Abstract

Protecting Your Drinking Water Quality: New Rules and Solutions for PFAS

Emerging contaminants like PFAS (per- and polyfluoroalkyl substances) pose a significant threat to water quality due to their persistence in the environment and potential health impacts. With New Jersey's water systems facing increasing challenges from these contaminants, understanding regulatory frameworks and remediation techniques is crucial for safeguarding public health and the environment. Learn about the new U.S. Environmental Protection Agency rules on PFAS and innovative remediation strategies.
Dr. Lauren Weinrich from American Water will delve into the latest EPA regulations surrounding PFAS, highlighting their significance and impact on water quality in New Jersey.
Dr. Paul Hatzinger from the Biotechnology Development and Applications Group will then explore cutting-edge PFAS remediation strategies and ongoing research efforts.

Paul Hatzinger, PhD, Director, Biotechnology Development and Applications Group
Lauren A. Weinrich, Principal Scientist, Research & Development, American Water

AMERICAN WATER

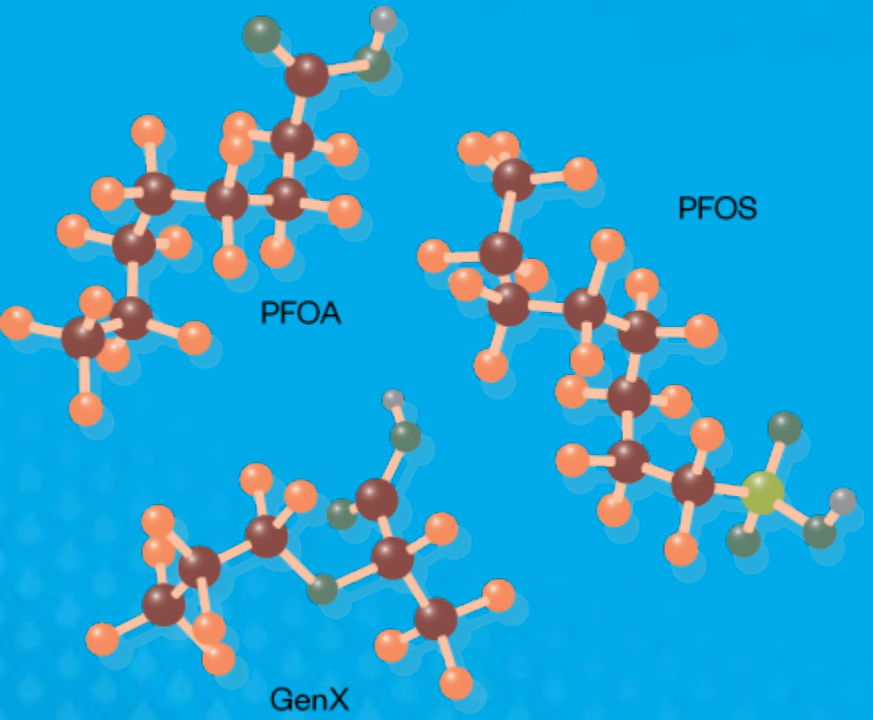
Protecting Your Drinking Water Quality

New Rules and Solutions for PFAS

Dr. Lauren Weinrich, Principal Scientist

Sept. 27th, 2024

Today’s topics

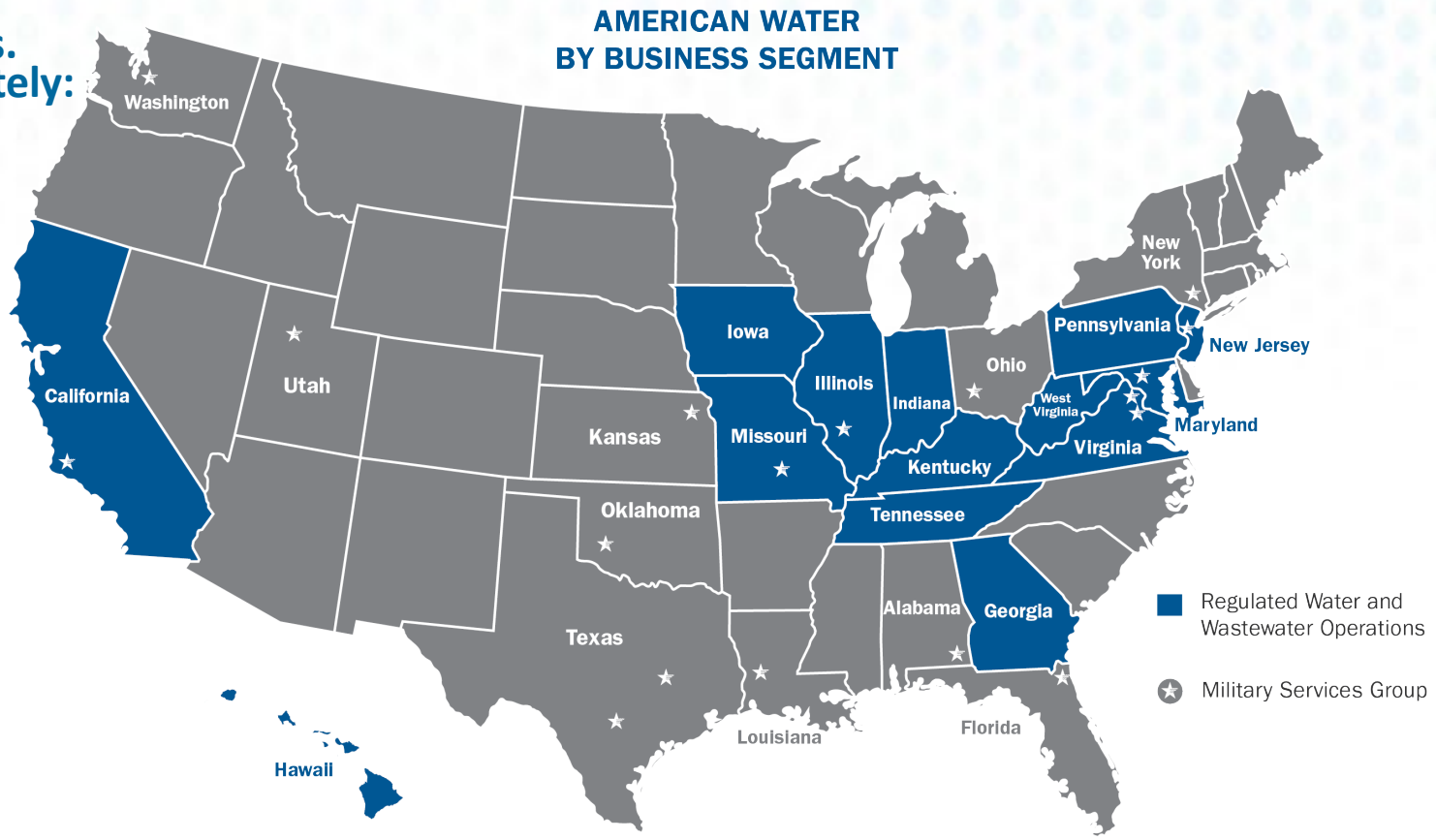


- Overview our operations
- What’s new with PFAS research and regulations?
- Communication resources
- How is PFAS removed?
- Projected financial impacts
- Utility perspectives moving forward

American Water Operations

We operate as regulated utilities in 14 U.S. states. Our primary operating assets include approximately:

- **80** surface water treatment plants
- **490** groundwater treatment plants
- **175** wastewater treatment plants
- **53,500** miles of transmission, distribution and collection mains and pipes
- **1,100** groundwater wells
- **1,700** water and wastewater pumping stations
- **1,100** treated water storage facilities
- **73** dams



American Water's Military Services Group partners with the Department of Defense through the Utilities Privatization ("UP") Program.

