

**BASINWIDE WATER RESOURCES
MANAGEMENT PLAN**

**CYCLE 4 –
CAPE FEAR RIVER BASIN 2026**

North Carolina
Department of Environmental Quality
Division of Water Resources
Basin Planning Branch

**DRAFT
Chapter 12
PFAS Related Emerging Contaminants
in the Cape Fear River Basin**



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12 PFAS-Related Emerging Contaminants in the Cape Fear River Basin

12.1 General PFAS Overview

Contaminants of emerging concern, or emerging compounds, are chemicals or materials characterized by potential threat to human health or the environment by a lack of published health standards and/or promulgated environmental regulations. Emerging compounds come from a wide range of sources, including industrial chemicals as well as their by-products, firefighting foams, pesticides, lawn and agricultural products, disinfection products, wood preservatives, pharmaceutical and personal care products (PCPs) ([EPA, 2024](#)). In addition to industrial sources, these contaminants are often sent to landfills and wastewater treatment plants and are subsequently discharged to surface waters.

Per- and polyfluoroalkyl substances (PFAS) are emerging compounds that have been identified in North Carolina. The science and research about emerging contaminants are quickly expanding, so DEQ has created a list of resources to help residents learn more. The information included in this chapter reflects the data and related information available as of the end of 2024 (for most studies). The latest information and updates can be found on DEQ's [Emerging Compounds](#) and [Understanding PFAS](#) webpages.

PFAS are of particular concern not only in North Carolina, but globally. PFAS are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s because of their useful properties. PFAS are sometimes referred to as “forever chemicals” because they are very difficult to break down and destroy, making them persistent in the environment. There are thousands of different PFAS, some of which have been more widely used and studied than others. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) have been two of the most widely used and studied PFAS chemicals. Scientific studies have shown that exposure to these compounds may be linked to harmful health effects in humans and animals. As a result, PFOA and PFOS have largely been replaced by alternate PFAS compounds. In chemical and product manufacturing, hexafluoropropylene oxide (HFPO) dimer acid, also known as “GenX,” is considered a replacement for PFOA. Perfluorobutane sulfonic acid (PFBS) and the related compound potassium sulfonate (potassium PFBS) are considered replacements for PFOS. Unfortunately, many PFAS compounds, including the more modern PFAS such as GenX and PFBS, also break down very slowly and can build up in people, animals and the environment over time.

Due to their widespread production and use, as well as their ability to travel and persist in the environment, surveys conducted by the Centers for Disease Control and Prevention (CDC) show that most people in the United States have been exposed to some PFAS. Current EPA research has shown that people can be exposed to PFAS by:

- Working in occupations such as firefighting or chemical manufacturing and processing.
- Drinking water contaminated with PFAS.
- Eating certain foods that may contain PFAS, including fish.
- Swallowing contaminated soil or dust.
- Breathing air containing PFAS.
- Using products made with PFAS or that are packaged in materials containing PFAS.

PFAS exposures can be elevated, particularly when people are exposed to a concentrated source over long periods of time. Scientific studies indicate that exposure to PFAS can lead to significant health effects including reduced immune function, kidney and/or testicular cancer, ulcerative colitis, thyroid disease, high cholesterol, pregnancy complications and birth defects. Additional PFAS source and human health information is available on North Carolina Department of Health and Human Services (NCDHHS) PFAS [website](#).

How can PFAS potentially affect my health?

The infographic features a central illustration of a pregnant woman, a child, and a man. To the right, a vertical list of six health effects is presented, each with a corresponding icon in a circle. The effects are: 1. Increased cholesterol levels (heart icon), 2. Decreased vaccine response in children (syringe icon), 3. Changes in liver enzymes (liver icon), 4. Increased risk of high blood pressure or pre-eclampsia in pregnant women (blood pressure cuff icon), 5. Small decreases in infant birth weights (scales icon), and 6. Increased risk of kidney or testicular cancer (ribbon icon). The text 'In adults, children, and pregnant women' is positioned below the illustration. At the bottom of the infographic, a blue banner states: 'More research is needed to better understand the health effects associated with PFAS exposure.' The footer of the infographic includes 'NCDHHS | GenX and PFAS Updates | November 16, 2021' and a page number '4'.

In adults, children, and pregnant women

- Increased cholesterol levels
- Decreased vaccine response in children
- Changes in liver enzymes
- Increased risk of high blood pressure or pre-eclampsia in pregnant women
- Small decreases in infant birth weights
- Increased risk of kidney or testicular cancer

More research is needed to better understand the health effects associated with PFAS exposure.

NCDHHS | GenX and PFAS Updates | November 16, 2021 4

Graphic from <https://www.deq.nc.gov/genx/genx-chemours-community-meeting-nov-16-all-presentations/download?attachment>

In 2013, researchers from North Carolina State University detected elevated levels of GenX and other PFAS in the Cape Fear River ([Sun et al., 2016](#); [Kulikowski, 2018](#)). After the discovery of PFAS in the drinking water supplies, the NC General Assembly took action to address rising concerns about PFAS compounds and concentrations in North Carolina. The Water Safety Act provision in the 2018 budget provided the NC Collaboratory with \$5 million for academic research, which was used to establish the [NC PFAS Testing \(PFAST\) Network](#). The PFAST Network is studying PFAS toxicology, occurrence in drinking water, atmospheric transformations/occurrence and removal technologies. The NC General Assembly has continued to fund the NC PFAST Network, and, as of 2023, has provided recurring appropriations as part of the state budget (<https://ncpfastnetwork.com/about/>). One of the goals of the NC PFAST Network is to “help inform state regulators and policy-makers regarding sources and levels of PFAS in the state’s

environment, strategies for reducing or eliminating PFAS exposures, and improve understanding of the toxic effects of PFAS” (2021 PFAST Network Legislative final report).

In 2017, the Secretaries’ Science Advisory Board (SSAB) was established by the Secretaries of DEQ and NCDHHS to examine new and emerging chemicals and their potential impacts on human health and the environment. The SSAB advises the agencies on the development of scientifically defensible health goals for emerging compounds. See the DEQ [SSAB website](#) for more information. In the absence of a federal drinking water regulation for GenX, NCDHHS established a provisional drinking water health goal for GenX in July 2017 (*Table 12-1*).

A health advisory level identifies the concentration of a compound in drinking water below which adverse health effects in the most sensitive populations are not anticipated to occur over specific exposure duration. The N.C. health advisory levels have changed as our scientific understanding has evolved. New research data has provided a better understanding of how PFAS compounds are taken up and processed by the human body and concentrated in the environment (*Table 12-1*).

In June 2022, the EPA's final Health Advisory Level of 10 parts per trillion (ppt) for GenX replaced North Carolina’s (NCDHHS) provisional drinking water health goal of 140 ppt, while also introducing interim levels for PFOA and PFOS. Subsequently, in April 2024, the EPA finalized their [National Primary Drinking Water Regulation](#) (NPDWR). This regulation established enforceable drinking water standards for five individual PFAS compounds: PFOA, PFOS, PFNA, PFHxS, and HFPO-DA/GenX. Additionally, it set a Hazard Index (HI) level for mixtures of two or more of four PFAS: PFNA, PFHxS, HFPO-DA/GenX, and PFBS. On May 14, 2025, EPA announced the intention to modify the finalized NPDWR (*Table 12-1*). Specific health advisory concentrations are discussed in the drinking water section below (*12.3.8.2* and *Table 12-10*).

Table 12-1: Timeline for NC and EPA PFAS Health Advisory Levels and NC Surface Water and Groundwater Standards Development.

Date	Actions	Links
Health Advisory Drinking Water Levels		
2016	EPA’s health advisory levels in finished drinking water was 70 ppt for PFOA and PFOS, or a combination of the two (PFOA + PFOS)	EPA, 2016
July 2017	NCDHHS established provisional drinking water health goal of 140 ppt for GenX	NCDHHS Link
June 15, 2022	EPA updated their interim health advisory in finished drinking water for PFOA and PFOS to 0.004 and 0.02 ppt respectively. They also established final health advisories for GenX at 10 ppt and for PFBS at 2,000 ppt.	EPA, 2022
April 10, 2024	EPA Final PFAS National Primary Drinking Water Regulation for six PFAS. See <i>Table 12-10</i> below for finalized MCLs for finished drinking water. (PFOA, PFOS, PFHxS, PFNA, HFPO-DA/GenX, PFBS)	Link <i>Table 12-10</i>
May 14, 2025	EPA announced 1.) The intent to extend the PFOA and PFOS MCL compliance deadline and 2.) The intent to rescind the regulations and	EPA press release Section <i>12.3.8.2</i>

Date	Actions	Links
	reconsider the regulatory determination for PFHxS, PFNA, HFPO-DA/GenX and PFBS. (As of September 2025, these are still in place.)	
Standards Development - For Surface Water and Groundwater – DEQ Timeline Website		
July 2023	DWR presented an introduction to the 2023-2025 Surface Water Standards Triennial Review & PFAS Rulemaking.	Link
November 2023	Assistant Secretary reviewed data collected across the state and the need for standards.	Intro Link Timeline Link
January 2024	DEQ presented informational presentation on affected sources and the cost-benefit analysis approach.	SW Link GW Link
March 2024	DEQ presented draft surface water (Water Supply (WS) and non-WS; 02B) and groundwater criterion (02L) to EMC as an information item (PFOA, PFOS, HFPO-DA/GenX, PFBS, PFBA, PFHxA, PFNA, PFHxS).	SW Link GW Link
May 2024	DEQ updated draft surface water and groundwater standards for PFOA, PFOS, HFPO-DA/GenX, PFBS, PFBA, PFHxA, PFNA, PFHxS. Modified post EPA finalized drinking water regulations.	SW Link GW Link
July 2024	DEQ presented draft surface water and groundwater PFAS standards, implementation and Regulatory Impact Analysis (RIA).	SW Link ; SW RIA Link GW Link ; GW RIA Link
September 2024	DEQ presented draft surface water and groundwater PFAS standards, implementation and Regulatory Impact Analysis (RIA).	WQC SW Links – Action Item 3.
	Three groundwater PFAS standards and RIA approved for release for public notice and comment.	EMC GW Links – Action Item 6 (24-21) ; GW Public Notice Link
October 2024	DEQ establishes interim groundwater limits (IMAC) for eight PFAS	Public Notification ; Groundwater IMAC webpage
November 2024	DEQ presented PFAS source reduction concepts based on WQC’s September guidance.	EMC general website link
January 2025	DEQ presented continuation of PFAS source reduction concepts.	WQC Link – Item 4
March 2025	DEQ presented proposed rule language for PFAS minimization and source reduction for SIUs and industrial direct dischargers.	No presentation at this meeting; Proposed rule language
May 2025	DEQ requests approval to proceed to the EMC with proposed PFOA, PFOS, and Gen-X monitoring and minimization rules 15A NCAC 02H .0923 and 15A NCAC 02B .0512 – Deferred to future meeting.	WQC Link
September 2025	DEQ presented three groundwater PFAS standards and RIA for EMC Final Rule approval. – APPROVED BY EMC	EMC general website link
September 2025	DEQ update on PFOA, PFOS, and GenX monitoring and minimization rules 15A NCAC 02H .0923 and 15A NCAC 02B .0512.	EMC general website link
November 2025	WQC approved DEQ’s request to proceed to the full EMC with proposed PFOA, PFOS, and GenX monitoring and minimization rules 15A NCAC 02H .0923 and 15A NCAC 02B .0512.	EMC Website
January 2026	EMC approved DEQ’s request to proceed to public notice and hearing with proposed PFOA, PFOS, and GenX monitoring and minimization rules 15A NCAC 02H .0923 and 15A NCAC 02B .0512 and associated RIA.	EMC Agenda Item 25-49 Link

Date	Actions	Links
March 16 - June 15, 2026	DEQ and EMC accepting public comments of proposed PFOA, PFOS, and GenX monitoring and minimization rules 15A NCAC 02H .0923 and 15A NCAC 02B .0512 and associated RIA. Three public hearings will be held during this time period.	DEQ public notice and hearing press release with associated links to rules and comment submission information.
In process	See the DEQ Drinking water PFAS Standards and other proposed PFAS related regulations for NC.	DEQ PFAS timeline website ; DWR Standards Website
Surface water and groundwater standards must be approved by the NC Environmental Management Commission (EMC) and surface water standards are ultimately approved by the US Environmental Protection Agency (EPA).		

