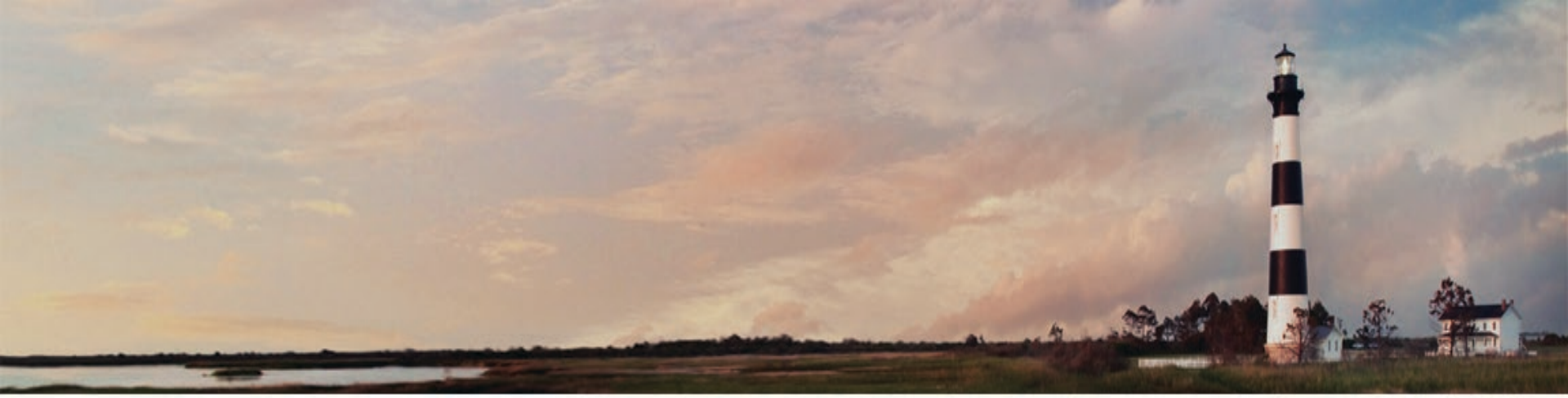


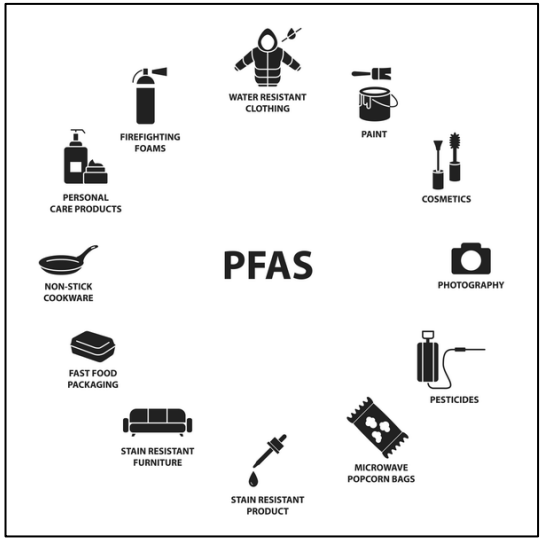
Federal PFAS Rule & North Carolina Public Water Systems

August 7, 2024

Rebecca Sadosky, Ph.D.

Overview

- NC Public Drinking Water Systems Impacted by the PFAS Rule
- Timeline of PFAS Rule Development
- Final Rule Maximum Contaminant Levels (MCLs) and Hazard Index (HI)
- Sample Frequency and Compliance
- PFAS Treatment
- Key Effective Dates
- Health Effect Language
- NC Public Water System PFAS Sampling Overview
- Implementation Challenges



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NC Public Drinking Water Systems Impacted by the PFAS Rule

All NC Community Water Systems (CWSs) and Non-Transient Non-Community Water Systems (NTNCWSs) with their own source will be affected by the new PFAS rule (April 2024).

Category	Number of Systems
Total Number of Water Systems Affected	1,958
CWSs	1,648
NTNCWSs	310
Groundwater (GW) Systems	1,789
Surface Water (SW) Systems*	169

*Includes surface water purchase systems with their own source and Groundwater Under the Direct Influence of Surface Water (GWUDI) systems.

Final Rule MCLs and HI

Five Maximum Contaminants Levels (MCLs) for five individual PFAS and the Hazard Index (HI).

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 determined by running annual averages at each entry point.

Hazard Index

The Hazard Index (HI) is a long-established approach that the EPA regularly uses, for example in the Superfund program.

