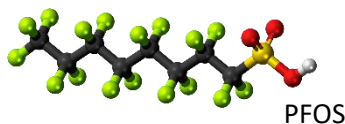


# Testing the Geoprobe® GWP 1.75 Groundwater Profiler System For PFAS Contamination

Technical Bulletin No. 2020DI02

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## Executive Summary

Geoprobe Systems® tested a GWP 1.75 groundwater profiling system to determine if under normal operating conditions components in the system would contribute detectable PFAS compounds to groundwater sampled with this system. This bulletin describes procedures and components used to conduct this test. Water collected during this test was submitted to an independent laboratory for analysis of 36 PFAS compounds. Laboratory results found that water sampled through this system was 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 (USEPA 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. 2020). Direct push groundwater sampling tools (ASTM D6001) are widely used during PFAS groundwater investigations. As such, many consultants, regulators and site owners will need to be confident that Geoprobe's GWP 1.75 system will not result in detectable PFAS cross contamination of collected groundwater samples. To address this need Geoprobe has conducted a PFAS rinsate test on a GWP 1.75 system 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 the GWP 1.75 groundwater profiling system under normal operating conditions. This was accomplished by conducting a rinsate test on the bench. The test included all GWP 1.75 system

components used in field logging and sampling operations that have contact with the injected and/or sampled water. The equipment used, procedures followed, and analytical results are presented below.

### Materials of Construction

This bulletin describes testing of the GWP 1.75 logging/groundwater profiling system for PFAS contaminants. The system includes a variety of components in series that act to deliver clean water to the injection/sample screens at the probe and measure the flow and pressure of water injection. At selected intervals the injection flow is halted, and the downhole syringe pump is operated to purge groundwater from permeable formations to the surface for sampling. Geoprobe Systems has made every effort to eliminate any materials from the GWP 1.75 system which could contribute PFAS compounds to the injection/sample stream. The use of Teflon tape as a sealant in threaded fittings on the HPT Flow Module system used with this system was discontinued in April 2019. Materials of construction in contact with the injected water stream in the GWP 1.75 system include: nylon, polyoxymethylene (POM) [aka acetal or Delrin], brass, stainless steel, ceramic, polyurethane, Buna o-rings (butadiene) and high density polyethylene (HDPE). Materials of construction in the sample water stream include stainless steel, silicone (o-rings) and HDPE.

### Equipment and Setup

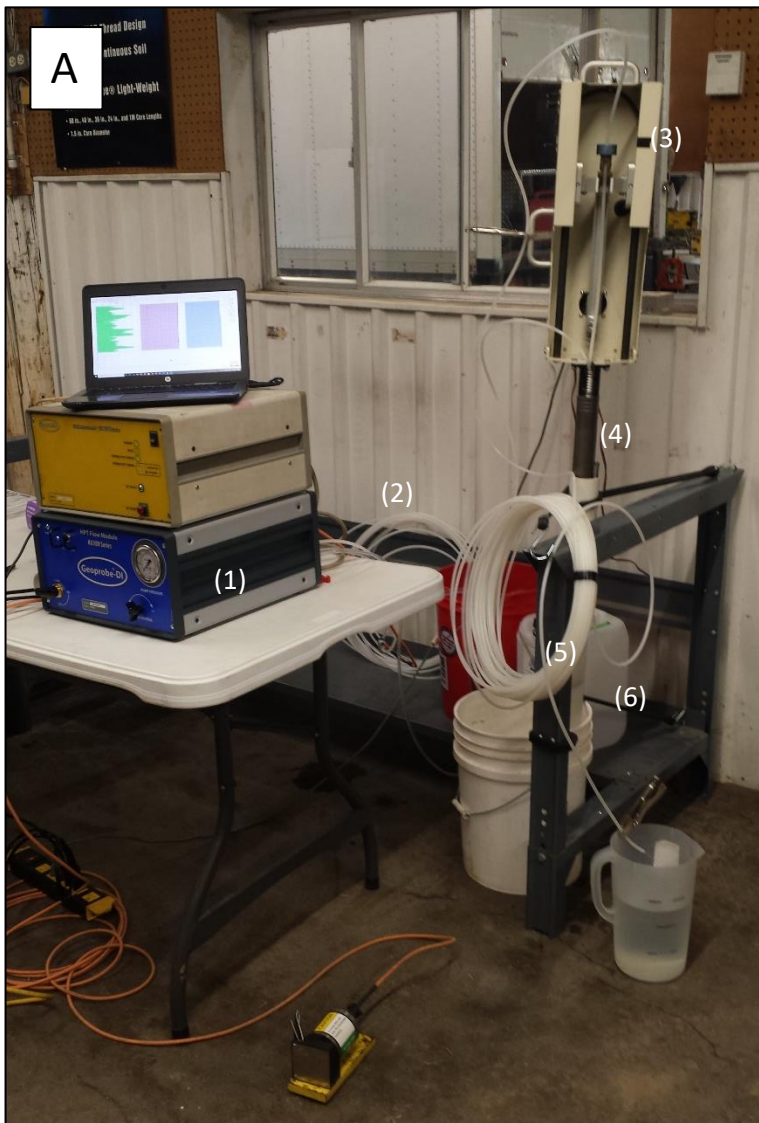
The equipment used in this PFAS rinsate test (Table 1) includes all components used in field operation of the 175GWS system with the exception of probe rods that do not have contact with the injected water or sampled groundwater. All components, including the HPT Flow Module and syringe pump, were taken from new stock ready for commercial sale. The equipment was set up on a bench to perform the rinsate test (Photo 1). A schematic of the bench set up (Figure 1) reveals that all components of the system that have water contact during the logging and sampling process were assembled as used in the field.

