



**DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF WASTE AND HAZARDOUS SUBSTANCES
(DNREC- DWHS)**

**Policy for Sampling and Evaluation of
Per- and Poly- Fluoroalkyl Substances (PFAS) in
Surface Water and Groundwater**

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Purpose: To define the Department of Natural Resources and Environmental Control -Division of Waste and Hazardous Substances (DNREC-DWHS) programs, facilities and, procedures where sampling of Per- and Poly- Fluoroalkyl Substances (PFAS) may occur in groundwater and surface water within the State of Delaware. The Department of Natural Resources and Environmental Control (DNREC) Division of Waste and Hazardous Substances (DWHS) hereby describes the framework of evaluation and response actions to the presence of PFAS chemicals detected in groundwater and surface water.

Nomenclature: DNREC-DWHS will use the terminology per- and poly-fluoroalkyl substances (PFAS) to describe the chemicals addressed in this policy. It is the intent of the DNREC-DWHS to phase out the use of the term perfluorinated compounds (PFCs) with the adoption of this policy as the terminology does not accurately capture the substances addressed by this policy. This adoption of PFAS follow the lead of the United States Environmental Protection Agency (USEPA) and national advisory boards (USEPA, 2018, ITRC, 2018)

Authority /Applicability: DNREC-DWHS has the authority to compel sampling of groundwater and surface water to determine the presence of a release of hazardous substances.

PFAS chemicals, including, but not limited to, Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), are regulated hazardous substances under the Hazardous Substance Cleanup Act (DNREC, 2015). Furthermore, the Secretary of DNREC has exercised the authority to add these compounds to the regulated hazardous substances list to determine the nature and extent of the presence at regulated facilities (DNREC, 2013 Updated 2018).

DNREC-DWHS addresses releases to the environment of contaminants that are defined as hazardous substances. DNREC-DWHS' definition of hazardous substance includes many of the chemicals listed by the United States Environmental Protection Agency (USEPA) with Regional Screening Levels (RSLs) - chemicals that are utilized, stored in a regulated vessel, transported otherwise present at a facility permitted or overseen by DWHS. In the DWHS, the Sections charged with implementation of regulations related to these chemicals are Site Investigation and Restoration, Solid and Hazardous Waste Management, and Tank Management. In addition, emerging contaminants may also be included. Emerging contaminants are those pollutants where a perceived, potential, or real threat to human health, welfare, and the environment may exist without a well-defined understanding of the risk posed (ITRC, 2017).

DNREC added PFOS and PFOA to the list of hazardous substances following the USEPA adoption of a Health Advisory Level (HAL) of 70 parts per trillion (70 ng/L) or 0.07 parts per billion (0.07 ug/L) for each contaminant alone or as a combined concentration. This value will be used as the screening level for determining if further evaluation leading to risk assessment needs to be conducted. That is a standard procedure for the application of a screening value for a hazardous substance detected at a site. A HAL is a non-enforceable guideline intended to provide technical guidance to state agencies and other public health officials regarding the possible health effects of PFOA and PFOS. HALs are used as threshold values to determine if action may be needed to provide a level of protection for the public from adverse health effects (USEPA, 2018). The HAL is based upon multiple potential cumulative (background) exposure pathways, including, but not limited to, ingestion of drinking water, food, and household dust (USEPA, 2016A). More realistic estimates of background exposure would increase the acceptable level of PFAS to levels greater than the 70 ppt. The EPA Regional Screening Level (RSL) Calculator, which does not consider background exposure, predicts an acceptable level of 400 ppt for either PFOA or PFOS (USEPA, 2016 A).

DNREC-DWHS adoption of the USEPA HAL follows inclusion of PFOS and PFOA on the Unregulated Contaminant Monitoring Rule 3 (UCMR3) list published in May 2012 (USEPA, 2016B). This Rule added the sampling and reporting of PFOA/PFOS in select public water systems between 2013 and 2015. Subsequent monitoring and reporting reflected a widespread presence of these and other PFAS chemicals in public water systems in proximity to facilities associated with the manufacturing, storage, use, or disposal of PFAS (USEPA, 2016C)

PFAS Chemicals: The term PFAS describes a family of 3,000 per- and polyfluoroalkyl man-made, persistent organic chemicals first produced in the 1940s. PFAS includes many thousands of compounds with similar chemical structure, environmental fates, and a diverse suite of commercial uses (ITRC, 2018). While there are many other PFAS compounds that have screening values, PFOA and PFOS have HALs that were adopted by the EPA and subsequently DNREC. The concentration of PFOA or PFOS or both summed are compared to the HAL while these other compounds are currently not included in the summation for the HAL.

