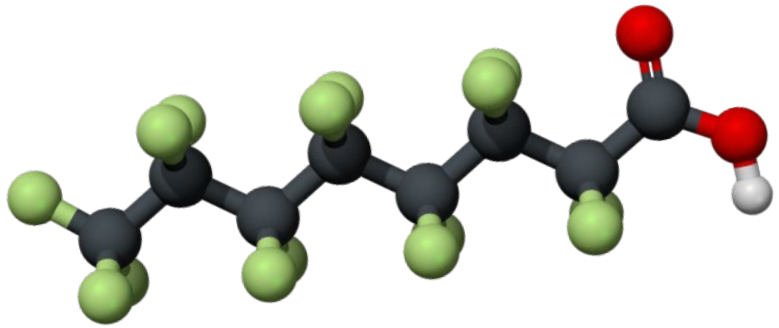
The Uninvited Party Guest:
A PFAS Regulatory and Technical Update

GSI ENVIRONMENTAL

GWPC UIC CONFERENCE



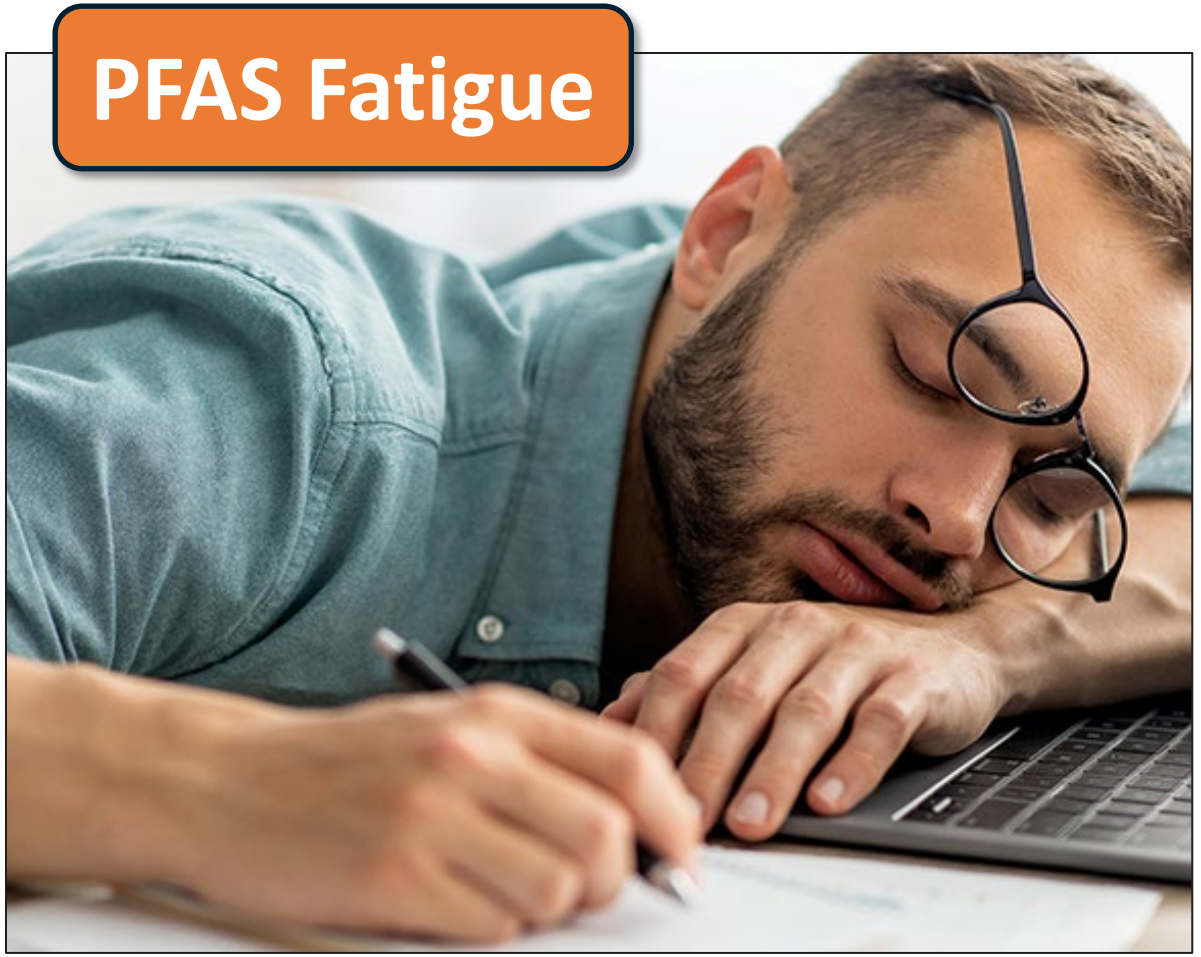
28 February 2024

Jonathan M. Skaggs, PG
Stephen D. Richardson, PhD, PE

Groundwater Protection Council
UIC Conference

Disclaimer

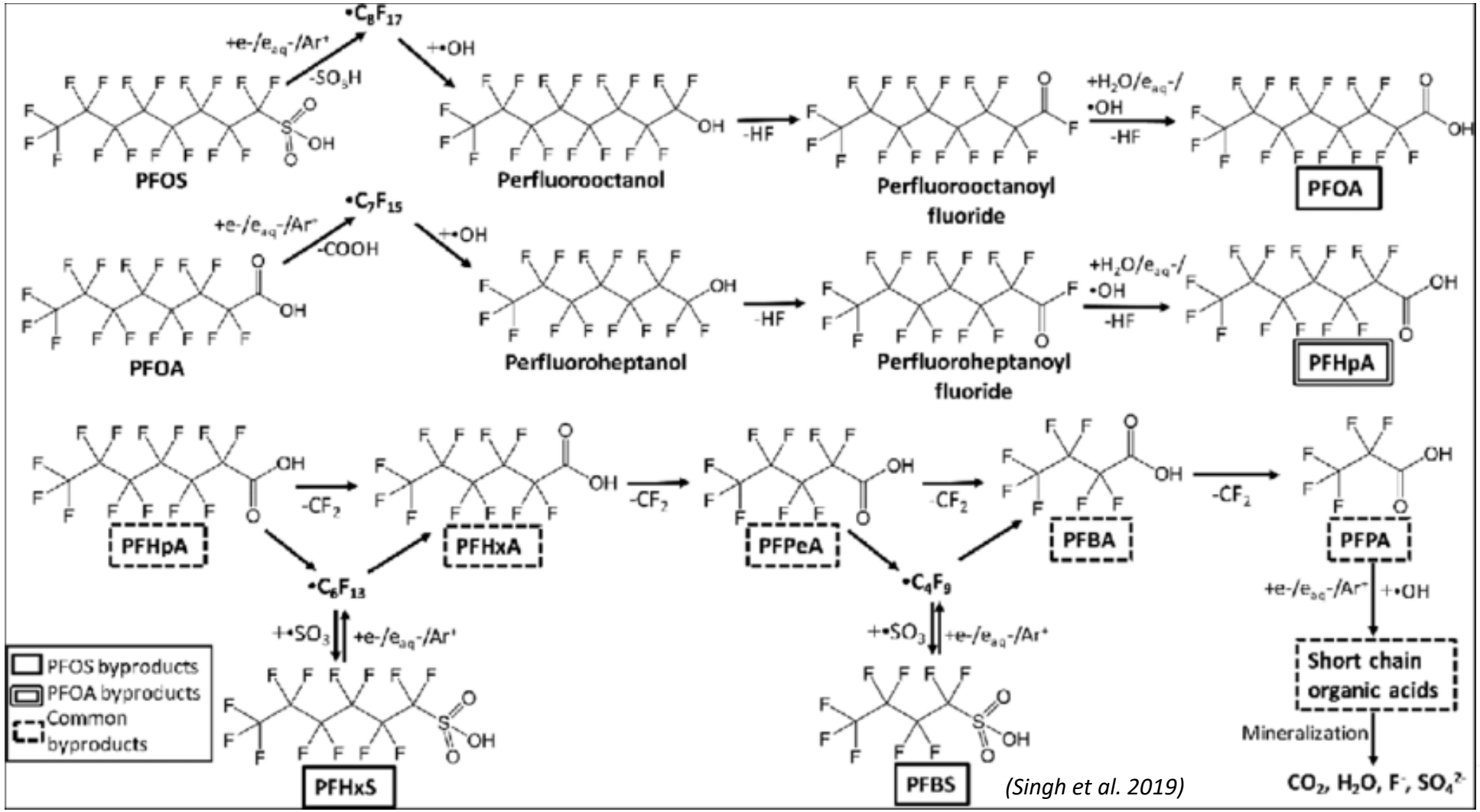
- Narcolepsy
- Apathy
- Intense yawning
- Anger/frustration



Key Points

- Large chemical class with **COMPLEX** chemistries
- **OVERHEATED** media and NGO environment
- **ENERGIZED regulatory agencies**
- Huge **VARIATION** in regulatory thresholds
- EPA's proposals have **WIDE-REACHING** impacts
- PFAS management approaches available