Through UP, our 50-year contracts allow us to serve as the water and/or wastewater utility system owner at 18 military installations across the U.S.

New Jersey American Water is the largest regulated water and wastewater service provider in the State of New Jersey

Our ~ 860 employees serve:

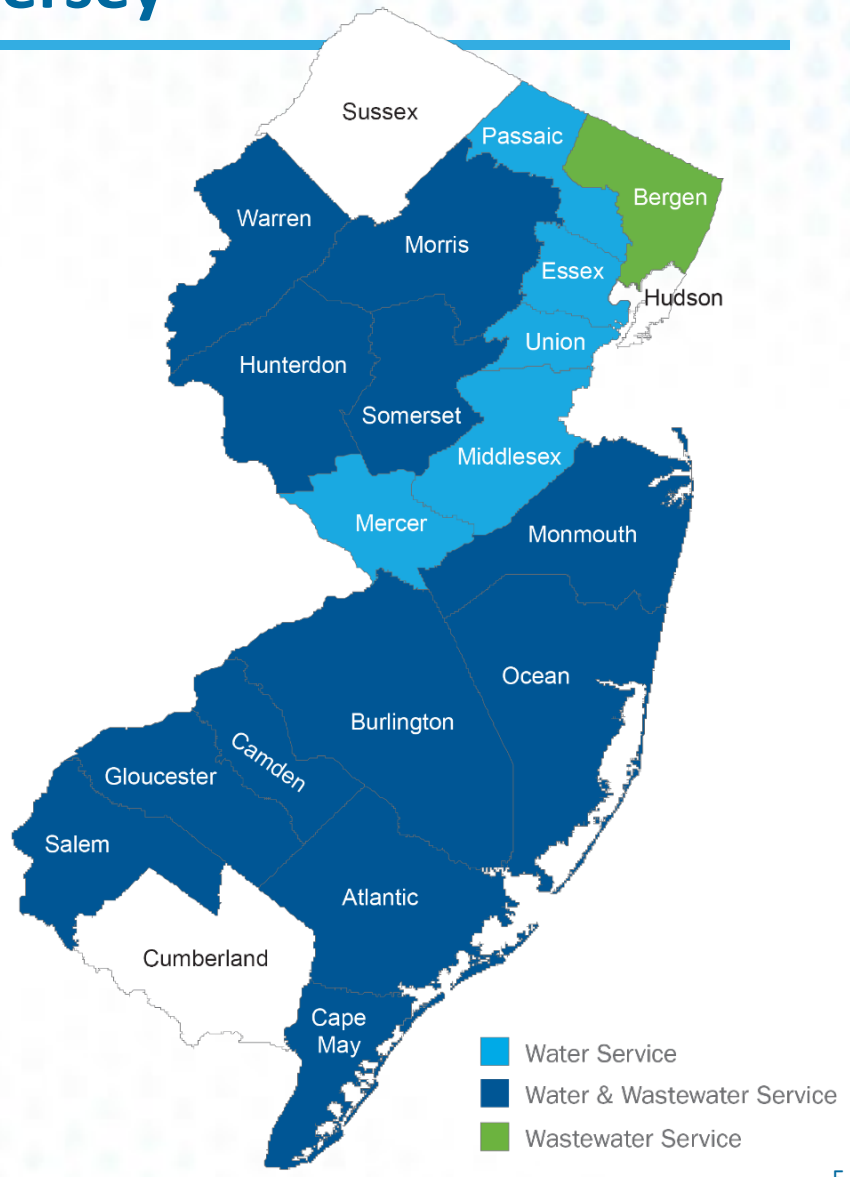
- ~ 2.9 million people in 18 counties
- ~ 668,000 water service customers
- 64,200 wastewater service customers

Source of Supply

- 75% surface water
- 21% groundwater
- 4% purchased water

Treatment Facilities

- **7 surface water treatment plants with five Directors Awards from the Partnership for Safe Water**
- **222 groundwater wells**
- 21 wastewater treatment plants



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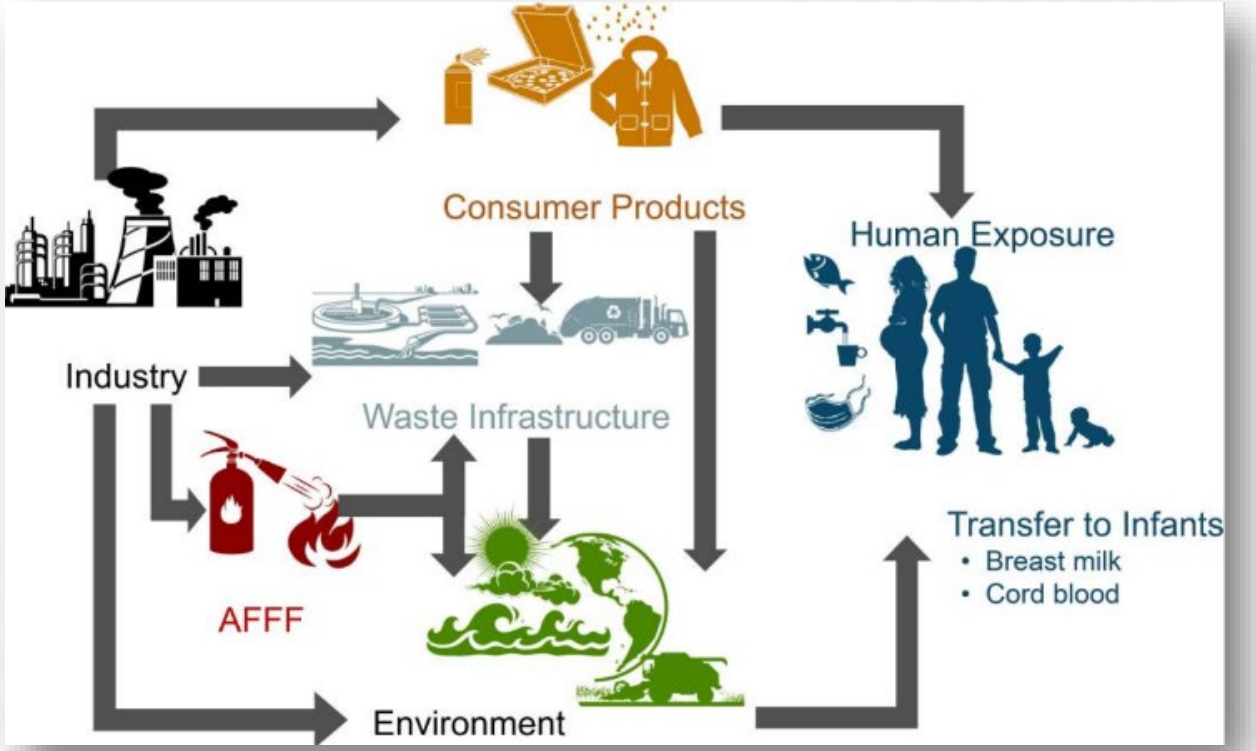
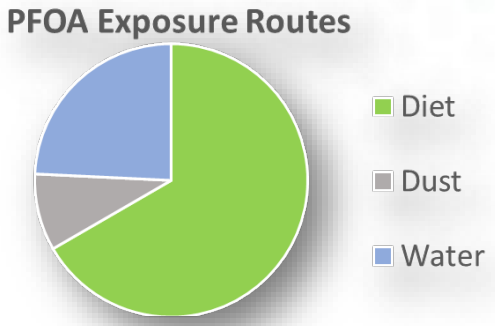
Learning About PFAS Exposure Points, Routes, and Ongoing Research



Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6380916/

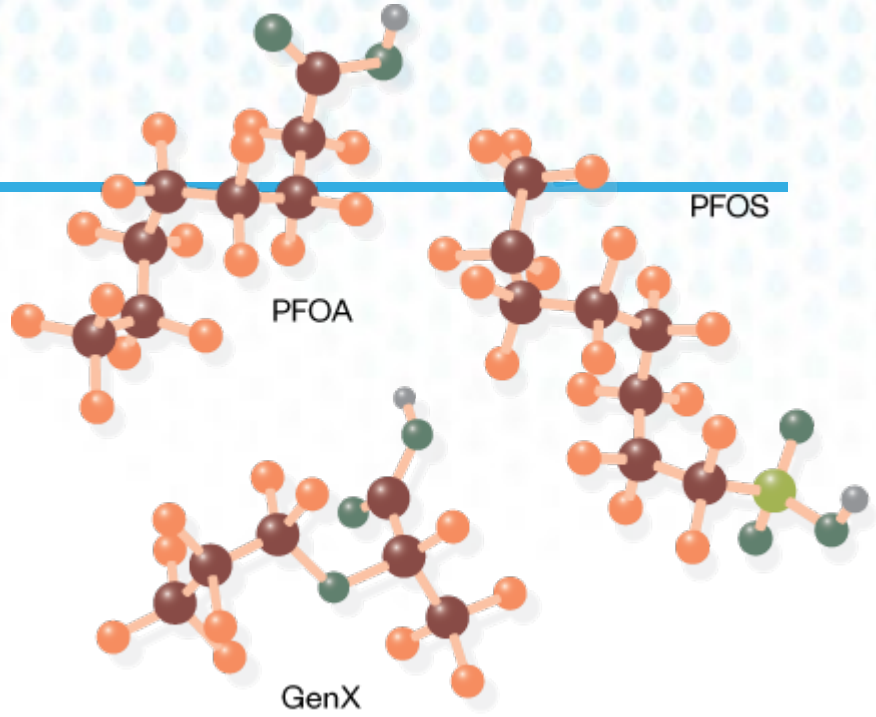


Data Source: Env. Sci. & Tech. 2011; 45: 8006–8014

Source: https://doi.org/10.1016/j.envint.2024.108454

Source: https://www.dailymail.co.uk/health/article-13104901/foods-forever-chemicals-revealed.html

Per- and Polyfluoroalkyl Substances (PFAS)



Did you know that PFAS chain length can impact their removal from drinking water?

Chain length can also correspond to toxicity, solubility in water, movement and accumulation in the environment, etc. Definitions and types of PFAS continue to emerge.

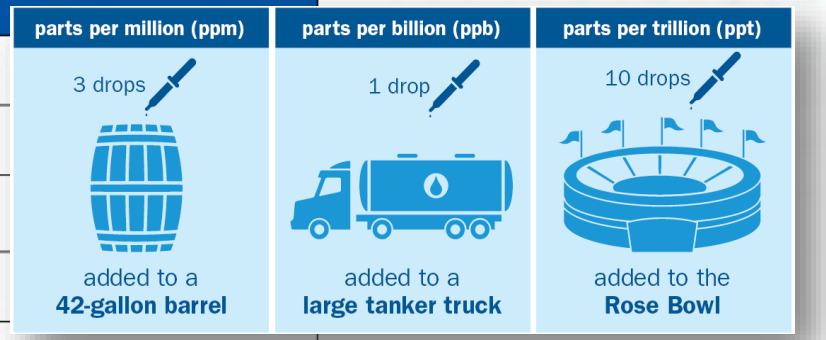
Source: PFAS terminology *https://pfas-1.itrcweb.org/2-2-chemistry-terminology-and-acronyms/*

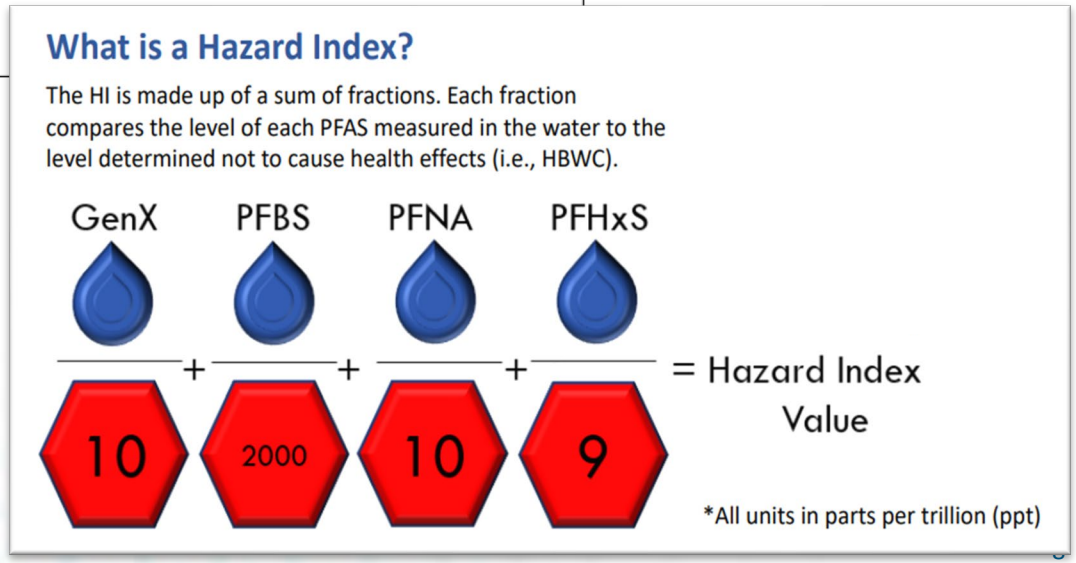
Number of Carbons	4	5	6	7	8	9
Perfluorocarboxylic acids	Short Chain				Long Chain	
	PFBA	PFPeA	PFHxA	PFHpA	**PFOA**	**PFNA**
Perfluorosulfonic acids	Short Chain		Long Chain			
	PFBS	PFPeS	**PFHxS**	PFHpS	**PFOS**	PFNS