12.2 Sources of PFAS in the Environment

PFAS, or per- and polyfluoroalkyl substances, are a group of human-made chemicals that includes PFOA, PFOS and GenX. There are thousands of different PFAS, some of which are more widely used and studied than others. Sources of PFAS to humans and the environment are from a wide array of sources including consumer products, industrial processes and firefighting foams resulting in PFAS found in landfills, wastewater and drinking water sources (*Figure 12-1* and *Figure 12-2*). A research study led by North Carolina State University in 2017 and 2018 assessed PFAS concentrations in the blood from 344 adults and children from Wilmington, NC. PFAS were detected in more than 97% of the participants over the study period ([Kotlarz et. al, 2020](#); [NCSU press release](#)).

DEQ’s plan for addressing PFAS includes (but not limited to) efforts to better identify PFAS sources and reduce emissions and discharges by:

- Requiring PFAS disclosure from new facilities and industries.
- Identifying and prioritizing locations where these substances may have been manufactured, used, discharged or disposed for additional assessment.
- Applying permit conditions as appropriate to address PFAS in air emissions or wastewater discharges and requiring additional monitoring and disclosure of data.
- Conducting groundwater testing and additional monitoring in areas with known PFAS contamination.
- Requiring all solid waste sanitary landfills to include PFAS analyses of all regular groundwater, surface water and leachate samples.

DEQ has taken specific action to address PFAS contamination directly attributed to the Chemours Fayetteville Works facility located in the middle portion of the Cape Fear River basin (*Figure 12-3*). In February 2019, a [Consent Order](#) between DEQ, Cape Fear River Watch (represented by the Southern Environmental Law Center) and Chemours was entered in Bladen County Superior Court. The court-enforceable order requires Chemours to address PFAS sources and contamination at the facility to prevent further impacts to air, soil, groundwater and surface waters. More detailed information is provided throughout this chapter and in section [12.3.2](#).

Figure 12-1: Sources of PFAS to Humans and the Environment (From EPA [PFAS Explained](#) Document).

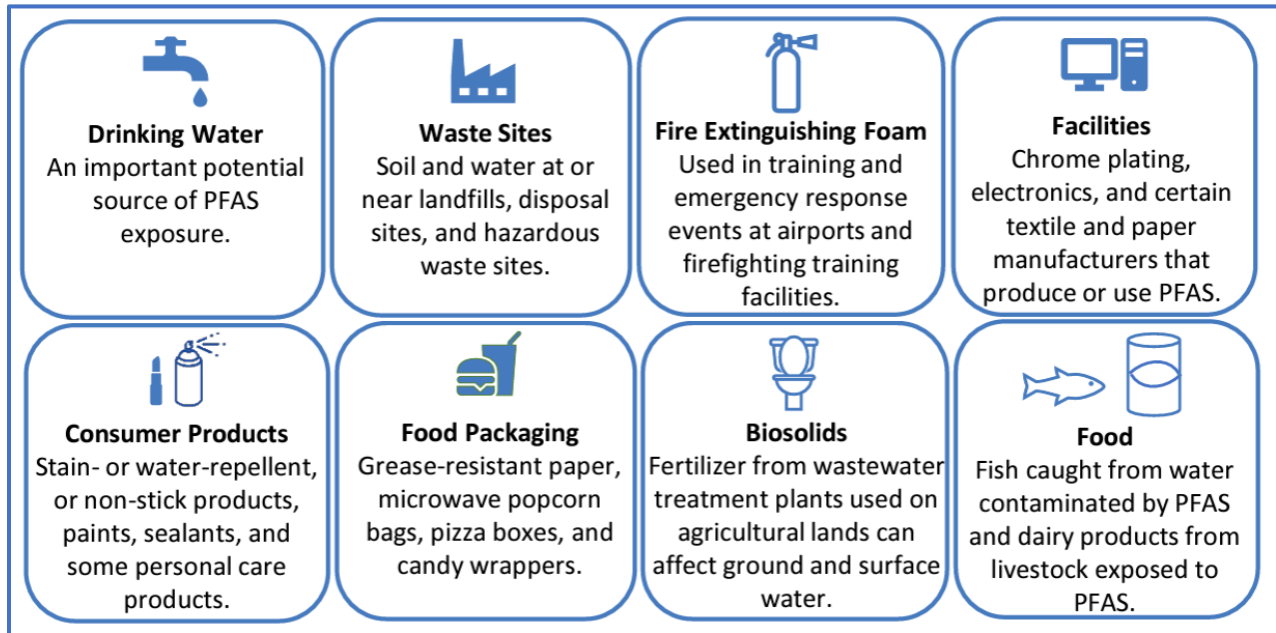


Figure 12-2: Illustration of PFAS Sources to Drinking Water (NC PFAST Network).

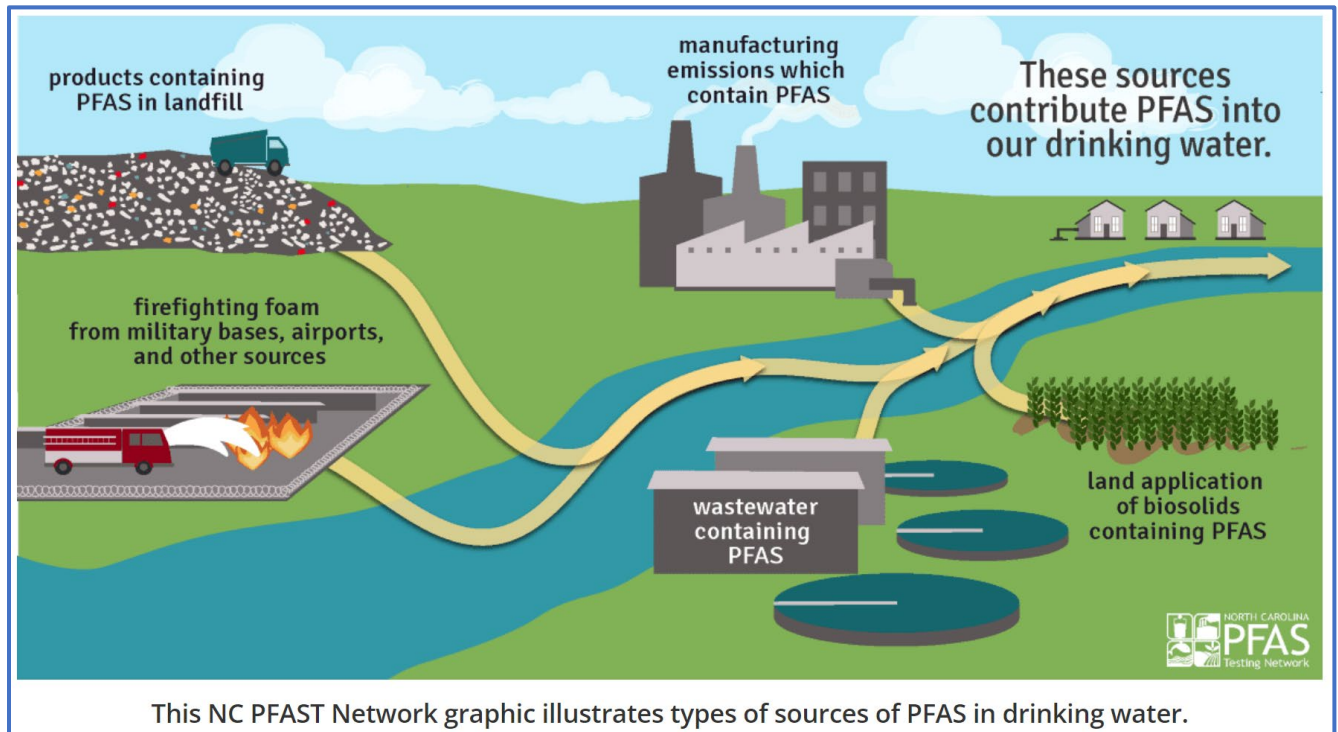
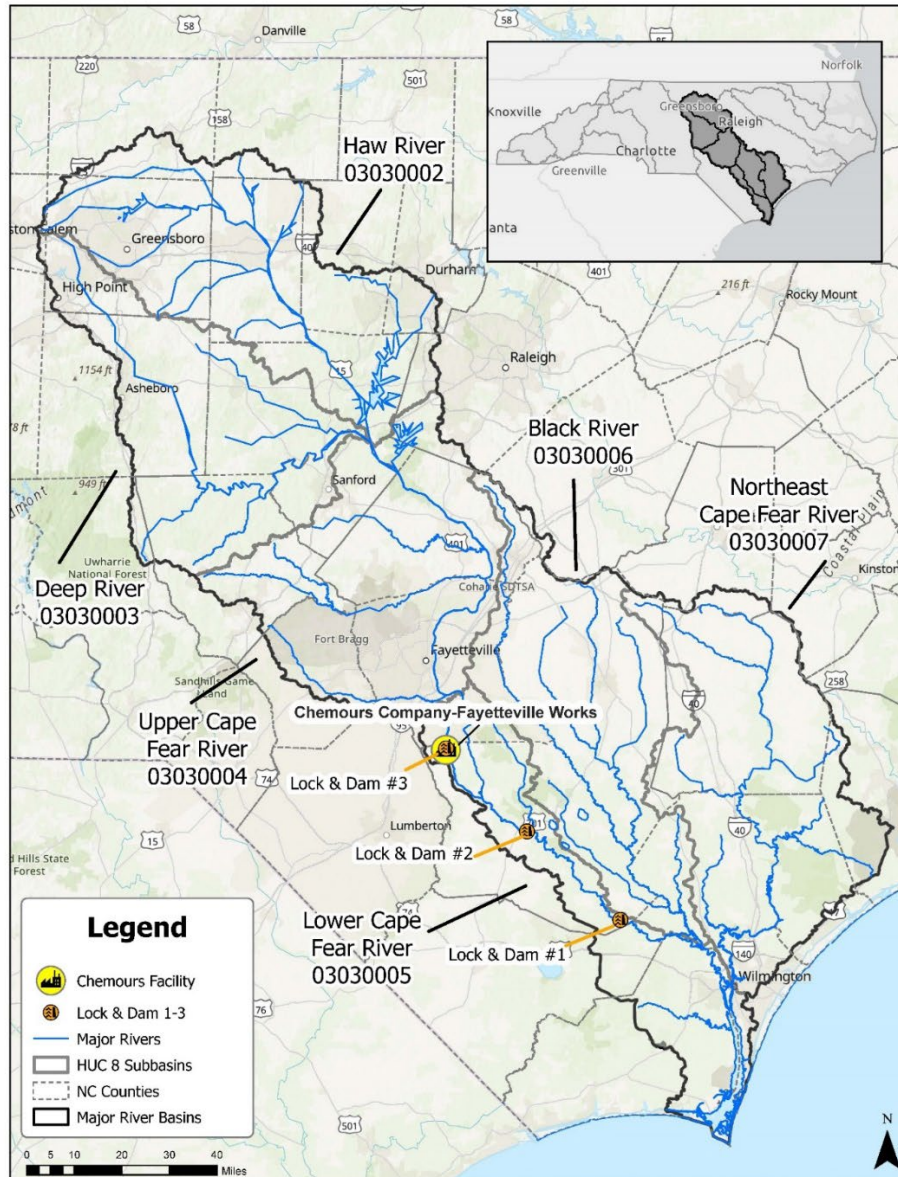


Figure 12-3: Cape Fear River Basin Map with Location of Chemours Fayetteville Works Facility.



