components of the 1.5" prepack well assembly used for extraction test. Taken from retail stock as packaged for delivery to clients. (D) Close up of stainless steel valve used for sampling from standpipe. (E) Filling sample bottle with water for PFAS analysis. Note: A liberal amount of Teflon® tape (pink in photos) was required on the PVC fittings of the standpipe casing to prevent leaks under positive head pressure.

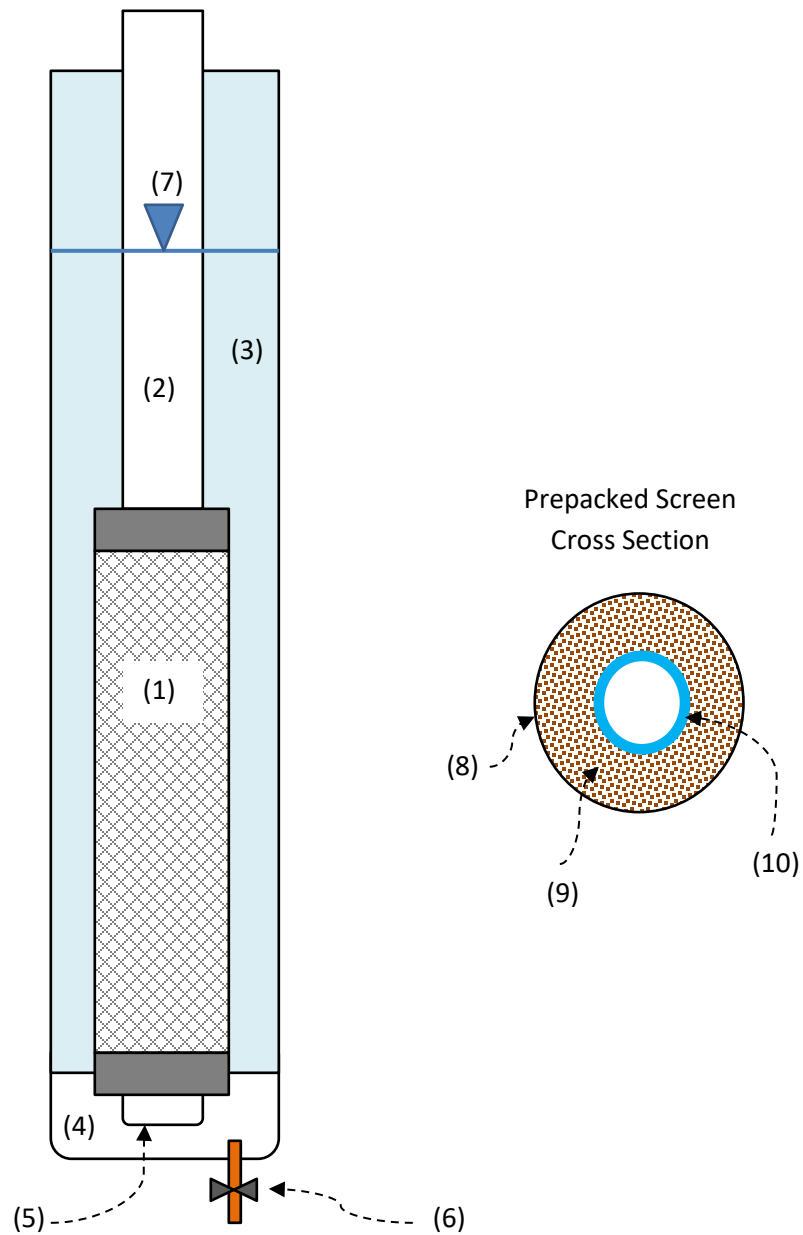


Figure 1: Diagram of bench set up of a prepacked well assembly for rinsate Test. (1) prepack screen assembly (2) PVC riser (3) clear PVC standpipe (4) standpipe PVC bottom cap (5) prepack well PVC bottom plug (6) stainless steel valve (7) PFAS free water level (8) stainless steel wire mesh (9) 20-40 grade silica sand (10) inner 10-slot PVC screen. Not to scale.