- To determine the health concerns associated with exposures to chemical mixtures.
- It is calculated by adding the ratio of the water sample concentration to a Health Based Water Concentration.
- A HI greater than 1 requires a system to take action.
- To be considered an exceedance, the HI has to be a *mixture* of a minimum of two contaminants.

$$HI\ MCL = \left(\frac{[HFPO\text{-}DA_{water}]}{[10\ ppt]}\right) + \left(\frac{[PFBS_{water}]}{[2000\ ppt]}\right) + \left(\frac{[PFNA_{water}]}{[10\ ppt]}\right) + \left(\frac{[PFHxS_{water}]}{[10\ ppt]}\right) = 1$$

MCL Calculation and Return to Compliance

- MCLs are based on an annual average calculated on a rolling basis (running annual average)

$$RAA = \frac{Q3_{2027} + Q4_{2027} + Q1_{2028} + Q2_{2028}}{4}$$

- Each time a new sample is collected, the system will return to compliance if the newly calculated RAA goes back below the MCL and/or HI.

PFAS Rule Implementation

Under the final PFAS Rule requirements, a public water system must:

- Conduct initial and ongoing compliance monitoring for the six regulated PFAS compounds.
- Implement solutions to reduce regulated PFAS in their drinking water if levels exceed the MCLs.
- Inform the public of the levels of regulated PFAS measured in their drinking water and if one or more MCLs are exceeded.
- Take samples at all entry points to the distribution system.
- Sample at an entry point to the distribution system “during periods of representative operating conditions”.

PFAS Initial Sampling Requirements

- Public water systems must initially monitor quarterly or bi-annually prior to April 26, 2027.
- Public water systems must conduct initial monitoring at each entry point to determine their compliance monitoring schedule.

Quarterly Samples

- Groundwater CWS and NTNCWS > 10,000 persons and all surface water CWS and NTNCWS.
- Must take four consecutive samples two to four months apart within a 12-month period (quarterly samples).

Bi-Annual Samples

- Groundwater CWS and NTNCWS ≤ 10,000 persons.
- Two samples five to seven months apart within a 12-month period.

PFAS Initial Sampling Results

Compound	Trigger Level (ppt) – ½ MCLs
PFOA	2.0
PFOS	2.0
PFHxS	5
HHFPO-DA (GenX)	5
PFNA	5
PFBS	N/A
HI	0.5 (unitless)

Quarterly Monitoring – If Any initial sampling result at the Entry Point > trigger level

Triennial Monitoring - If ALL initial sampling results at an Entry Point < trigger levels

Each Entry Point can be on it's own schedule.

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Key PFAS Rule Effective Dates

Requirement	Effective Date
Meet the analytical requirements. (Initial monitoring samples must be collected in accordance with approved methods.)	June 25, 2024
Report the results of initial monitoring to the State	April 26, 2027
Meet the compliance monitoring requirements	April 26, 2027
Consumer confidence report and public notification requirements	April 26, 2027
Meet the MCL compliance requirements	April 26, 2029

NC PWS PFAS Sampling Overview

Sampling Event	Number of Systems	Complete?	Notes
The NC Collaboratory	376	Yes	Raw water. 47 analytes. Municipal systems.
Public Water Supply Section 2022	50	Yes	Raw and treated water. One sample/month for three months. 57 analytes.
Public Water Supply Section 2023	534	Yes	Treated water. One sample at one entry point per system. 57 analytes.
Public Water Supply Section 2024	212	Yes	Treated water. One sample at one entry point per system. 57 analytes.
UCMR5	298	No	Treated water. Multiple samples per system/per entry point. 29 analytes. 192 systems sampled as of July 31, 2024.
Aqua North Carolina, Inc.	707	No	Treated water samples only. Data available for six analytes. Received results in April 2024.
Carolina Water Service, Inc. of NC	96	?	18 analytes. Received results in April 2024.

General Summary of All NC Data

- As of June 18, 2024, based on single sample results, 344 systems (18%) of systems have had at least one result greater than an MCL or HI.
- PFOS and PFOA most prominent of the contaminants > MCL.
- We are seeing a few exceedances of the HI.
- We are finding PFAS other than the six compounds in the proposed regulation.

Thank You!

