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HDR'S SAFE DRINKING WATER ACT NEWSLETTER

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PFAS — Moving to the Next Chapter

Introduction

Per- and polyfluoroalkyl substances (PFAS) are a group of human-made chemicals characterized by strong carbon-fluorine bonds. This class of chemicals is very complex and includes several sub-groups, based on physical and chemical properties such as carbon chain length, functional group and structural variations.

PFAS have been in commercial use since the 1940s. They are found in food packaging; stain- and water-repellent fabrics; nonstick products (e.g., Teflon); polishes; waxes; paints; cleaning products; fire-fighting foams; at production facilities involved in chrome plating, electronics manufacturing or oil recovery; in drinking water; and in fish, animals and humans.

These chemicals are persistent and accumulate in the environment — in surface and groundwater, soil and sediment and in living tissue over time.

The most well-known PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). They are the most frequently regulated PFAS, addressing historic contamination, as they have largely been phased out of production in the United States.

Research indicates exposure to PFAS can result in adverse human health effects. There are consistent findings showing that increased cholesterol levels can occur, as well as more limited findings on infant birth weights, immune system effects, cancer (PFOA) and thyroid hormone disruption (PFOS).

Next Generation PFAS

PFAS also include the newer, "replacement" chemicals for PFOA and PFOS, e.g., hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt (trade name is GenX) and perfluorobutane sulfonic acid (PFBS).

Additional information can be found at AWWA's **Resource Topics webpage on PFAS**.

As the nation transitions to the new Administration, President-Elect Biden has stated he will pursue a renewed focus on the response to PFAS contamination.

Federal Action

In February 2019, the United States Environmental Protection Agency (EPA) laid out a PFAS Action Plan to be implemented across several EPA programs. The Plan and February 2020 update include the following elements:

To Address PFAS in Drinking Water

- EPA published a new validated method (EPA Method 533) to test for 11 additional PFAS in drinking water, bringing the total to 29 (coupled with EPA Method 537.1), see analyte list at right. Method 533 analyzes for "short chain" PFAS, with carbon chain lengths of four to 12.

- Made a preliminary determination to regulate PFOS and PFOA; comments are under review. If the preliminary determination is finalized, the process of establishing a Maximum Contaminant Level (MCL) for PFOA and PFOS would begin. EPA also accepted comments on varying regulatory approaches for other PFAS, including evaluation of individual PFAS, groupings of PFAS chemicals or based on drinking water treatment techniques. EPA has already established lifetime health advisories for PFOA and PFOS in drinking water. If the determination is finalized, EPA has 24 months to propose a non-enforceable maximum contaminant level goal and an enforceable national primary drinking water regulation for PFOS and PFOA.

- Under the Safe Drinking Water Act (SDWA) and National Defense Authorization Act (NDAA), EPA committed to monitor PFAS in the next Unregulated Contaminant Monitoring Rule cycle; the final rule is anticipated in December 2021. The NDAA mandates actions for EPA and Department of Defense (DOD) on PFAS.

EPA PFAS Method 533 - Analysis of 11 Additional PFAS

PFAS Analyte	Abbreviation
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2FTS
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2FTS
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA
Perfluorobutanoic acid	PFBA
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA
Perfluoroheptanesulfonic acid	PFHpS
Perfluoro-4-methoxybutanoic acid	PFMBA
Perfluoro-3-methoxypropanoic acid	PFMPA
Perfluoropentanoic acid	PFPeA
Perfluoropentanesulfonic acid	PFPeS

To Reduce PFAS Exposure Through Cleanups

- EPA issued Interim Recommendations for Addressing Groundwater Contaminated with PFOA and PFOS for remedial actions through the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

- Designation of PFAS as a "hazardous substance" under CERCLA is being considered. The PFAS Action Act of 2019, passed in the House in January 2020, would require EPA to designate PFOS and PFOA as hazardous substances under CERCLA within one year and consider other PFAS for inclusion within five years. The Act would also require comprehensive toxicity testing on all PFAS and may establish both categories and testing of PFAS based on hazard or chemical properties. It requires EPA to promulgate a MCL for PFOS and PFOA within two years and address other PFAS or class of PFAS, among other provisions.

