PFAS Analysis in Soil, Groundwater, Surface Water & Potable Water

Per and polyfluoroalkyl substances (PFAS) are a large group of synthetic fluorinated organic compounds. They contain the C-F bond, which is the shortest and strongest bond in nature, and is responsible for most of the functional characteristics of these compounds. PFAS are manufactured compounds that have been used in a wide range of industrial applications and in a variety of products for decades. Common uses of PFAS are for making products that are non-stick and water-repellent. PFAS are also well known for having been present in firefighting foams at airports and oil terminals. The characteristics that make them attractive for use in industry also mean they are persistent in the environment and resistant to normal degradation. Therefore, PFAS residues are commonly found in soil, sediment, environmental water, and biota. They are considered to have potential adverse effects on environmental and human health. The best-known PFAS are perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), and perfluorooctanoic acid (PFOA).

Method Summary & Quality Control

Hill Labs is validated for the determination of >40 PFAS (including linear and branched PFHxS and PFOS) in soil, groundwater, surface water and potable water.

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) analysis is used to identify the common PFAS, some of the precursors and degradation compounds e.g. 5:3 FTCA. The use of LC-MS/MS provides a high degree of specificity for the determination of PFAS in environmental matrices.

Hill Labs soil method follows ASTM D7698-23 and is applicable to soils and sediments.

Hill Labs waters method follows ASTM D8241-24 and is applicable to groundwater, surface water and potable water.

See Table 1 “Analytes & Reporting Limits, Soils and Waters” for the PFAS in the Hill Labs PFAS suite, along with reporting limits for both screen and trace methods.

It is critical that all consumables used in sampling and processing of samples do not contain PFAS. Hill Labs uses a combination of certified products, batch testing, rinsing and stringent lab procedures to reduce the risk of contamination. PFAS sampling protocols are also recommended when sampling PFAS samples. See further information section for links relating to PFAS sampling and guidelines.

Each batch of samples will incorporate a range of laboratory QC samples including:

- A blank
- Lab control spike
- Lab control spike duplicate (waters only)
- Sample spike (soils only)
- Sample spike duplicate (soils only)

Reporting Limits

Hill Labs reporting limits meet the NEMP 2.0 guidelines, Drinking Water Standards for New Zealand and the 95% ANZECC guideline.

As reporting limits are evolving and other analytes are being included, Hill Labs will work towards meeting future market requirements where possible.

Turnaround Time (TAT)

All PFAS analysis is carried out at our Hamilton laboratory. The standard turnaround time for soils and waters is five working days following day of receipt at the Hamilton laboratory. Please discuss any urgent TAT request with our Environmental CSM team.

For more information, freephone 0508 HILL LAB 44 555 22 mail@hill-labs.co.nz hill-labs.co.nz

Reporting Limits and Calculations

Results for >40 PFAS are reported, along with three calculated results.

The calculated results are,

- Total PFOS = Linear perfluorooctanesulfonic acid (L-PFOS) + branched perfluorooctanesulfonic acid (B-PFOS).
- Total PFAS = Sum of 46 PFAS.
- Total of PFHxS and PFOS = Linear perfluorohexanesulfonic acid (L-PFHxS) + branched perfluorohexanesulfonic acid (B-PFHxS) + linear perfluorooctanesulfonic acid (L-PFOS) + branched perfluorooctanesulfonic acid (B-PFOS).

For calculated results where some/all of the individual results are less than the reporting limit (<RL), Hill Labs standard procedure is to utilise the raw result in the calculation. This means that calculated totals or sums can give a >RL result when individual compounds were <RL. For example, the numerical value for L-PFOS and B-PFOS may be 0.0009 mg/kg, reported as <0.001 mg/kg, but the total for PFOS (linear and branched) will be reported as 0.0018 mg/kg, rounded to 0.002 mg/kg.

To request a quote or sampling supplies please contact env.csm@hill-labs.co.nz

Future Scope

Wastewater, effluent, sludge, biosolids, TCLP/SPLP or highly contaminated Aqueous Film-Forming Foam (AFFF) tank water cannot be analysed using our current method. We are working towards being able to analyse more matrices as demand for these increases.

Currently Hill Labs does not offer ultra-trace reporting limits for waters, Total Oxidisable Precursor Assay (TOPA), Total Organic Fluorine (TOF) or Adsorbable Organic Fluoride (AOF) analysis for soils or waters. If these methods are of interest then please discuss options with the Environmental CSM team.

Further Information

More details on commonly used guidelines, sampling protocols etc. Can be found in the following references:

https://www.dcceew.gov.au/sites/default/files/documents/pfas-nemp-2.pdf

https://www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Guidance/23c396d3b3/PFOS-disposal-to-trade-waste-guidance.pdf

https://environment.govt.nz/assets/publications/land/draft-sampling-protocols-guidance.pdf

https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=5498

https://te-puna-korero.taumataarowai.govt.nz/regulatory/drinking-water-standards/user_uploads/drinking-water-standards.pdf

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Table 1 - Analytes & Reporting Limits, Soils and Waters