Uses of PFAS: PFAS has been commonly used in fire-fighting foam known as aqueous film-forming foam (AFFF), in metal plating, as a textile coating (such as for carpets or clothes), in personal-care products, to create paper packaging, as part of cleaning products, in adhesives, and in the non-stick (friction-reducing) compound Teflon™. Overall, PFAS was used to create products that were touted for stain, water, oil, and grease-repellant properties.

The concentration in these products is significantly low enough that it does not present the same level of exposure as the most impactful exposure scenario: consumption of contaminated water. (ASTDR, 2018)

Health Risks: PFAS chemicals persist indefinitely in the environment and do not readily metabolize in humans (ASTDR, 2015). Exposure to PFAS has been associated with reproductive and developmental effects, along with effects on liver function, and the endocrine and immune systems. The typical route of potential exposure to PFAS for humans is through ingestion of food, household dust, or water. In this policy, the HAL for PFAS applies to the potential for ingestion of water.

Method of Analysis: The analytical method used to determine the presence of PFAS is USEPA Method 537. This method was designed to be used for finished (drinking) water samples due to the low probability of interference from particulate matter in finished drinking water. A modified method (USEPA Method 537 Modified) is used for samples taken from the environment, such as groundwater and surface water, where there is a high probability of particulate matter in the water sample (USEPA, 2015). The method detection limit for these methods is sufficient to measure PFOA and PFOS at levels below the HAL and other associated chemicals not currently covered by a HAL. As this method of analysis is not typically part of the standard suite of contaminants requested for analysis, it must be requested from the laboratory.

Locations for Sampling: This policy proposes to require sampling within the regulatory authority of each DWHS Program for PFAS in groundwater and surface water at investigations within 1,000 ft of the site/facility boundary of known or suspected areas of current or historical production, use, handling, storage, or release, which includes, but is not limited to, manufacturing facilities, airports, former or current military facilities, fire-training schools, car wash and detailing facilities, refineries, landfills and dumps, leachate discharges, and wastewater treatment plant (WWTP) discharges or wastewater spray applications. In the instances where wellhead protection areas (WHPA) overlap the targeted sampling areas, the public well(s) associated with that WHPA shall also be sampled for PFAS as part of the investigation.

Media for Sampling: This policy focuses on first acquiring data related to the most common exposure pathway of ingestion. Therefore, at sites that meet the criteria above, groundwater and surface water will be sampled to document the presence of PFAS. Therefore, at a minimum, all initial surface water and groundwater samples will be analyzed for PFAS chemicals detectable using USEPA Method 537 Modified.

Sampling Precautions/ Special Procedures: Special precautions are needed when sampling PFAS. Some of these include, but are not limited to: multiple blanks, limitations on clothing worn by the sample collector, prohibition of Teflon™ tubing, and HDPE bottles with unlined screw tops, and other precautions. The sampler should avoid all contact with samples, ensure that no field filtering of samples occurs, keep the sample chilled, and collect more frequent equipment blanks. The DNREC-SIRS will incorporate this policy in the Standard Operating

Procedures for Chemical Analytical Programs (SOPCAP) before the implementation date which will include a list of items to avoid when sampling.

Remediation Goals: The remedial actions for SIRS, TMS, and SHWMS Corrective Action sites will be implemented based upon the evaluation conducted in the Risk Assessment Information System (RAIS) or at the discretion of the Secretary of DNREC. These risk-based goals are set to be protective of human health and the environment. Limited information is available to determine ecological risk at the drafting of this policy.