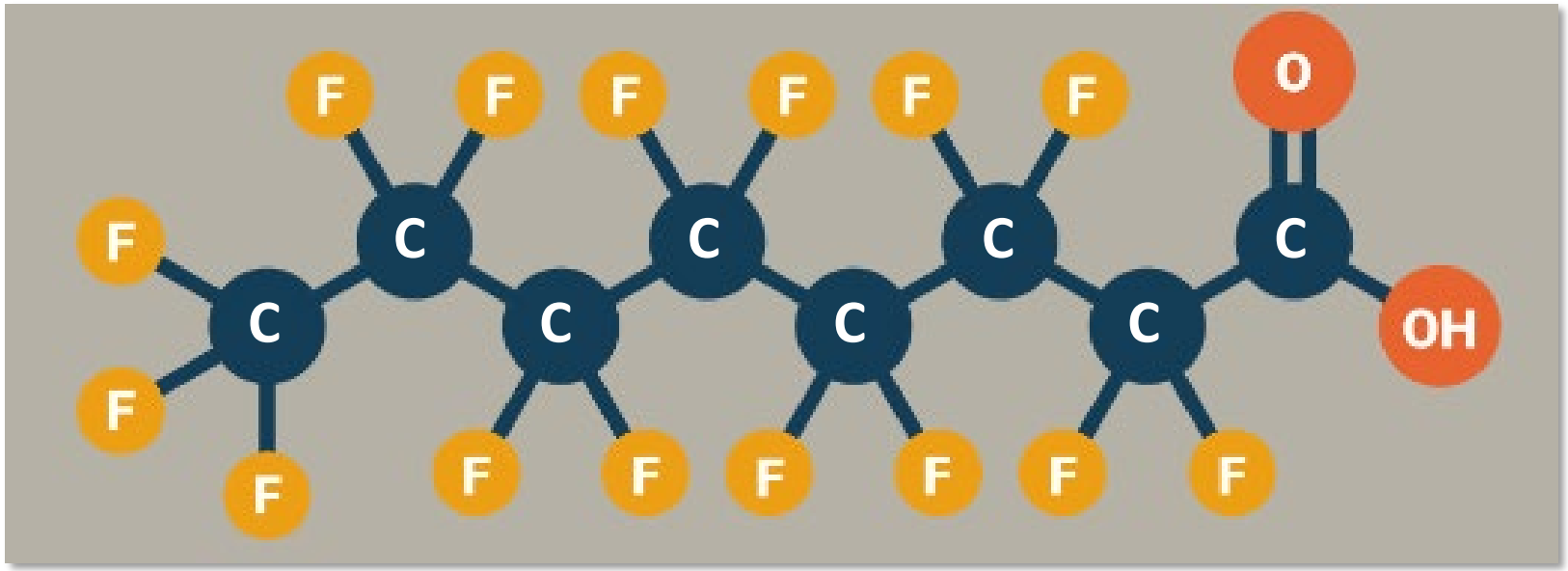
What are PFAS?



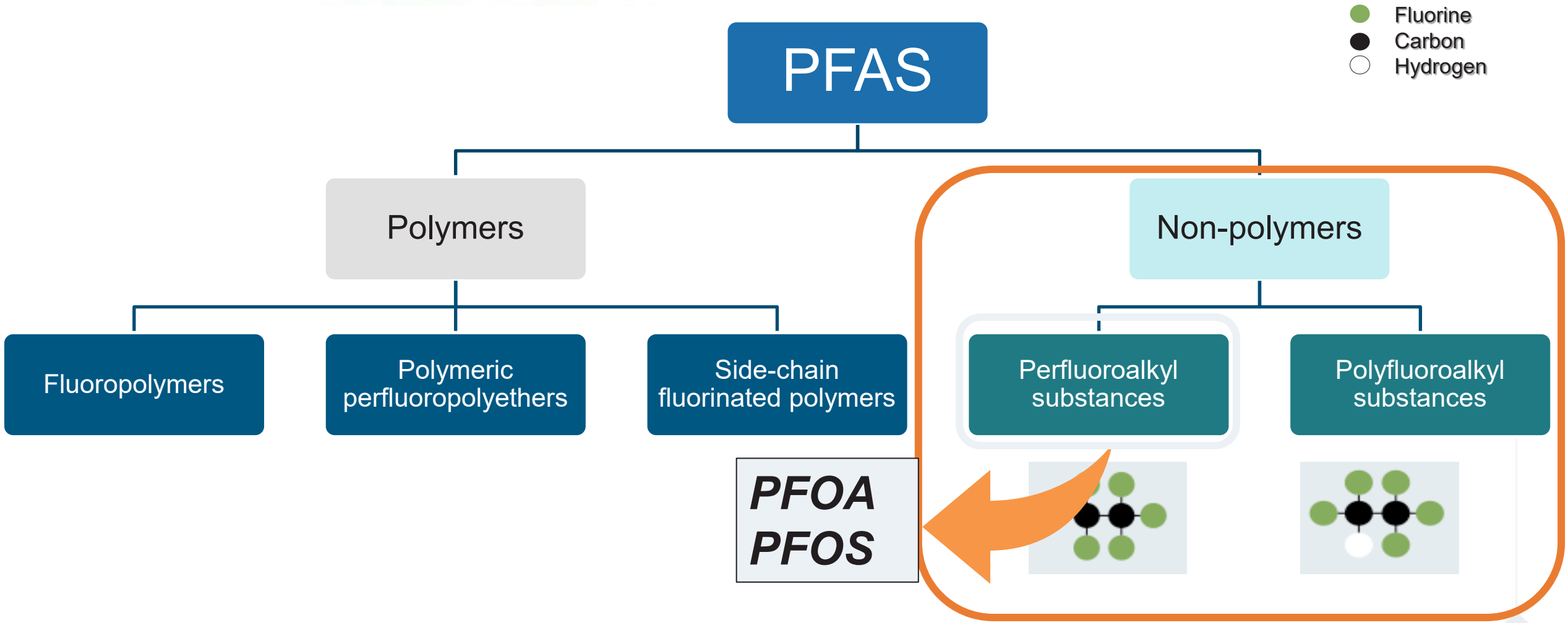
(Singh et al. 2019)

What are PFAS?

Per- and poly**f**luoro**a**lkyl **s**ubstances

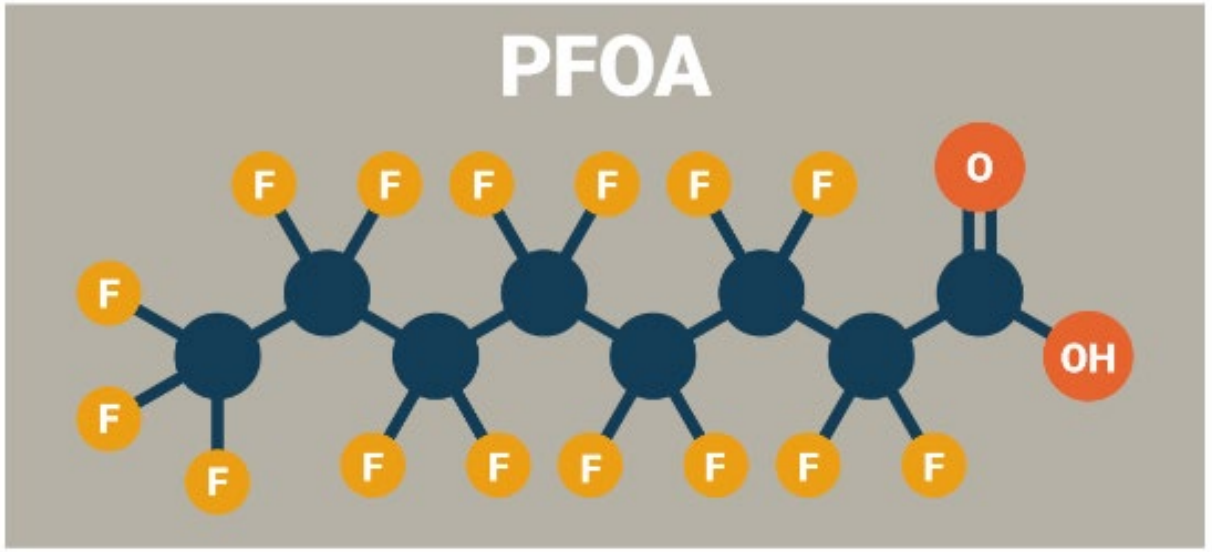


12,000+ PFAS Grouped by Chemistry
All Very Different Chemistries and Uses

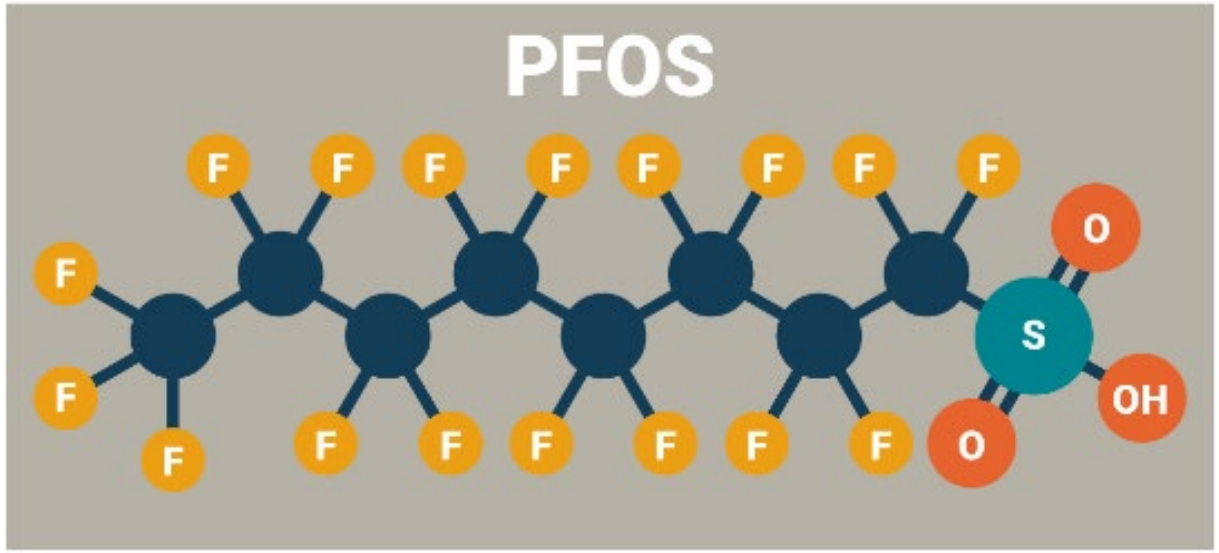


What are PFAS?