Rebecca Sadosky, Ph.D. (Rebecca.Sadosky@deq.nc.gov)

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02B Surface Water PFAS Standards - Rulemaking Overview

Secretaries' Science Advisory Board - August 7, 2024

Chris Ventaloro, Water Quality Standards Coordinator, DWR

Surface Water Standard Rulemaking Process

Development

- Staff review current standards, available EPA guidance & literature and develop rulemaking package
- Staff present proposed amendments to Environmental Management Commission (WQC/EMC) for approval to proceed

State Approval

- EMC adoption
- RRC approval
- NC Attorney General sign off

Federal Approval

- EPA Clean Water Act review
- Endangered Species Act consultation
- NC notified of approval/disapproval

Proposed PFAS Compounds for Surface Water Standards Development

	PFAS Compound	Acronym
1	Perfluorooctane sulfonic acid	PFOS*
2	Perfluorooctanoic acid	PFOA*
3	Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)*
4	Perfluorobutanesulfonic acid	PFBS*
5	Perfluorononanoic acid	PFNA*
6	Perfluorohexanesulfonic acid	PFHxS*
7	Perfluorobutanoic acid	PFBA
8	Perfluorohexanoic acid	PFHxA

*Regulated under the Safe Drinking Water Act in the form of MCLs and hazard Index

Why these specific PFAS Compounds?

1. Health effects of all compounds are published in peer-reviewed scientific studies and have been evaluated by a federal agency and other scientific experts
2. This health effects data supports development of a reference dose and/or cancer slope factor
3. All compounds have been detected in NC's environmental media (for example: air, water, soil, and fish)
4. All compounds can be accurately measured by EPA Test Method 1633

NC SSAB Assistance in Development of Standards

NC SSAB provided critical scientific support for the development of the 02B standards:

1. Evaluated the EPA and DEQ Bioaccumulation Factor (BAF) data and determined that the data was similar and scientifically sound
2. Evaluated the PFAS toxicity assessments provided by EPA & CDC and determined that they are of equivalent scientific quality to IRIS toxicity assessments

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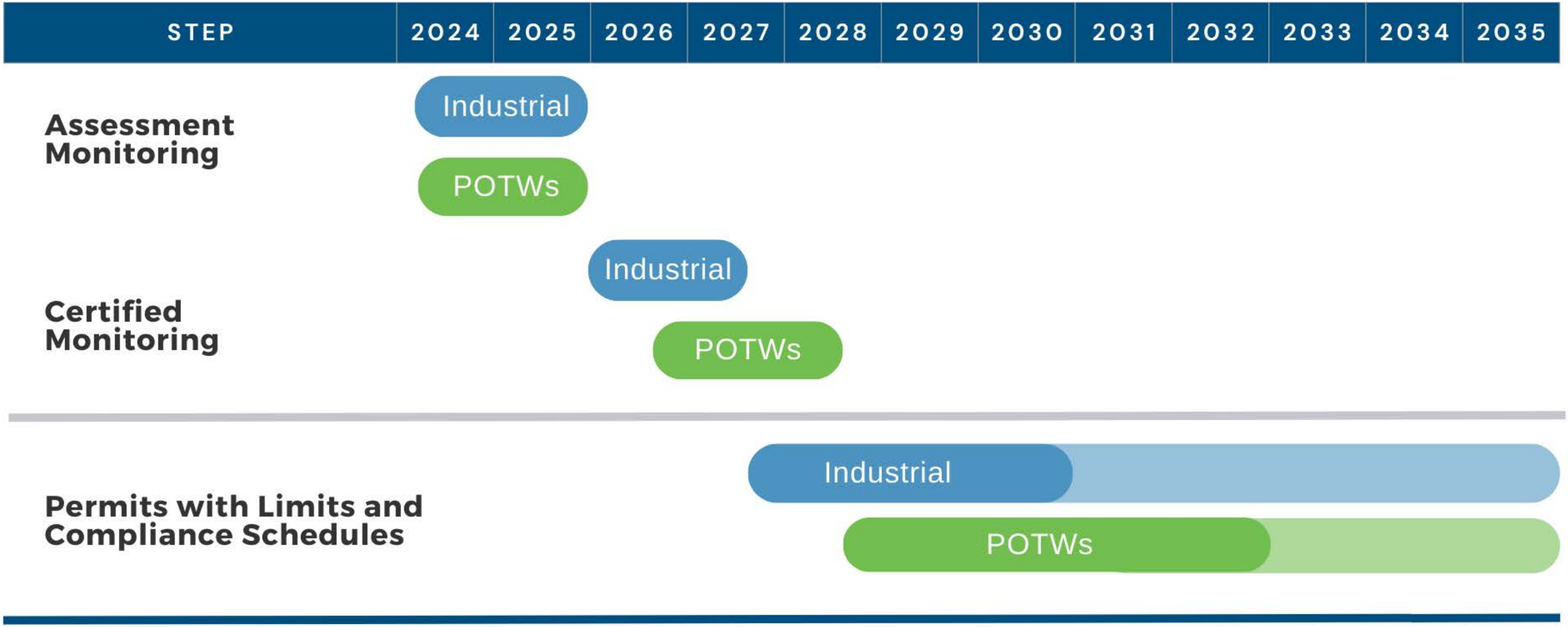
Summary of Proposed PFAS Standards to be added to 02B

