

The Legal Consequences Of High PFAS Background Levels

By **Grant Gilezan, Paul Stewart and Dylan Eberle** (April 18, 2023, 5:45 PM EDT)

The legal landscape for per- and polyfluoroalkyl substances is changing rapidly. Last year, the U.S. Environmental Protection Agency issued nonbinding lifetime health advisories for four types of PFAS. Most recently, on March 14, the EPA proposed maximum contaminant levels, or MCLs, for PFAS in public drinking water systems.

And later this year, the agency is expected to finalize its designation of two PFAS — perfluorooctanoic acid, or PFOA, and perfluorooctane sulfonic acid, or PFOS — as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act, or CERCLA, also known as the Superfund law.

Concurrently, a flurry of state-level PFAS regulations are now in effect, or in the process of being promulgated. And all these new federal and state regulations will only accelerate tort claims related to PFAS contamination and exposures.

The sheer number of new PFAS regulations is striking by itself, but the remarkably low regulatory limits are just as salient. For example, the recently proposed MCLs for PFOA and PFOS are 4 parts per trillion each — with a part per trillion often equated to a single drop in 20 Olympic-sized swimming pools.

But what if PFAS exist in a locality or region due to nonspecific, unidentifiable sources — so-called PFAS background — at levels that exceed these low regulatory limits?[1] As explained in this article, the emerging scientific literature is showing that this is not an uncommon scenario, and the potential legal implications are significant.

Background Contamination

Background contamination comes in two forms: natural and anthropogenic. Natural background is where geologic forces deposit a naturally occurring hazardous substance at a location, and is common for radon and a variety of heavy metals.

Anthropogenic background results from historical human activity — such as when an area has undergone a long period of industrial use, or was historically built upon fill material.

Urban fill and industrial areas are commonly found to have anthropogenic background levels of a variety of metals and polycyclic aromatic hydrocarbons that are often not attributable to any specific historic operation. Rather, these are due to a long history of development, industrial activity and redevelopment — sometimes going back hundreds of years.

In the context of PFAS, background conditions are often more convoluted, with a multitude of potential point sources combined with more widespread diffuse sources.



Grant Gilezan



Paul Stewart



Dylan Eberle

Defining PFAS Background

PFAS — which are generally understood to encompass many thousands of compounds — were first synthesized in the late 1930s, and have been used extensively since approximately the 1950s.

One of their best-known uses — and perhaps the one with the most widespread environmental impact — is in aqueous firefighting foam, which has been used at military installations and civilian airports across the country since the 1960s to combat (and for training to combat) liquid fuel fires.

However, PFAS have also been used in innumerable industries and consumer products, ranging from aerospace to food packaging.[2] The strong carbon-fluorine bond that makes PFAS so useful in so many applications also tends to make them resistant to degradation in the environment — particularly for long-chain PFAS like PFOA and PFOS.

Once released into the environment, some PFAS are known to gradually travel, disperse and accumulate in various media — in effect, circulating through the environment in the so-called PFAS cycle. Significant transport mechanisms in the PFAS cycle include stack emissions leading to aerial deposition, the use of aqueous firefighting foam, stormwater discharges, wastewater discharges, on- and off-site disposal, and landfill leachate.

Current Science and Understanding of PFAS Background

Researchers are beginning to compile surface soil, groundwater and aerial deposition samples in remote and nonindustrial locations to determine background PFAS levels. A few background studies outlining findings of ambient PFAS levels in precipitation, groundwater and soils are outlined below, but there are other media also undergoing similar evaluations.

Precipitation

In a 2021 publication by Kyndal Pike and other researchers, PFAS were measured in precipitation samples from locations in the industrialized Ohio-Indiana region, as well as a location in northwest Wyoming well-removed from urban and manufacturing centers.[3]

The researchers reported that the observed PFAS concentrations in their study — about 0.1 to 10 ppt — were consistent with concentrations from other North American studies performed between 1999 and 2006.[4]

In 2022, Ian Cousins and other researchers evaluated rainwater, soils and surface water for PFOS, PFOA, perfluorohexane sulfonic acid and perfluorononanoic acid from locations across the globe.[5]

They discovered that the levels of PFOA and PFOS in rainwater exceeded the EPA drinking water health advisory levels — 0.004 ppt PFOA and 0.02 ppt PFOS — even in remote locations, and that atmospheric deposition also leads to global soils being ubiquitously contaminated.