Perfluorooctanoic acid

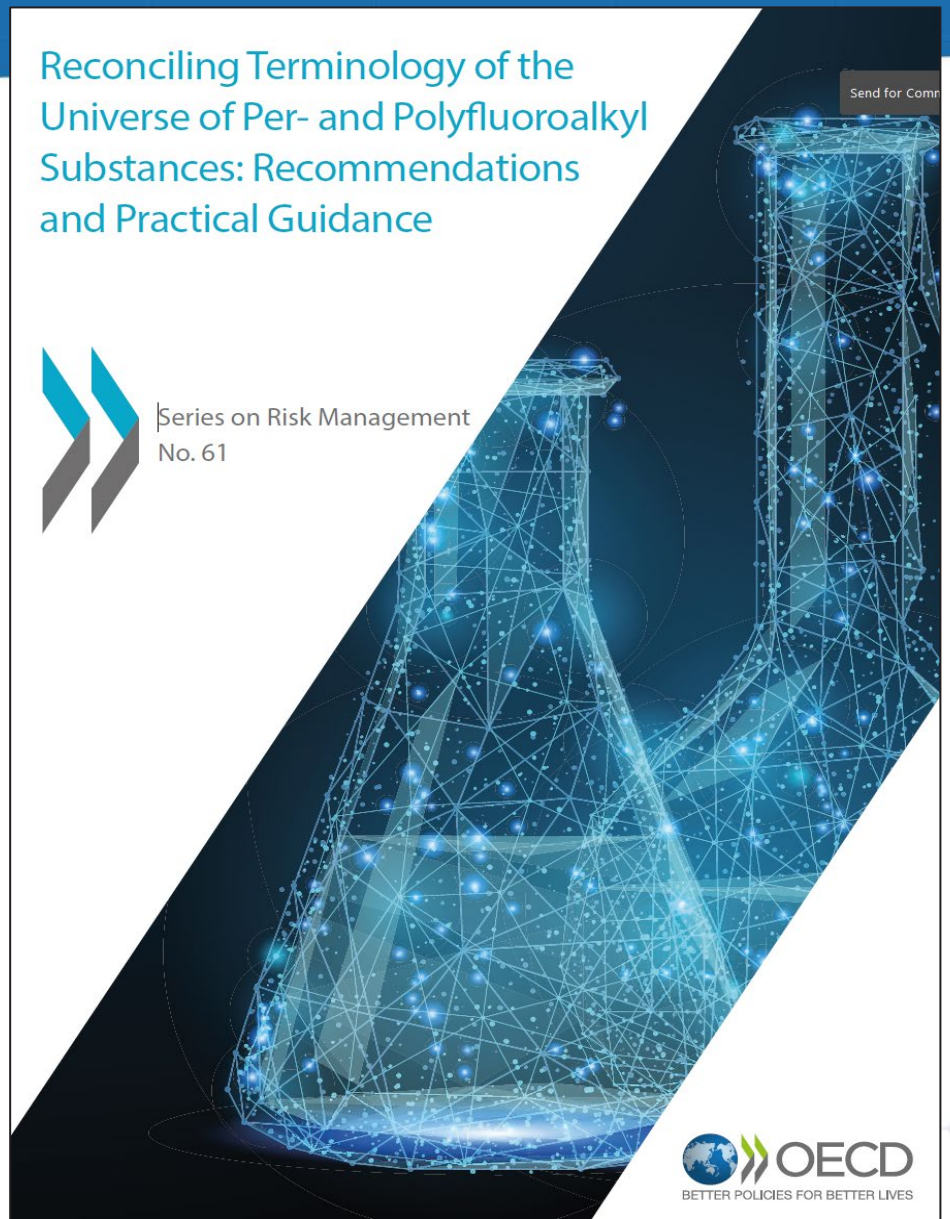


Perfluorooctanesulfonic acid



What are PFAS?

"PFAS" is a broad, general, non-specific term, which should only be used when talking about all the substances included in the PFAS definition… Otherwise, it would introduce **ambiguity, and factual inaccuracies and miscommunication**…



OECD (2021), *Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances: Recommendations and Practical Guidance*, OECD Series on Risk Management, No. 61, OECD Publishing, Paris. July 2021

PFAS are used in a Wide Range of Industries

Examples of Industries

Automotive/aerospace	Nuclear industry
Biotechnology/medical	Oil & gas industry
Building and construction	Pharmaceutical industry
Chemical industry	Photographic industry
Electroplating	Production of plastic/rubber
Electronic industry	Renewable energy
Energy sector	Semiconductor industry
Food production industry	Telecommunication
Machinery and equipment	Textile production
Metals manufacturing	Watchmaking industry
Mining	Wood industry

Use Categories

Aerosol propellants	Metallic/ceramic surfaces
Antifoaming agent	Pipes, pumps, fittings, liners
Ammunition	Plastic and rubber
Coatings, paints, varnishes	Refrigerant systems
Dispersions	Resins
Fire-fighting foam	Sealants and adhesives
Flame retardants	Soldering
Lubricants and greases	Wire and cable insulation, gaskets and hoses

Modified from Gluege et al. 2020

What are PFAS?

- **Some** are environmentally persistent
- **Some** are mobile in the environment
- **Some** can bioaccumulate in humans/food chain
- **All** regulatory thresholds at **low** levels

Why Now?

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Nearly half of the tap water in the US is contaminated with 'forever chemicals,' government study finds

SUNDAY MORNING ›

PFAS: The water contaminant that scientists say isn't going away

'Forever Chemicals' Are Everywhere. What Are They Doing to Us?

PFAS lurk in so much of what we eat, drink and use. Scientists are only beginning to understand how they're impacting our health — and what to do about them.

How can I avoid eating food with 'forever' chemicals?

It's hard to avoid PFAS, but experts say there are ways to mitigate your exposure to the man-made chemicals

Why Now?

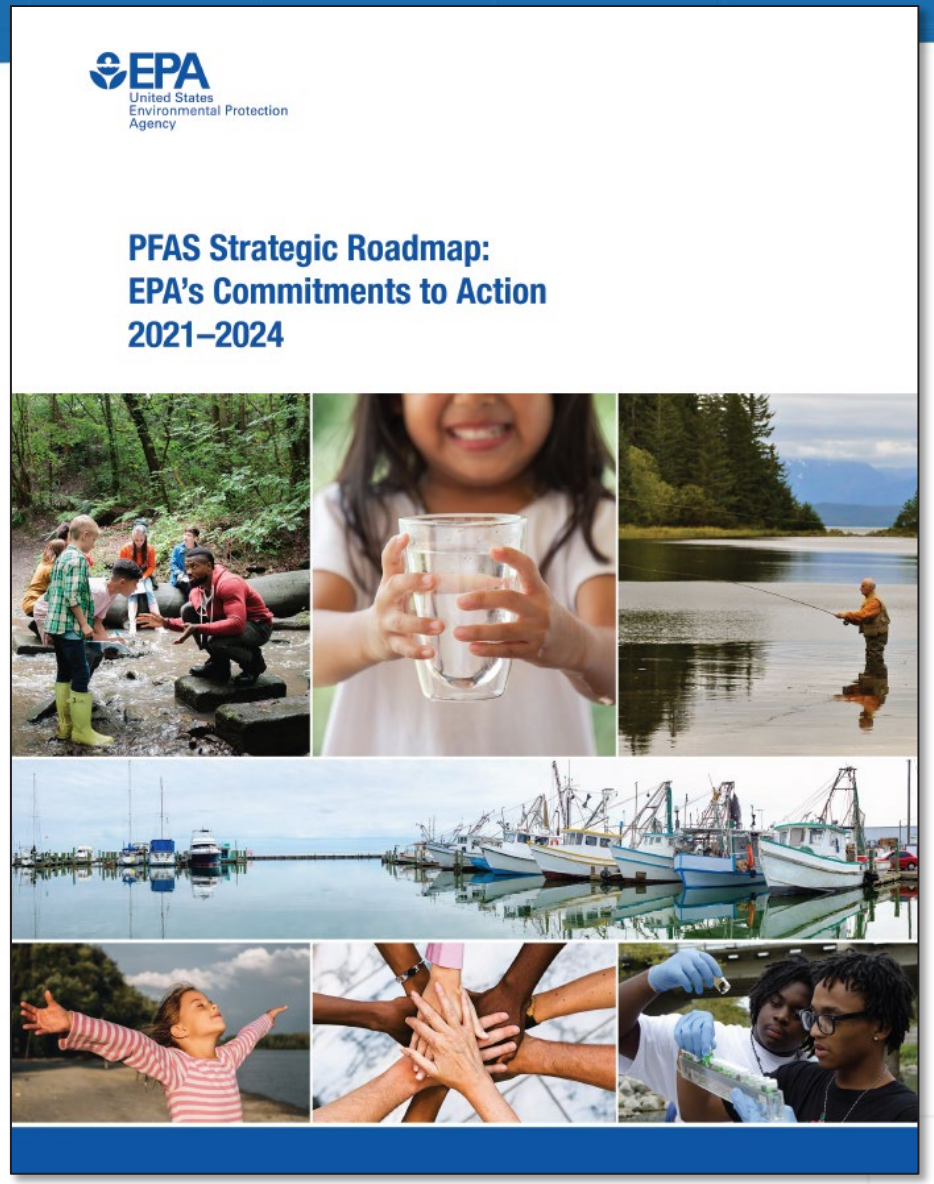
Energized regulatory focus on a federal level and increasing number states

States take matters into their own hands to ban 'forever chemicals'