Analytical Results

The rinsate water samples were submitted to Alpha Analytical, Inc. (Westborough, MA) for analysis. Alpha Analytical holds both DOD ELAP and NELAC certification for both EPA Method 537 as well as their proprietary LC/MS/MS isotope dilution method for PFAS compounds. Alpha Analytical utilizes solid phase extraction (SPE) with liquid chromatography and tandem mass spectrometry (LC/MS/MS) protocols for PFAS analysis of aqueous samples. The rinsate samples were analyzed for the Wisconsin list of 36 PFAS compounds (Wisconsin DNR 2019) using Alpha Labs proprietary isotope dilution LC/MS/MS method. All three prepacked well systems were nondetect for all 36 PFAS compounds at the method reporting limits. The reporting limits for most of the compounds are below 2 ng/l. The Alpha Laboratory reports for the prepack well assembly rinsate samples are attached (Appendix I).

This PFAS rinsate test is a point-in-time test of the three prepacked screen well systems with parts taken from new components in retail stock. The results reported here should be representative of new equipment purchased from Geoprobe Systems®. However, these results may not be representative of other prepacked well screen systems or materials that have been shipped and handled prior to installation. If needed, each prepacked well screen could be rinsate tested prior to use onsite to verify its current status relative to the presence/absence of PFAS compounds or other analytes of concern. If a rinsate test is performed be sure to separately sample the water before it is used for the rinsate test to verify the water source is PFAS free. This blank water sample can be held at the lab until the rinsate sample is tested. Then analyzed only if the rinsate test sample is positive for any PFAS analytes.

References and Links

Agency for Toxic Substances and Disease Registry (ATSDR). Per- and Polyfluoroalkyl Substances and Your Health. <https://www.atsdr.cdc.gov/pfas/index.html>

American Society of Testing and Materials (ASTM), 2020. D6724 Standard Guide for Installation of Direct-Push Groundwater Monitoring Wells. www.astm.org

American Society of Testing and Materials (ASTM), 2020. D6725 Standard Practice for Direct-Push Installation of Prepacked Screen Monitoring Wells in Unconsolidated Aquifers. www.astm.org

California State Water Resources Control Board, 2019. Drinking Water PFAS Information and Resources: PFOA and PFOS Notification Levels. https://www.waterboards.ca.gov/pfas/drinking_water.html

Denly, E., J. Occhialini, P. Bassignani, M. Eberle, N. Rabah, 2019. Per- and polyfluoroalkyl substances in environmental sampling products: Fact or fiction? *Remediation*, Vol. 29, pages 65-76. DOI: 10.1002/rem.21614

Federal Register, May 25, 2016. Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane sulfonate. Federal Register Vol. 81, No. 101. Wednesday. <https://www.epa.gov/sites/production/files/2016-05/documents/2016-12361.pdf>

Massachusetts DEP, 2020. Per- and Polyfluoroalkyl Substances (PFAS): Health advisories and downloadable fact sheets: PFAS Levels of Concern. January. <https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#health-advisories-and-downloadable-fact-sheets->

Massachusetts ORSG, 2019. Documentation for Updated Office of Research and Standards Guidelines (ORSG) for Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water. <https://www.mass.gov/doc/massdep-ors-guideline-for-pfas/download>

Michigan Dept. of Env., Great Lakes and Energy (EGLE), 2019. PFAS Action Response Team: Drinking Water. <https://www.michigan.gov/pfasresponse/0,9038,7-365-95571---,00.html>

Michigan Dept. of Env., Great Lakes and Energy (EGLE), 2019. Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Minimum Laboratory Analyte List. October. https://www.michigan.gov/pfasresponse/0,9038,7-365-88059_95747--_,00.html

Rodowa, Alix E., E. Christie, J. Sedlak, G.F. Peaslee, D. Bogdan, B. DiGuseppi and J.A. Field. 2020. Field Sampling Materials Unlikely Source of Contamination for Perfluoroalkyl and Polyfluoroalkyl Substances in Field Samples. *Environ. Sci. Technol. Lett.* Vol. 7, pages 156-163.