While it can be challenging to reduce or eliminate PFAS exposure entirely, EPA recommends taking practical steps to minimize personal exposure and reduce PFAS loading to the environment. These include:

1. Understand where your drinking water comes from and if PFAS is a concern. If so, utilize some type of water filtration device.
2. Avoid nonstick cookware that contains PFAS.
3. Be mindful of food packaging and avoid reheating food in takeout containers and wrappers.
4. Be mindful of personal care products that contain PFAS.
5. Avoid textiles that are waterproof or stain-resistant that don't explicitly state they are PFAS-free. This includes stain-resistant and waterproof clothing, carpeting and furniture.

These are just a few recommendations to help protect yourself and the environment from additional PFAS exposure and adding to the environmental contamination issues. There are many resources available to help understand the sources of PFAS and impacts to human health and the environment located on the [EPA](#), [DEQ](#) and [NCDHHS](#) websites.

DEQ is working to eliminate PFAS at the source, which will reduce the contribution to, and ultimately from, wastewater treatment plants and to drinking water facilities. DEQ is working with the public water suppliers to understand contamination issues at their water supply intakes and to properly treat the water if needed. These source reduction and onsite treatment efforts will take time to implement and achieve the desired reductions. These are discussed in detail in the following sections.

12.3 DEQ Action Strategy Implementation Measures to Address PFAS Contamination

North Carolina is working to address the impacts of PFAS in our state. North Carolina has been a national leader on PFAS since 2017, when the public became aware that GenX, a PFAS produced at the Chemours Fayetteville Works facility, had been discovered in the Cape Fear River. As a result of the contamination from Chemours, North Carolina has been aggressively moving forward to manage the risks of PFAS. In the absence of federal standards or guidance, North Carolina has taken steps to address contamination from the Chemours Fayetteville Works facility.

While the spotlight on PFAS in North Carolina arose through GenX and Chemours-related compounds, the issue of PFAS is larger than one compound or one company. DEQ has done significant work responding to PFAS contamination at specific sites. However, DEQ also understood the need for a larger strategy to address these compounds in a comprehensive way and across all Divisions. Completed DEQ actions as well as ongoing efforts are discussed below. Please see the [Emerging Compounds webpage](#) for the most up-to-date information and status of these activities and actions.

12.3.1 DEQ's Action Strategy For PFAS

In 2021, the EPA announced their [Strategic Roadmap](#) to address PFAS nationwide with actions that complement and strengthen the state's efforts to protect our residents and resources; in June 2022, DEQ released the [Action Strategy for PFAS](#), a comprehensive approach to address PFAS contamination statewide. The DEQ strategy prioritizes three key action areas:

- ☑ **Protecting Communities** – DEQ will continue to identify and notify those who may be at risk of exposure, investigate the human health risks and expand the base of scientific knowledge for North Carolina specific PFAS compounds.
- ☑ **Protecting Drinking Water** – DEQ will work to minimize future releases of PFAS to drinking water sources by setting regulatory standards and driving actions to prevent future PFAS pollution.
- ☑ **Cleaning Up Existing Contamination** – DEQ will continue to hold responsible parties accountable for remediating known PFAS contamination sites affecting drinking water.

Under the Action Strategy for PFAS, DEQ is taking a whole-of-department approach to protect communities by identifying, reducing, and remediating PFAS pollution. DEQ is also utilizing federal funding under the Bipartisan Infrastructure Law (BIL) to help address PFAS contamination, including funding

designated specifically for small, rural and underserved communities. This chapter highlights many of the actions DEQ has taken through 2023, 2024 and into early 2025. A full list of actions can be found within the [Action Strategy for PFAS](#).

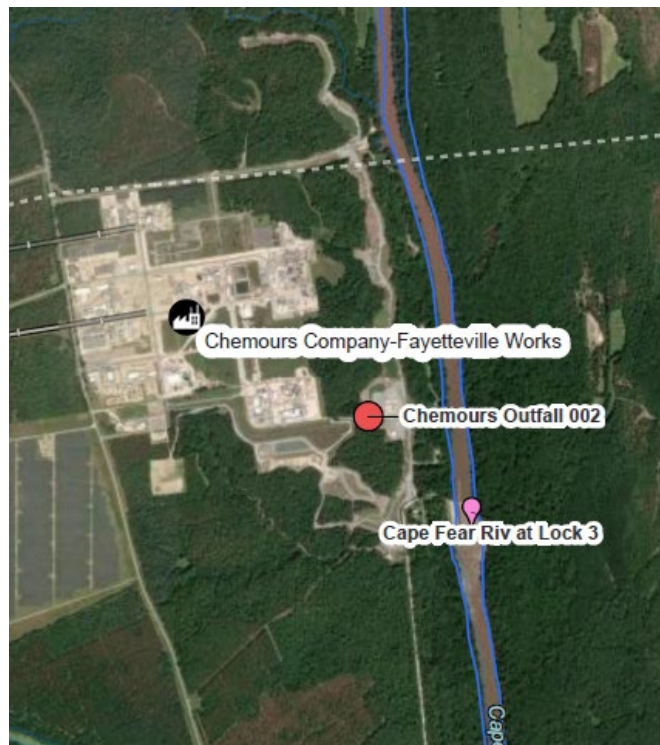
12.3.2 Chemours Consent Order

DEQ's Action Strategy Implementation

- ☑ **Protecting Communities**
- ☑ **Protecting Drinking Water**
- ☑ **Cleaning Up Existing Contamination**

12.3.2.1 Chemours Consent Order Overview

In June 2017, DEQ and NCDHHS began investigating the presence of the PFAS chemical GenX in the Cape Fear River. The Chemours Fayetteville Works facility is the only manufacturing facility of GenX in the United States and was identified as the source of GenX in the Cape Fear River. Through actions by DEQ and the Consent Order, Chemours was required to stop discharging process wastewater, drastically reduce atmospheric emissions and provide alternate water for thousands of households whose drinking water wells have been contaminated (timeline [Table 12-2](#); NPDES discharge permits [Table 12-3](#)).



In February 2019, the [Consent Order](#) between DEQ, Cape Fear River Watch represented by the Southern Environmental Law Center, and Chemours was entered in Bladen County Superior Court. The court-enforceable order requires Chemours to address PFAS sources and contamination at the facility to prevent further impacts to air, soil, groundwater and surface waters, including:

- Sampling of private wells for PFAS and providing replacement drinking water supplies to impacted residents.
- Implementing multiple remedial strategies to significantly reduce Chemours' PFAS discharges to the Cape Fear River.
- Installation of a thermal oxidizer and reduction of GenX air emissions facility-wide by 99.9%.
- Conduct a comprehensive assessment of on and offsite groundwater contamination that complies with the requirements of Title 15A of the North Carolina Administrative Code (NCAC), [Subchapter 2L Groundwater Classification and Standards](#).
- Other compliance measures to characterize and reduce PFAS pollution leaving the Chemours Fayetteville Works site.

In October 2020, DEQ ordered additional significant actions by Chemours to prevent PFAS pollution from entering the Cape Fear River in the [Addendum to the Consent Order](#) (Paragraph 12; see timeline [Table 12-2](#)). Many of the actions required by the addendum require 99.9% removal of the captured PFAS. The addendum required the design of a subsurface barrier wall, with extraction wells and a treatment system to address the contaminated groundwater that flows to the Cape Fear River. The installation of the

subsurface barrier wall and extraction system was completed on June 11, 2023. Sixty-eight extraction wells have been installed behind the wall footprint to collect contaminated groundwater stopped by the wall. The wall and extraction system is expected to reduce flow to the four main seeps that were transporting GenX into the Cape Fear River. Contaminated groundwater and water collected from the seeps is pumped into a treatment system to remove PFAS compounds ([Table 12-3](#); NPDES permit [NC0090042](#)).

Table 12-2: General Timeline for Regulatory Efforts Related to PFAS and Chemours.

Date	Actions
Early-Mid 2017	Focus on surface water issues
Mid 2017	Groundwater issues discovered
Mid-late 2017	Air emissions contributions
October 2017	Chemours prohibited from discharging process wastewater
Throughout 2018	Testing of emissions and drinking wells
February 26, 2019	Consent Order signed; 2020 Addendum
December 30, 2019	Thermal Oxidizer Completed
2019-current	Private well testing
September 30, 2020	Chemours NPDES Permit (NC0089915) approved (Outfall 003); Treating surface water, groundwater and stormwater (Table 12-3).
October 2020	Addendum to the Consent Order
November 3, 2021	DEQ letter stating that Chemours is responsible for contamination of groundwater monitoring wells and water supply wells in New Hanover County and potentially other counties in the lower Cape Fear River basin.
May 3, 2022	DEQ directs Chemours to expand well sampling to New Hanover, Brunswick, Pender, and Columbus counties and provide alternate water supplies based on results as specified by the Consent Order.
September 15, 2022	Chemours NPDES Permit (NC0090042) approved (Outfall 004); Treating contaminated groundwater, stormwater, and surface water seeps (Table 12-3). (Public Notification Link)
June 11, 2023	Chemours barrier wall complete
November 29, 2023	EPA rescinded approval to import GenX containing waste materials from other Chemours facilities around the world to the Fayetteville Works site for treatment and disposal.
March 2025	DEQ directs Chemours to expand well sampling to include portions of Harnett and Hoke counties. (Public Notification Link)
GenX Case History timeline November 16, 2021 presentation .	

For more information on the barrier wall and wastewater treatment permit see chapter 9, section 9.9.1.1. Chemours has a video on their website describing the technology used to remove the PFAS from the groundwater before it is discharged into the Cape Fear River (video linked [here](#)).