By Kimberly Kindy

June 5, 2023 at 6:00 a.m. EDT

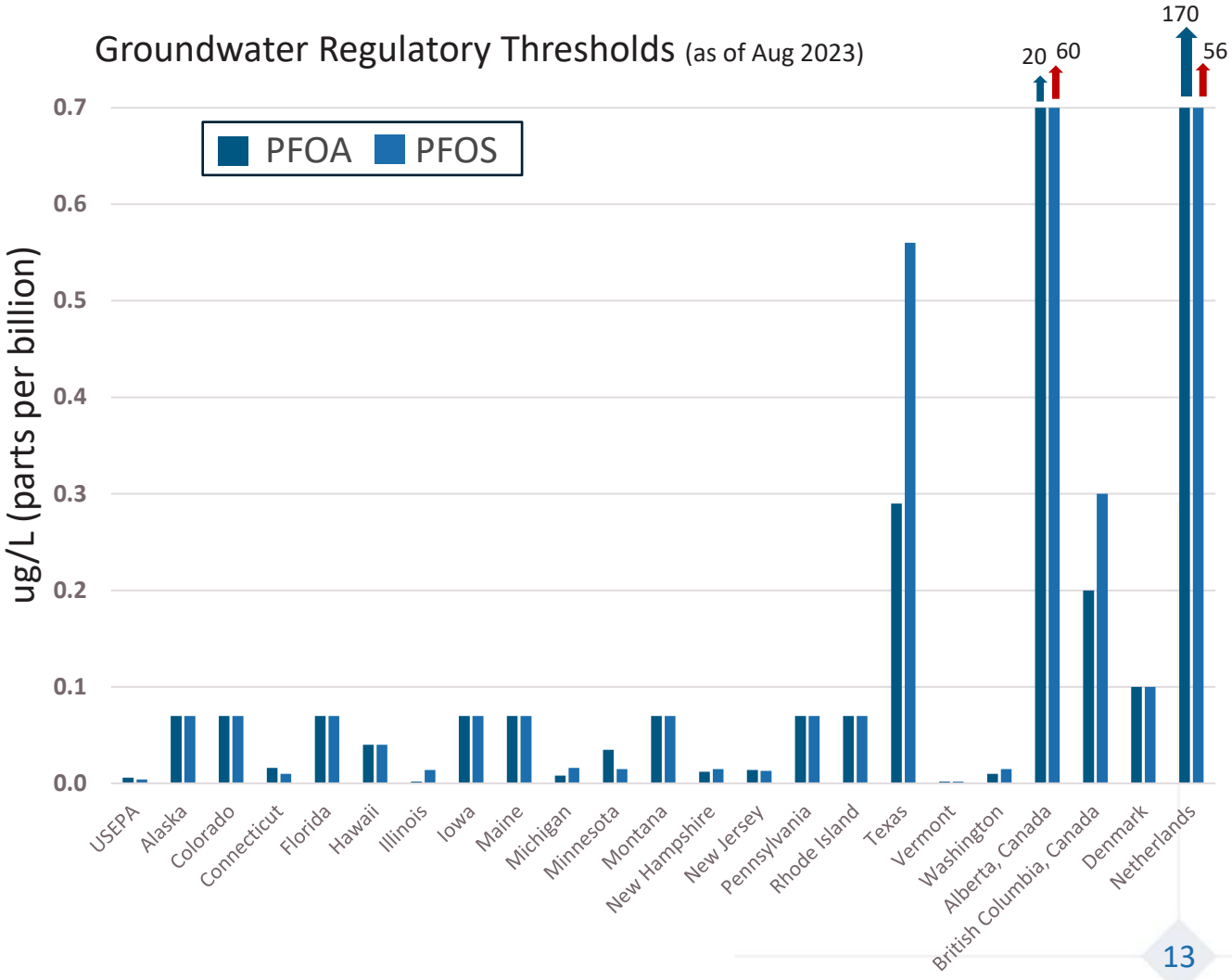
This year alone, 195 new bills were introduced in dozens of state legislatures, seeking to require that an expanding list of products be PFAS-free. Some states have set deadlines that require all or most products made or sold in their states to be PFAS-free, with Minnesota the latest to pass such a measure last month.



Groundwater Regulatory Thresholds

Groundwater cleanup values vary DRAMATICALLY

- ✓ Less than half of states have screening or cleanup values
- ✓ Based on various state-specific toxicity values or outdated EPA information



Full list of numbers can be found: https://pfas-1.itrcweb.org/fact-sheets/

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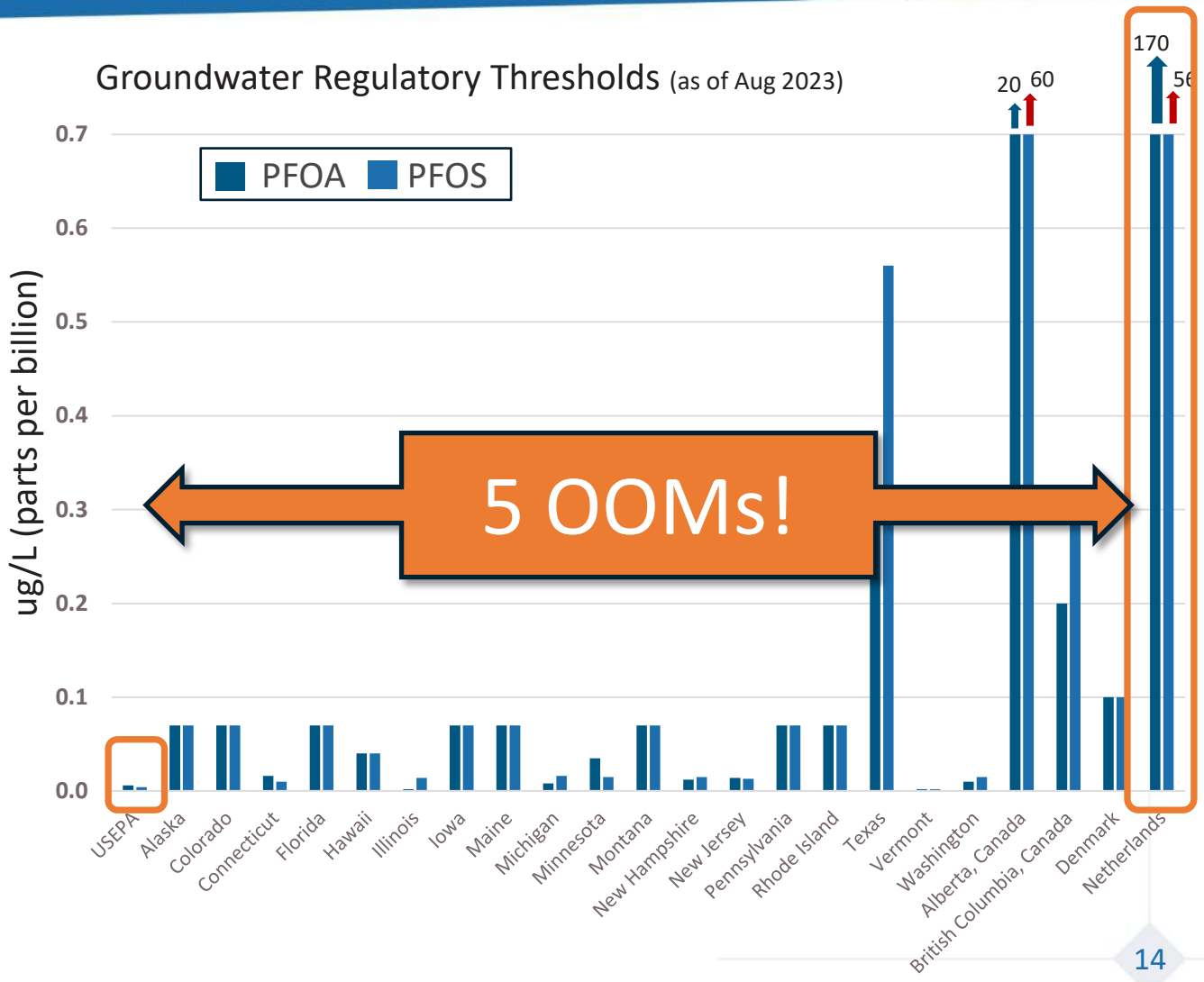

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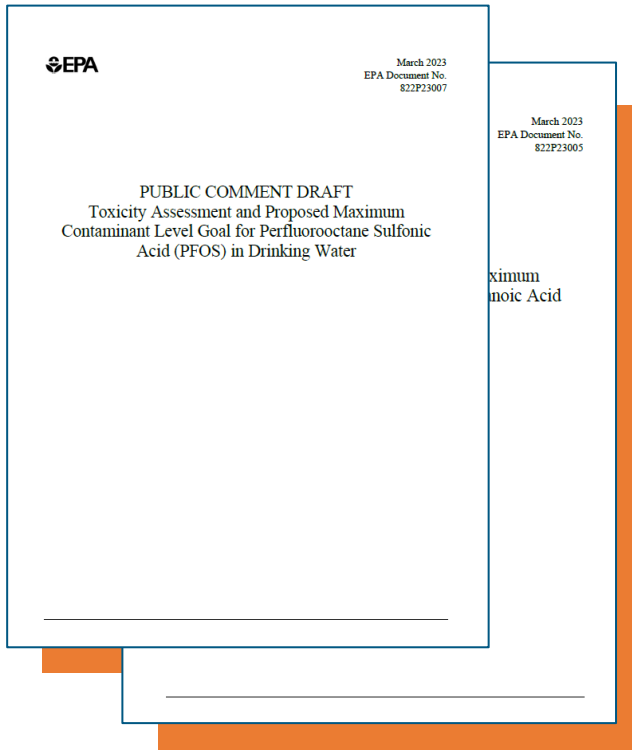
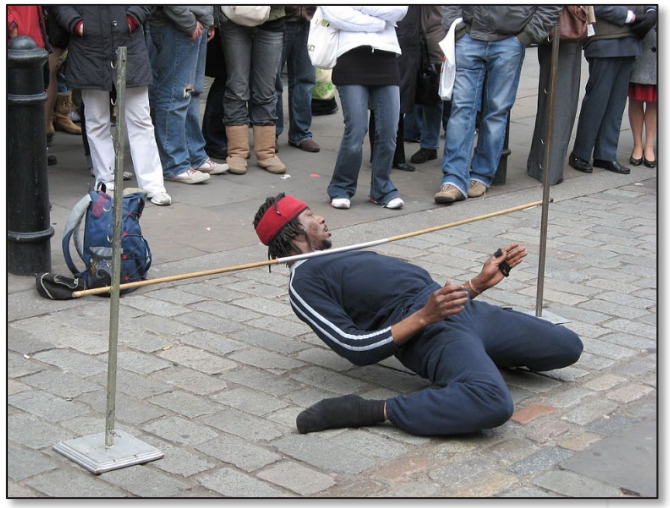
EPA's Proposed PFAS MCLs