USEPA PFAS Drinking Water Rule for Public Water Systems

Chemical	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX chemicals)	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
Mixture of two or more: PFHxS, PFNA, HFPO-DA, and PFBS	Hazard Index of 1	Hazard Index of 1

*Compliance is determined by running annual averages at the sampling point





USEPA PFAS Drinking Water Rule for Public Water Systems

Implementation: Timeframes for Water Systems

Within **three years** of rule promulgation (2024 – 2027):

- Initial monitoring must be complete

Starting **three years** following rule promulgation (2027 – 2029):

- Results of initial monitoring must be included in Consumer Confidence Reports (i.e., Annual Water Quality Report)
- Regular monitoring for compliance must begin, and results of compliance monitoring must be included in Consumer Confidence Reports
- Public notification for monitoring and testing violations

Starting **five years** following rule promulgation (starting 2029)

- Comply with all MCLs
- Public notification for MCL violations

EPA United States Environmental Protection Agency

Office of Water

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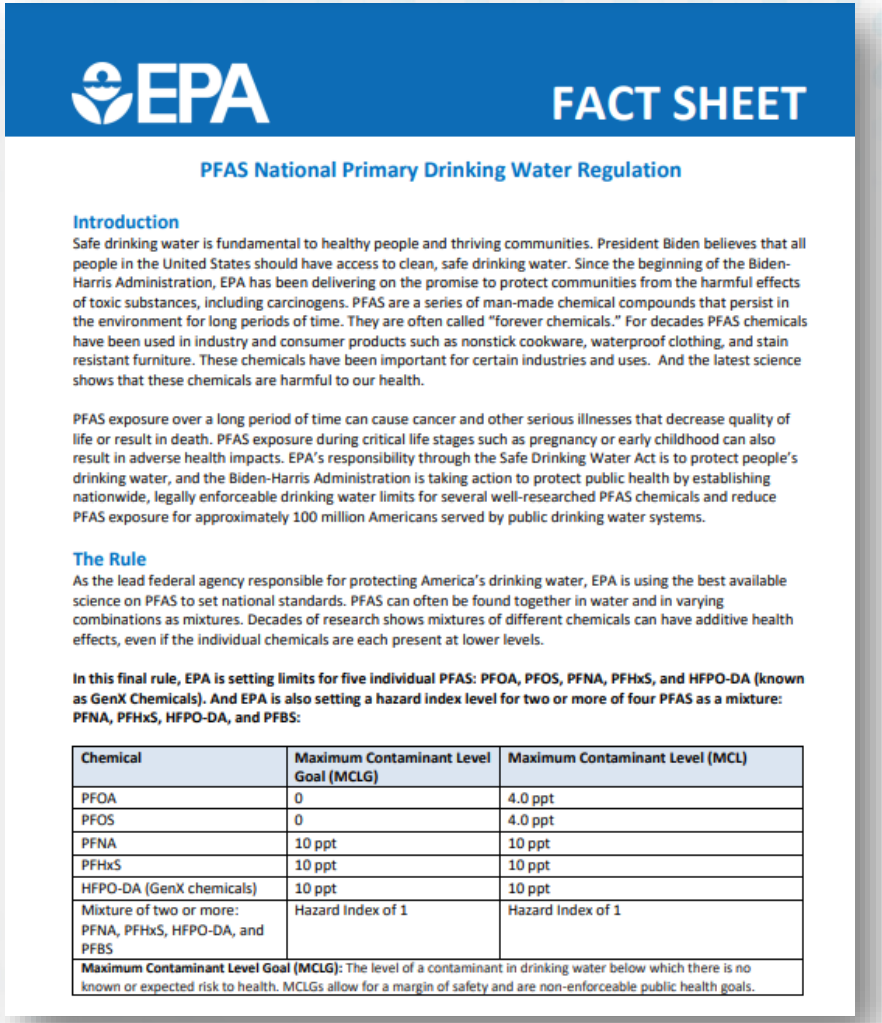
EPA Resources for Drinking Water Utilities

https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas

- Presentation recordings from April 2024 webinars
- General Q&A
- Fact Sheet: Reducing PFAS in Your Drinking Water with a Home Filter
- Fact Sheet: Benefits and Costs of Reducing PFAS in Drinking Water
- Fact Sheet: PFAS NPDWR Monitoring and Reporting
- Fact Sheet: Understanding the Hazard Index
- Fact Sheet: Small systems
- Fact Sheet: Treatment Options for Removing PFAS in Drinking Water



EPA FACT SHEET

PFAS National Primary Drinking Water Regulation

Introduction

Safe drinking water is fundamental to healthy people and thriving communities. President Biden believes that all people in the United States should have access to clean, safe drinking water. Since the beginning of the Biden-Harris Administration, EPA has been delivering on the promise to protect communities from the harmful effects of toxic substances, including carcinogens. PFAS are a series of man-made chemical compounds that persist in the environment for long periods of time. They are often called "forever chemicals." For decades PFAS chemicals have been used in industry and consumer products such as nonstick cookware, waterproof clothing, and stain resistant furniture. These chemicals have been important for certain industries and uses. And the latest science shows that these chemicals are harmful to our health.

PFAS exposure over a long period of time can cause cancer and other serious illnesses that decrease quality of life or result in death. PFAS exposure during critical life stages such as pregnancy or early childhood can also result in adverse health impacts. EPA's responsibility through the Safe Drinking Water Act is to protect people's drinking water, and the Biden-Harris Administration is taking action to protect public health by establishing nationwide, legally enforceable drinking water limits for several well-researched PFAS chemicals and reduce PFAS exposure for approximately 100 million Americans served by public drinking water systems.

The Rule

As the lead federal agency responsible for protecting America's drinking water, EPA is using the best available science on PFAS to set national standards. PFAS can often be found together in water and in varying combinations as mixtures. Decades of research shows mixtures of different chemicals can have additive health effects, even if the individual chemicals are each present at lower levels.

In this final rule, EPA is setting limits for five individual PFAS: PFOA, PFOS, PFNA, PFHxS, and HFPO-DA (known as GenX Chemicals). And EPA is also setting a hazard index level for two or more of four PFAS as a mixture: PFNA, PFHxS, HFPO-DA, and PFBS:

Chemical	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFNA	10 ppt	10 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX chemicals)	10 ppt	10 ppt
Mixture of two or more: PFNA, PFHxS, HFPO-DA, and PFBS	Hazard Index of 1	Hazard Index of 1
Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.		