This included detections of PFOS and PFOA in rainwater at concentrations near or exceeding the recently proposed EPA MCLs of 4 ppt for each.

Groundwater

Also in 2022, Gwynn Johnson and other researchers surveyed published literature reporting PFAS concentrations in groundwater for sites distributed in 20 countries across the globe, to evaluate global distributions.[6] They reported concentration ranges over many orders of magnitude, but identified distinct differences in PFAS concentration ranges observed between sites with no known sources, sites with primary sources and sites with secondary sources.

PFOA, PFOS, perfluorohexane sulfonic acid, perfluoroheptanoic acid and perfluorohexanoic acid were reported multiple times throughout the literature, with perfluorobutane sulfonic acid being the most frequently detected. The weighted mean for PFOA and PFOS at sites with no known source of PFAS were 13 ppt and 46 ppt, respectively.[7]

Soil

A 2020 study by Mark Brusseau and other researchers investigated PFAS background levels in soil compared to levels at known contaminated sites by compiling previously published data.[8] This data set included more than 30,000 soil samples collected from more than 2,500 sites throughout the world.

Like Johnson's group, Brusseau's group compared background sites, primary source sites and secondary source sites. Their meta-analysis showed that PFAS contamination was ubiquitous in soils across the globe.

Total PFAS concentrations at sites with no known sources ranged from less than 0.001 to 237 parts per billion, with PFOA and PFOS being the most prevalent substances — detected at median concentrations of 2.7 ppb for both.[9]

The vast majority of the samples were from populated regions across the globe. But PFOA and PFOS were reported at unpopulated forested sites located in the mountainous regions of China at maximum values of 0.01 and 0.003 ppb, and at a single sampling site located in Antarctica at 0.05 and 0.007 ppb, respectively.

Recently, several U.S. states have led studies to investigate the range of background PFAS concentrations within their states. Studies completed by Maine, Vermont and Massachusetts have found largely consistent background levels of PFAS, with 95% upper tolerance limits ranging from 1.6 to 2.18 ppb for PFOA, and 3.036 to 3.64 ppb for PFOS.[10]

Considering Background Levels of PFAS During Site Characterization

Before choosing to do additional environmental sampling at a site, one should consider what data is already available locally. Does the site have historical data available? What is the operational history of the site and historical operations of other surrounding industry?

Are there any upgradient or background sampling locations that were sampled previously? Is the site located in an area that has a historical industrial use or was it built upon fill? All these initial questions can lead to an understanding of PFAS background levels in the area, and if there are preferential pathways for PFAS to historically enter the environment at that location.

PFAS detection above a health advisory, regulatory standard, or other applicable or relevant and appropriate requirements does not, in and of itself, necessarily indicate a local process, source or release to the environment. There are a variety of data evaluation tools that — especially when combined with a solid conceptual site model — can help form conclusions about whether PFAS detections are consistent with background levels, or can be reliably attributed to a local source.

These data evaluation tools include total oxidizable precursor assay analysis, nontarget analysis, indicator compound analysis, linear versus branched speciation, principal component analysis and fingerprinting.

Ultimately, multiple lines of evidence from historical research, traditional investigation data and forensics evaluation results can be combined to form a more holistic and scientifically defensible model differentiating PFAS sources and background.

Alternatively, such an evaluation may also conclude that low-level PFAS detections are indistinguishable from background.

Legal Implications

The ubiquity of certain PFAS in the environment, their resistance to degradation, and the development of exceptionally low regulatory limits for PFAS is an unprecedented combination, with potentially profound legal consequences.

To put things in perspective, Michigan's groundwater cleanup criteria for PFOA is 8 ppt. Yet rainwater containing PFAS from dispersed sources has been found to contain concentrations near or above 8 ppt of PFOA — meaning that rainwater would actually violate Michigan's enforceable PFOA standard.