Final Regulatory Determination for MCLs

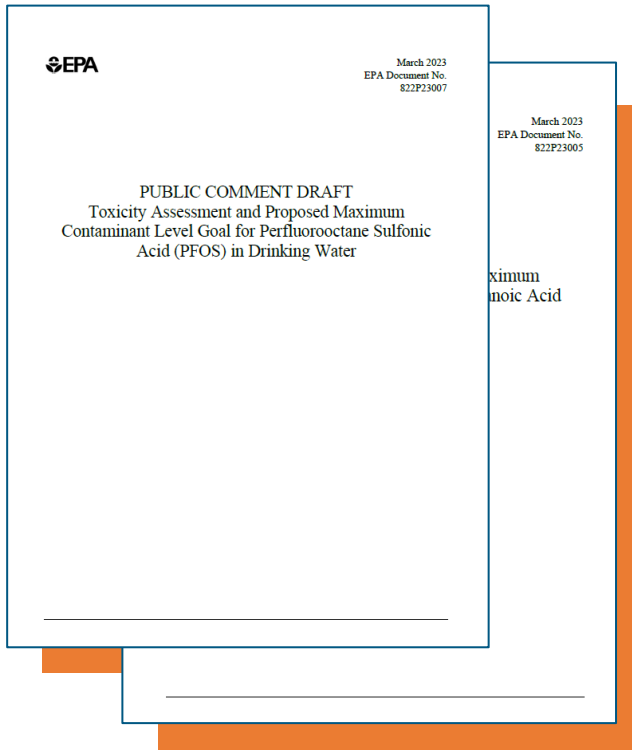
- ✓ PFOA/PFOS MCLs proposed at ***Practical Quantitation Limit***

PFAS	Proposed MCL (ppt)
PFOA	4
PFOS	



- ✓ Hazard index approach for four other PFAS (PFNA, PFBS, Gen-X, PFHxS)

EPA's Proposed PFAS MCLs

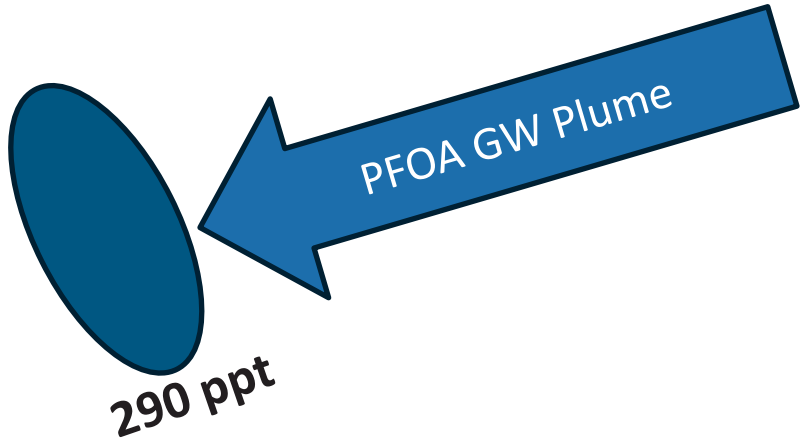


120,000+ Comments Received!

- ✓ Limited health effect studies
- ✓ HI approach contrary to EPA policy
- ✓ Estimated cost to comply too low
- ✓ Overestimates quantifiable benefits
- ✓ Disproportionate impacts on underserved communities

Final Rule- Any Day Now!

Implications of EPA's Proposed MCLs



$^{GW}GW_{Ing}$ PCLs*

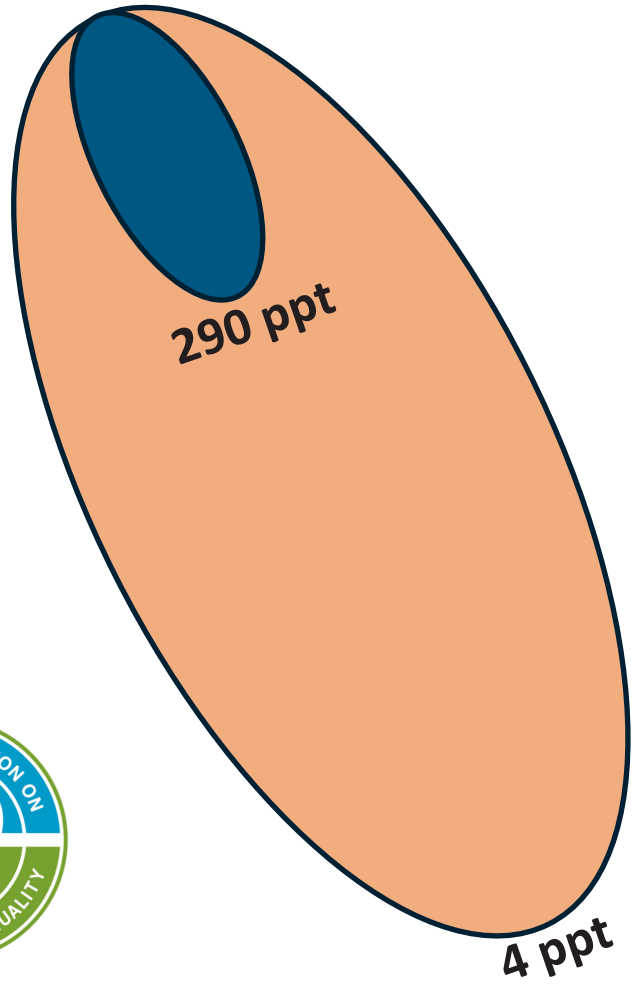
PFOS
590 ppt

PFOA
290 ppt

4 ppt

* For Class I and II GWBUs

Implications of EPA's Proposed MCLs



$^{GW}GW_{Ing}$ PCLs*

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590 ppt

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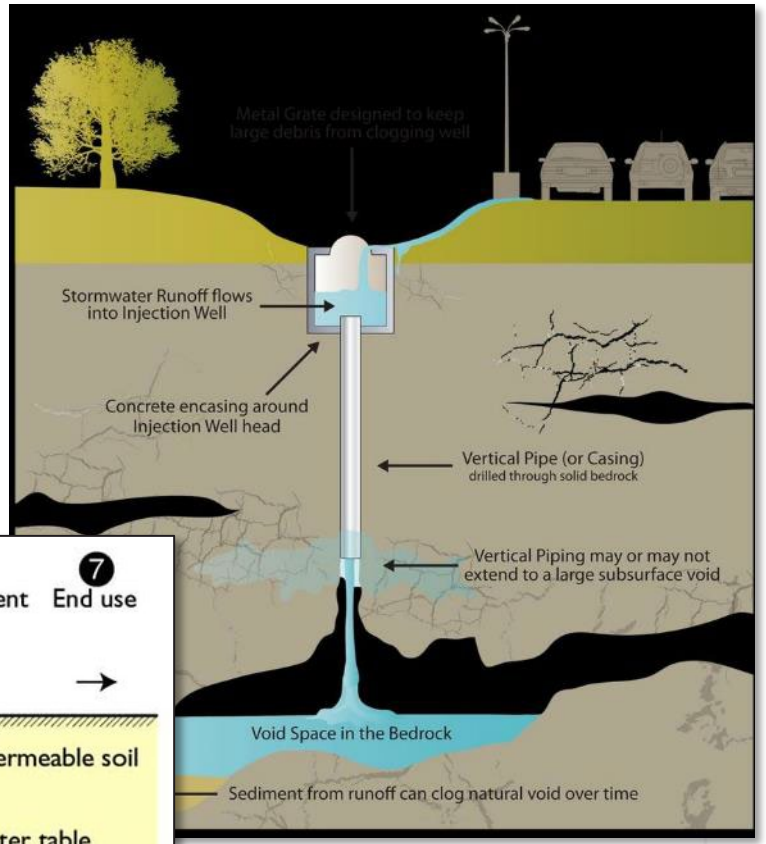
* For Class I and II GWBUs

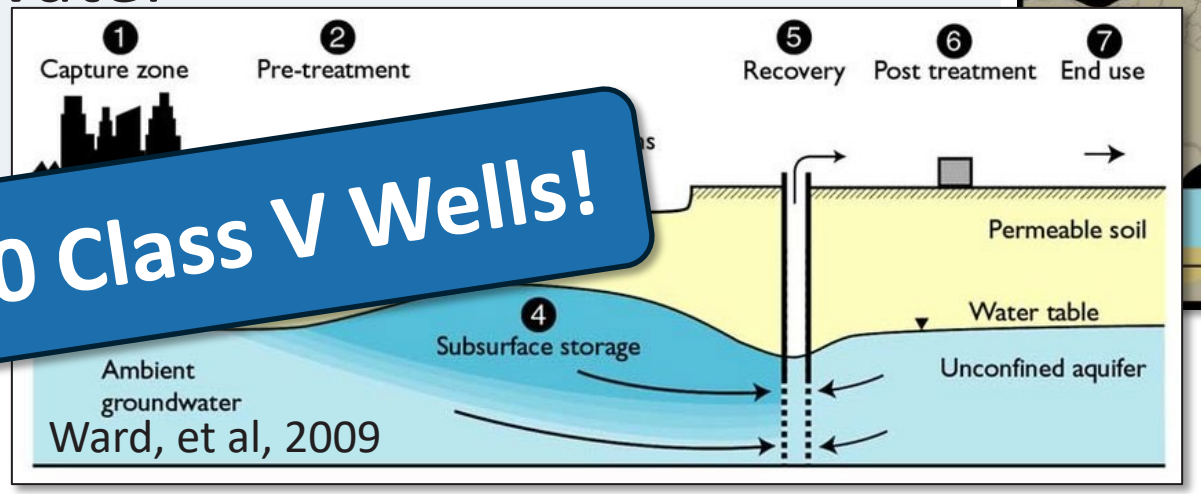
Implications of EPA's Proposed MCLs

Class V UIC Wells

- **Incidental PFAS presence in non-waste streams**
  - Raw source water
  - Reused wastewater
  - Stormwater



580,000 Class V Wells!



