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Technical BRIEF

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

Methods and guidance for sampling and analyzing water and other environmental media

Background

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a large group of manufactured compounds used in a variety of industries, such as aerospace, automotive, textiles, and electronics, and are used in some food packaging and firefighting materials. For example, they may be used to make products more resistant to stains, grease, and water. In the environment, some PFAS break down slowly, if at all, allowing bioaccumulation (concentration) to occur in humans and wildlife. Some have been found to be toxic to laboratory animals, producing reproductive, developmental, and systemic effects in laboratory tests.

The U.S. Environmental Protection Agency's (EPA) methods for analyzing PFAS in environmental media are in various stages of development. EPA is working to develop validated robust analytical methods for groundwater, surface water, wastewater, and solids, including soils, sediments, and biosolids.

Drinking Water

Analysis using EPA Method 537

To assess for potential human exposure to PFAS in drinking water, EPA-approved commercial drinking water laboratories successfully analyzed finished (treated) drinking water samples for six PFAS monitored under the third Unregulated Contaminant Monitoring Rule (UCMR3). For the UCMR3 analyses, laboratories used EPA Method 537, which also includes eight additional PFAS analytes not listed on the UCMR3.

Health Advisories

In May 2016, EPA issued drinking water health advisories for two types of PFAS: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). EPA's health advisories are non-enforceable and non-regulatory, and provide technical information to state agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

EPA expects to have a draft method for non-potable water by winter 2018.

Method Development & Validation

Currently, there are no standard EPA methods for analyzing PFAS in surface water, non-potable groundwater, wastewater, or solids. For non-drinking water samples, some U.S. laboratories are using modified methods based on EPA Method 537. These modified methods have no consistent sample collection guidelines and have not been validated or systematically assessed for data quality.

EPA formed a cross-Agency method development and validation workgroup to provide sampling guidance and validated methods for sample types other than drinking water, which will fill this sampling and analytical gap. The workgroup will develop SW-846 analytical methods for quantifying 24 PFAS analytes. The method development process will occur in a phased approach.

Phase I EPA labs tested an existing direct injection analytical protocol for preparing and analyzing 24 PFAS analytes in groundwater, surface water, and wastewater. Labs completed this phase in winter 2017, and results warranted moving to Phase II.

EPA has also drafted a solid-phase extraction/isotope dilution (SPE-ID) method. Pending an acceptable Phase I outcome, this method will be internally validated in fall 2018 for inclusion into Phase II.

Phase II In October 2018, seven external labs are validating the direct injection method. The target timeframe for publishing a validated SW-846 direct injection method (Draft Method 8327) for public review is winter 2018. Following internal testing in fall 2018, the SPE-ID protocol (Draft Method SW-846 8328) will be externally validated, with a target start time in winter 2018. Draft Method 8328 will include solid matrices in addition to non-drinking water aqueous matrices. Additionally, an analytical method for short-chained PFAS in drinking water is under development and planned for external validation and publication for public review by early 2019.

Developing Sampling & Storage Methods

EPA ran time-based studies on degradation or loss of target analytes during sample storage (45 days) and assessed the effects of different sample vessel materials (e.g., plastic, glass) on analyte recovery. Based on these studies, the SW-846 methods under development will utilize PFAS-free, high-density polyethylene containers; whole sample preparation; and sample holding times of 28 days. EPA will also develop guidelines for field sampling, which are critical for minimizing sample contamination and optimizing data quality for site characterization and remediation.

Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. For example, polytetrafluoroethylene products (tubing, sample containers, and sampling tools) are often used in sampling; however, since these products can contain PFAS, they cannot be used in sampling for PFAS. In addition, many consumer goods, such as water-resistant jackets or fast food wrappers, brought to a sampling site may contain PFAS that can contaminate samples. Proper field sampling and laboratory hygiene protocols are critical to ensuring that testing results reflect actual PFAS levels in the analyzed media.

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Additional Information

- **PFAS in Your Environment:** epa.gov/pfas
- **Clean-Up Information:** clu-in.org/
- **EPA Method 537:** nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100EQ6W.txt
- **SW-846 (Compendium):** epa.gov/hw-sw846/sw-846-compendium
- **Drinking Water Health Advisories for PFOA and PFOS:** epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos
- **Third Unregulated Contaminant Monitoring Rule (UCMR3):** epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule
- **EPA's Water Research:** epa.gov/water-research