whitepaper

New Test for PFAS in Solid, Aqueous, and Tissue Samples

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On September 2, 2021, the U.S. Environmental Protection Agency (EPA) in collaboration with the U.S. Department of Defense (DoD) announced the availability of Draft Method 1633 to test for 40 per- and polyfluoroalkyl substances (PFAS) in soil, biosolids, sediments, landfill leachate, wastewater, surface water, groundwater, and fish tissue. This draft method should improve the certainty and consistency around PFAS testing. Previously, many laboratories relied on in-house procedures or modified EPA methods originally developed for potable water samples. This could result in inconsistent PFAS concentrations and analyte lists from different laboratories.

EPA is scheduled to complete multi-laboratory validation studies on Draft Method 1633 in 2022 and then finalize the method. However, EPA is recommending, but not requiring, that Draft Method 1633 be used for National Pollutant Discharge Elimination System (NPDES) permits. In the interim, EPA is encouraging laboratories to review and use Draft Method 1633 with the understanding that it is subject to potential revision.

Briefly, for Draft Method 1633 samples from the eight media (listed above) are extracted and cleaned up to remove interferences. Analyses are conducted using liquid chromatography and tandem mass spectrometry (LC-MS/MS). PFAS concentrations are measured by isotope dilution or extracted internal standards quantified using labelled isotopes. Table 1 (below) lists the 40 PFAS that can be assessed with Draft Method 1633 and other EPA methods.

Table 1. Names, Abbreviations, and CASRN for PFAS by Draft Method 1633 and Other EPA Methods.

Target Analyte Name	Abbreviation	CASRN	EPA Methods			
			1633	533	537.1	8327
Perfluoroalkyl Carboxylic Acids						
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	PFTrDA	72629-94-8	✓		✓	✓
Perfluorotetradecanoic acid	PFTeDA	376-06-7	✓		✓	✓
Perfluoroalkyl Sulfonic Acids (Acid Form)						
Perfluorobutanesulfonic acid	PFBS	375-73-5	✓	✓	✓	✓
Perfluoropentansulfonic 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	✓			
Fluorotelomer Sulfonic Acids						
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2FTS	757124-72-4	✓	✓		✓
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2	✓	✓		✓[a]
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4	✓	✓		✓
Perfluorooctane Sulfonamides						
Perfluorooctanesulfonamide	PFOSA	754-91-6	✓			✓
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	✓			
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	✓			
Perfluorooctane Sulfonamidoacetic Acids						
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	✓		✓	✓
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	✓		✓	✓
Perfluorooctane Sulfonamide Ethanols						
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7	✓			
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2	✓			
Per- and Polyfluoroether Carboxylic Acids						
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6	✓	✓	✓	
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	✓	✓		
Ether Sulfonic Acids						
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic aci	9Cl-PF3ONS	756426-58-1	✓	✓	✓	
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic aci	11Cl-PF3OUdS	763051-92-9	✓	✓	✓	
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	✓	✓		
Fluorotelomer Carboxylic Acids						
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5	✓			
2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-3	✓			
3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4	✓			

Notes/Comments: (a) = Does not meet criteria for acceptable method performance, CASRN = Chemical Abstracts Service Registry Number

EPA Method 533 Determination of Per- and Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry; Publ. No.: 815-B-19-020; dated November 2019.

EPA Method 537.1 Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Version 2.0, Publ. No.: EPA/600/R-20/006; dated March 2020.

EPA Method 8327 Per-and Polyfluoroalkyl Substances (PFAS) by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), SW-846 Update VII; dated July 2021.

More to Explore:

EPA's Draft Method 1633, copy here.

EPA's CWA Analytical Methods for Per- and Polyfluorinated Alkyl Substances (PFAS), copy here.

EPA's PFAS Analytical Methods Development and Sampling Research, copy here.