Ensuring Safety and Understanding PFAS in Commerce

- EPA issued a proposal to limit new uses of long-chain PFAS in surface coatings under the Toxic Substances Control Act (TSCA). In July 2020, EPA published a final Significant New Use Rule (SNUR) for PFAS requiring 90-day notice before manufacturing, processing or importing PFAS for the uses in the rule. The SNUR also applies to products surface coated with certain PFAS and carpets containing perfluoroalkyl sulfonate. The advance notice triggers EPA review and authorization of the activity; EPA may ban use under TSCA.

- Related to the above, as of December 10, EPA is seeking comment on a draft guide for articles subject to the July SNUR as they include regulated chemicals in their surface coatings. These include clothing, auto parts, carpets and solar panels, but exclude the long-chain perfluoroalkyl carboxylate coating materials themselves before they are applied, which are not considered "articles."

EPA Actions Under the Toxics Release Inventory (TRI) and TSCA

- Issued advance notice of rulemaking to allow public input on adding PFAS to the TRI toxic chemical list, which will help EPA determine if the information needed to meet TRI chemical listing criteria is available and useful. If EPA decides to propose adding PFAS to the TRI list, the public will also have input on that proposal, including where to set reporting thresholds.

Increasing Research to Reduce Risks, Risk Communications and Engagement

- $4.8 million in funding for new research on managing PFAS in agriculture was made available.
- Site-specific technical assistance now exists to identify and reduce PFAS exposures. Enforcement, support and funding for additional PFAS efforts is underway or anticipated.

State Action

States have taken steps to regulate PFAS in advance of federal action, including establishing guidance and/or standards. To stay up to date on individual state action, you can reference:

- Interstate Technology Regulatory Council's **PFAS Water and Soil Values Table**
- AWWA's **Summary of State Policies to Protect Drinking Water**
- EPA's **U.S. State Resources about PFAS**

Examples of key initiatives from states are provided below.

Wisconsin PFAS Action Plan

On December 16, Wisconsin released its own **PFAS Action Plan**, including statewide testing of public water systems for PFAS, said to be like programs in other Midwest states of Illinois, Indiana, Michigan, Minnesota and Ohio. The testing program would include municipal systems, priority community and non-community water systems. Public notice will be required when detected PFAS exceed a state or federal health advisory level.

Other components of the Action Plan related to drinking water include establishing science-based environmental standards, including those for safe drinking water; collecting data on water supply treatment and costs; enhancing efficiency in developing long-term water supply solutions; developing recommendations on exposure reduction; and increasing collaboration on PFAS management on military installations.

Drinking Water Standards

On October 2, 2020, Massachusetts published its PFAS MCL of 20 parts per trillion (ppt) for individual or the sum of the concentrations of six PFAS.

The "PFAS-6" include PFOS, PFOA, PFHxS, PFNA, PFHpA and PFDA. All public water systems will be required to monitor PFAS; if detected, confirmatory sampling is required. Above 10 ppt, monitoring is required monthly; above 20 ppt, notice must be provided to those served by the public water system.

The state has completed extensive testing of drinking water in advance of developing the MCL, as shown in Figure 1. Monitoring is to be done using EPA Method 537 or 537.1, with all analyzed PFAS reported to MassDEP. Use of EPA Method 533 will be considered in a future amendment.

Michigan, New Hampshire, New Jersey, New York and Vermont have also developed drinking water MCLs. New York's MCL is lowest, set at 10 ppt for PFOS and PFOA.