The Consent Order Addendum requires sampling of the Cape Fear River and mass loading assessment for PFAS compounds listed in Attachment C of the Consent Order ([Table 12-4](#)). Since October 2020, Chemours has installed many PFAS capture and treatment systems to prevent PFAS from reaching the Cape Fear River ([Table 12-5](#)). There are many other interim and permanent actions taken by Chemours to limit PFAS from reaching the river that may not be reflected in the captured mass load calculations such as air abatement measures, grouting of terracotta pipes, sediment removal from onsite channels, etc.

Table 12-3: Chemours Fayetteville Works Site NPDES Treated Wastewater/Stormwater Discharge Permit Information (Outfall #, Type of Waste Treated, Receiving Stream, PFAS Permit Limits and Instream Monitoring Requirements).

Permit Number (Renewal date)	Volume (MGD)	Outfall	Treating	Receiving Stream	PFAS Limits	Monitoring requirements
NC0003573* Old permit link (July 1, 2015)	2.0 (Major)	Outfall 002	Outfall 001 (process wastewater from tenants)/non-contact cooling water/boiler blowdown / stormwater / water treatment plant reject wastewater No Process wastewaters from Chemours are discharged.	Cape Fear River above LD#3 at Outfall 002	PFAS discharges are regulated under the Consent Order	Flow, temperature, BOD5, COD, DO, PFOA, TP, conductivity, Chronic Toxicity testing, pH and bi-monthly sampling of ~57 PFAS at 30 locations around the site per the Consent Order
		Internal outfall 001 (discharge from a biological treatment system to Outfall 002)	No Process wastewaters from Chemours are discharged. Biological treatment system: Treats and discharges process wastewater from Tenants: DuPont and Kuraray. Includes wastewaters from the following manufacturing lines: Butacite®, Nafion®, SentryGlas®, Trosifol®, SentryGlas®, and PVF (polyvinyl fluoride resin), process stormwater(?),	Cape Fear River at Outfall 002	Process wastewaters from Chemours manufacturing sites are treated using reverse osmosis and reused in the plant. RO reject wastewaters are stored in frac tanks and sent out-of-state for deep well injection. PFAS discharges are regulated under the Consent Order	Flow, BOD5, TSS, Temperature, oil & Grease, pH OCPSF 40 CFR 414 Subpart I sampling for 62 parameters
		Monomers /IXM Manufacturing stormwater treatment system (internal outfall discharging to Outfall 002)	Granulated Activated Carbon (GAC) system installed to treat stormwater from a stormwater collection system a installed around the IXM/Monomers Manufacturing area.	Cape Fear River at Outfall 002	Requires 99% removal of PFAS per the Consent Order	PFAS
NC0089915 (Sept. 30, 2020) Factsheet Map	1.58 (Major)	Outfall 003 (old outfall 002)	Treated surface water, groundwater and stormwater In order to reduce PFAS loading to the Cape Fear River, this Permit requires the treatment of dry weather base flow from a contaminated stream. This stream, often referred to as "Old Outfall 002," was used to discharge process wastewater from the facility prior to June 2012, when the process wastewater discharge was relocated to the current outfall location (permit NC0003573) above Lock and Dam #3 in the Cape Fear River. The treated stream base flow, covered in this permit, will be discharged from Outfall 003 which will be located downstream of the capture dam, and will flow from the channel into the Cape Fear River below Lock and Dam #3.	Cape Fear River Below LD#3 at outfall 003	GenX - <0.060 µg/L (MA and DM); PFMOAA - <0.85 µg/L (MA and DM); PMPA - <0.054 µg/L (MA and DM); The flow from Outfall 003 must be treated to remove at least 99% of the PFAS in the stream. This removal efficiency will be demonstrated through measurements of indicator parameters HFPO-DA (GenX), PFMOAA, and PMPA.	Effluent Monitoring and Load reporting Monitoring at: 1. Upstream of water intake; 2. Influent to treatment system; 3. Outfall 003 effluent from treatment system; 4. Downstream of boat ramp. Monitoring frequency: Monthly & Quarterly ¹
NC0090042 (Sept. 15, 2022)	2.38	Outfall 004 Current outfall 002 discharge point	Treated contaminated groundwater, stormwater, and surface water from seeps A and B (91% of flow from groundwater) – Treating well water from 68 extraction wells behind the barrier wall.	Cape Fear River at outfall 002	GenX - < 0.010 µg/L (MA and DM); PFMOAA - <0.020 µg/L (MA and DM); PMPA - <0.100 µg/L (MA and DM); Must be treated to remove at least 99% of indicator parameters GenX, PFMOAA, and PMPA	Influent and Effluent from treatment system, Monthly & Quarterly ¹ . Four transects along the Cape Fear River (permit section (A.(7.); see map)

*Permit NC0003573 – has not been renewed since 2016. Currently the 2019 Consent Order is steering the permit requirements. ¹ See permit for list of PFAS associated with Monthly (24 total compounds) and Quarterly (plus 35 additional PFAS compounds) monitoring. MA = Monthly Average and DM = Daily Maximum. Chemours Permit Information webpage – [Permitting Actions by Division; Attachment C; Consent Order](#)

Table 12-4: Chemours Consent Order Attachment C PFAS Compound List.

Consent Order Attachment C PFAS Compounds
PFMOAA
PMPA
PFO2HxA
PEPA
PFO3OA
PFO4DA
PFESA-BP1/Nafion BP #1 (PS Acid)
PFESA-BP2/Nafion BP #2 (Hydro-PS Acid)
PFECA-G
TAFN4/PFO5DA
PFHpA
HFPO-DA/PFPrOPrA/Gen-X
Link to Consent Order Attachment C PFAS compounds list - https://www.deq.nc.gov/genx/consentorder/paragraph19/attachment-c-chemours-consent-order/download?attachment

Table 12-5: List of Chemours PFAS Treatment Systems Installed Between October 2020 and December 2023. ([Cape Fear River PFAS Mass Loading Assessment – Fourth Quarter 2023 Report](#))

Date	Chemours Installed PFAS Treatment Systems
October 1, 2020	Outfall 003 treatment system (previously referred to as Old Outfall 002)
December 16, 2020	Seep C Flow-Through Cell
April 28, 2021	Seep A Flow-Through Cell
June 8, 2021	Seep B Flow-Through Cell
June 24, 2021	Seep D Flow-Through Cell
June 30, 2021	Outfall 002 Stormwater Treatment System
Sept. 15, 2022	Outfall 004 treatment system
March 14, 2023	Groundwater Extraction
April 20, 2023	Seep Ex-situ Capture Systems
June 11, 2023	Barrier Wall

12.3.2.2 Chemours Reporting Requirements

Pursuant to Consent Order Paragraph 28, Chemours submits several reports including quarterly progress report to the department and can be found on the [Chemours Consent Order Compliance website](#). The quarterly report includes information such as:

- **Control Technology Improvements:** The thermal oxidizer continued to control process emission at an average PFAS destruction efficiency exceeding 99.99%.
- **No Discharge of Process Wastewater from Chemours Manufacturing Areas:** Chemours does not discharge its processed wastewater and instead collects and ships the process wastewater offsite for disposal or recycles treated water internally within several manufacturing processes.
- **Characterization of PFAS in Process and Non-Process Wastewater and Stormwater at the Facility.**

- Reduction of PFAS Contamination in the Cape Fear River and Downstream Water Intakes, and Addendum to Consent Order Paragraph 12: Chemours continued operation of the treatment system for the Old Outfall 002 (Outfall 003) pursuant to Consent Order Paragraph 12(e) and a NPDES permit issued by DEQ. Chemours’s Addendum implementation activities report on:
 - Chemours Mass Loading Assessment: For the rolling four-quarter, Q1 2024 to Q4 2024, the calculated Total Quantifiable PFAS mass loading of 116 lbs was an 88% reduction from the baseline PFAS Mass loading of 947 lbs (Geosyntec, March 2025 [Cape Fear River PFAS Mass Loading Assessment – Fourth Quarter 2024](#)).
 - Long-term remedy performance monitoring report for Chemours four flow-through cells at seeps A-D.
 - Stormwater Sampling Plan report. The stormwater treatment system is consistently removing greater than 99.9% of PFAS and consistently captures stormwater runoff from precipitation events up to the 1-inch, 24-hour design.
- Toxicity study testing reports for aquatic and mammalian studies.
- Groundwater Remediation: On-going groundwater remediation activities are being conducted pursuant to Consent Order Addendum Paragraph 3.

Sections 19 and 20 - Provision of Public Water Supplies, Whole Building Filtration Systems and Reverse Osmosis (RO) Drinking Water Systems: As shown in the summary

- Table 12-6, Chemours continues to make significant progress in implementing the Consent Order requirements of Paragraphs 19 and 20. RO acceptance rates and installations have maintained a steady pace. Operation and maintenance activities for installed GAC systems continue uninterrupted. Bottled water services continued uninterrupted for 2,309 homes. Chemours is working on installation of water meters, where available, so that eligible residences can be connected to a public water system. Based on property owners’ preferences for permanent replacement drinking water, Chemours continues the installation of mitigation systems or connections to public water systems to those eligible residences and properties. Details are provided below in section [12.3.2.3](#).
- Private Well Testing: Private well testing has expanded as additional areas of concern have been identified. Details are provided below in section [12.3.2.4](#).

Chemours Consent Order reports are submitted to DEQ. For the most up to date reports see [Chemours Consent Order Compliance website](#).

Table 12-6: Chemours Replacement Drinking Water Actions Table from [2024 Fourth Quarter Consent Order Progress Report](#).

Replacement Drinking Water Actions

(Replacement drinking water actions from November 2018² - December 31, 2024)

Fayetteville Counties Area

Metric	Total	Cumberland	Bladen	Robeson	Sampson	Hoke
Eligibility for Replacement Drinking Water						
Total Number of Private Wells Above the CO Criteria Including Shared Well Users	7,789	6,885	342	338	224	0
Number of Sampled Private Wells Above the CO Criteria	7,255	6393	327	320	215	0
Number of Shared Private Well Users Above the CO Criteria	534	492	15	18	9	0
RO						
Total Number of Properties Sent an Offer Letter	5,892	5200	182	286	224	0
Total Number of Responses to RO Offers	4,406	3906	124	220	156	0
Total Number of Properties with RO Systems Installed	3312	2991	86	131	104	0
Total Number of Properties Connected to Public Water	216	166	10	25	15	0
RO Declines	121	109	1	6	5	0
GAC						
Total Number of Properties Sent an Offer Letter	1951	1696	184	69	2	0
Total Number of Responses to GAC Offers	1623	1431	139	51	2	0
Total Number of Properties with GAC System Installed	958	894	55	8	1	0
Total Number of Properties with Both RO and GAC Systems Installed	17	17	0	0	0	0
Total Number of Properties Connected to Public Water	166	96	45	25	0	0
GAC Declines	4	4	0	0	0	0
Locations without Permanent Replacement Drinking Water						
Total number of Locations Currently Being Provided Interim Replacement Drinking Water	2309	1981	131	129	68	0
Bottled Water Declines	113	101	6	2	4	0
Total eligible for any filtration who are not yet on any filtration or have declined bottled water	988	855	51	43	39	0

12.3.2.3 Consent Order Private Drinking Water Well Testing – Counties Near Chemours Facility

The 2019 Consent Order requires Chemours to sample private drinking water wells in the four counties (Bladen, Cumberland, Robeson and Sampson) near the Chemours Fayetteville Works facility. Under the Consent Order, residents qualify for replacement water supplies if any of the following apply to water in private drinking water wells:

- At or above 10 ppt or any applicable health advisory of GenX – qualifies for granular activated carbon (GAC) system, municipal water or reverse osmosis units for each sink in the house.