Evaluation of Policy Implementation: This policy is adopted on the date of the Director's signature with implementation to begin on July 2, 2018. All sampling and analysis plans submitted to the DNREC-DWHS on or after the implementation date shall fully comply with the policy. Any adoption of PFAS by USEPA as a hazardous substance or primary drinking water contaminant will supersede the limited scope of this policy. Review of this policy will also address the potential need to collect data on the presence of PFAS in soil, sediment, air and, wildlife.

Evaluation Duration: This policy is in effect for 3 years following the implementation date. At that time, the policy will be re-evaluated to determine if more data are needed through this effort, the geographic scope of the investigation should be expanded, or if the policy should be rescinded. These decisions are at the discretion of the DWHS Director.

References Cited

ASTDR, 2018, "Per- and Polyfluoroalkyl Substances (PFAS) and Your Health." *Centers for Disease Control and Prevention*. Centers for Disease Control and Prevention, 10 Jan. 2018. Web. 30 Apr. 2018. <<https://www.atsdr.cdc.gov/pfas/pfas-exposure.html>>.

DNREC, 2013 (update 2018) *Screening Level Table*. Department of Natural Resources and Environmental Control, Division of Waste and Hazardous Substances, Site Investigation and Restoration Section, Feb. 2018. Web. 30 Apr. 2018. <<http://www.dnrec.delaware.gov/dwhs/SIRB/Documents/Screening%20Level%20Table.pdf>>.

DNREC, 2015 Division of Waste And Hazardous Substances, Site Investigation & Restoration Section, Delaware Regulations Governing Hazardous Substance Cleanup, and September 1996. *DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL (Delaware's Regulations Governing Hazardous Substance Cleanup*. July 2015. Web. 30 Apr. 2018. <<http://www.dnrec.delaware.gov/dwhs/SIRB/Documents/HSCA%20Regulations.pdf>>.

ITRC, 2017 A, "Per- and Polyfluoroalkyl Substances (PFAS) Fact Sheets Introductory Document." Interstate Technology and Regulatory Council, Nov. 2017. Web. 30 Apr. 2018. <https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_introductory__11_13_17.pdf>.

ITRC, 2017 B, "History and Use of Per- and Polyfluoroalkyl Substances (PFAS)." Interstate Technology and Research Council, Nov. 2017. Web. 30 May 2018. <https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use__11_13_17.pdf>.

ITRC, 2018, "Naming Conventions and Physical and Chemical Properties of Per- and Polyfluoroalkyl Substances (PFAS)." Interstate Technology and Regulatory Council, Mar. 2018. Web. 30 Apr. 2018. <https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_naming_conventions__3_16_18.pdf>.

SHOEMAKER, J.A., P. GRIMMETT, and B. BOUTIN, 2015 "Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)." *EPA*. Environmental Protection Agency, 07 Oct. 2015. Web. 30 Apr. 2018. <https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=198984&simpleSearch=1&searchAll=EPA%2F600%2FR-08%2F092%2B>.

USEPA, 2016 A, Fact Sheet: PFOA and PFOS Drinking Water Health Advisories (PDF) (5 Pp, 391 K, November 2016, EPA 800-F-16-003)." Nov. 2016. Web. 30 Apr. 2018. https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf

USEPA, 2016 B "Third Unregulated Contaminant Monitoring Rule." *EPA*. Environmental Protection Agency, 09 Dec. 2016. Web. 30 Apr. 2018. <<https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule>>.

USEPA, 2016 C, "The Third Unregulated Contaminant Monitoring Rule (UCMR3) Fact Sheet for Assessment Monitoring (List 1 Contaminants)." Web. 30 Apr. 2018. <<https://www.epa.gov/sites/production/files/2016-05/documents/ucmr3-factsheet-list1.pdf>>.

USEPA, 2017, "Drinking Water Health Advisories for PFOA and PFOS." *EPA*. Environmental Protection Agency, 30 Aug. 2017. Web. 30 Apr. 2018. <<https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos>>

USEPA, 2018, "Per- and Polyfluoroalkyl Substances (PFAS)." *EPA*. Environmental Protection Agency, 20 Mar. 2018. Web. 30 Apr. 2018. <<https://www.epa.gov/pfas>>.