**Table 1**

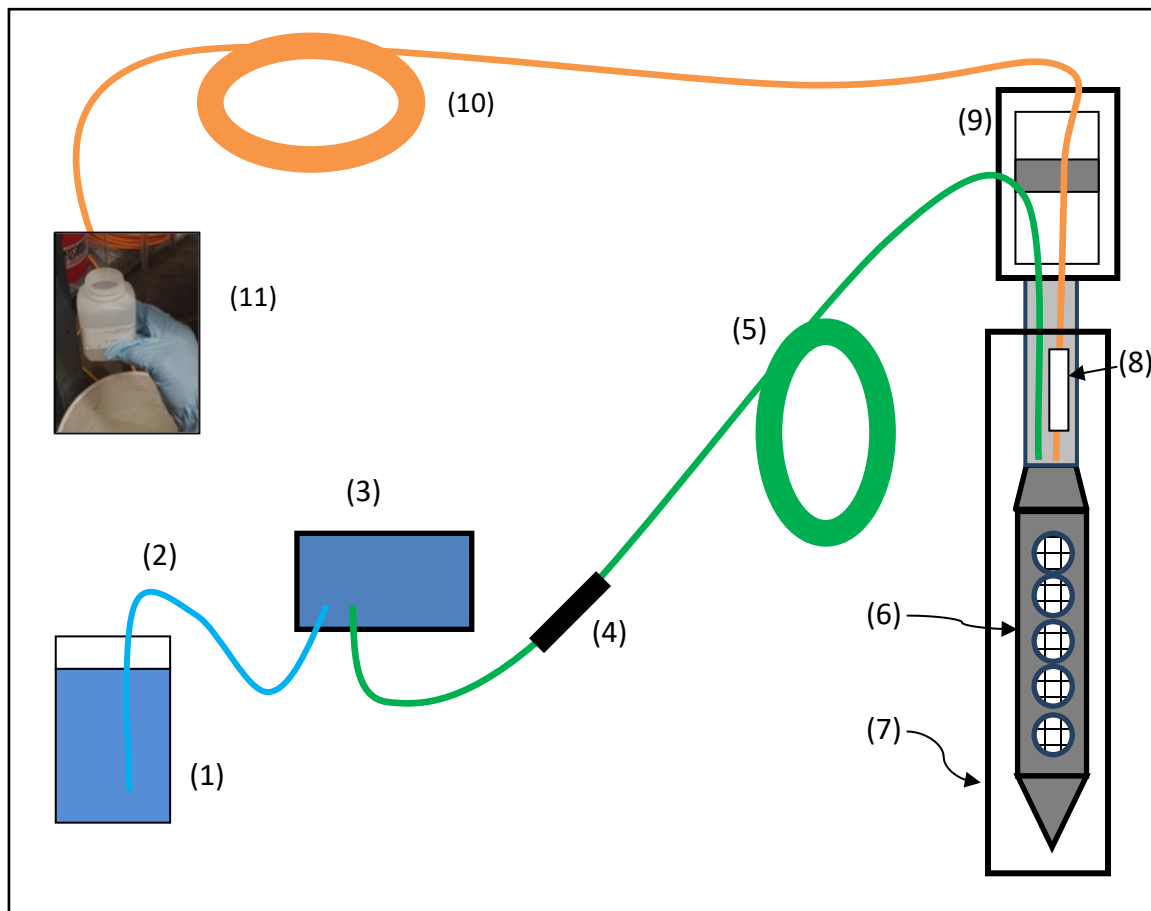
**Water Contact GWP 1.75 Components Assembled for PFAS Rinsate Testing**