PFAS Communication for Water Sector Professionals

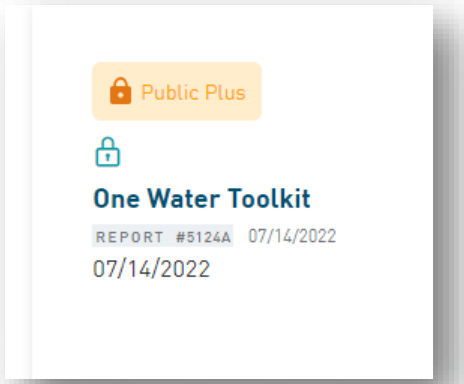
Materials are accessible *via free registration* using the *Public Plus* option

https://www.waterrf.org/research/projects/pfas-one-water-risk-communication-messaging-water-sector-professionals

Deliverable 1: UCMR 5 Toolkit

The HOW TO manual allows water systems to design their own Frequently Asked Questions (FAQs) for sharing with customers, stakeholders and posting on websites.

Deliverable 2: One Water Toolkit



Brochures and materials for informing stakeholders to have:

- actual perception of risk,
- ownership, and
- acceptance of action being taken by utilities to mitigate that risk

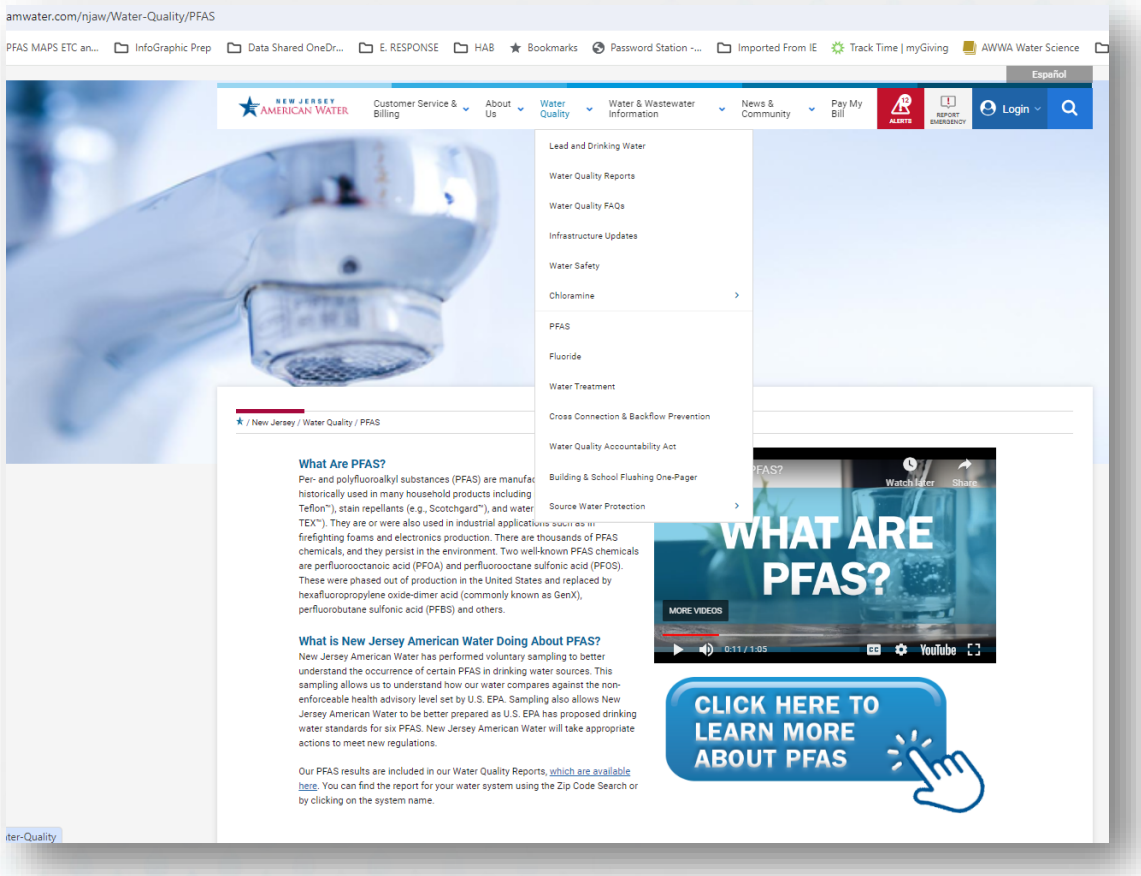
Toolkit includes copy for emails, inserts, social media, web content creation, images and graphics (single page and microsite), PFAS product information and certification.

What Steps Are Utilities Taking to Inform?

Steps to inform: Drinking water systems and public health officials should continue to provide consumers with information about the levels of PFAS in their drinking water.

- Identify paths of communication to meet customers where they are
- Speaking engagements and the community
- Knowledge sharing internally and to other stakeholders
- Website/social media updates
- Consumer Confidence Reports
- Press release on new rule, summarize current/future utility actions

PFAS Resources on Websites; linked videos, FAQs



Telling Your Story – CCRs, Websites, Media, FAQs

PFAS Sections in CCRs

PFAS

Per- and polyfluoroalkyl substances (PFAS) are manufactured chemicals used in many household products including nonstick cookware (e.g., Teflon™), stain repellants (e.g., Scotchgard™), and waterproofing (e.g., GORE-TEX™). They are also used in industrial applications such as in firefighting foams and electronics production. There are thousands of PFAS chemicals, and they persist in the environment. Two well-known PFAS chemicals are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). These were phased out of production in the United States and replaced by hexafluoropropylene oxide-dimer acid (commonly known as GenX), perfluorobutane sulfonic acid (PFBS) and others.

The City of Camden Division of Utilities operated by American Water Contract Services is currently performing a combination of regulated sampling required by the NJDEP as well as voluntary sampling. The three (3) regulated contaminants in the PFAS group are currently being monitored for include PFNA with an MCL set at 13 nanograms per liter or parts per trillion(ppt), PFOA with an MCL of 14 ppt and PFOS with an MCL of 13 ppt.

The science and regulation of PFAS and other contaminants is always evolving, and the City of Camden's Division of Utilities operated by American Water Contract Services strives to be a leader in research and development. PFAS contamination is one of the most rapidly changing areas in the drinking water field. We have invested in our own independent research, as well as engaging with other experts in the field to understand PFAS occurrence in the environment. We are also actively assessing treatment technologies that can effectively remove PFAS from drinking water, because we believe that investment in research is critically important to addressing this issue.