[11]

Admittedly, those PFOA concentrations may be diminished as that rainwater cycles through the environment prior to reaching groundwater. But mean background groundwater levels for PFOA have been found to be 13 ppt, with higher concentrations generally found in more urbanized and industrial areas.[12]

And while Michigan's PFOA groundwater standard is one of the lowest in the country, Illinois has proposed a standard of 2 ppt — at approximately the reporting limit of most commercial labs. Meanwhile, the EPA's nonbinding health advisory levels for PFOA and PFOS are 0.004 ppt and 0.02 ppt, respectively, and the recently proposed federal MCLs are 4 ppt for each compound respectively.

Similarly, Michigan's PFOS soil standard of 0.240 ppb is set below median PFOS concentrations observed in multiple background studies on global soils (0.470 ppb),[13] Vermont soils (0.660 ppb), [14] New York soils (0.676 ppb),[15] and remote Swedish forest soils (0.330 ppb).[16]

Put simply, enforceable regulatory limits are already descending below PFAS background levels for certain regions, with the EPA's recent health advisory levels and proposed MCLs almost certainly falling below background levels measured in some places. This could affect numerous legal areas, from regulatory compliance to tort actions claiming property damage or personal injury from PFAS.

Beginning with regulatory compliance, background levels are relevant to most, if not all, risk-based cleanup programs at the federal and state levels. Many such programs, including CERCLA, do not require potentially responsible parties to remediate hazardous substances to concentrations below background levels, either through agency policy positions or the statutes or regulations themselves. [17]

Further, some courts have held that an otherwise status-labile party may avoid CERCLA's joint and several liability by showing that hazardous substances forming the basis for liability do not exceed background levels at the facility.[18]

Relatedly, establishing that the concentrations of hazardous substances at a facility do not exceed background can provide circumstantial evidence that a potentially responsible party is not prima facie liable for a release or threatened release under CERCLA or comparable regulatory schemes.

Turning to tort law, proving but-for causation could turn on the ability of counsel to reliably distinguish between PFAS attributable to a defendant and PFAS background that may have contributed to the alleged property damage or exposure.

In essence, defendants who aren't thinking about PFAS background could be missing a critical opportunity — and plaintiffs who aren't considering it prior to bringing a case are doing so at their risk.

Conclusion

Whether in a regulatory or litigation setting, the issue of PFAS background may be lurking underneath any attempt to connect PFAS contamination to a particular source. There is an array of analytical tools that can shed light on whether PFAS located at a site, or associated with a particular exposure pathway, can reasonably be attributed to background levels.

Legal practitioners would be wise to always consider the potential influence of PFAS background — and to be fully apprised of the analytical tools that can help differentiate background.

Grant Gilezan is a member at Dykema Gossett PLLC.

Paul Stewart is a member at Dykema.

Dylan Eberle is a scientist at Geosyntec Consultants Inc.

Geosyntec principal Wayne Amber and senior staff professional Mary Ensich contributed to this article.

The opinions expressed are those of the author(s) and do not necessarily reflect the views of their employer, its clients, or Portfolio Media Inc., or any of its or their respective affiliates. This article is for general information purposes and is not intended to be and should not be taken as legal advice.

[1] The terms "PFAS anthropogenic background," "PFAS ambient background" and "PFAS background" are often used to describe these types of ubiquitous PFAS detections.

[2] ITRC, <https://pfas-1.itrcweb.org/2-pfas-chemistry-and-naming-conventions-history-and-use-of-pfas-and-sources-of-pfas-releases-to-the-environment-overview/>; Place, B. J., and Field, J. A. (2012), Identification of novel fluorochemicals in aqueous film-forming foams used by the US military, *Environmental Science and Technology*, 46(13), 7120–7127, <https://doi.org/10.1021/es301465n>; Krafft, M. P., and Riess, J. G. (2015), Per- and polyfluorinated substances (PFASs): Environmental challenges, in *Current Opinion in Colloid and Interface Science* (Vol. 20, Issue 3, pp. 192–212), Elsevier Ltd. <https://doi.org/10.1016/j.cocis.2015.07.004>.

[3] Pike, Kyndal A., Edmiston, Paul L., Morrison, Jillian J., Faust, Jennifer A. (2021), Correlation Analysis of Perfluoroalkyl Substances in Regional U.S. Precipitation Events, *Water Research*.