Item No.	Material Number	Description
1	214091	HPT Flow Module, 120V AC, FI Based: Serial No. HPT10060 (This includes water intake hose assembly)
2	210091	HPT Pressure Sensor Assy, 100psi (Serial No. XD31313A)
3	114348	HDPE tubing (0.19" ID X 0.25" OD X 500ft) (Includes 60ft on supply line, 120ft on sample line)
4	230905	GWP 1.75 Probe
5	205558	HPT Screen Assy. (20 screens in the 175GWS probe)
6	235206	GWP to MBP/MSP connector tube (single)
7	234560	Syringe Pump*

*\*The mechanical bladder pump (MN 214098) may be used when sampling for volatile organic compounds.*



**Photograph 1:** Bench setup of the GWP 1.75 system for PFAS rinsate testing. Components include: Photo A: (1) HPT Flow Module, includes pump, flow meter, valves, internal plumbing, pressure meter, pressure gauge, water inlet line, bypass valve, bypass line, etc. (2) 60 ft HDPE water supply line with HPT pressure sensor behind flow module (3) MB6120 12V pump actuator (4) Assembled GWP 1.75 probe and syringe pump inside 2" PVC standpipe (5) 120 ft of ¼" HDPE sample line (6) Carboy of PFAS free water provided by Alpha Labs. Photo B: (7) GWP 1.75 Probe with 20 screened injection ports (8) syringe pump (9) connection tube with water supply line and sample line routed through it.



**Figure 1:** Schematic of GWP 1.75 system setup for PFAS rinsate test (not to scale). Components are (1) container of DI water then PFAS free water (2) HPT water supply line (3) HPT Flow Module (4) HPT pressure sensor (5) 1/4" X 60 ft HDPE supply line (6) GWP 1.75 probe with 20 screened injection/sample ports (7) 2" PVC standpipe (8) syringe pump (9) MB6120 12V pump actuator [no sample contact] (10) 1/4" X 120 ft HDPE sample line (11) sample collection.

The GWP 1.75 probe (MN 230905) was assembled with the HPT pressure sensor (MN 210091) uphole on the water injection line as standard for this system. The injection line (60ft HDPE) was connected to the barb fitting on top of the probe. The syringe pump was connected to the second barb on top of the GWP 1.75 probe with the connector tubing (MN 235206). The groundwater sample return tubing (120ft of 1/4" HDPE) was installed on the barb fitting at the top of the syringe pump. The assembled probe with connection tube (MN 219594) was inserted into a clean, 3ft tall, 2-inch diameter PVC standpipe. Then the MB6120 pump actuator was installed on top of the assembled probe and connection tube and the sample line was connected to the actuator arm. All water flow connections made as for field logging procedure.

### **PFAS Rinsate Procedure**

After the GWP 1.75 probe and HPT system components were assembled on the bench as described above the following steps were performed to complete the PFAS rinsate test of the system.