> American Water has a history of leading research to understand contaminants that can make their way through the environment. Our dedicated scientists work with leaders in the water community to develop methods to detect, sample, measure and address these contaminants. Because investment in research is critical to address PFAS, American Water actively assesses treatment technologies that can effectively remove PFAS from drinking water.
>
> **Lauren A. Weinrich, Ph.D.**
> Principal Scientist

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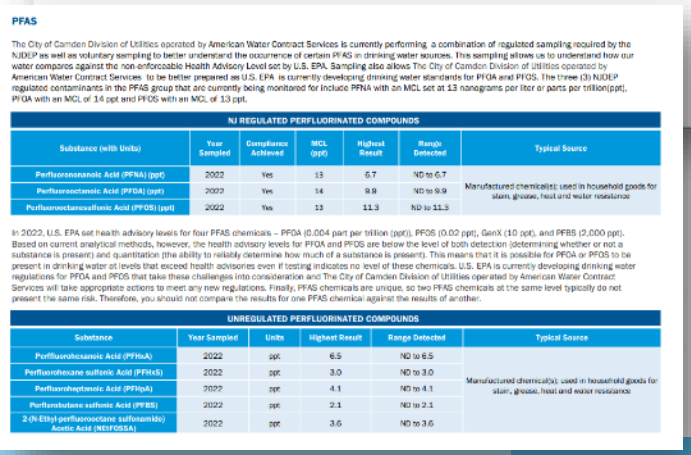

PFAS

The City of Camden Division of Utilities operated by American Water Contract Services is currently performing a combination of regulated sampling required by the NJDEP as well as voluntary sampling to better understand the occurrence of certain PFAS in drinking water sources. This sampling allows us to understand how our water compares against the non-enforceable Health Advisory Level set by U.S. EPA. Sampling also allows The City of Camden Division of Utilities operated by American Water Contract Services to be better prepared as U.S. EPA is currently developing drinking water standards for PFOA and PFOS. The three (3) NJDEP regulated contaminants in the PFAS group that are currently being monitored for include PFNA with an MCL set at 13 nanograms per liter or parts per trillion(ppt), PFOA with an MCL of 14 ppt and PFOS with an MCL of 13 ppt.

NJ REGULATED PERFLUORINATED COMPOUNDS

Substance (with Units)	Year Sampled	Compliance Achieved	MCL (ppt)	Highest Result	Range Detected	Typical Source
Perfluorononanoic Acid (PFNA) (ppt)	2022	Yes	13	6.7	ND to 6.7	Manufactured chemical(s); used in household goods for stain, grease, heat and water resistance
Perfluorooctanoic Acid (PFOA) (ppt)	2022	Yes	14	9.9	ND to 9.9	
Perfluorooctanesulfonic Acid (PFOS) (ppt)	2022	Yes	13	11.3	ND to 11.3	

In 2022, U.S. EPA set health advisory levels for four PFAS chemicals – PFOA (0.004 part per trillion (ppt)), PFOS (0.02 ppt), GenX (10 ppt), and PFBS (2,000 ppt). Based on current analytical methods, however, the health advisory levels for PFOA and PFOS are below the level of both detection (determining whether or not a substance is present) and quantitation (the ability to reliably determine how much of a substance is present). This means that it is possible for PFOA or PFOS to be present in drinking water at levels that exceed health advisories even if testing indicates no level of these chemicals. U.S. EPA is currently developing drinking water regulations for PFOA and PFOS that take these challenges into consideration and The City of Camden Division of Utilities operated by American Water Contract Services will take appropriate actions to meet any new regulations. Finally, PFAS chemicals are unique, so two PFAS chemicals at the same level typically do not present the same risk. Therefore, you should not compare the results for one PFAS chemical against the results of another.

UNREGULATED PERFLUORINATED COMPOUNDS

Substance	Year Sampled	Units	Highest Result	Range Detected	Typical Source
Perfluorohexanoic Acid (PFHxA)	2022	ppt	6.5	ND to 6.5	Manufactured chemical(s); used in household goods for stain, grease, heat and water resistance
Perfluorohexane sulfonic Acid (PFHxS)	2022	ppt	3.0	ND to 3.0	
Perfluoroheptanoic Acid (PFHpA)	2022	ppt	4.1	ND to 4.1	
Perfluorobutane sulfonic Acid (PFBS)	2022	ppt	2.1	ND to 2.1	
2-(N-Ethyl-perfluorooctane sulfonamido) Acetic Acid (NEtFOSSA)	2022	ppt	3.6	ND to 3.6	

HAS AMERICAN WATER ADDRESSED PFAS IN THE PAST?

Yes. We have successfully addressed PFAS in the past. Here are two examples:

- **Picatinny Arsenal, NJ:** In January 2018, American Water's Military Services Group made recommendations to remove PFOA/PFOS contaminants and were awarded a contract in April 2018 to install a temporary Granular Activated Carbon (GAC) system within 90 days. The American Water-led team kept the project ahead of schedule, completing the design, permitting, implementation, construction and treatment in just 38 days. Sample results were returned that showed PFOA/PFOS w
  across the system, hi
  of the GAC treatment
- **Sacramento Region,**
  California American W
  funding for PFAS treat
  a well in the Suburba
  2016, and in March 2
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  Four months later, Ca
  learned that it was de
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  construction, and in S
  American Water place
  unit into operation.