[4] For liquid samples — e.g., groundwater or drinking water — parts per trillion are equivalent to nanograms per liter.

[5] Cousins, Ian T., Johansson, Jana H., Salter, Matthew E., Sha, Bo, Scheringer, Martin (2022), Outside the Safe Operating Space of a New Planetary Boundary for Per- and Polyfluoroalkyl Substances (PFAS), *Environmental Science and Technology*.

[6] Johnson, Gwynn R., Brusseau, Mark L., Carroll, Kenneth C., Tick, Geoffrey R., Duncan, Candice M. (2022), Global Distributions, Source-Type Dependencies, and Concentration ranges of per- and polyfluoroalkyl substances in groundwater, *Science of the Total Environment*.

[7] The weighted mean concentrations for PFOA and PFOS had 95% confidence intervals of 5 ppt and 48 ppt, respectively (Cousins et al., 2022).

[8] Brusseau, Mark L., Anderson, R. Hunter, Guo, Bo (2020), PFAS Concentrations in Soils: Background Levels Versus Contaminated Sites, *Science of the Total Environment*.

[9] For solid samples, parts per billion (ppb) is equivalent to micrograms per kilograms ($\mu\text{g}/\text{kg}$) or nanograms per gram (ng/g).

[10] Massachusetts Department of Environmental Protection (2023), PFAS in Massachusetts Soils, Establishing Background Conditions to Inform Regulatory Decision-Making, EBC 4th Annual PFAS Seminar — Taking a Deeper Dive, Westborough, MA, Feb. 9, available online: <https://ebcne.org/wp-content/uploads/2023/02/Presentations-EBC-4th-Annual-PFAS-Seminar.pdf>. The 95% upper tolerance limit indicates the level that 95% of PFAS background soil concentrations are expected to fall below.

[11] Pike, Kyndal A., Edmiston, Paul L., Morrison, Jillian J., Faust, Jennifer A. (2021), Correlation Analysis of Perfluoroalkyl Substances in Regional U.S. Precipitation Events, *Water Research*.

[12] Cousins, Ian T., Johansson, Jana H., Salter, Matthew E., Sha, Bo, Scheringer, Martin (2022), Outside the Safe Operating Space of a New Planetary Boundary for Per- and Polyfluoroalkyl Substances (PFAS), *Environmental Science and Technology*.

[13] Strynar et al. (2012), Pilot Scale Application of a method for the analysis of perfluorinated compounds in surface soils, *Chemosphere*, 86, 252-257.

[14] Zhu et al. (2019), PFAS background in Vermont shallow soils, report commissioned by Vermont Department of Environmental Conservation (DEC); Zhu et al. (2022), Vermont-wide assessment of anthropogenic background concentrations of perfluoroalkyl substances in surface soils, *Journal of Hazardous Materials*. 438, 129470.

[15] Schroeder, T., Bond, D., Foley, J, PFAS soil and groundwater contamination via industrial airborne emission and land deposition in SW Vermont and Eastern New York State, USA. *Environ. Sci.: Process Impacts*.

[16] Mattias, et al. (2022), Spatial distribution and load of per- and polyfluoroalkyl substances (PFAS) in background soils in Sweden, *Chemosphere*, 295.

[17] See, e.g., EPA (2002), *Role of Background in the CERCLA Cleanup Program*, p. 3 ("Background information is important to risk managers because the CERCLA program, generally, does not clean up to concentrations below natural or anthropogenic background levels"); Michigan Compiled Laws 324.20120a(10) ("If the target detection limit or the background concentration for a hazardous substance is greater than a cleanup criterion developed for a category pursuant to subsection (1), the criterion is the target detection limit or background concentration, whichever is larger, for that hazardous substance in that category"); Florida Department of Environmental Protection 2019, *Guidance for Comparing Background and Site Chemical Concentrations in Soil* ("If chemicals are present due to natural soil conditions, or unrelated anthropogenic impacts, then cleanup is not needed under current rules even if the concentrations exceed risk-based criteria").

[18] *Acushnet Co. v. Mohasco Corp.*, 191 F.3d 69, 77-78 (1st Cir. 1999); *U.S. v. Alcan Aluminum Corp.*, 990 F.2d 711, 717 (2d Cir. 1993).