PFAS Compound	Proposed 02B Numeric Criteria		Permit Effluent Limit
	Water Supply (ng/L) 15A NCAC 02B .0212, .0214, .0215, .0216, .0218	Non-Water Supply Waters (Class C & SC-Fish Consumption) (ng/L) 15A NCAC 02B .0211 & .0220	
PFOS*	0.06	0.06	Calculated based on site-specific conditions. If PFOS and PFOA effluent limits are calculated at < 4.0 ng/L, the effluent limits will be 4.0 ng/L (for those permits with reasonable potential to exceed the 02B numeric criteria).
PFOA*	0.001	0.01	
HFPO-DA (GenX)	10	500	
PFBS	2,000	10,000	
PFBA	6,000	200,000	
PFHxA	3,000	200,000	
PFNA	9	20	
PFHxS	10	70	

* Proposed health-based standards for PFOA and PFOS are below Limit of Quantitation. Permit effluent limit compliance for PFOA and PFOS will be determined based on 4.0 ng/L as reported by EPA as a Limit of Quantitation from national lab validation of the wastewater test method (1633).

NPDES Implementation of PFAS Standards

2B IMPLEMENTATION SCHEDULE OVERVIEW



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Surface Water Quality Standards Rulemaking Efforts To Date

November 2023 EMC Meeting

- Information Items - Proposed PFAS Toxicological Summaries and Potential Affected Sources

January 2024 WQC Meeting

- Information Items - Implementation Strategy for Proposed PFAS Surface Water Quality Standards; Cost and Benefits Analysis Approach

March 2024 WQC Meeting

- Information Item - Implementation Plan Timeline; DWR Stakeholder Meetings Overview and Feedback

May 2024 WQC Meeting

- Information Item – Proposed surface water standards, implementation plan update and cost benefit analysis

July 2024 WQC Meeting

- Information Item – Proposed surface water standards, implementation plan update and cost benefit analysis

July 2024 02B PFAS Rulemaking Request

Request to Proceed to the EMC to request to go to public notice & hearing with:

- ❖ Proposed 02B PFAS numeric criteria
- ❖ Proposed NPDES Implementation Rules
- ❖ Fiscal Analysis

Results & Next Steps

Result:

- The WQC declined to approve this request
- Questions related to the Regulatory Impact Analysis (RIA) & the development of the numeric values

Next steps:

- Respond to WQC questions
- Return to WQC with request to proceed with rulemaking

Link to 02B RIA : https://www.osbm.nc.gov/documents/files/DEQ_2024-07-10

Questions?

02L Groundwater Quality Standards PFAS Rulemaking Update

Secretaries' Science Advisory Board Meeting – August 7, 2024

Bridget Shelton, Groundwater Quality Standards Coordinator, DWR

North Carolina Groundwater Quality Standards

NC Groundwater Quality Standards	
Federal Requirement	No*
North Carolina Rule	15A NCAC 02L .0202
Population	Human Adults
Target use	Ingestion Household use
Standard endpoints	Noncancer Cancer Aqueous taste and odor

*Groundwater standards are used in Federal programs in NC (such as Superfund, RCRA, etc.)

- Maximum allowable concentrations which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage
- Best Usage: existing or potential source of drinking water supply for humans
- Protect groundwaters of the state as a resource for human consumption
  - Groundwater supports approximately 50% of drinking water use in the state
- Implemented in various programs including site clean-ups, risk assessments, health evaluations, etc.