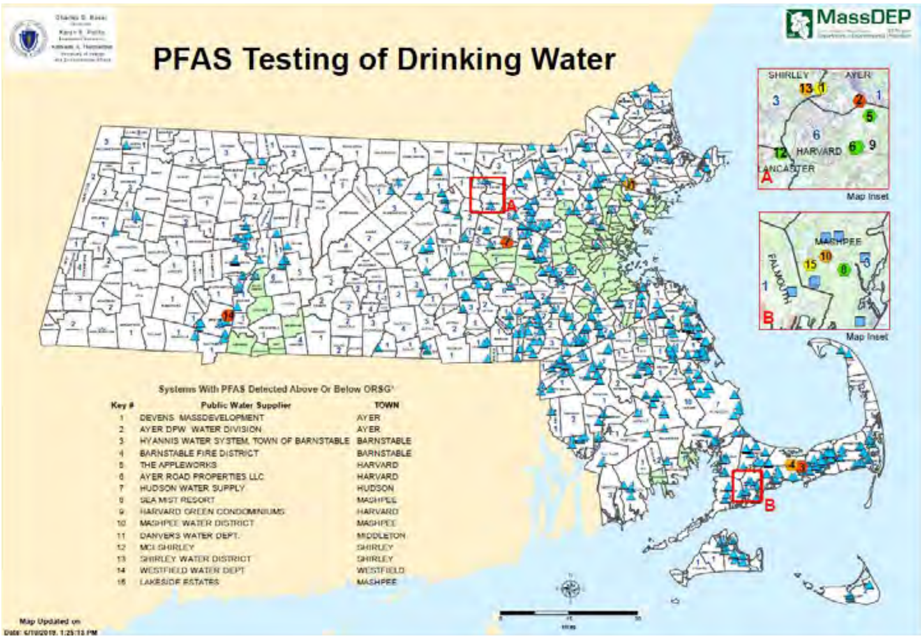

Figure 1. *PFAS Testing of Drinking Water*

Groundwater Quality Standards

Illinois has proposed health-based groundwater quality standards that, unlike MCLs, do not consider treatability and cost. The Illinois EPA used Agency for Toxic Substances and Disease Registry Minimal Risk Levels in setting PFHxS, PFNA, PFOA and PFOS, and the EPA Provisional Peer-Reviewed Toxicity Value for PFBS. Michigan has proposed groundwater cleanup criteria for PFNA, PFHxS, PFBS, PFHxA and HFPO-DA, equal to the state's drinking water standards. These are examples of how the basis for these and other PFAS values varies on the federal and state level.

Aqueous Film Forming Foam (AFFF) Incineration

Other recent actions include regulation of the storage, use and incineration of firefighting foams in New York. On November 23, 2020, legislation banned incineration of AFFF at the state's only commercial hazardous waste incinerator in Cohoes. The plant had been incinerating AFFF from the DOD stockpile until last year. Figure 2 shows an aerial photo of the plant.

Also related to PFAS incineration, the **"Interim Guidance on the Destruction and Disposal of PFAS and Materials Containing PFAS"** was published by EPA on December 18, starting a 60-day public comment period.

The interim guidance provides information on the current state of the science of commercially available PFAS destruction and disposal and includes three technological categories: destruction via thermal treatment, and disposal by landfilling and underground injection. It also includes information on the major uncertainties, that if resolved, would allow for specific destruction and disposal recommendations in the future.

Important data gaps noted include a lack of data on the production of potential products of incomplete combustion from the use of thermal treatment in commercial incinerators, cement kilns and lightweight aggregate kilns; a need to establish better means to manage landfill disposal, including liner integrity, leachate and gaseous emission characterization and treatment; and

Figure 2. *1994 NYS GIS Clearinghouse Orthoimage North Quarry Area Highlighted*

the limited number, location and cost of permitted Class I Underground Injection Control wells to receive PFAS liquid wastes. A research and development program to address these gaps is described.

Potential releases of PFAS during destruction or disposal, impacts to neighboring vulnerable populations and community involvement are also considered. The guidance provides a conceptual model of potential releases from destruction and disposal of PFAS-containing materials (Figure 3).