Ward, et al, 2009

Fifth Unregulated Contaminant Monitoring Rule
Initial Results – July 2023

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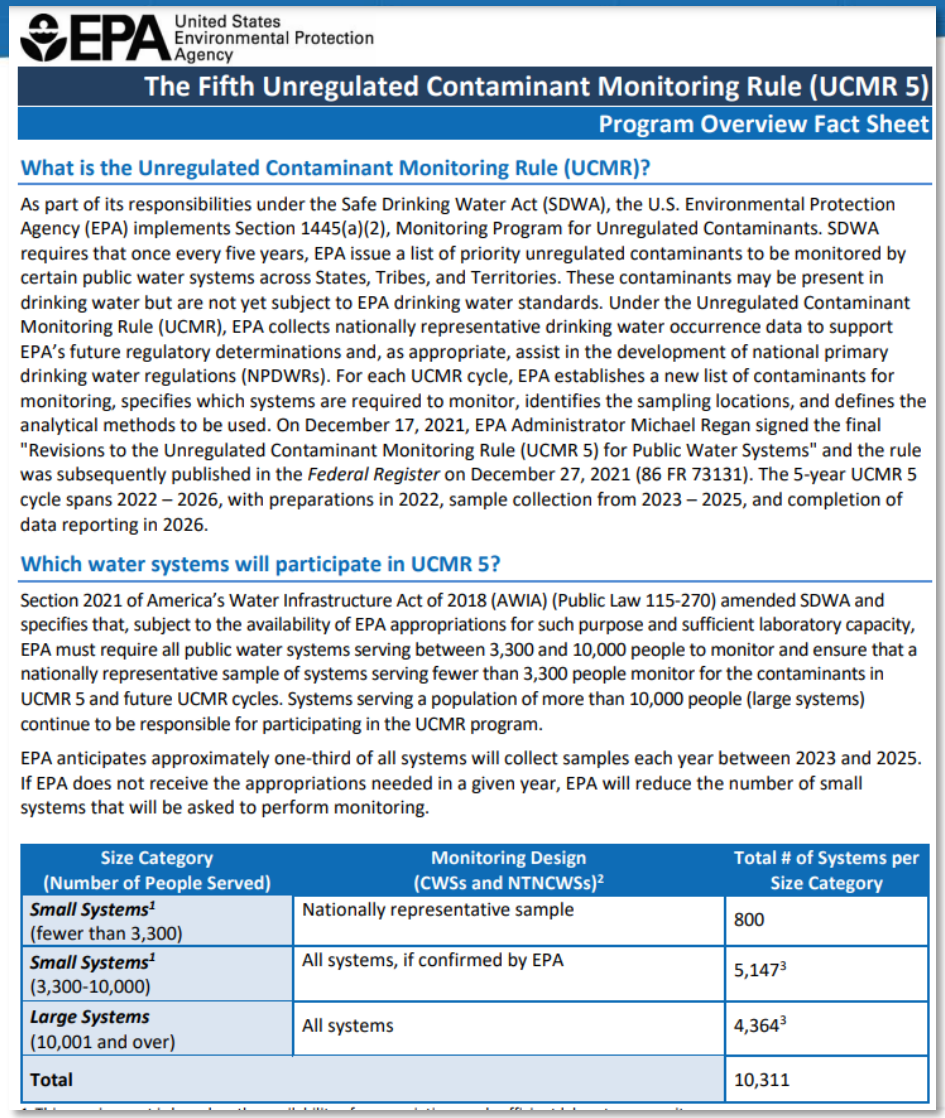
EPA

The Fifth Unregulated Contaminant Monitoring Rule (UCMR 5)
Data Summary: July 2023

THE FACTS

- 4,665 PWS sampled
- PFOA or PFOS were not detected in 92% of samples
- Only 13 of 29 PFAS detected



EPA United States Environmental Protection Agency

The Fifth Unregulated Contaminant Monitoring Rule (UCMR 5)
Program Overview Fact Sheet

What is the Unregulated Contaminant Monitoring Rule (UCMR)?

As part of its responsibilities under the Safe Drinking Water Act (SDWA), the U.S. Environmental Protection Agency (EPA) implements Section 1445(a)(2), Monitoring Program for Unregulated Contaminants. SDWA requires that once every five years, EPA issue a list of priority unregulated contaminants to be monitored by certain public water systems across States, Tribes, and Territories. These contaminants may be present in drinking water but are not yet subject to EPA drinking water standards. Under the Unregulated Contaminant Monitoring Rule (UCMR), EPA collects nationally representative drinking water occurrence data to support EPA's future regulatory determinations and, as appropriate, assist in the development of national primary drinking water regulations (NPDWRs). For each UCMR cycle, EPA establishes a new list of contaminants for monitoring, specifies which systems are required to monitor, identifies the sampling locations, and defines the analytical methods to be used. On December 17, 2021, EPA Administrator Michael Regan signed the final "Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems" and the rule was subsequently published in the *Federal Register* on December 27, 2021 (86 FR 73131). The 5-year UCMR 5 cycle spans 2022 – 2026, with preparations in 2022, sample collection from 2023 – 2025, and completion of data reporting in 2026.

Which water systems will participate in UCMR 5?

Section 2021 of America's Water Infrastructure Act of 2018 (AWIA) (Public Law 115-270) amended SDWA and specifies that, subject to the availability of EPA appropriations for such purpose and sufficient laboratory capacity, EPA must require all public water systems serving between 3,300 and 10,000 people to monitor and ensure that a nationally representative sample of systems serving fewer than 3,300 people monitor for the contaminants in UCMR 5 and future UCMR cycles. Systems serving a population of more than 10,000 people (large systems) continue to be responsible for participating in the UCMR program.

EPA anticipates approximately one-third of all systems will collect samples each year between 2023 and 2025. If EPA does not receive the appropriations needed in a given year, EPA will reduce the number of small systems that will be asked to perform monitoring.

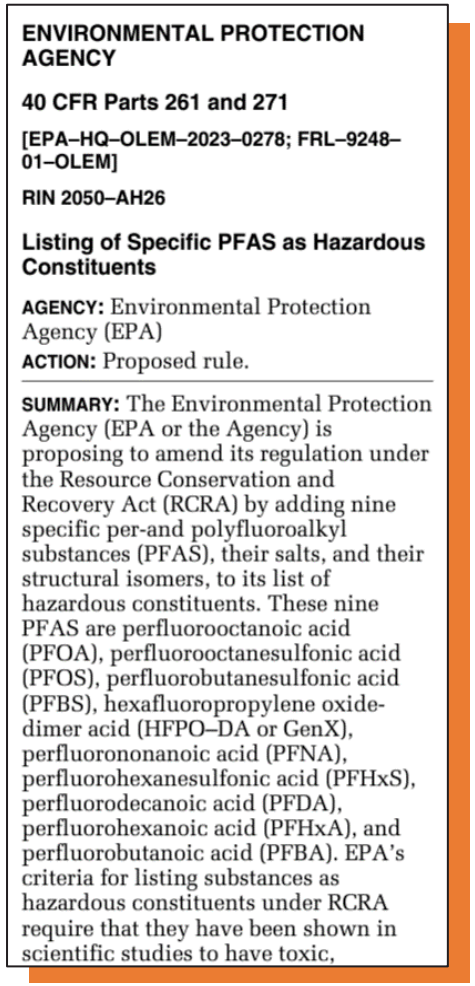
Size Category (Number of People Served)	Monitoring Design (CWSs and NTNCWSs)[2]	Total # of Systems per Size Category
Small Systems[1] (fewer than 3,300)	Nationally representative sample	800
Small Systems[1] (3,300-10,000)	All systems, if confirmed by EPA	5,147[3]
Large Systems (10,001 and over)	All systems	4,364[3]
Total		10,311

Cleanup Programs – More than GW / DW

- **Soil Standards**
  - 21 states (incl. TX), USEPA
  - Human Health and GW migration
- **Surface Water Quality Criteria**
  - USEPA, WI, FL, MI, NY
  - Human Health, Fish Consumption, Eco
- **Industrial Air Standards**
  - MI, NH, NY, MN
  - Route-to-route extrapolation
- **Biosolids Land Application**
  - CA, ME

Image from: https://www.americangeosciences.org/critical-issues/faq/what-affects-quality-surface-and-groundwater

RCRA Corrective Action Authority



ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 261 and 271

[EPA–HQ–OLEM–2023–0278; FRL–9248–01–OLEM]

