REGULATORY CHALLENGES POSED BY EMERGING CONTAMINANTS

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Awareness of the presence of contaminants of emerging concern (a.k.a. emerging contaminants) in public and private water supplies around the country has become a considerable focus of public officials and the general public. This awareness arose from recent developments in analytical techniques which allow lower concentrations of these compounds to be detected, new drinking water health advisory levels announced by the U.S. Environmental Protection Agency (EPA), and an increased understanding of the potential health effects of chemicals in food, air, water, and other environmental media.

Certain emerging contaminants—such as pharmaceuticals and personal care products, endocrine disruptors, brominated flame retardants, n-nitrosodimethylamine, perchlorate, and trichloropropane—continue to confound regulatory agencies. Agencies are struggling to determine the potential impacts of these contaminants and to develop strategies to manage the risks.

For other emerging contaminants, several regulatory agencies have begun to act. In May 2016, EPA announced revised lifetime health advisories for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Specifically, EPA revised the drinking water health advisories for these two compounds to 0.07 parts per billion (ppb) or 70 parts per trillion (ppt) (individually or in combination with each other) from the previous 0.4 ppb for PFOA and 0.2 ppb for PFOS. Although EPA health advisories are non-enforceable and non-regulatory, they prompted several states to regulate PFOA and PFOS. *See* Jeff Kray & Sarah Wrightman, *Emerging Contaminants Cause Regulatory Uncertainty for Water Suppliers and Landowners*, 19 A.B.A. Water Resources Comm. Newsletter 17–19 (Aug. 2017) (discussing regulatory steps taken in Washington, New York, and Vermont). But the states' approaches have not been uniform, which is likely to complicate compliance, enforcement, and public perception of risk.

What Are PFAS?

PFOA and PFOS fall within a class of emerging contaminants called "per- and polyfluoroalkyl substances" ("PFAS"). PFAS comprise a large group (believed to be in the thousands) of anthropogenic or synthetic fluorinated organic compounds. They do not occur naturally, but have been manufactured around the world for use in various applications where water, oil, heat, or stain-resistant properties are required.

PFAS also have been called "perfluorinated chemicals (PFCs)," but EPA is now trying to standardize the term "PFAS" instead. EPA hopes that such standardization will help avoid confusion with another group of chemicals, perfluorocarbons, which also have been called "PFCs." *See* EPA, *What Are PFCs and How Do They Relate to Per- and Polyfluoroalkyl Substances (PFASs)?*, https://www.epa.gov/pfas/what-are-pfcs-and-how-do-they-relate-and-polyfluoroalkyl-substances-PFAS (last visited Nov. 17, 2017).

One of the key differentiators among PFAS is the chemical "chain length," or the number of carbon atoms in the compound. For example, PFOS and PFOA each have 8 carbon atoms. Other PFAS can have between 2 and more than 20 carbons atoms. Because these carbon chains are either completely or partially surrounded by carbon-fluorine bonds, PFAS molecules are generally resistant to heat, stains, grease, and water. As such, PFAS have been used in countless industrial applications and everyday consumer products, such as non-stick cookware, stain-resistant upholstery and carpets, waterproof clothes and mattresses, and grease-repellent food packaging. PFAS have also been found in dental floss and a variety of cosmetics, including nail polish, facial moisturizers, and eye makeup. Because of their surfactant properties, PFAS are also used in a variety of industries, including aerospace, automotive, building and construction, electronics, apparel, pharmaceutical, oil/gas, and mining, and are a primary component in some firefighting foams.

Concern About PFAS

Because of their widespread use and relative mobility, PFAS are ubiquitous in the environment. Given the high mobility of some PFAS in water and uncertainty regarding health effects at low concentrations, human exposure through ingestion of contaminated drinking water is of rising concern around the country.

Due to such concerns, the major U.S. manufacturers of PFAS began a voluntary production phase-out of certain long-chain PFAS in 2002 which was completed in 2015. While some "long-chain" PFAS (with 6 or more carbon atoms) have been removed from manufacturing processes, they still exist in a wide range of consumer products that people use daily. The concentrations of many PFAS in these products, and the level of exposure that occurs when people use these products, remain the subject of study.

Largely in response to EPA's non-binding revised health advisories, the public has called for further action, creating challenges for large and small public water suppliers around the country. In areas where PFAS are known or believed to be present in private drinking water wells, there have been demands to extend public drinking water systems to areas previously served by private water supply wells. *See* New Hampshire Department of Environmental Services (NHDES), *NH PFAS Investigation, Public Water Line Extension Projects*, https://www4.des.state.nh.us/nh-pfas-investigation/?page_id=64 (last visited Nov. 20, 2017).