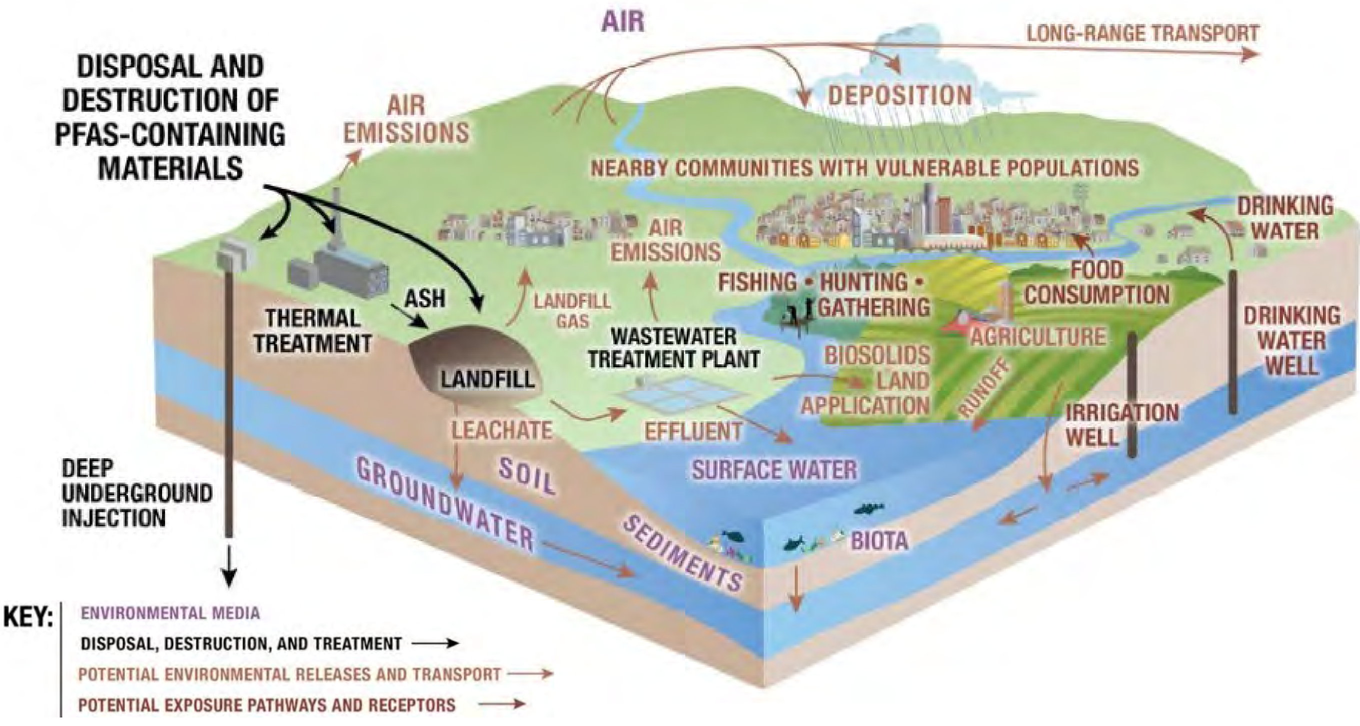

Figure 3. *Conceptual Model of Potential Releases from Destruction and Disposal of PFAS-Containing Materials*

Information on industry-specific PFAS waste streams is provided in the guidance. Manufacturers and industrial users of PFAS generate wastes, e.g., as byproducts of process wastewater in making surfactants and other materials to be applied to finished products.

Spills, accidental discharges of liquid product and wastes, and AFFF mixtures also contribute to loadings in the environment. In treating wastewater effluent, sludges and biosolids containing PFAS are produced at the manufacturing plant or at municipal wastewater treatment plants receiving wastewater from industrial sources.

