



# WESTWATER HYDROLOGY LLC

PFAS SAMPLING | ANALYSIS | REPORTING CAPABILITIES

**Westwater Hydrology develops and performs defensible environmental assessment, remediation, and water resource projects, providing environmental consulting services to developers, attorneys, municipalities, fellow consultants, and industrial clients.**

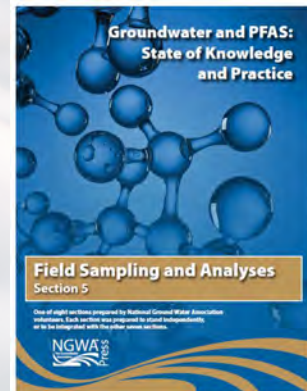
**Westwater can meet your needs with cost-effective, responsive, and high quality service.**

Westwater is part of a consulting community that includes local, regional, and multi-national firms. Whatever your needs, we can quickly and nimbly provide a turn-key project team ranging from experienced field technicians to seasoned science and engineering professionals. Westwater can deliver multi-disciplinary expertise including: hydrology and geology, geochemistry, environmental statistics, regulatory strategy, groundwater modeling, industrial hygiene, risk assessment and toxicology, chemistry and data validation, GIS and data management, and 3-D data visualization.

## Sampling and Analysis Expertise

Westwater's Principal Hydrologist, Andy Horn, PG, has over 25 years' of environmental consulting experience. He recently served as an expert on the National Groundwater Association's PFAS Best Suggested Practices Task Group for which he coauthored Section 5, Field Sampling and Analyses.

Andy's specialties include defensible data collection program design and management, data analysis and synthesis, and reporting and presentation. A recognized field investigation expert, Andy participated in an international consulting firm's company-wide development of environmental field procedures (SOPs) guiding all field activities. In addition to PFAS sampling and analysis, he has designed sampling plans and performed soil and groundwater investigation for a wide range of constituents under various regulatory regimes.



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# PFAS Fact Sheet

## Overview

Per- and Polyfluoroalkyl Substances (PFAS) are a class of up to 5,000 synthetic compounds manufactured since the 1940s. PFAS are formed from the carbon-fluorine bond, the strongest molecular bond known, and PFAS chemistry is very complex. Ubiquitous in our society, PFAS have been used in a wide variety of industrial and commercial products such as fire-fighting foams, paper and fabric treatments, pesticides, and many other consumer and industrial products. The presence of PFAS in solid waste and municipal wastewater can result in PFAS contamination in landfill leachate and wastewater treatment plant effluent. Despite a 70-year manufacturing history and widespread use, our understanding of PFAS toxicology, environmental fate and transport, sampling and analysis methods, and treatment are still very immature.



## Sampling and Analysis

PFAS sampling and analysis is complex. Due to the presence of PFAS compounds in many common materials used in field investigations and required detection limits of parts-per-trillion (ppt) or lower, care must be taken by the field sampling team to avoid contaminating the samples being collected with PFAS derived from sampling equipment other items. Many PFAS sampling SOPs prohibit common investigation items such as pumps with Teflon™ parts or hoses, Gore-Tex™, waterproof field books, and even Post-it™ notes. The commonly-used USEPA Method 537 analysis uses liquid chromatography with tandem mass spectrometry, costs from \$250 to \$500 per sample, and requires a field blank from each sampling location.

## PFAS Remediation

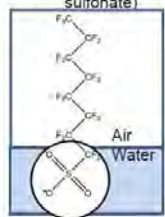
Treatment options for PFAS include excavation and landfilling for solid media and activated carbon, ion exchange, or reverse osmosis filtration for water. There are no commercialized methods yet to address PFAS contamination *in-situ*. Wellhead treatment is the only currently-available remediation alternative for PFAS in groundwater.



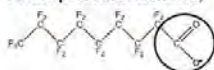
## PFAS in the Environment

Many PFAS compounds are highly water-soluble, mobile, and persistent in the environment. PFAS contaminants can travel miles in groundwater to wells, wetlands, and streams. Due to the amount of energy required to break the C:F bond, microbes gain nothing and cannot degrade PFAS compounds.

PFOS (perfluorooctane sulfonate)



PFOA (perfluorooctanoate)

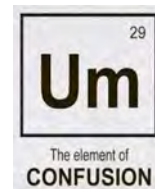


## PFAS Toxicology

PFAS compounds mimic fatty acids and bind to proteins in the body; developing fetal tissue is particularly susceptible to incorporation of PFAS into organs. PFAS bodily elimination half-lives can range to almost a decade, allowing PFAS in tissue to accumulate to levels 100 to 200 times the concentrations originally consumed. PFAS compounds have been detected in 95% of schoolchildren and are present in most adults. PFAS have been linked to health conditions including low birth weight and developmental effects to fetuses and breastfed infants, accelerated puberty, testicular and kidney cancer, liver tissue damage, immune system disorders, and thyroid defects.

## Regulatory Status

Nationally, regulatory levels for PFAS only include non-enforceable 2016 EPA "Lifetime Health Advisory Levels (HALs)" of a *combined* 70 ppt for the two common PFAS compounds, PFOS and PFOA. A recent CDC study concluded "minimum risk levels" translate to 7 ppt for PFOS and 11 ppt for PFOA. In a vacuum of federal regulation many states are setting their own widely varying limits for PFOA, PFOS, and other PFAS compounds. Several states have set HALs or regulatory cleanup levels at less than 20 ppt for some compounds. Other states, such as Colorado with our site-specific Widefield Aquifer standard mimic the EPA HALs, while others have set regulatory limits for the sum of larger groups of PFAS compounds. Both of Colorado's senators are cosponsoring legislation to regulate the entire class of PFAS compounds.



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