In addition, the public has put significant pressure on regulators to formally enact more stringent standards. As of the date of this writing, there are at least 13 pending bills before the New Hampshire legislature relative to PFAS, including a pending bill to require PFAS analysis and reporting for bottled water in the state. *See* New Hampshire General Court, *HB 1682—As Introduced*, http://www.gencourt.state.nh.us/lsr_search/billText.aspx?id=1583&type=4 (last visited Nov. 24, 2017). In the federal legislature, due to the widespread use of these compounds at military bases (see discussion below), a $7 million national health study about the effects of PFAS has been authorized as an amendment to a military spending bill that was signed into law on December 12, 2017. *See PFAS Health Study Required by Congress May Lift Threat of Superfund Suit*, InsideEPA, https://insideepa.com/daily-news/pfas-health-study-required-congress-may-lift-threat-superfund-suit (last visited Jan. 5, 2017).

Regulatory Challenges

The regulation of PFAS poses several unique challenges. One game changer for both regulated and regulatory communities is the low concentrations of PFAS that some studies suggest may be tied to potential health effects. Although they have no force and effect under federal law, EPA's 70 ppt health advisories for PFOA and PFOS have been adopted by several states as regulatory standards for drinking water. *See* EPA, *Supporting Documents for Drinking Water Health Advisories for PFOA and PFOS*, https://www.epa.gov/ground-water-and-drinking-water/supporting-documents-drinking-water-health-advisories-pfoa-and-pfos (last accessed Nov. 24, 2017). These are the first compounds to be regulated at such low levels. EPA health advisories and drinking water standards across the country for other compounds (e.g., benzene, trichloroethylene, methyl-tert-butyl-ether [MTBE]) are regulated in the parts per *million* (ppm) or parts per *billion* (ppb) range.

For comparison, 1 ppm is equivalent to 1000 ppb, which is equivalent to 1,000,000 ppt. Said another way, 1 ppt is equivalent to one drop of water (0.05 milliliters) in 20 Olympic-size swimming pools.

To quantify PFAS in drinking water at concentrations orders of magnitude lower than typically evaluated, EPA approved a specific analytical method, EPA Method 537, for commercial laboratories using liquid chromatography and tandem mass spectrometry. However, EPA Method 537 was developed to analyze drinking water. There are currently no EPA-approved methods for analyzing PFAS in groundwater, surface water, sediment, wastewater, or solids. As a result, in many states, impacts to drinking water sources have evolved into more traditional source evaluation investigations, and many laboratories are using modified methods for non-drinking water samples based on EPA Method 537. These modified methods have no consistent sample collection guidelines and have not been validated nor systematically assessed for data quality.

Another unique challenge associated with PFAS regulation arises from the variety of sources from which PFAS are believed to have been released into the environment. PFAS contamination of drinking water has been attributed to the use of aqueous film-forming foams used to fight fires at military installations, civilian airports, and even automobile accidents involving fires caused by liquid hydrocarbons. Landfills and waste water treatment plants, land application of wastewater residuals (paper mill solids, municipal biosolids, etc.), car washes, garment/upholstery manufacturing, photography production, paper/paperboard manufacturing, and metal plating operations also have been identified as potential sources of PFAS contamination. In addition to traditional "point sources" (from spills and releases), manufacturing-related air emissions deposited to the ground surface (and then infiltrating to groundwater) have been identified as a potential source of PFAS contamination, with PFAS concentrations exceeding drinking water standards in relatively large areas (miles) around certain manufacturing facilities. *See* Associated Press, New Hampshire Suspects Chemical Emissions Tainted Wells, https://apnews.com/553960e1ac8c4ffcbfd2330f60e84354/new-hampshire-suspects-chemical-emissions-tainted-wells (last visited Nov. 24, 2017). In sum, PFAS contamination is ubiquitous, creating significant challenges to effectively enforce any regulatory regime.

Regulatory Uncertainty

Due to the challenges presented by PFAS, it remains uncertain how, if, and when many PFAS will come to be regulated. Several states (e.g., Alabama, California, Colorado, Delaware, Florida, New Hampshire, New York, and Rhode Island) have adopted EPA's health advisories for PFOA and PFOS as enforceable standards and/or guidelines.

Other states have adopted or are considering more stringent standards for PFOA and PFOS. For example:

- Vermont has adopted a drinking water health advisory level of 20 ppt standard for PFOA and PFOS. *See* Vermont Department of Health, http://www.healthvermont.gov/health-environment/drinking-water/perfluorooctanoic-acid-pfoa (last visited Nov. 24, 2017);
- In May 2017, the Minnesota Department of Health released updated guidance values for PFOA and PFOS of 35 and 27 ppt, respectively. *See* Minnesota Department of Health, *MDH Current Activities: Perflurochemicals (PFCs) in Minnesota*, http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/current.html (last visited Nov. 24, 2017);
- New Jersey is considering a drinking water guidance value for PFOA of 14 ppt. *See* New Jersey Drinking Water Quality institute, *Maximum Contaminant Level Recommendation for Perfluorooctanoic Acid in Drinking Water*, http://www.nj.gov/

dep/watersupply/pdf/pfoa-recommend.pdf (last visited Nov. 24, 2017); and

- Michigan legislators recently proposed a bill that would establish state drinking water standards of 5 ppt for PFOS and PFOA. *Michigan Bill Proposes Nation's Lowest PFAS Limit in Drinking Water*, http://www.mlive.com/news/index.ssf/2017/12/michigan_pfas_standard_5-ppt.html (last visited Dec. 18, 2017).