- At or above 70 ppt combined levels of PFAS compounds listed in [Attachment C \(Table 12-4\)](#) – qualifies resident for three under-sink reverse osmosis (RO) systems.
- At or above 10 ppt for an individual PFAS compound listed in [Attachment C \(Table 12-4\)](#) – qualifies resident for three under-sink reverse osmosis (RO) systems.

DEQ developed an informational private drinking water well sampling flyer in both English and Spanish – [“Questions about the well sampling process?”](#)

In June 2022, EPA finalized the GenX Health Advisory Level of 10 ppt which replaced the 2017 NCDHHS provisional drinking water health goal of 140 ppt. When the health advisory was updated, Chemours was required to review existing well sampling in the communities surrounding the Fayetteville Works facility to determine additional eligibility for whole house filtration and public water supply connections, in light of the revised health standards for GenX from the EPA.

As of December 31, 2024, as shown in the summary [Table 12-6](#), approximately 19,929 residences not connected to public water have been identified within the current study area, of which 13,432 have been sampled and 2,758 additional residences have received at least one initial sample offer letter, and 2,830 are vacant/empty lots. Current Step-out and Infill distance intervals range from 2.5 miles to 27.5 miles from the Chemours Fayetteville Works site. Chemours continues to collect samples from private drinking water wells, confirm residences/tenants/owners’ names, phone numbers and addresses and determine public water connections. See [Table 12-6](#) for the number of systems eligible and type of systems installed by county. For the most up to date numbers see the latest quarterly progress report on the [Chemours Consent Order Compliance website](#).

In March 2025, at DEQs direction, Chemours significantly expanded sampling eligibility for PFAS contamination in private drinking water wells around the Fayetteville Works plant to include portions of Harnett and Hoke counties ([DWM website](#)). Approximately 150,000 additional residences have now become eligible for private well testing in the expanded area, which includes significant portions of Cumberland, Bladen, Robeson, Sampson, Hoke, and Harnett counties. This will speed up the data collection process and provide access to clean water to impacted homeowners surrounding the facility.

12.3.2.4 Consent Order Private Drinking Water Well Testing – New Hanover, Pender, Columbus and Brunswick

Based on several studies (discussed below in Section [12.4](#)), in late 2021, DEQ determined that Chemours was likely responsible for contamination of groundwater monitoring wells and water supply wells in four downstream counties: New Hanover, Pender, Columbus and Brunswick. The Consent Order directed Chemours, among other things, to determine the extent of the PFAS contamination related to the Fayetteville Works site and provide replacement water supplies to affected residents.

At DEQ’s direction, Chemours has expanded sampling for PFAS contamination in private drinking water wells in the four downstream counties (November 3, 2021; [Table 12-2](#)). More than 14,000 additional residences may now qualify for sampling. For more information on well sampling eligibility criteria in the lower Cape Fear River area, please visit the DEQ [Well Sampling Information website](#). These include:

- The private well is the primary source of drinking water on the property, and;
- The private well is located within the 100-year floodplain associated with the Cape Fear River, or;

- The private well is within a quarter-mile of public water service lines or sanitary sewer networks, including area where PFAS may have seeped into surrounding aquifers, such as areas of leaking utility pipes, or direct injection or application of Cape Fear River water. Information obtained to date shows that these areas are within the public water distribution areas and captured by this criterion, or;
- The private well is within a quarter-mile radius of known Attachment C PFAS concentrations in private and non-private wells exceeding the 2019 Consent Order criteria.

Table 12-7 Chemours Four Counties Replacement Drinking Water Actions Table from [2024 Fourth Quarter Consent Order Progress Report](#).

Four Counties Interim Replacement Drinking Water Actions

Replacement drinking water actions from February 15, 2022, the start date of the Chemours Call Line in the Four Counties Area, through December 31, 2024.

Metric	Total	New Hanover	Brunswick	Pender	Columbus
Eligibility for Replacement Drinking Water					
Total Number of Private Wells Above the CO Criteria Including Shared Well Users	2,098	1,083	326	682	7
Number of Sampled Private Wells Above the CO Criteria	1,812	902	321	582	7
Number of Shared Private Well Users Above the CO Criteria	286	181	5	100	0
RO					
Total Number of Properties Sent an Offer Letter	1,814	895	241	671	7
Total Number of Responses to RO Offers	1,424	677	190	553	4
Total Number of Properties with RO Systems Installed	950	541	123	283	3
Total Number of Properties Connected to Public Water	178	10	23	145	0
RO Declines	9	6	1	2	0
GAC					
Total Number of Properties Sent an Offer Letter	269	176	83	10	0
Total Number of Responses to GAC Offers	241	158	73	10	0
Total Number of Properties with GAC System Installed	148	92	52	4	0
Total Number of Properties with Both RO and GAC Systems Installed	7	6	0	1	0
Total Number of Properties Connected to Public Water	13	0	8	5	0
GAC Declines	2	1	1	0	0
Locations without Permanent Replacement Drinking Water					
Total number of Locations Currently Being Provided Interim Replacement Drinking Water	818	436	126	252	4
Bottled Water Declines	9	4	0	5	0
Total eligible for any filtration who are not yet on any filtration or have declined bottled water	808	438	119	247	4

[Table 12-2](#) provides a general timeline for many of the regulatory actions taken to address Chemours and the PFAS contamination in the Cape Fear River. Actions by DEQ and EPA are ongoing, therefore, for the most complete and up-to-date actions and enforcements related to the Chemours investigation and Consent Order, see the [DEQ Recent Actions, Investigations and Enforcement webpage](#).

As of December 31, 2024, there are 34,789 addresses that have been screened for sample eligibility, and 11,823 met the criteria. Of these, 8,568 have been sampled with analytical results showing a total of 2,098 properties exceedances of the Consent Order Attachment C criteria, these include 1,812 private wells and 286 shared private wells ([Table 12-7](#)). There were 818 households provided with bottled water, 950 RO systems, 148 GAC systems, and 7 combination of both RO and GAC systems installed as well as 191 public water connections completed. For the most up to date numbers see the latest quarterly progress report on the [Chemours Consent Order Compliance website](#).

In September 2025, DEQ again expanded PFAS contamination sampling eligibility area for private wells in additional portions of New Hannover, Brunswick, Columbus and Pender County. Approximately 14,000 additional residence are now eligible for private well testing in the expanded area (9/3/2025 [expanded area map](#)). Additional information about well sampling for residents in this four-county area is available on the [DEQ website](#).

12.3.3 Bernard Allen Emergency Drinking Water Fund

DEQ's Action Strategy Implementation

- Protecting Communities**
- Protecting Drinking Water**

DEQ also launched a pilot program under the Bernard Allen Emergency Drinking Water Fund to support North Carolina residents that have PFAS contamination in their private drinking water wells. Funding for treatment systems will be provided to eligible residents with PFAS contamination that equals or exceeds health advisory levels, on a scale based on household income. The program is meant to address PFAS contamination when there is no designated responsible party that provides alternate drinking water. The Bernard Allen program supports DEQ's well sampling across the state and applications for the pilot treatment program will be provided to residents who meet the program criteria, as long as funding is available. For additional information see the [PFAS Treatment System Assistance Program](#) webpage.

12.3.4 Division of Water Infrastructure PFAS Funding Opportunities

DEQ's Action Strategy Implementation

- Protecting Communities**
- Protecting Drinking Water**
- Cleaning Up Existing Contamination**

The DEQ [Division of Water Infrastructure](#) (DWI) provides financial assistance through grants and low-interest loans to local government units for water and wastewater infrastructure projects to improve water quality. These projects include drinking water distribution systems, water treatment plans, sewer collection and treatment systems, stormwater management systems and stream restoration. Funds available to provide financial assistance are continually changing. In 2023, the NC legislature passed the 2023 Appropriations Act ([S.L. 2023-134](#)) which allocated \$2 billion for water and sewer infrastructure

projects in NC. See the [DWI website](#) for the most up to date funding opportunities and application requirements and due dates.

There have been several rounds of funding in 2023 and 2024 specifically offered to address emerging contaminants. This funding has been available to local government units, non-profit water corporations and investor-owned drinking water companies for planning or construction projects addressing PFAS in water or wastewater systems. More information is available on the DWI [Emerging Contaminant/PFAS Funding website](#).

12.3.5 State Surface Water, Groundwater and Drinking Water Standards Rulemaking

DEQ's Action Strategy Implementation

- ☑ **Protecting Communities**
- ☑ **Protecting Drinking Water**

Under Section 303 of the Clean Water Act (CWA) and Title 40 of the Code of Federal Regulations (40 CFR), states are responsible for adopting water quality standards necessary to protect designated best uses of a surface water body (e.g., drinking water supply, fish consumption, recreation). Both the CWA, 40 CFR, and NC law and regulations require that water quality standards must, among other things, “protect human health and welfare” (CWA 303(c)(2)(A), [40CFR 131.2](#), [NCGS 143-211\(c\)](#)). The standards consist of three required components:

- Designated uses of a waterbody such as aquatic life propagation and survival, recreation, shellfishing, drinking water, etc. Designated uses are communicated through the waterbody classification;
- Water quality standards necessary to protect the designated uses; and
- Antidegradation requirements.

In July 2023, DEQ initiated key steps to develop state surface water and groundwater standards for PFAS compounds ([Table 12-1](#)). In March 2024, during the Environmental Management Commission committee meetings, DEQ presented plans to draft rules to enact standards for eight PFAS compounds ([Table 12-8](#)). Completing the standards rulemaking process involves several key steps. First, the development of draft scientifically based standards using the latest available science. Any new draft standards, rulemaking language and regulatory impact analysis must then be approved by the EMC committees and the full EMC. Next, the proposed rules are published for public notice and comment, including public hearings. The EMC reviews the feedback and gives approval to adopt the rules. The Rules Review Commission (RRC) then reviews and approves the rules. Finally, for surface water standards, the EPA grants final approval before the new standards are implemented. For the latest PFAS standards rule development information see the [DEQ Water Quality PFAS Standards for North Carolina](#) webpage.

In North Carolina, a specific set of scientific data is needed to support the development of water quality standards for toxic substances for either surface or groundwater. The requirements are specified in NC statute [15A NCAC 02B .0208](#) for surface water and [15A NCAC 02L .0202](#) for groundwater. This includes high-quality scientific studies to understand which chemicals pose a human health concern, if the compounds are classified as carcinogenic or non-carcinogenic, and whether chemicals can bioaccumulate. This information is used to develop appropriate concentration levels (fixed or narrative) to protect human health, aquatic life and the environment. Without this background knowledge, an appropriate standard

cannot be developed. Water quality standards for additional PFAS compounds can be proposed in the future as more peer-reviewed scientific data becomes available. DEQ is currently working with the [Secretaries' Science Advisory Board](#) (SSAB) to review the newest scientific data available on PFMOAA (Perfluoro-2-methoxyacetic acid) to determine if there is enough knowledge to develop a scientifically defensible water quality standard. DEQ will pursue standards development when there is appropriate scientific data to support the development of such a standard. In 2017, the scope of the SSAB expanded beyond toxic air pollutants to focus on the impact of new and emerging chemicals. The board's role has been to assist DEQ and NCDHHS by examining new and emerging chemicals and providing guidance on how to manage the compounds to better protect public health and the environment.