U.S. EPA, 2016. Fact Sheet: PFOA & PFOS Drinking Water Health Advisories. EPA 800-F-16-003. November. https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf

U.S. EPA, 2016. Supporting Documents for Drinking Water Health Advisories for PFOA and PFOS. <https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos>

Wisconsin Dept. of Health Services, 2019. Recommended Groundwater Enforcement Standards: Recommendation Table. June. <https://www.dhs.wisconsin.gov/water/gws.htm>

Wisconsin Dept. of Natural Res. 2019. Wisconsin PFAS Aqueous (Non-Potable Water) and Non-Aqueous Matrices Method Expectations – Version 12.16.2019 – Per- and Polyfluorinated Alkyl Substances (PFAS) Analysis Using Isotope Dilution by LC/MS/MS. <https://dnr.wi.gov/topic/LabCert/documents/EA-19-0001-C.pdf> (see pages 13 & 14).

Appendix I

Alpha Analytical Laboratory Report

Selected Geoprobe® Prepacked Screen Well Systems

PFAS Rinsate Test

Sample Analysis Identifier

Lab Sample ID	Geoprobe Sample ID	Sample Description
L2016355-02	SLM2PP	Slim Prepack 2.0 X 2.8 X 60 inches
L2016355-04	PP1.5X2.5	Prepack 1.5 X 2.5 X 60 inches
L2016355-05	PP0.75X1.4	Prepack 0.75 X 1.4 X 60 inches

Project Name: GEOPROBE PFAS TEST
 Project Number: 7200352

Serial_No:04242009:21
 Lab Number: L2016355
 Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-02
 Client ID: SLM2PP
 Sample Location: DI BLDG

Date Collected: 04/15/20 13:22
 Date Received: 04/20/20
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water
 Analytical Method: 134,LCMSMS-ID
 Analytical Date: 04/22/20 19:59
 Analyst: JW

Extraction Method: ALPHA 23528
 Extraction Date: 04/21/20 11:29

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.89	-	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.89	-	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.89	-	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.89	-	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.89	-	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.89	-	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.89	-	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.89	-	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.89	-	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.89	-	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.89	-	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.89	-	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.89	-	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.89	-	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.89	-	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.89	-	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.89	-	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.89	-	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.89	-	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.89	-	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.89	-	1
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND		ng/l	47.2	-	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	1.89	-	1
Perfluorohexadecanoic Acid (PFHxDA)	ND		ng/l	3.77	-	1



Project Name: GEOPROBE PFAS TEST
 Project Number: 7200352

Serial_No:04242009:21
 Lab Number: L2016355
 Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-02
 Client ID: SLM2PP
 Sample Location: DI BLDG

Date Collected: 04/15/20 13:22
 Date Received: 04/20/20
 Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctadecanoic Acid (PFODA)	ND		ng/l	3.77	-	1
Perfluorododecane Sulfonic Acid (PFDoDS)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS)	ND		ng/l	4.72	-	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	1.89	-	1
11-Chloroicosafuoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	1.89	-	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	18.9	-	1
N-Ethyl Perfluorooctane Sulfonamide (NEFOSA)	ND		ng/l	18.9	-	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	47.2	-	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEFOSE)	ND		ng/l	47.2	-	1
PFOA/PFOS, Total	ND		ng/l	1.89	-	1
PFAS, Total (5)	ND		ng/l	1.89	-	1



Project Name: GEOPROBE PFAS TEST
 Project Number: 7200352

Serial_No:04242009:21
 Lab Number: L2016355
 Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-04
 Client ID: PP1.5X2.5
 Sample Location: DI BLDG