RIN 2050–AH26

Listing of Specific PFAS as Hazardous Constituents

AGENCY: Environmental Protection Agency (EPA)

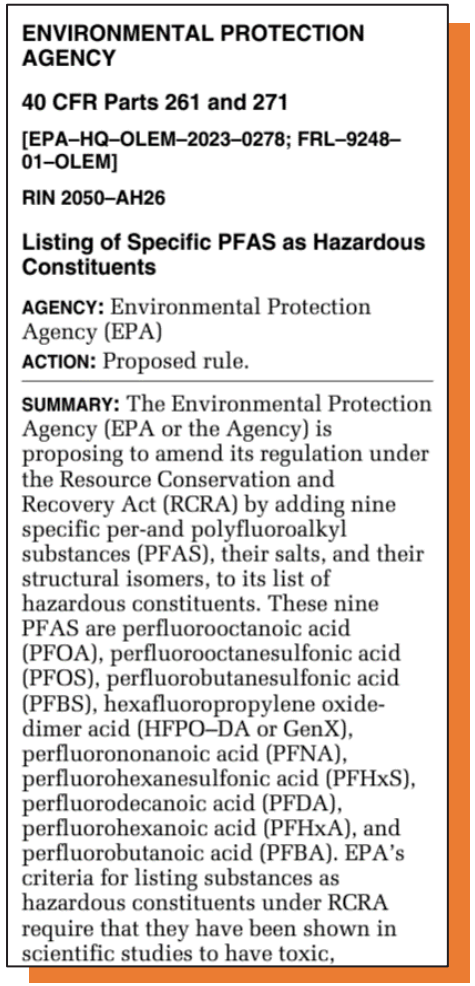
ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA or the Agency) is proposing to amend its regulation under the Resource Conservation and Recovery Act (RCRA) by adding nine specific per-and polyfluoroalkyl substances (PFAS), their salts, and their structural isomers, to its list of hazardous constituents. These nine PFAS are perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorobutanesulfonic acid (PFBS), hexafluoropropylene oxide-dimer acid (HFPO–DA or GenX), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluorodecanoic acid (PFDA), perfluorohexanoic acid (PFHxA), and perfluorobutanoic acid (PFBA). EPA's criteria for listing substances as hazardous constituents under RCRA require that they have been shown in scientific studies to have toxic,

Two proposed RCRA rules to address PFAS

- **Lists of 9 PFAS as Hazardous Constituents – Appendix VIII**
  - First step to regulate waste "cradle-to-grave"
  - RCRA Corrective Action
- **Clarifies EPA's (and states) Corrective Action Authority**
  - Revises definition "hazardous waste" to broader statutory definition, instead of narrower regulatory definition
  - Clarifies EPA authority for cleanup of emerging contaminants not yet been designated hazardous waste

RCRA Corrective Action Authority



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Public Comment Ends: **April 8**

Public Comment Ends: **March 11**

CERCLA Hazardous Substance Designation

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 302

[EPA–HQ–OLEM–2019–0341; FRL–7204–02–OLEM]

RIN 2050–AH09

Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (''CERCLA'' or ''Superfund''), the Environmental Protection Agency (EPA or the Agency) is proposing to designate perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), including their salts and structural isomers, as hazardous substances. CERCLA authorizes the Administrator to promulgate regulations designating as hazardous substances such elements, compounds, mixtures, solutions, and substances which, when released into the environment, may present substantial danger to the public health or welfare or the environment. Such a designation would ultimately facilitate cleanup of contaminated sites and reduce human exposure to these ''forever'' chemicals.

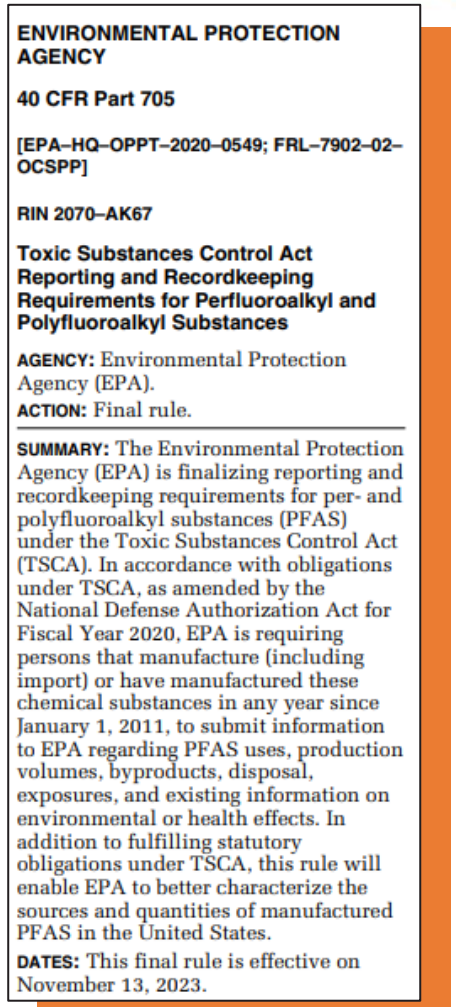
64,000+ Comments Received!

- ✓ Cost burden is inadequate
- ✓ Significant expansion of site, re-openers
- ✓ Increase disposal costs
- ✓ Disproportionate liability on water service providers

PFAS PAs/SIs/RIs, OH MY!

Final Rule Mar. 2024?

PFAS TSCA Reporting Requirements



ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 705

[EPA–HQ–OPPT–2020–0549; FRL–7902–02–OCSPP]

RIN 2070–AK67

Toxic Substances Control Act Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) is finalizing reporting and recordkeeping requirements for per- and polyfluoroalkyl substances (PFAS) under the Toxic Substances Control Act (TSCA). In accordance with obligations under TSCA, as amended by the National Defense Authorization Act for Fiscal Year 2020, EPA is requiring persons that manufacture (including import) or have manufactured these chemical substances in any year since January 1, 2011, to submit information to EPA regarding PFAS uses, production volumes, byproducts, disposal, exposures, and existing information on environmental or health effects. In addition to fulfilling statutory obligations under TSCA, this rule will enable EPA to better characterize the sources and quantities of manufactured PFAS in the United States.

DATES: This final rule is effective on November 13, 2023.

PFAS Reporting and Recordkeeping

Due May 2025!

- ✓ Manufactured or imported PFAS for a commercial purpose since January 1, 2011
- ✓ Broad information requirements
  - ✓ Chemical trade names and identities
  - ✓ Volumes
  - ✓ Byproducts
  - ✓ Environmental and health effects for each substance
  - ✓ Number of individuals exposed
  - ✓ Disposal methods

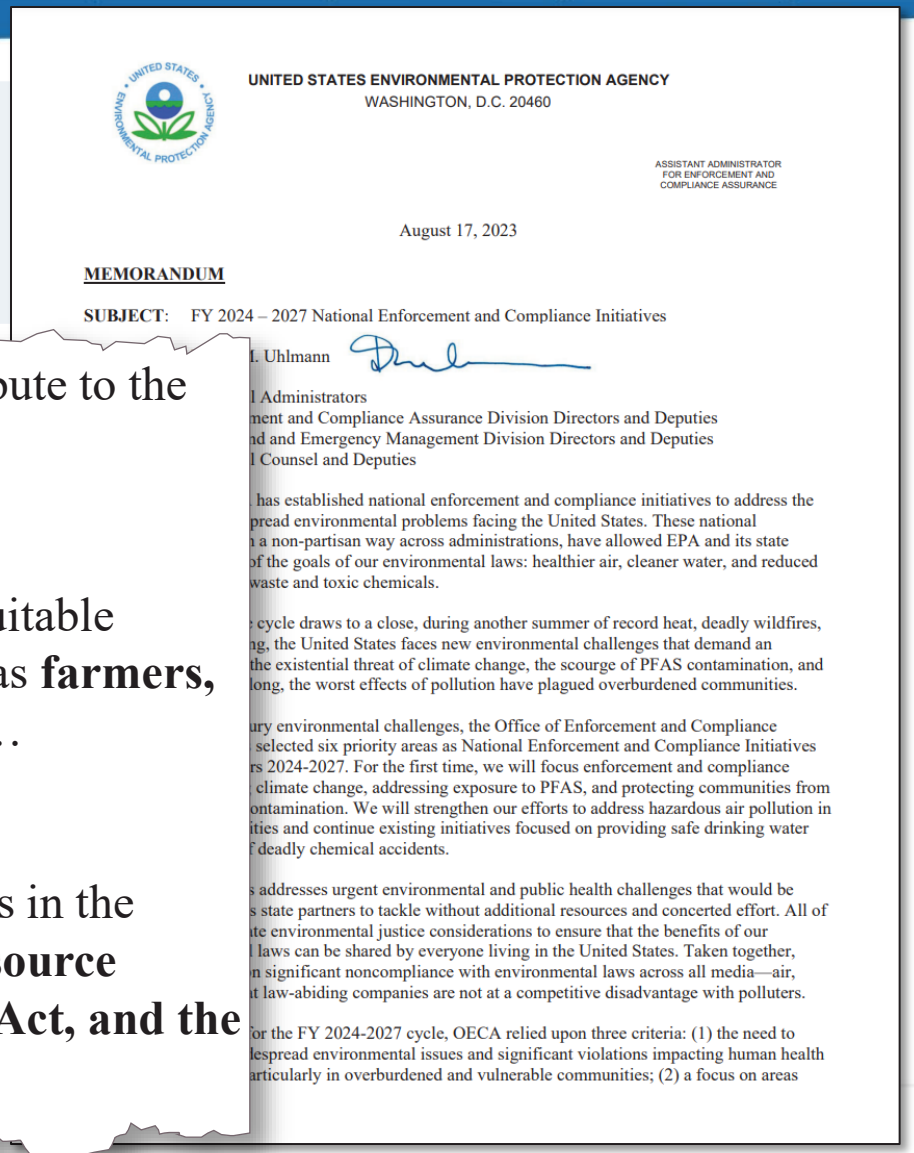
Federal Enforcement Stance

- NECI for PFAS for FY2024-2027

…holding responsible those who significantly contribute to the release of PFAS into the environment, such as **major manufacturers and users of manufactured** PFAS...