Contaminated spent water treatment media (e.g., GAC, ion exchange resins) can also be generated, adding to the waste stream. Evaluating PFAS destruction efficiency during reactivation, regeneration or disposal of such PFAS-containing media is one topic of the ongoing research program.

If immediate destruction of contaminated materials is not imperative, the guidance suggests interim storage for 2-5 years; however, the guidance does not set what concentrations of PFAS in waste or other materials would necessitate eventual destruction or disposal.

EPA is also studying activated carbon and resins, as well as high-pressure membrane technologies to determine which methods work best to remove PFAS from drinking water, at central treatment facilities, in commercial building water systems, at home point-of-entry and point-of-use systems. Further information can be found in the **EPA Drinking Water Treatability Database**.

The implications of the local ban in New York and the interim guidance on the national DOD PFAS destruction program are still to be determined.

Biosolids Application

In Maine, biosolids (sludge from wastewater treatment) used on agricultural fields as fertilizer (Figure 4) have resulted in groundwater contamination. As of March 2019, the state requires PFAS testing of all biosolids, which have been detected in most samples above the screening level of 50 ppt.

Neither biosolids nor biosolids-derived compost may be land applied if the screening concentrations for PFOA, PFOS or PFBS are exceeded until certain provisions are met. Land application and/or distribution of these products cannot resume until approved by the state.

Antidegradation Policies

Antidegradation is to be considered in water quality standard development to preserve existing beneficial uses and minimize degradation of surface waters. It can have wide-ranging impact, as it applies to any proposed new or increased activity, (e.g., point and nonpoint source discharges of pollutants, a proposed increase in loadings associated with existing activities, an increase in flow alteration over that which is existing, or modifications to hydrology, including dam construction and water withdrawals).

States, including California and New Hampshire have antidegradation policies in place under their Clean Water Act (CWA) programs to protect groundwater quality related to PFAS. These can be used in setting requirements for remedial action and in setting limits on waste discharges in permits.

California requires the initial effluent limitation or cleanup standard to be set at the background concentration of a chemical, whether a drinking water standard or other health-based value is available or not.

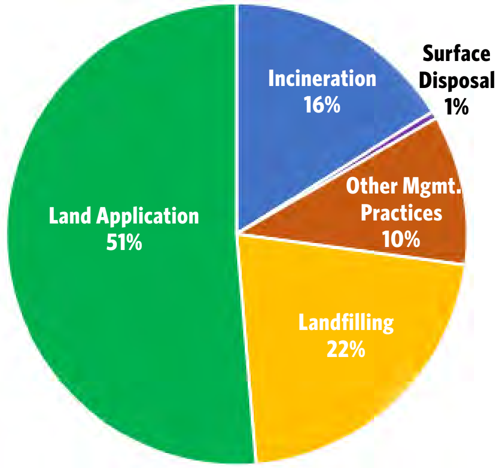

Figure 4. *Biosolids Use & Disposal from Major Publicly-Owned Treatment Works in 2019*

The final limits consider potential health impacts, designated use of the water body, and technical and economic feasibility.

In late 2019, New Hampshire developed a plan to establish surface water quality standards for four PFAS, noting a need to fill a gap, in that EPA does not provide recommendations in the National Recommended Water Quality Criteria 304(a) Guidance for PFAS compounds, which states typically depend on. The New Hampshire plan notes that while a few states are looking into surface water quality criteria for PFAS, only Minnesota and Michigan have promulgated them to date.

Fish Consumption

On a site-specific basis, Minnesota has issued PFOS water quality criteria for fish tissue to be protective of fish consumption and a surface water value that supports meeting the fish tissue value. The value for fish tissue is a maximum 0.37 nanograms PFOS per gram (ng/g); the maximum is 0.05 ng/L PFOS in water. There are site-specific criteria for Lake Elmo, Bde Maka Ska and Pool 2 of the Mississippi River, which are connected water bodies. These are not statewide criteria.