Eight PFAS ([Table 12-8](#)) were initially selected for rulemaking because all eight have a significant literature base from which health effects can be determined; the literature bases for all eight PFAS compounds have been evaluated by a federal agency; all eight have health effects data to support the derivation of the necessary toxicological values; all eight have been detected in NC's surface and groundwater; and there is a final EPA test method for measuring these compounds in different environmental media ([DEQ, 2024a](#)).

Bioaccumulation Factors (BAFs) are used in the development of NC surface water quality standards as specified in 15 A NCAC 02B .0208. BAFs are determined by comparing fish tissue concentrations to water column concentrations from samples taken at the same location. To further understand bioaccumulation of PFAS in NC and to support NC surface water standards development, DEQ studied fish in the Cape Fear River.

An agency must also prepare a regulatory impact analysis (RIA) for any permanent rulemaking, or rule changes as required by G.S. 150B-21.4. The purpose of conducting a regulatory impact analysis or fiscal note is to improve rule design, inform decision-makers and communicate with the regulated community and the public. These analyses identify, describe and quantify the expected effects (costs and benefit) of the proposed rule to the extent possible.

12.3.5.1 Surface Water Standards

In 2024, DEQ presented surface water PFAS standards and discussed implementation plans and schedules with the regulated and non-regulated watershed stakeholders for feedback. DWR also presented this information and an Office of State Budget and Management (OSBM) approved draft RIA or fiscal analysis to the Water Quality Committee of the EMC ([Table 12-8](#)).

In September 2024, the Water Quality Committee did not move forward with proposed PFAS standards and the RIA. The motion that was made and passed was "the EMC Water Quality Committee does not accept nor take any action related to the RIA benefits category human health benefits also cited as human health in Table 20 or in Appendix F and the section entitled estimated exposure to food containing PFAS in North Carolina until members of the EMC meet with the FDA and receive a written response that the information related to food in the US and NC is accurate" (WQC September 2024 [meeting minutes](#) and meeting [materials](#) and [RIA](#)). The September WQC members proposed working with the Department to come up with alternative rulemaking to include wastewater monitoring requirements and development of PFAS source-reduction plans for all NPDES permitted dischargers and significant industrial users. The Department will continue to work with the EMC to develop rulemaking to protect surface waters for all uses. This process will be reported on [DEQ](#) and the [EMC's](#) webpages. Please see these pages for the latest information regarding PFAS surface water related rulemaking and standards development.

Table 12-8: 2024 DEQ Proposed PFAS Surface water and Groundwater Standards.

PFAS Compounds	Surface Water 02B		Groundwater 02L	EPA Limit of Quantification or PQL (ppt)
	Water Supply Standard (ppt)	Non-Water Supply Standard (ppt)	Calculated 02L Standard (ppt)	
PFOS*	0.06	0.06	0.7 [^]	4.0
PFOA*	0.001	0.01	0.001 [^]	4.0
HFPO-DA (GenX)	10	500	10 [^]	5.0
PFBS	2,000	10,000	2,000	3.0
PFBA	6,000	200,000	7,000	5.0
PFHxA	3,000	200,000	4,000	3.0
PFNA	9	20	10	4.0
PFHxS	10	70	10	3.0

PQL – Practical Quantification Limit, the lowest concentration that can be reliably achieved within specified limits of precision and accuracy; ppt = ng/L;
 *Proposed health-based standards for PFOA and PFOS are below detection limits. Permit effluent limits will be determined based on 4 ppt as reported in EPA Method 1633A as a Limit of Quantification based on the national lab Multi-Laboratory Validation Study of PFAS by Isotope Dilution LC-MS/MS in Wastewater, Surface Water, and Groundwater.
[^]Three PFAS compounds approved September 12, 2024, by the full EMC to go out for public comment - [Link](#); Standards approved and effective November 1, 2025.
 EMC archived meeting materials are available [here](#).

12.3.5.2 Groundwater Standards

In North Carolina, contaminants not currently included in general statute 15A NCAC 02L groundwater standards, such as PFAS, are covered under section 02L .0202 (c) which states in part: “substances which are not naturally occurring and for which no standard is specified shall not be permitted in concentrations at or above the practical quantitation limit.” This allows for protection from all detectable PFAS compounds until such time a groundwater standard can be developed based on the availability of appropriate toxicity information.

In 2024, DEQ presented draft groundwater standards for eight PFAS compounds to stakeholders to get feedback on the proposed standards, implementation plan and schedule ([Table 12-1](#) and [Table 12-8](#)). In July 2024, the Groundwater and Waste Management Committee (GWWMC) of the Environmental Management Commission (EMC) requested DEQ bring forth a proposed rulemaking package to adopt new groundwater standards for three PFAS compounds (PFOA, PFOS, and GenX/HFPO-DA), which was presented on September 11 and 12, 2024 ([GWWMC](#) and [EMC Meeting Links](#)). The proposed standards and the RIA were approved by the EMC to go out to public notice and comment at that meeting. The public comment period was from November 1, 2024, through December 31, 2024.

Following a public comment period and public hearings, DWR presented the Hearing Officers’ report and proposed PFAS groundwater standards to the full EMC at their September 2025 meeting (EMC [Item 25-35 link](#)). The EMC approved the report and adopted the proposed rule amendments to establish the groundwater standards for PFOA, PFOS, and GenX. The rule and the three PFAS groundwater standards became effective on November 1, 2025. For the latest PFAS standards rule development information see the [DEQ Water Quality PFAS Standards for North Carolina](#) webpage. For more information on DEQ’s

actions, available sampling results, and ways for residents to reduce PFAS exposures, visit the [Understanding PFAS webpage](#).

Ultimately, rulemaking actions will support the Department's work to limit PFAS discharges to the environment and protect public health and address remediation efforts to clean up existing contamination at sites with known PFAS detections. State standards would also complement the proposed federal drinking water standards and support source reduction efforts in North Carolina. Reducing PFAS at the discharge source is the most cost-effective way to protect public health and lower the cost of meeting the federal drinking water standards. The proposed surface water and groundwater rules protect public health and ensure residents do not bear the entire cost of removing PFAS from drinking water.

12.3.5.3 Public Drink Water Standards

DWR's Public Water Supply Section (PWS) has the responsibility of implementing and enforcing provisions of the federal Safe Drinking Water Act. DWR enforces public drinking water standards that are based on the federal regulations set by the EPA and are generally incorporated by reference into NC's water supply rules found in [15A NCAS 18C](#). These standards establish maximum contaminant levels (MCLs) for various contaminants and are legally enforceable for public water supply systems. Public water systems must meet these standards by a certain date to ensure public health. NC public water supply rules are approved by the state [Commission for Public Health](#) which adopts rules for public water supply systems under statutory authority Chapter 130A Article 10. The EMC is responsible for setting surface and groundwater quality standards and regulations as described above. The EMC however, received an overview of drinking water standards and development of regulations in May 2024 ([presentation](#)).

On April 10, 2024, the EPA announced a National Primary Drinking Water Regulation to limit six PFAS compounds in public drinking water systems.

- PFOA = 4.0 ppt
- PFOS = 4.0 ppt
- HFPO-DA/GenX = 10 ppt
- PFNA = 10 ppt
- PFHxS = 10 ppt
- Also includes a Hazard Index (HI) calculation to limit mixtures of GenX chemicals, PFNA, PFHxS and PFBS.

EPA established legally enforceable levels for these PFAS in drinking water and gave public water systems until 2029 to comply with the MCLs. The EPA approved National Primary Drinking Water Regulations are covered in detail in the EPA PFAS Actions section ([12.3.9.2](#)) below.

DEQ accepted public comments on the proposed PFAS public drinking water standards (15A NCAC 18C .1540) in early 2025 ([DEQ press release](#), Dec. 2024). The rules were approved by the Commission for Public Health and the NC Rules Review Commission (RRC) and went into effect on September 1, 2025. The rule incorporates the PFAS National Primary Drinking Water Regulation by reference and includes any subsequent amendments and editions made to the federal rule.

15A NCAC 18C .1540 CONTROL OF PER- AND POLYFLUOROALKYL SUBSTANCES

The provisions of 40 C.F.R. 141, Subpart Z – Control of Per- and Polyfluoroalkyl Substances (PFAS) are hereby incorporated by reference including any subsequent amendments and editions. Copies for public inspection are available at no cost from the United States Federal Register at <https://www.federalregister.gov/documents/2024/04/26/2024-07773/pfas-national-primary-drinking-water-regulation#p-amd-25> or from the EPA's Drinking Water Hotline at 1-800-426-4791.

*History Note: Authority G.S. 130A-315; 130A-320(c); P.L. 93-523; 40 C.F.R. 141;
Eff. September 1, 2025.*

On May 14, 2025, the EPA announced “the agency will keep the current National Primary Drinking Water Regulations (NPDWR) for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS)” however they intend to extend the compliance date to 2031. The EPA also announced the “intent to rescind the regulations and reconsider the regulatory determination for PFHxS, PFNA, HFPO-DA (commonly known as GenX), and the Hazard Index mixture of these three plus PFBS”. As of September 2025, these standards are still in place and the extension has not been formally finalized. For more information, see EPA’s [press release](#).

DEQ has been working with public water supply systems across the state to prepare for these regulations and assessing PFAS in their systems. Detailed information on the public water supply monitoring efforts and data are included below in section [12.4.2](#).

12.3.6 NPDES Permitting Requirements

DEQ’s Action Strategy Implementation

- Protecting Communities**
- Protecting Drinking Water**
- Cleaning Up Existing Contamination**

In a December 5, 2022, memorandum entitled, “[Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs](#),” EPA provided approval authorities with recommended National Pollution Discharge Elimination System (NPDES) program actions for Publicly Owned Treatment Works (POTWs). EPA identified industrial categories known or suspected to discharge PFAS, including organic chemicals, plastics and synthetic fibers (OCPSF), metal finishing, electroplating, electric and electronic components, landfills, centralized waste treaters (CWTs), pulp, paper & paperboard, leather tanning & finishing, plastics molding and forming, textile mills, paint formulating and airports.

Since indirect industrial dischargers are identified as part of the controlled wastewater loading to the POTW [15A NCAC 02B .0202 (33)], to assess the industrial contribution of PFAS and assess levels of PFAS compounds in the facility’s effluent, investigative monitoring for PFAS is required at the POTWs effluent and samples collected should be representative of the typical wastewater discharged from their facility. Such investigative actions can be required under 15A NCAC 02B .0508 (b)(2) and G.S. 143-215.66.