…OECA does not intend to pursue entities where equitable factors do not support CERCLA responsibility, such as **farmers, water utilities, airports, or local fire departments**…

…identifying and characterizing the extent of PFAS contamination near PFAS manufacturing/use facilities in the country, using authorities such as **CERCLA, the Resource Conservation and Recovery Act, the Clean Water Act, and the Safe Drinking Water Act**…



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

ASSISTANT ADMINISTRATOR
FOR ENFORCEMENT AND
COMPLIANCE ASSURANCE

August 17, 2023

MEMORANDUM

SUBJECT: FY 2024 – 2027 National Enforcement and Compliance Initiatives

L. Uhlmann

l Administrators
ment and Compliance Assurance Division Directors and Deputies
d and Emergency Management Division Directors and Deputies
l Counsel and Deputies

has established national enforcement and compliance initiatives to address the
pread environmental problems facing the United States. These national
a non-partisan way across administrations, have allowed EPA and its state
f the goals of our environmental laws: healthier air, cleaner water, and reduced
waste and toxic chemicals.

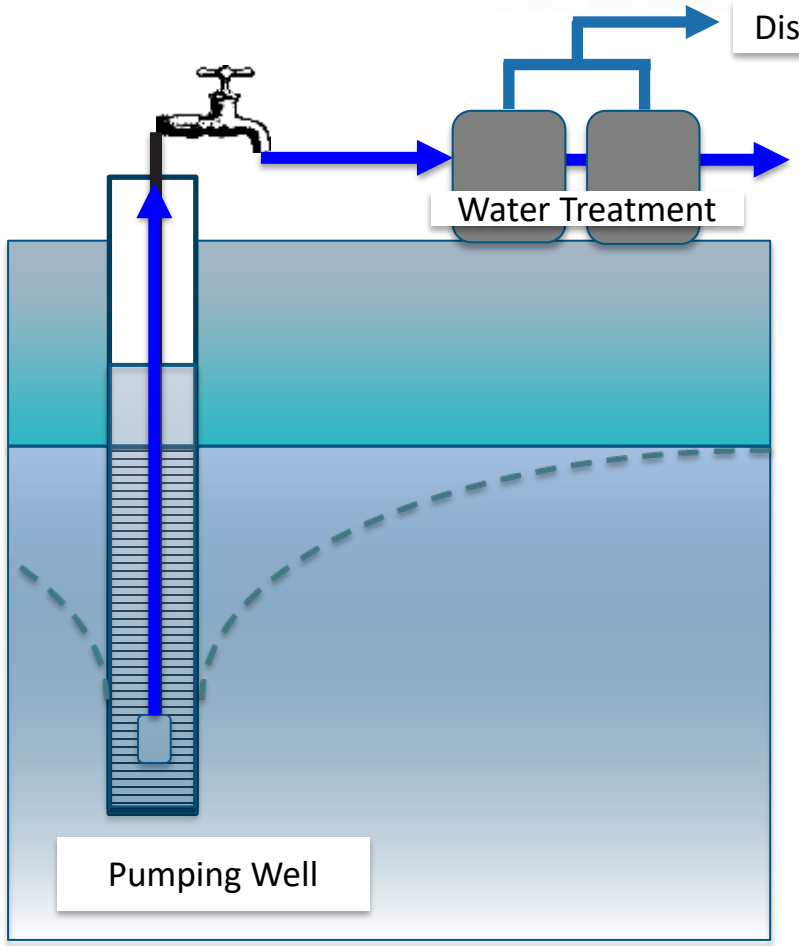
cycle draws to a close, during another summer of record heat, deadly wildfires,
g, the United States faces new environmental challenges that demand an
the existential threat of climate change, the scourge of PFAS contamination, and
long, the worst effects of pollution have plagued overburdened communities.

ry environmental challenges, the Office of Enforcement and Compliance
selected six priority areas as National Enforcement and Compliance Initiatives
s 2024-2027. For the first time, we will focus enforcement and compliance
climate change, addressing exposure to PFAS, and protecting communities from
ontamination. We will strengthen our efforts to address hazardous air pollution in
ities and continue existing initiatives focused on providing safe drinking water
deadly chemical accidents.

addresses urgent environmental and public health challenges that would be
s state partners to tackle without additional resources and concerted effort. All of
te environmental justice considerations to ensure that the benefits of our
l laws can be shared by everyone living in the United States. Taken together,
n significant noncompliance with environmental laws across all media—air,
t law-abiding companies are not at a competitive disadvantage with polluters.

or the FY 2024-2027 cycle, OECA relied upon three criteria: (1) the need to
lespread environmental issues and significant violations impacting human health
rticularly in overburdened and vulnerable communities; (2) a focus on areas

PFAS Water Management Options

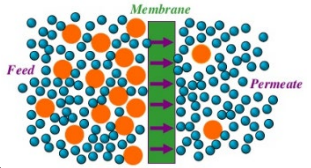


Sorption/Filtration

1. **Carbon Sorption** $

2. **Ion Exchange** $$

3. **Membrane Filtration & Reverse Osmosis** $$$



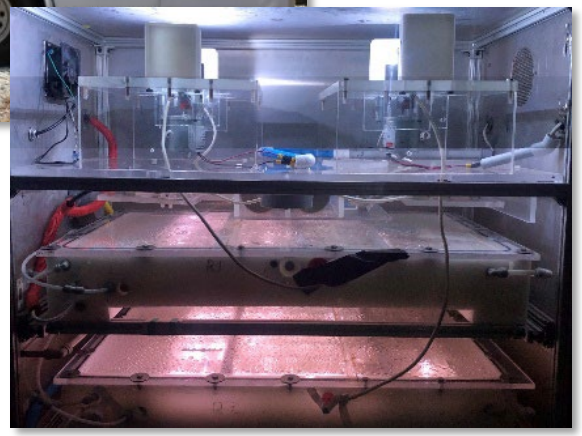
Disposal / Destruction

1. **Landfill Disposal** $$
2. **Class I Well Injection** $$
3. **Incineration** $$$$
4. **Emerging Destructive Technologies** $???

Emerging PFAS Treatment and Remediation

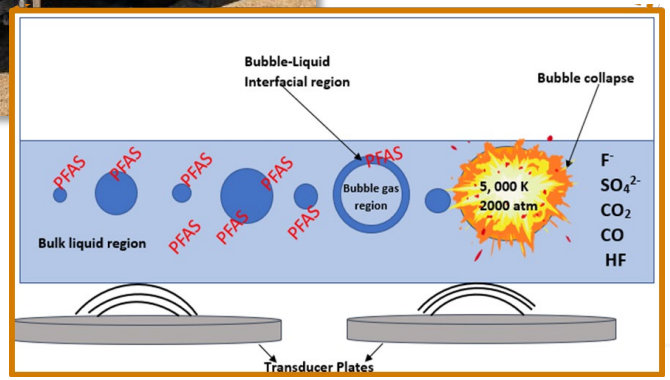
Enhanced Contact Plasma Reactor

Field demonstration of an enhanced contact electrical discharge **plasma** treatment unit for the treatment of PFAS-contaminated groundwater at an Air Force site



Sonolysis (Sonochemical Degradation)

Field demonstration of a combined treatment system of **sorption** and **sonolysis** for the treatment of PFAS groundwater at Navy sites



Emerging PFAS Treatment and Remediation

Application	Technology
Concentration	Granular Activated Carbon
	Ion Exchange Resin
	Regenerable Ion Exchange Resin
	Biochar
	Injectable Adsorbent Media
	Reverse Osmosis
	Nanofiltration
	Foam Fractionation
	Colloidal Gas Aphrons
	Novel Ligands

Application	Technology
Destruction	Electrochemical Oxidation
	Non-Thermal Plasma
	Ultraviolet Photoreduction
	Hydrothermal Alkaline Treatment (HALT)
	Supercritical Water Oxidation
	Sonolysis
	Electron Beam
	Photocatalysts
Biological	Bacteria, Enzymes, Fungi
	Phytoremediation
PMR/PER	PFAS Monitored Retention (PMR)
	PFAS Enhanced Retention (PER)

Key Points

- Large chemical class with **COMPLEX** chemistries
- **OVERHEATED** media and NGO environment
- **ENERGIZED regulatory agencies**
- Huge **VARIATION** in regulatory thresholds
- EPA's proposals have **WIDE-REACHING** impacts
- PFAS management approaches available

Thanks for attending!

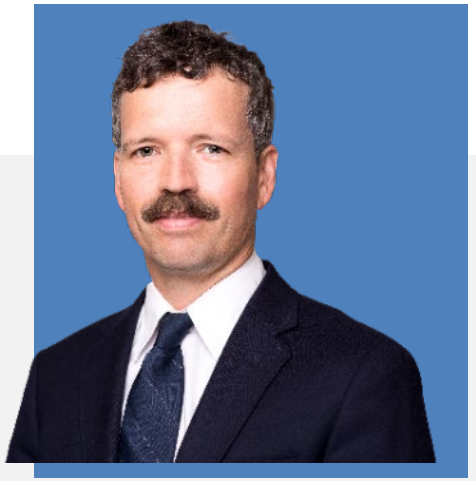
https://itrcweb.org/guidance?page=2

https://www.enviro.wiki/index.php?title=Remediation_Technologies

https://frtr.gov/

https://clu-in.org/technologies/

https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater



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