Date Collected: 04/16/20 13:03
 Date Received: 04/20/20
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water
 Analytical Method: 134.LCMSMS-ID
 Analytical Date: 04/22/20 20:15
 Analyst: JW

Extraction Method: ALPHA 23528
 Extraction Date: 04/21/20 11:29

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.89	-	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.89	-	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.89	-	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.89	-	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.89	-	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.89	-	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.89	-	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.89	-	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.89	-	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.89	-	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.89	-	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.89	-	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.89	-	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.89	-	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.89	-	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.89	-	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.89	-	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.89	-	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.89	-	1
Perfluorotridecanoic Acid (PFTDA)	ND		ng/l	1.89	-	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.89	-	1
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND		ng/l	47.2	-	1
4,8-Dioxo-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	1.89	-	1
Perfluorohexadecanoic Acid (PFHxDA)	ND		ng/l	3.77	-	1



Project Name: GEOPROBE PFAS TEST
 Project Number: 7200352

Serial_No:04242009:21
 Lab Number: L2016355
 Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-04
 Client ID: PP1.5X2.5
 Sample Location: DI BLDG

Date Collected: 04/16/20 13:03
 Date Received: 04/20/20
 Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctadecanoic Acid (PFODA)	ND		ng/l	3.77	-	1
Perfluorododecane Sulfonic Acid (PFDoDS)	ND		ng/l	1.89	-	1
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2F7S)	ND		ng/l	4.72	-	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	1.89	-	1
11-Chloroicosafafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	1.89	-	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	18.9	-	1
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	ND		ng/l	18.9	-	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	47.2	-	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	ND		ng/l	47.2	-	1
PFOA/PFOS, Total	ND		ng/l	1.89	-	1
PFAS, Total (5)	ND		ng/l	1.89	-	1



Serial_No:04242009:21

Project Name: GEOPROBE PFAS TEST
 Project Number: 7200352

Lab Number: L2016355
 Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-05
 Client ID: PP0.75X1.4
 Sample Location: DI BLDG

Date Collected: 04/16/20 13:11
 Date Received: 04/20/20
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water
 Analytical Method: 134,LCMSMS-ID
 Analytical Date: 04/22/20 20:48
 Analyst: JW

Extraction Method: ALPHA 23528
 Extraction Date: 04/21/20 11:29

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.77	–	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.77	–	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.77	–	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.77	–	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.77	–	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.77	–	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.77	–	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.77	–	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.77	–	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.77	–	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.77	–	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.77	–	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.77	–	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.77	–	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.77	–	1
Perfluoronanesulfonic Acid (PFNS)	ND		ng/l	1.77	–	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.77	–	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.77	–	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.77	–	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.77	–	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.77	–	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.77	–	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.77	–	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.77	–	1
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND		ng/l	44.2	–	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	1.77	–	1
Perfluorohexadecanoic Acid (PFHxDA)	ND		ng/l	3.53	–	1



Serial_No:04242009:21

Project Name: GEOPROBE PFAS TEST
Project Number: 7200352

Lab Number: L2016355
Report Date: 04/24/20

SAMPLE RESULTS

Lab ID: L2016355-05
Client ID: PP0.75X1.4
Sample Location: DI BLDG

Date Collected: 04/16/20 13:11
Date Received: 04/20/20
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctadecanoic Acid (PFODA)	ND		ng/l	3.53	-	1
Perfluorododecane Sulfonic Acid (PFDoDS)	ND		ng/l	1.77	-	1
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS)	ND		ng/l	4.42	-	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	1.77	-	1
11-Chloroicosafafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	1.77	-	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	17.7	-	1
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	ND		ng/l	17.7	-	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	44.2	-	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	ND		ng/l	44.2	-	1
PFOA/PFOS, Total	ND		ng/l	1.77	-	1
PFAS, Total (5)	ND		ng/l	1.77	-	1

For additional information about the sample preparation and analytical method used please see this link: <https://alphalab.com/analytical-services/emerging-contaminants/per-and-polyfluorinated-alkyl-substances-pfas>