12.3.6.1 Pretreatment Program

The Municipal Pretreatment Programs have the regulatory authority to control the discharge of industrial wastewater into municipal POTWs. The objectives of the Pretreatment Program are to prevent pass-through, interference or other adverse impacts to the POTW, its workforce or the environment, and to assure that all categorical pretreatment standards are met. There are more than 600 Significant Industrial Users (SIUs) who discharge industrial wastewater to more than 125 POTWs through the state of North Carolina's oversight. A Significant Industrial User (SIU) in the EPA's pretreatment program is an industrial facility that, due to its wastewater discharge, has a high potential to negatively impact a Publicly Owned Treatment Works (POTW) or violate pretreatment standards. SIUs include all Categorical Industrial Users (CIUs) and other industrial users meeting specific criteria related to discharge volume or impact on the POTW.

The 2022 EPA memo described above provided guidance to states and POTW pretreatment programs to help identify and locate each SIU in industry categories expected or suspected of PFAS discharges to their treatment works and begin sampling and/or modify Industrial User Permits (IUPs) for each SIU identified as suspected PFAS dischargers to ensure appropriate sampling occurs. This information is to be provided to DWR as part of their Pretreatment Annual Report, due in March of each year. The POTWs Industrial Waste Survey (IWS) inventory should also be revised, as necessary, to include all indirect dischargers in the industry categories expected or suspected of PFAS discharges.

DWR has determined that the discharge from EPA targeted SIUs, industries likely to have PFAS in their discharge, should analyze for PFAS quarterly unless the POTW provides an alternate PFAS sampling plan for the divisions approval to be included in their NPDES permit. Collection and evaluation of this information will also assist the Department in developing sound policies with respect to PFAS in the environment.

In the absence of local limits, and based upon data as they become available, POTWs should encourage Best Management Practices (BMPs), pollution prevention, product substitution and good housekeeping practices to make meaningful reductions in PFAS introduced to the POTWs. Such BMPs could be similar to those included in the EPA Office of Water, December 5, 2022, memorandum, "[Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs](#)," Section 3 "Best Management Practices (BMPs) for discharges of PFAS, including product substitution, reduction, or elimination of PFAS, as detected by method 1633."

The POTW should modify or reissue the IUP to include EPA PFAS [Pollution Prevention Strategies](#), as necessary, or use other Pretreatment Program mechanisms to address PFAS discharges to POTWs.

12.3.6.2 NPDES Permit Program

All wastewater dischargers to surface waters in NC must receive a NPDES permit to control wastewater discharges (15A NCAC ##). The NPDES program within DWR is responsible for the issuance of wastewater discharge permits. This process includes determining the quality and quantity of treated wastewater that a receiving stream can assimilate in order to protect the designated uses as described above.

Based on the 2022 EPA memo, DWR-NPDES permitting staff are adding PFAS monitoring requirements to industrial direct dischargers who are likely to have PFAS in their process wastewaters. Sampling requirements are being added during permit renewals, expansions, or when a new permit is requested. See [Figure 12-4](#) for map of POTW and industrial direct dischargers sampling for PFAS as of August 1, 2025.

In the future, as NC surface water quality standards and the EPA’s national primary drinking water regulations for PFAS compounds are established, implementation of these standards will require permittees to comply with discharge concentrations which protect drinking water supplies and fish consumption downstream of their facilities. As a step towards achieving this goal, the EMC Water Quality Committee (WQC) passed the following motion on November 13, 2024 - *“The WQC directs DWR staff to develop a PFAS Minimization Initiative for major and minor industrial direct dischargers to surface water and all Significant Industrial Users (SIUs) that discharge to Publicly Owned Treatment Works (POTWs). The minimization initiative will require monitoring for PFAS, and implementation of minimization activities required to eliminate or significantly reduce discharges of PFOS, PFOA, and GenX, (levels TBD) over a 3-to-5-year period.”* The PFAS minimization plan rules (15A NCAC 02B .0512 and 15A NCAC 02H .0923) and the OSBM approved Minimization Rules Fiscal Note were presented at the Sept. 2025 WQC meeting.

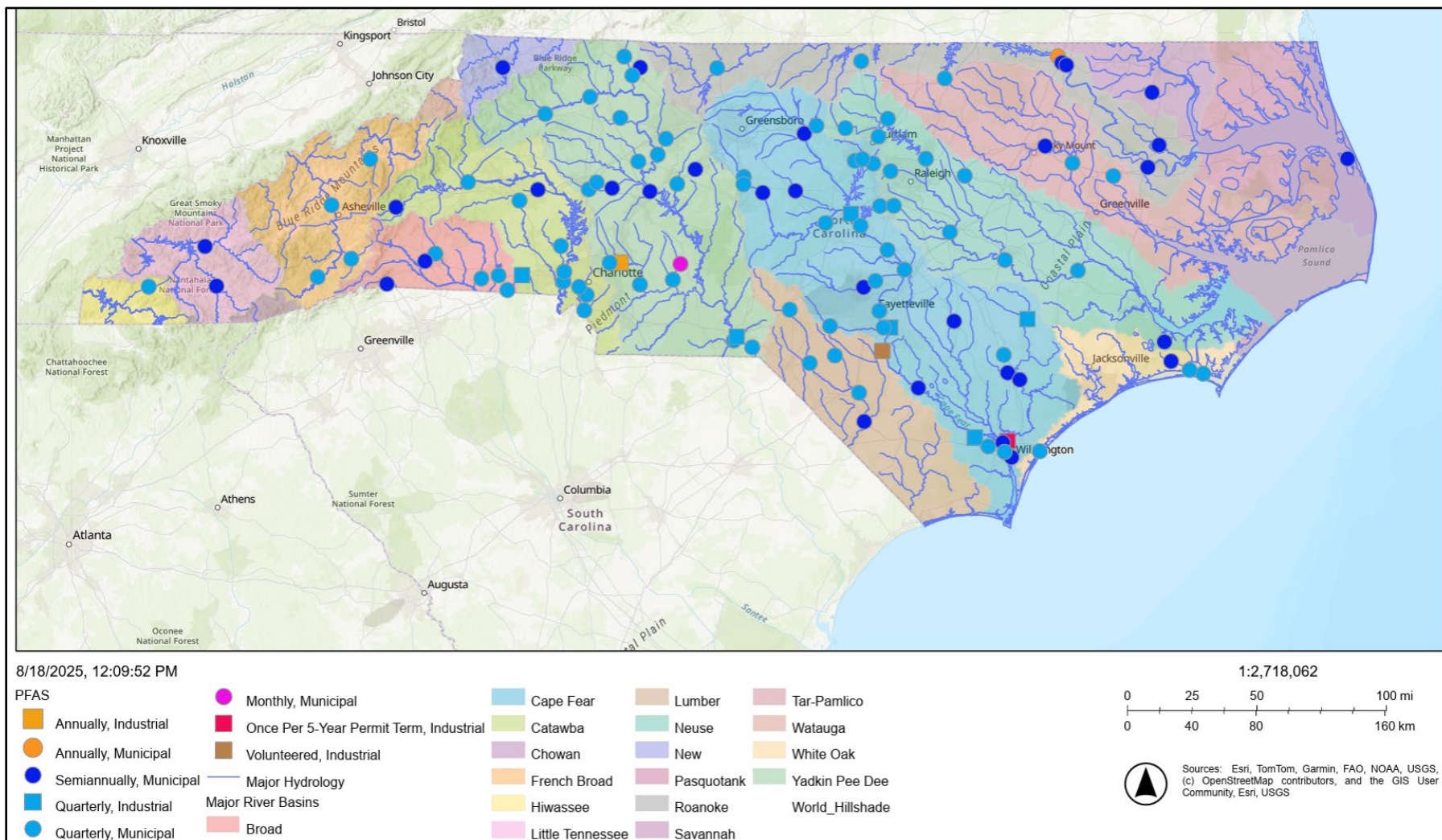
The overarching goal of the Minimization Rules is to expedite the sampling and minimization of PFAS compounds at the source. In NC, there are approximately 126 POTWs with pretreatment programs, 595 significant industrial users (SIUs), and 216 industrial direct dischargers that will be required to perform baseline PFAS monitoring. SIUs and industrial direct dischargers will then determine if they need to develop a PFAS minimization plan based on their sampling results ([Table 12-9](#)).

Table 12-9 Number of Facilities Anticipated to Conduct Baseline and Continued Monitoring and Develop a Minimization Plan (June 6, 2025 OSBM approved Fiscal Note for Rules 15A NCAC 02B .0512 and 02H .0923).

Permit/Facility Type	Baseline Monitoring	Continued Monitoring Only	Continued Monitoring and Minimization Plans
Significant Industrial Users	595	N/A	583
Industrial Direct Dischargers	216	N/A	154
POTWs with Pretreatment Programs	126	126	N/A

As of early 2026, DEQ has been working with the Environmental Management Commission to develop monitoring and minimization rules for 1,4-dioxane and three PFAS compounds. The goal of these rules are intended to achieve two key objectives: (1) Characterize the presence of PFOS, PFOA and GenX in NPDES discharges (Publicly Owned Treatment Works (POTWs) with Significant Industrial Users (SIUs) and industrial direct dischargers to surface waters), and (2) require affected entities to develop minimization plans that identify approaches to reduce these emerging compounds discharged directly or indirectly to surface waters ([Fiscal note, April 23, 2025](#)). The PFOS, PFOA, and GenX Monitoring and Minimization plan rules ([15A NCAC 02B .0512 and 15A NCAC 02H .0923](#), March 2026 proposed version) along with their OSBM approved Minimization Rules Fiscal Notes were presented to the January 2026 EMC ([EMC meeting link](#)). The EMC approved the proposed PFAS rule with amendments, allowing the specific questions and associated fiscal notes to proceed to a public comment period. Three public hearings will be held with public comments accepted between March 16 and June 15, 2026. For specific details on the 2026 public hearings and submission of public comments, see the DEQ press release for [PFAS](#).

Figure 12-4 NPDES Industrial Direct Dischargers (squares) and Municipal (circles) Wastewater Treatment Plants with Permit PFAS Monitoring Requirements and Frequencies (August 2025).



12.3.7 PFAS Monitoring Requirements for Solid Waste Sanitary Landfills

DEQ's Action Strategy Implementation

- ☑ **Protecting Communities**
- ☑ **Protecting Drinking Water**
- ☑ **Cleaning Up Existing Contamination**

As previously described, PFAS-containing products are widely used in commercial and consumer products and many of these products and by-products are commonly disposed of in solid waste landfills. In [March 2023, DEQ's DWM, Solid Waste Section](#) sent a letter to all solid waste directors and landfill owners/operators notifying them of new PFAS monitoring requirement as part of their normal monitoring protocols ([July 2023 DEQ DWM follow letter](#) with clarifying information).

The Solid Waste Section requires that all groundwater, surface water, underdrains and leachate samples collected at solid waste sanitary landfills after July 1, 2023, be analyzed for PFAS. These include any active, inactive, or closed sanitary landfills currently conducting and reporting water quality or leachate sampling results to the Section.

Sanitary landfills are defined in [15A NCAC 13B .0101 \(49\)](#) and [G.S. 130A-290 \(31\)](#) and include all municipal solid waste landfills, construction and demolition landfills, industrial landfills (including coal ash) and tire monofils.