	Soil (mg/kg dry wt)		Water (µg/L)	
	Reporting Limit (RL)		*Reporting Limit (RL)*	
	Screen	*Trace*	*Screen*	*Trace*
Perfluorooctanesulfonic acid - Total (PFOS)	0.005	0.001	0.025	0.001
The numerical sum of Total PFHxS and Total PFOS (PFHxS+PFOS)	0.005	0.001	0.025	0.001
Total of Reported PFAS (Total PFAS)	0.23	0.046	1.2	0.06
Perfluorocarboxylic Acids				
Perfluorobutanoic acid (PFBA)	0.005	0.001	0.025	0.001
Perfluoropentanoic acid (PFPeA)	0.005	0.001	0.025	0.001
Perfluorohexanoic acid (PFHxA)	0.005	0.001	0.025	0.001
Perfluoroheptanoic acid (PFHpA)	0.005	0.001	0.025	0.001
Perfluorooctanoic acid (PFOA)	0.005	0.001	0.025	0.001
Perfluorononanoic acid (PFNA)	0.005	0.001	0.025	0.001
Perfluorodecanoic acid (PFDA)	0.005	0.001	0.025	0.001
Perfluoroundecanoic acid (PFUnDA)	0.005	0.001	0.025	0.001
Perfluorododecanoic acid (PFDoDA)	0.005	0.001	0.025	0.001
Perfluorotridecanoic acid (PFTrDA)	0.005	0.001	0.025	0.001
Perfluorotetradecanoic acid (PFTeDA)	0.005	0.001	0.025	0.001
Perfluorosulfonic Acids				
Perfluoropropanesulfonic acid (L-PFPrS)	0.005	0.001	0.025	0.001
Perfluorobutanesulfonic acid (L-PFBS)	0.005	0.001	0.025	0.001
Perfluoropentanesulfonic acid (L-PFPeS)	0.005	0.001	0.025	0.001
Perfluorohexanesulfonic acid (L-PFHxS)	0.005	0.001	0.025	0.001
Perfluorohexanesulfonic acid - Branched (B-PFHxS)	0.005	0.001	0.025	0.001
Perfluorohexanesulfonic acid - Total (PFHxS)	0.005	0.001	0.025	0.001
Perfluoroheptanesulfonic acid (L-PFHpS)	0.005	0.001	0.025	0.001
Perfluorooctanesulfonic acid (L-PFOS)	0.005	0.001	0.025	0.001
Perfluorooctanesulfonic acid - Branched (B-PFOS)	0.005	0.001	0.025	0.001
Perfluorooctanesulfonic acid - Total (PFOS)	0.005	0.001	0.025	0.001
Perfluorononanesulfonic acid (L-PFNS)	0.005	0.001	0.025	0.001
Perfluorodecanesulfonic acid (L-PFDS)	0.005	0.001	0.025	0.001
Perfluorododecanesulfonic acid (L-PFDoS)	0.005	0.001	0.025	0.001

Table 1 – Continued

	Soil (mg/kg dry wt)		Water (µg/L)	
	Reporting Limit (RL)		*Reporting Limit (RL)*	
	Screen	*Trace*	*Screen*	*Trace*
Fluorotelomer Sulfonic Acids				
4:2 Fluorotelomersulfonic acid (4:2 FTS)	0.005	0.001	0.025	0.002
6:2 Fluorotelomersulfonic acid (6:2 FTS)	0.005	0.001	0.025	0.002
8:2 Fluorotelomersulfonic acid (8:2 FTS)	0.005	0.001	0.025	0.002
10:2 Fluorotelomersulfonic acid (10:2 FTS)	0.005	0.001	0.025	0.002
Fluorotelomer Carboxylic Acid				
3:3 Fluorotelomercarboxylic acid (3:3 FTCA)	0.005	0.001	0.025	0.002
5:3 Fluorotelomercarboxylic acid (5:3 FTCA)	0.005	0.001	0.025	0.002
7:3 Fluorotelomercarboxylic acid (7:3 FTCA)	0.005	0.001	0.025	0.002
Miscellaneous				
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.005	0.001	0.025	0.001
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	0.005	0.001	0.025	0.001
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	0.005	0.001	0.025	0.001
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.005	0.001	0.025	0.002
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.005	0.001	0.025	0.005
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.005	0.001	0.025	0.001
Perfluoro-3-methoxypropanoic acid (PFMPA)	0.005	0.001	0.025	0.001
Perfluoro-4-methoxybutanoic acid (PFMBA)	0.005	0.001	0.025	0.001
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.005	0.001	0.025	0.001
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.005	0.001	0.025	0.001
Perfluorooctanesulfonamide (FOSA)	0.005	0.001	0.025	0.001
N-methylperfluoro-1-octanesulfonamide (NMeFOSA)	0.005	0.001	0.025	0.001
N-ethylperfluoro-1-octanesulfonamide (NEtFOSA)	0.005	0.001	0.025	0.001
2-[N-methylperfluoro-1-octanesulfonamido]-ethanol (NMeFOSE)	0.005	0.001	0.025	0.001
2-[N-ethylperfluoro-1-octanesulfonamido]-ethanol (NEtFOSE)	0.005	0.001	0.025	0.001
Perfluoro-4-ethylcyclohexanesulfonic acid (PFECHS)	0.005	0.001	0.025	0.001
Perfluoro-3,7-dimethyloctanoic acid (P37DMOA)	0.005	0.001	0.025	0.001

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