EXPERTISE

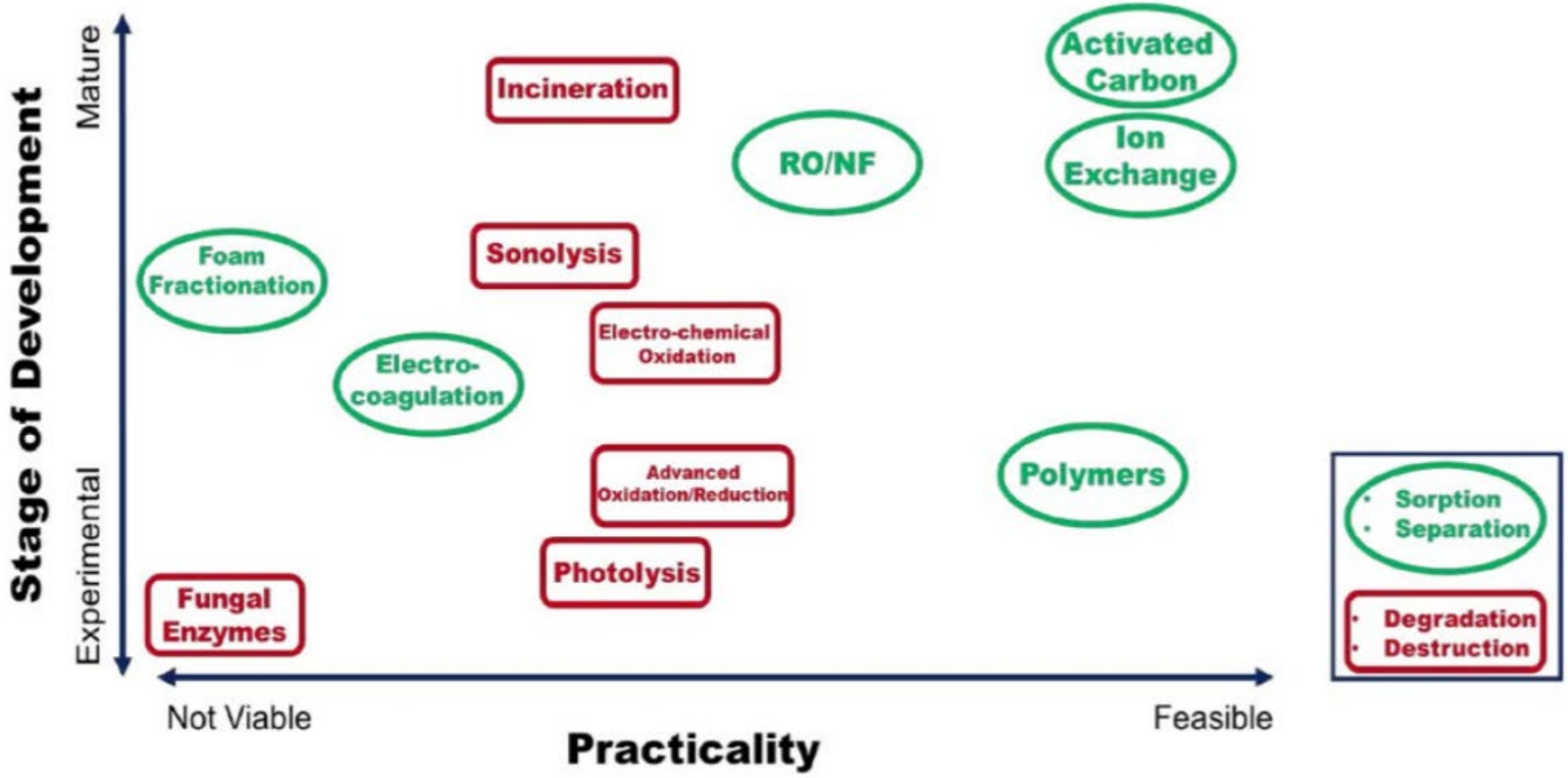
Our Central Laboratory, located in Belleville, IL, is a U.S. EPA accredited lab with high throughput, fast turnaround time, and expanded capability for PFAS. The Central Laboratory is NELAC certified and prepared for UCMR 5 monitoring of 29 PFAS chemicals. UCMR 5 monitoring will be done with U.S. EPA methods 533 and 537.1. American Water is also using expanded technologies and analytical capabilities in our research labs to better understand the broader occurrence of these chemicals in the environment, including fluorinated replacements such as short-chain and other next generation PFAS chemicals.

WORKING WITH OTHERS ON PFAS

American Water is active in several external collaborations that are helping us stay at the forefront of regulatory and monitoring strategies:

- American Water staff are members of the technical advisory workgroup for Safe Drinking Water Act Processes and New Contaminants of the American Water Works Association, which has been actively contributing to the fast-paced changes related to detection and regulatory strategies for PFAS.
- American Water experts frequently collaborate with state and federal regulators in departments of environmental protection, EPA, CDC, American Water Works Association, Water Research Foundation, universities and other organizations to better understand issues related to PFAS and public health.
- American Water is a utility participant in the Water Research Foundation project, entitled "Investigation of Treatment Alternatives for Short-Chain Poly and Perfluoroalkyl Substances."

PFAS Removal Strategies



Courtesy of – Dr. Tanju Karanfil, Clemson University

PFAS Treatment Summary

TECH	ADVANTAGES	DISADVANTAGES
Granular Activated Carbon (GAC)	• Easy to use • Able to remove other contaminants • Reactivation offers destruction of PFAS • Compatible in gravity absorbers/contactors	• Less effective for short chain PFAS • Larger footprint than IX • Iron and manganese removal sometimes required upstream of GAC • (Generally) higher capital than IX • More frequent replacement of GAC than IX
Anion Exchange (AIX/IX)	• Easy to use • Smaller footprint than GAC • Resin can be specialized for specific PFAS compounds	• Less effective for short chain PFAS • Pre-filtration (Fe/Mn) sometimes required • Disposal requires incineration for destruction of PFAS • Not practical in gravity absorbers
Reverse Osmosis (RO)	• Likely effective for broadest range of PFAS	• Disposal options limited for high waste volume with elevated PFAS • High Capital and Operating Expenses • High complexity

Projected PFAS Treatment Costs

Source:
Consider the Hidden Costs of PFAS Treatment
AWWA OpFlow January/February 2021,
Patricia Whitby, Rosa Yu, Erin Mackey https://doi.org/10.1002/opfl.1484

Federal PFAS Drinking Water Rule Cost Headlines

- EPA estimates a total annualized national compliance cost of **$1.5 billion** (20-year lifecycle)
- American Water Works Association (AWWA) estimates the total annualized national compliance cost of **$3.9 billion to $5.2 billion** (20-year lifecycle, 3% and 7% discount rates, 2022 dollars)
  - **$47.4 billion initial capital cost**
  - **$726 million annual operating cost**
- American Water's internal estimates for PFAS treatment across our own footprint align closely to AWWA's estimates (as scaled from AWWA's national compliance cost estimates)
  - **~$1 billion initial capital investment for treatment at approximately 80 facilities across our footprint**
  - **Up to $50 million annual operating cost**