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Developing Groundwater Quality Standards

Established as the least of the following*:

1. Systemic/non-cancer threshold concentration
2. Concentration which corresponds to an incremental lifetime cancer risk of 1×10^{-6} (one in a million)
3. Taste threshold limit value
4. Odor threshold limit value
5. Maximum contaminant level
6. National secondary drinking water standard

*15A NCAC 02L .0202 (d)

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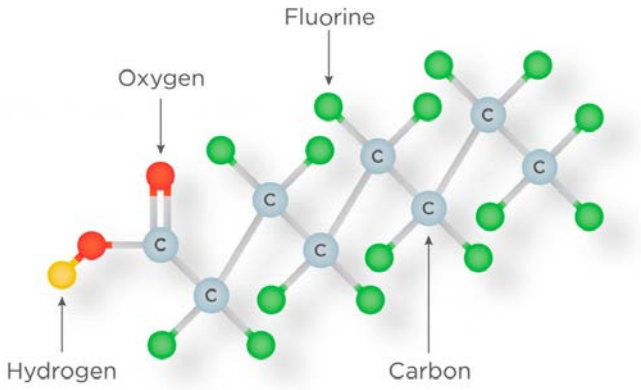
Per- and Polyfluorinated Substances (PFAS)

- PFAS are a group of manufactured chemicals that are used to make fluoropolymer coatings and products
- Perfluorinated compounds are chemicals of specific concern to North Carolina
  - Widely produced and used; significant presence in NC
  - Persist in the environment
  - Bioaccumulate in humans, animals, and the environment
- Evaluated the available scientific data to develop groundwater standards for a subset of PFAS



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Background – EPA PFAS Actions

- 2021-2023 – Finalized multiple Toxicity Assessments
- April 2024 – Finalized National Primary Drinking Water Regulation (NPDWR), establishing legally enforceable levels for drinking water, called Maximum Contaminant Levels (MCLs), for six PFAS:

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index	1 (unitless) Hazard Index

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

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Rulemaking Authority

- The Environmental Management Commission (EMC) has the statutory authority to adopt groundwater standards under 15A NCAC 02L.
  - Meeting materials for both current and prior meetings can be accessed on the EMC website at: https://www.deq.nc.gov/about/divisions/water-resources/water-resources-commissions/environmental-management-commission

- The Groundwater and Waste Management Committee (GWWMC) of the EMC must first approve the rule changes before they can proceed to the full EMC.

Background- Previous GWWMC and EMC Presentations

2022-2023

- May 2022 EMC Meeting
  - Information Item – Prevalence of PFAS in NC, EPA actions, and regulations in other states
- July 2022 EMC Meeting
  - Information Item – PFAS Update
- July 2023 GWWMC Meeting
  - Information Item – Groundwater Quality Standards and PFAS Rulemaking Update
- November 2023 EMC Meeting
  - Information Item – Proposed PFAS Toxicological Summaries

2024

- January 2024 GWWMC Meeting
  - Information Item – Affected Sources and Anticipated Implementation Requirements; Cost and Benefits Analysis Approach
- March 2024 GWWMC Meeting
  - Information Item – Plan Implementation Timeline; DWM Stakeholder Meetings Overview and Feedback
- May 2024 GWWMC Meeting
  - Information Item – Proposed Groundwater Standards; Regulatory Impact Analysis Overview
- July 2024 GWWMC Meeting
  - Action Item – Proposed Groundwater Standards; Regulatory Impact Analysis Overview

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Compounds Initially Proposed by DEQ for Groundwater Standards Development

	Compound	Acronym
1	Perfluorooctane sulfonic acid	PFOS*
2	Perfluorooctanoic acid	PFOA*
3	Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)*
4	Perfluorobutane sulfonic acid	PFBS*
5	Perfluorononanoic acid	PFNA*
6	Perfluorohexane sulfonic acid	PFHxS*
7	Perfluorobutanoic acid	PFBA
8	Perfluorohexanoic acid	PFHxA

*Regulated under the Safe Drinking Water Act in the form of MCLs and Hazard Index.

Why this subset of PFAS?

1. All eight compounds have an available literature base and available health effects data to support the development of groundwater standards.
2. The literature bases for all compounds have been reviewed and evaluated by a federal agency.
3. All eight compounds have been detected in North Carolina's environmental media.
4. There is a final EPA test method (Method 1633) available to measure these compounds in groundwater.