Such low concentrations appear to be very conservative, considering that EPA's health advisory is already reportedly five times lower than the level determined not to cause health effects in sensitive populations, which is reportedly ten times lower than the level determined not to cause health effects in average adults. *See* New York Department of Health, *Frequently Asked Questions: Newburgh Area PFOS Contamination*, https://www.health.ny.gov/environmental/investigations/newburgh/faq.htm (last visited Nov. 17, 2017).

In addition to creating wider margins of protection than suggested by EPA, states are expanding their regulations to cover additional PFAS compounds and to extend to media other than drinking water. For example:

- New Jersey recently proposed to establish a drinking water maximum contaminant level of 13 ppt for a PFAS compound called "perfluorononanoic acid" (PFNA). New Jersey Department of Environmental Protection (NJDEP), *Notice of Rule Proposal, PRN 2017-140*, http://www.nj.gov/dep/rules/notices/20170807b.html (last visited Nov. 20, 2017);
- Massachusetts recently announced that it is developing regulatory levels for up to five PFAS compounds for drinking water, groundwater, and soil;
- Connecticut established a 70 ppt drinking water "action level" for private wells for PFOA, PFOS, PFNA, and two other PFASs: perfluorohexane sulfonate (PFHxS) and perfluoroheptanoic acid (PFHpA). Connecticut Department of Public Health, *Perfluoroalkyl Substances (PFAS) in Drinking Water: Health Concerns*, http://www.ct.gov/dph/lib/dph/environmental_health/eoha/groundwater_well_contamination/101217_pfas_in_drinking_water_fs.pdf (last visited Nov. 20, 2017). Connecticut also has announced groundwater standards for these five compounds and anticipates publishing proposed soil standards for these five as well. *See* Connecticut Department of Energy and Environmental Protection; Remediation Division, *Remediation Roundtable, June 20, 2017*, http://www.ct.gov/deep/lib/deep/site_clean_up/remediation_roundtable/roundtablepresent6_20_17.pdf (last visited Nov. 24, 2017);
- Texas has set cleanup standards, called protective concentration levels, for 16 PFAS compounds in groundwater and has soil standards as well. *See* Texas Commission on Environmental Quality, *March 2017 Tier 1 PCL and Supporting Tables*, https://www.tceq.texas.gov/remediation/trrp/trrppcls.html (last visited Nov. 17, 2017); and
- Michigan has established surface water thresholds of 11 ppt for PFOS and 42 ppt for PFOA, established to guide fish consumption advisories. *See EPA Data Shows Toxic PFCs in Two Large Michigan Water Systems*, http://www.mlive.com/news/index.ssf/2016/07/pfos_pfoa_plainfield_ann_arbor.html (last visited Nov. 24, 2017).

States also vary in their recommendations on sampling and analysis regimens. For example, NHDES "strongly encourages stakeholders to sample and analyze, at a minimum, for the expanded list of nine PFAS analytes," while Massachusetts currently recommends sampling and analyzing for 14 PFAS analytes. *See* NHDES, *Inclusion of Per- and Polyfluoroalkyl Substances (PFAS) as Contaminants of Concern at New*

Hampshire Waste Sites: Clarification to May 18, 2017 Letter (Oct. 2017); Massachusetts Department of Environmental Protection, *Draft Fact Sheet: Guidance on Sampling and Analysis for PFAS at Disposal Sites Regulated Under the Massachusetts Contingency Plan* (Jan. 2017).

Some regulatory agencies are investigating the potential environmental and health impacts of recently formulated PFAS that have been used to replace some of the phased-out PFAS. For example, North Carolina environmental and health officials are reportedly focusing on the presence of "GenX," the chemical used as replacement for PFOA for some manufacturing applications, in water supplies. *See How Did GenX Get in This Cumberland County Lake?*, http://www.fayobserver.com/news/20171118/how-did-genx-get-in-this-cumberland-county-lake (last visited Nov. 24, 2017). Meanwhile, EPA is expanding its focus to other PFAS, researching the use of Method 537 to include GenX and other short-chain PFAS, and developing toxicity testing methods for approximately 75 PFAS other than PFOA and PFOS. *Floored by Fluorochemicals: What Are the Health Risks?*, Bloomberg BNA Daily Environment Report (Dec. 12, 2017).

Conclusion

Regulation and management of risks from PFAS compounds in drinking water and other media will be a moving target for regulators and the regulated community for the near future. Entities with affected interests should closely monitor the processes that develop the relevant rules, and should participate in those processes as their interests warrant. Agencies should include the public and the regulated community in the rulemaking process, to help ensure the merit and legitimacy of emerging rules.

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