- 1) The RV antifreeze used to protect the HPT Flow Module plumbing during shipping and storage was purged from the module (prior to connection to the ¼" HDPE water supply line).
- 2) Ten liters of de-ionized (DI) water were pumped with the HPT Flow Module into the assembled GWP 1.75 probe at a rate of approximately 250ml/min. Initially the DI water was allowed to flow out of the screen to fill the 2" PVC standpipe. Then the MB6120 Actuator operated the syringe pump purging water out through the sample line at approximately 250ml/min.
- 3) After the DI purge was completed the water intake tube was removed from the DI water supply. Ambient air was pumped through the system to purge out the DI water. Air was purged through both the supply line and sample line and the PVC standpipe was emptied.
- 4) The HPT intake tube was then placed in a carboy of PFAS Free water supplied by Alpha Laboratory. A total of 5 liters of PFAS free water was purged through the HPT Flow Module and gwp 1.75 system as outlined in #2 above. Flow rates for this step were again set at approximately 250 ml/min.
- 5) After 5 liters of PFAS free water were purged two 250ml HDPE sample bottles were filled with water flowing out of the GWP 1.75 sample line (Figure 1, item #10). 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.

### **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 DHS 2019) using Alpha Labs proprietary isotope dilution LC/MS/MS method. The GWP1.75 system rinsate sample (GWP-1) was 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 report for the GWP-1 sample is attached (Appendix I).

This PFAS rinsate test is a point-in-time test of one GWP 1.75 system 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 GWP 1.75 systems that have been previously used at other sites. If needed, each GWP 1.75 system 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

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U.S. EPA, 2016B. 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>

## **Appendix I**

**Alpha Analytical Laboratory Report  
175GWS Groundwater Profiler System  
PFAS Rinsate Test**

Project Name: GEOPROBE PFAS TEST  
 Project Number: Not Specified

Serial\_No:03302016:12  
 Lab Number: L2012905  
 Report Date: 03/30/20

**SAMPLE RESULTS**

Lab ID: L2012905-03  
 Client ID: GWP-1  
 Sample Location: SALINA, KS

Date Collected: 03/20/20 11:40  
 Date Received: 03/23/20  
 Field Prep: Not Specified

Sample Depth:  
 Matrix: Water  
 Analytical Method: 134,LCMSMS-ID  
 Analytical Date: 03/26/20 20:04  
 Analyst: JW

Extraction Method: ALPHA 23528  
 Extraction Date: 03/26/20 09:29

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
<b>Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab</b>						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.80	-	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.80	-	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.80	-	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.80	-	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.80	-	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.80	-	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.80	-	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.80	-	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.80	-	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.80	-	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.80	-	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.80	-	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.80	-	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.80	-	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.80	-	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.80	-	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.80	-	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.80	-	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.80	-	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.80	-	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.80	-	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.80	-	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.80	-	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.80	-	1
2,3,3,3-Tetrafluoro-2-[1,1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND		ng/l	45.0	-	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	1.80	-	1
Perfluorohexadecanoic Acid (PFHxDA)	ND		ng/l	3.60	-	1





Serial\_No:03302016:12

Project Name: GEOPROBE PFAS TEST

Lab Number: L2012905

Project Number: Not Specified

Report Date: 03/30/20

**SAMPLE RESULTS**

Lab ID: L2012905-03

Date Collected: 03/20/20 11:40

Client ID: GWP-1

Date Received: 03/23/20

Sample Location: SALINA, KS

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	3.60	-	1
Perfluorododecane Sulfonic Acid (PFDoDS)	ND		ng/l	1.80	-	1
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS)	ND		ng/l	4.50	-	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	1.80	-	1
11-Chloroicosafuoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUDS)	ND		ng/l	1.80	-	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	18.0	-	1
N-Ethyl Perfluorooctane Sulfonamide (NEFOSA)	ND		ng/l	18.0	-	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	45.0	-	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEFOSE)	ND		ng/l	45.0	-	1
PFOA/PFOS, Total	ND		ng/l	1.80	-	1
PFAS, Total (5)	ND		ng/l	1.80	-	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>