Compounds Initially Proposed by DEQ for Groundwater Standards Development

	Compound	Reference	Critical Health Effects	Toxicity Benchmarks and Values Available^
1	PFOS	2023 EPA Toxicity Assessment[+]	Developmental and Cardiovascular effects	**RfD**, CSF, MCL
2	PFOA	2023 EPA Toxicity Assessment[+]	Renal cell carcinomas	RfD, **CSF**, MCL
3	HFPO-DA (GenX)	2021 EPA Human Health Toxicity Assessment[+]	Liver effects	RfD, **MCL**
4	PFBS	2021 EPA Human Health Toxicity Assessment[+]	Thyroid effects	**RfD**
5	PFNA	2021 ATSDR* Minimal Risk Level[+]	Developmental effects	RfD, **MCL**
6	PFHxS	2021 ATSDR* Minimal Risk Level[+]	Thyroid effects	**RfD**, **MCL**
7	PFBA	2022 EPA IRIS Assessment	Liver and Thyroid effects	**RfD**
8	PFHxA	2023 EPA IRIS Assessment	Developmental effects	**RfD**

[+]Used as basis for EPA's PFAS National Primary Drinking Water Regulation
*ATSDR= Agency for Toxic Substances and Disease Registry
^RfD: reference dose; CSF: cancer slope factor; MCL: Maximum Contaminant Level in drinking water

Groundwater Standards for 8 PFAS Initially Proposed by DEQ

Compound		Proposed 02L Standard (ng/L)	Existing 02L Limit – PQL* (ng/L)	Compliance Level Under Proposed Rule (ng/L)
1	PFOS	0.7	4.0	PQL (4.0)
2	PFOA	0.001	4.0	PQL (4.0)
3	HFPO-DA (GenX)	10	5.0	10
4	PFBS	2,000	3.0	2,000
5	PFNA	10	4.0	10
6	PFHxS	10	3.0	10
7	PFBA	7,000	5.0	7,000
8	PFHxA	4,000	3.0	4,000

*PQLs were calculated using the method detection limits (MDLs) reported in EPA Method 1633, which were based on the national Multi-Laboratory Validation Study of PFAS by Isotope Dilution LC-MS/MS Wastewater, Surface Water, and Groundwater.

15A NCAC 02L .0202 (b)(1):

Where the standard for a substance is less than the PQL, the detection of that substance at or above the PQL constitutes a violation of the standard.

Current Rulemaking Status

- DEQ presented the Proposed Rule and Regulatory Impact Analysis (RIA) for **8** PFAS to the GWWMC in July 2024.

- The GWWMC voted to have DEQ to revise the rulemaking package to address proposed standards for only **3 PFAS: PFOA, PFOS, and HFPO-DA (GenX)**, and return to the GWWMC with the agenda item as revised.

- DEQ is currently revising the Proposed Rule and RIA accordingly and will re-send to OSBM for approval.

- DEQ plans to present the revised Proposed Rule and RIA for PFOA, PFOS, and HFPO-DA (GenX) to the GWWMC at their September 2024 meeting for approval to proceed to the EMC to request public notice.

Proposed Groundwater Standards for 3 PFAS As Requested by GWWMC

	Compound	Proposed 02L Standard (ng/L)	Existing 02L Limit – PQL* (ng/L)	Compliance Level Under Proposed Rule When Revised (ng/L)
1	PFOS	0.7	4.0	PQL (4.0)
2	PFOA	0.001	4.0	PQL (4.0)
3	HFPO-DA (GenX)	10	5.0	10
4	PFBS	NA	3.0	3.0
5	PFNA	NA	4.0	4.0
6	PFHxS	NA	3.0	3.0
7	PFBA	NA	5.0	5.0
8	PFHxA	NA	3.0	3.0

*PQLs were calculated using the method detection limits (MDLs) reported in EPA Method 1633, which were based on the national Multi-Laboratory Validation Study of PFAS by Isotope Dilution LC-MS/MS Wastewater, Surface Water, and Groundwater.

15A NCAC 02L .0202 (b)(1):

Where the standard for a substance is less than the PQL, the detection of that substance at or above the PQL constitutes a violation of the standard.

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Proposed Rulemaking Schedule

(if approved by the GWWMC in September)

Action / Responsibility	Date
Stakeholder Meetings	January and February 2024
Previous GWWMC/EMC Presentations	May and July 2022; July and November 2023; and January, March, May, and July 2024
GWWMC – Decision to Approve Rule Text and RIA to go to EMC	**September 12, 2024**
EMC – Decision to Approve Rule and RIA for Public Comment	November 14, 2024
Public Comment Period	December 2024 – February 2025
EMC – Decision to Approve Hearing Officer's Report and final RIA, Adopt Rule	May 2025
RRC – Approval of Rule	June 2025
Proposed effective date, if approved	July 2025

Thank you

Bridget Shelton

Groundwater Quality Standards Coordinator

Division of Water Resources

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