Michigan finalized Fish Consumption Screening Values for PFOS in 2014 that range from <9 parts per billion (ppb), with no restrictions on consumption, to 300 ppb or greater, the "do not eat" level (Figure 5). Again, these examples show that the basis for health-based values for PFAS, regardless of the media and regulatory authority involved, is varied and evolving.

Meal Category	FCSV Ranges	
meals per month [a]	*µg/g (ppm)* [b]	*ng/g (ppb)* [c]
16	≤0.009	≤9
12	>0.009 to 0.013	>9 to 13
8	>0.013 to 0.019	>13 to 19
4	>0.019 to 0.038	>19 to 38
2	>0.038 to 0.075	>38 to 75
1	>0.075 to 0.15	>75 to 150
6 meals per year	>0.15 to 0.3	>150 to 300
Do Not Eat	>0.3	>300

a. Units are in months unless otherwise stated.
b. micrograms of chemical per gram of wet weight fish tissue (µg/g) that is the same as parts per million (ppm).
c. nanograms of chemicals per grams of wet weight fish tissue (ng/g) that is the same as parts per billion (ppb)

Figure 5. *State of Michigan Fish Consumption Screening Value Ranges for PFOS*

NPDES Wastewater and Stormwater Discharge Permitting

On November 22, 2020, the EPA Office of Water issued an interim PFAS National Pollutant Discharge Elimination System (NPDES) Section 402 strategy for permits issued by EPA in Massachusetts, New Hampshire, New Mexico, District of Columbia and U.S. territories. It can also be considered for use in state primacy programs. The strategy is being provided while EPA considers how to regulate PFAS discharges.

Permitting recommendations include:

- Consider including requirements for phased-in monitoring and best management practices where PFAS are expected to be present in point source wastewater discharges, including PFAS that are part of EPA's multi-lab validated wastewater analytical method. See AWWA's **PFAS Monitoring, Sampling and Analysis Fact Sheet**. This includes direct and indirect dischargers where authorized. This is consistent with EPA's NPDES Permit Writers Manual, which includes facilities where raw materials are stored or used, are products or byproducts of operation, or the permit writer has a strong basis for expecting the pollutant could be in the discharge.
- Consider including permit requirements for phased-in monitoring and stormwater pollutant control when PFAS are expected to be present in stormwater discharges. Also consider pollutant control measures in municipal separate storm sewer systems (MS4) and industrial stormwater permits when PFAS are expected to be present in stormwater discharges. Similar to wastewater, a phased approach to monitoring should be considered.

  Where PFAS are of concern, typical MS4 controls may be considered to reduce PFAS discharges in stormwater, i.e., public education and outreach, illicit discharge detection and elimination, construction site stormwater runoff control, and pollution prevention measures.

  Typical industrial stormwater controls to reduce discharges and achieve water quality standards, i.e., implementing stormwater pollution prevention plans (SWPPPs), conducting inspections and monitoring, may also be considered to reduce PFAS discharges in industrial stormwater.
- Continue to share information on permitting practices, develop a permitting compendium and information sharing platform, and continue workgroup activity to help establish best practices and technical knowledge. The workgroup recommends use of EPA's NPDES Permit Writers' Clearinghouse to share information on PFAS relevant to permitting.

The timeline for implementing these recommendations begins in 2021. The potential for the interim permitting strategy to be implemented in its current form is not known at this time, as the main focus related to CWA Section 402 permits has been on other provisions, i.e., the controversial rulings for defining what is considered a connection between surface and groundwaters and therefore constituting a discharge to Waters of the United States requiring a NPDES permit.

Conclusion

How the next chapter in PFAS regulation will be written largely depends on decisions yet to be made as both state and federal policy are developed and our understanding of these complex chemicals is elucidated. Concurrent efforts are underway to characterize the toxicity, treatability, presence and implications of PFAS in all water sources.

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