Multi District Litigation

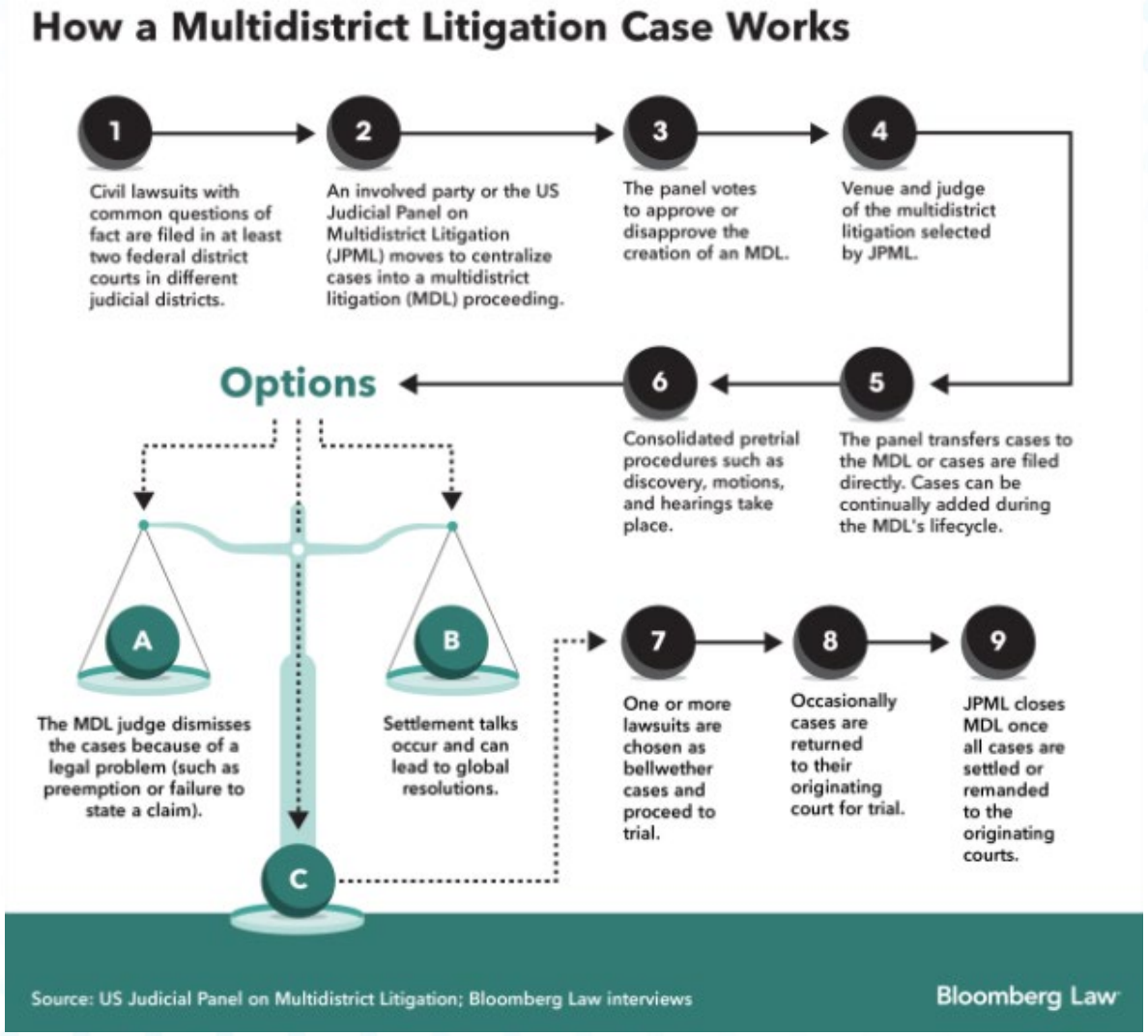
Aqueous Film-Forming Foams (AFFF) MDL No. 2873

December 7, 2018 -The Transfer Order from the Judicial Panel on Multi District Litigation was docketed by the Clerk in the District of South Carolina.

The PFAS AFFF MDL is currently home to over 2,500 cases- **we have seven states (NJ, PA, IN, IL, TN, WV and CA)** -and is being presided over by **Judge Richard Gergel of the United States District Court of South Carolina**.

In early **September, 2023**, proposed settlements were announced by 3M and DuPont totaling approximately $13.8B for water providers.

Personal injury and natural resource claims remain in the MDL and wastewater claims are not, generally, covered by the proposed settlements.



PFAS MDL – Status

DuPont

- Final Fairness hearing occurred on **December 14, 2023**
- Order approving Settlement on **February 8, 2024**
- Notice of appeal timely filed
- Effective date of the settlement **April 16, 2024**

3M

- Final Fairness hearing set for **February 2, 2024**
- Order approving Settlement on **April 1, 2024**
- Notice of appeal filed timely filed
- Effective date of the settlement **April 29, 2024**

Federal Funding for PFAS

Bipartisan Infrastructure Law makes nearly $5 billion in grants available to disadvantaged communities (2022-2026):

What it covers:

- Efforts to address emerging contaminants in drinking water that would benefit a small or disadvantaged community on a per household basis;
- Technical assistance to evaluate emerging contaminant problems;
- Programs to provide household water-quality testing, including testing for unregulated contaminants;
- Local contractor training; and
- Activities necessary and appropriate for a state to respond to an emerging contaminant.

Who can qualify:

- Public water systems and homes served by privately owned wells located in the fifty states and Puerto Rico, Guam, the U.S. Virgin Islands, American Samoa and the Commonwealth of the Northern Mariana Islands.
- States are to use this funding to make grants to eligible emerging contaminant projects and/or activities in small or disadvantaged communities.
- National tribal allotment of 2% of the appropriations.

Bipartisan Infrastructure Law provides an additional loans through the Drinking Water State Revolving Fund:

- $4 billion specifically to fund PFAS related projects
- $12 billion for safer drinking water generally

CERCLA – Seeking constructive policy and urging the U.S. EPA, Congress, and other decision-makers to implement law and policies to mitigate financial impact for PFAS under CERCLA.

LIHWAP - Water organizations urging Congress and other decision-makers to implement permanent funding for a water and wastewater low-income assistance program like LIHEAP.

Future Challenges (from the Utility Perspective)

- **Thinking ahead, is PFAS sticking around for UCMR6?**
- **Additional research is needed on the fate of PFAS from granular activated carbon reactivation and ion exchange regeneration incineration methods**
- **Additional cost and complexity to treat some short-chain PFAS compounds if required by evolving state and/or federal regulations**
  - Effectiveness of GAC and IX not confirmed for all 12k+ PFAS compounds
  - High-pressure membrane treatment (reverse osmosis or nanofiltration) would result in substantially higher treatment cost
- **Designation of PFAS as hazardous substances under CERCLA**
  - Exemption of water and wastewater systems not guaranteed
- **Addressing PFAS in wastewater**
  - No viable treatment technology to address PFAS at utility-scale within conventional wastewater treatment plants
  - Prohibitions on land application of biosolids could significantly increase operating expenses

How We Can Manage Our Exposure

PFAS exposure can vary depending on your local environment, but you can take steps to reduce the PFAS around you. You can identify PFAS in products by looking for "fluoro" or "perfluoro" in an ingredients list. Choosing products that do not have PFAS can require some research, but it is an effective way to reduce your exposure. It can also mean giving up some product features such as *non-stick*, or *water-* or *stain-resistant*. Consider replacing older and worn-out products that have these features. Studies have also found that cooking more of your meals at home can lower PFAS blood levels.

Stay Informed

Look to official sources of information to stay up-to-date on the latest news. Reliable sources include:

- The U.S. Centers for Disease Control
- The U.S. Environmental Protection Agency

What Can I Do?

Avoid buying non-stick cookware that has PFAS and stain-resistant furniture and carpeting. Look for "fluoro" or "perfluoro" in an ingredients list or ask the manufacturer.

Limit eating foods packed in materials that use PFAS. Common food packaging that may have PFAS includes microwave popcorn bags, fast food boxes (like french fry containers and pizza boxes), and bakery bags.

Minimize the dust in your home to limit PFAS particles in the air. Change your home's air filter on a regular basis and leave your shoes at the door to avoid tracking in dirt and pollutants.

Avoid personal care products that have PFAS. These include certain types of dental floss, nail polish, facial moisturizers, and cosmetics.

Learn about the PFAS levels in your local drinking water. If you want an at-home treatment option, look at the NSF International list of products certified to remove PFAS from drinking water in the home.

PFASCentral.org maintains a list of manufacturers and retailers that have taken steps to remove PFAS chemicals from their products.

What to know about PFAS

Thank you!

Dr. Lauren Weinrich
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