PFAS samples are to be collected from each specified monitoring location for two consecutive sampling events based on the facility's regular water quality monitoring schedule as required by the facilities permit and/or most current approved water quality monitoring plan. Surface water samples must include at least one upstream and one downstream sampling location.

The Solid Waste Section will work with the facilities on any additional monitoring requirements beyond the initial two sampling efforts and decisions on further monitoring will be site-specific and depend on several factors including the results reported, the need for further confirmation or source determination, potential offsite receptors (for protection of human health and the environment), and/or regulatory development such as new rules or Department policies.

The [March 2023 memorandum](#) included the requirement to use EPA PFAS Method 1633 and to test for all 40 PFAS compounds covered under this method. The results are required to be submitted as part of their monitoring report submittal and laboratory data must be submitted in accordance with DEQ electronic data deliverable format (EQUIS).

This requirement is in conjunction with the DEQ's Action Strategy for PFAS to manage the risks of PFAS in the State. Collection and evaluation of this information will also assist the Department in developing sound policies and procedures with respect to PFAS in the environment.

As of December 2024, all 278 landfill facilities required to conduct PFAS monitoring have completed at least one sampling event ([March 2025, Groundwater and Waste Management Committee meeting](#)). Data and DWM Site Locator Tool is available online at the [DWM PFAS Solid Waste Landfill Data webpage](#).

12.3.8 Aqueous Film Forming Foam (AFFF) Take-Back Program

DEQ's Action Strategy Implementation

- ✓ **Protecting Communities**
- ✓ **Protecting Drinking Water**
- ✓ **Cleaning Up Existing Contamination**

Aqueous Film Forming Foam (AFFF) is a PFAS-based firefighting agent used to extinguish flammable liquid fires like jet fuel. AFFF works by forming a film over flammable liquids, separating the fuel from oxygen and extinguishes the fire. The use and disposal of AFFF during firefighting and training activities has led to contamination of surface and groundwater around NC, as shown through work done by the [NC PFAS Testing Network](#) and others. AFFF are being phased out due to health and environmental concerns. The NC General Assembly directed the [NC Collaboratory](#) to design a [AFFF Take-Back Program](#) to assist fire departments and airports across the state with removal and safe disposal of their AFFF inventory. The NC Collaboratory is partnering with officials and staff from the [Office of the State Fire Marshal](#) and DEQ, as well as academic researchers to execute the program.

The program benefits include:

- Removes the financial burden of fire departments wishing to dispose of their AFFF.
- Prevents the further use and release of AFFF into the environment.
- Create a safe mechanism for the destruction and disposal of AFFF.

DEQ continues to work with the NC Collaboratory to sample fire stations and the surrounding communities serviced by private wells for potential PFAS contamination. For more information see the NC Collaboratory AFFF Take-Back Program [website](#).



12.3.9 EPA PFAS Actions

12.3.9.1 EPA's Strategic Roadmap

In October 2021, EPA announced the Agency's "[PFAS Strategic Roadmap](#)" - laying out a whole-of-agency approach to addressing PFAS." The roadmap set out timelines by which the EPA plans to take specific actions and develop new policies to safeguard public health, protect the environment and hold polluters accountable.

EPA's integrated approach to PFAS is focused on three central directives:

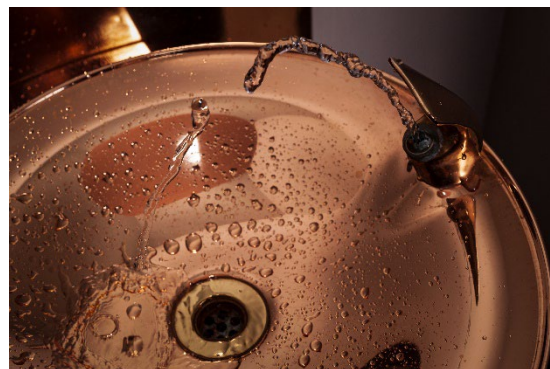
1. **Research.** Invest in research development and innovation to increase understanding of PFAS exposures and toxicities, human health and ecological effects and effective interventions that incorporate the best available science.
2. **Restrict.** Pursue a comprehensive approach to proactively prevent PFAS from entering air, land and water at levels that can adversely impact human health and the environment.
3. **Remediate.** Broaden and accelerate the cleanup of PFAS contamination to protect human health and ecological systems.

For more specific information see the [PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024](#) website and see the November 2024 [EPA's PFAS Strategic Roadmap: Three Year Progress](#) report for what has been completed thus far.

12.3.9.2 Final PFAS National Primary Drinking Water Regulation

On March 14, 2023, the EPA announced the proposed drinking water maximum contaminant levels (MCLs) for two PFAS compounds and defined a Hazard Index (HI) which included four additional ones. On April 26, 2024, EPA published the final approved standards for five individual PFAS compounds and set a Hazard Index level for two or more of four PFAS compounds as a mixture ([Table 12-10](#)).

The National Primary Drinking Water Regulations (NPDWR) are legally enforceable drinking water standards that apply to public water systems. The MCL reflects the level that protects human health and that water systems can achieve using the best available technology. The Maximum Contaminant Level Goal (MCLG) is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of individuals would occur ([NCDHHS fact sheet](#), 2023). MCLG's are non-enforceable targets. EPA estimates that this action will reduce PFAS exposure for approximately 100 million people across the United States and prevent thousands of deaths, and tens of thousands of



illnesses due to drinking contaminated water. More information is also available on the EPA’s [NPDWR website](#), [EPA fact sheet](#) and DEQ’s [Understanding PFAS webpages](#).

Table 12-10 EPA Final National Primary Drinking Water Standards for Six PFAS Compounds (EPA website). (May 14,2025 – See note below for modification to EPA Standards. The table was not modified to reflect the EPA’s intended change.)

PFAS Compound		MCLG (Non-Enforceable Health-Based Goals)	MCL (Enforceable Levels)
Perfluorooctanoic Acid	PFOA	Zero	4.0 ppt
Perfluorooctane Sulfonic Acid	PFOS	Zero	4.0 ppt
Perfluorononanoic Acid	PFNA	10 ppt	10 ppt
Perfluorohexanesulfonic Acid	PFHxS	10 ppt	10 ppt
Hexafluoropropylene Oxide DimerAcid	HFPO-DA (GenX)	10 ppt	10 ppt
Mixture containing two or more of PFNA, PFHxS, HFPO-DA (or GenX) and PFBS * ²		Hazard Index 1 (unitless) * ¹	Hazard Index 1 (unitless) * ¹
ppt or parts per trillion; ppt units are equivalent to ng/L; MCLG = Maximum Contaminant Level Goal (non-regulatory); MCL = Maximum Contaminant Level (Enforceable, regulatory value); * ¹ Hazard Index Value is based on calculation listed below; * ² PFBS is Perfluorobutanesulfonic acid			

The final National Primary Drinking Water Regulations for public water systems include:

- Enforceable Maximum Contaminant Level (MCL) for PFOA and PFOS of 4 ppt (a level that can be reliably measured by most labs working with EPA approved methods).
- Enforceable Maximum Contaminant Level (MCL) for PFNA, PFHxS and HFPO-DA (GenX) of 10 ppt.
- Rule would regulate a mixture of two or more of GenX, PFNA, PFHxS and PFBS through the use of a Hazard Index calculation to determine if the combined levels of these PFAS compounds pose a potential risk to human health. To be defined as a “mixture” at minimum two of the four compounds that are included into the HI have to be detected.

$$\text{Hazard Index} = \left(\frac{[\text{GenX}_{\text{water}}]}{[10 \text{ ppt}]} \right) + \left(\frac{[\text{PFBS}_{\text{water}}]}{[2000 \text{ ppt}]} \right) + \left(\frac{[\text{PFNA}_{\text{water}}]}{[10 \text{ ppt}]} \right) + \left(\frac{[\text{PFHxS}_{\text{water}}]}{[10 \text{ ppt}]} \right)$$

The National Primary Drinking Water Regulations require public water systems to:

- Monitor for these six PFAS and have three years to complete initial monitoring (by 2027), followed by ongoing compliance monitoring.
- Notify the public of the levels of these PFAS beginning April 26, 2027.
- Implement solutions that reduce these PFAS if monitoring shows that drinking water levels exceed these MCLs and provide notification to the public of the violation beginning April 26, 2027.

More information about the NPDWR can be found on [EPA's website](#). DEQ is working with public water systems across the state to provide technical assistance and funding where appropriate, as they prepare for compliance with the MCLs. DWR's PWS Section will adopt the NPDWR requirements into rule ([15A NCAC 18C- Water Supplies](#)) in the near future.

Through the 2022 [Infrastructure Investment and Jobs Act](#), the EPA is helping states, Tribes and local communities to leverage billions of dollars in funding dedicated to investments in infrastructure solutions. Those investments will allow communities to remove emerging contaminants like PFAS from their drinking water. The EPA's free [Water Technical Assistance programs](#) are also available to support communities to develop plans, build technical, managerial and financial capacity, and apply for water infrastructure funding.

On May 14, 2025, EPA announced that they “will keep the current National Primary Drinking Water Regulations (NPDWR) for PFOA and PFOS. As part of this action, EPA also announced its intent to extend the PFOA and PFOS Maximum Contamination Level compliance deadlines by two years and establish a federal exemption framework. Additionally, EPA announced its intent to rescind the regulations and reconsider the regulatory determination for PFHxS, PFNA, HFPO-DA (commonly known as GenX), and the Hazard Index mixture of these three PFAS plus PFBS to ensure the determination and any resulting drinking water regulation follow the Safe Drinking Water Act process” (EPA [website](#)). As of September 2025, the original NPDWR standards ([Table 12-10](#)) and timeline are still in place and the extension has not been formally finalized. For more information, see EPA's [press release](#).

12.3.9.3 EPA Interim Guidance on Destroying and Disposing of Certain PFAS and PFAS-Containing Materials

On April 9, 2024, concurrent with the release of the final PFAS National Primary Drinking Water Regulation rule (discussed above section [12.3.8.2](#)), EPA also released an updated “[Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances](#)” (Version 2). The guidance reflects the best available science to provide information that managers of PFAS wastes can use to evaluate the most appropriate destruction, disposal or storage method among those currently available. The updated guidance can help decision-makers and private industry make informed decisions on PFAS destruction and disposal technologies, and aid in the implementation of forthcoming rules to protect public health from exposure to PFAS. The EPA is required to update the guidance at least every three years.

12.3.9.4 PFAS Designation of PFOA and PFOS as a Hazardous Substance

On April 19, 2024, EPA announced a final rule to designate PFOA and PFOS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund. EPA is designating PFOA and PFOS as hazardous substances under CERCLA based on significant evidence, including epidemiological and toxicological studies, that when released into the environment, they may present a substantial danger to public health, welfare or the environment.

The “CERCLA designation will help protect public health and the environment from potentially harmful exposure to these chemicals and will provide tools to hold polluters accountable” ([EPA website](#)). EPA will focus on holding accountable those parties that have played a significant role in releasing or exacerbating the spread of PFAS into the environment, such as those who have manufactured PFAS or used PFAS in the manufacturing process and other industrial parties. EPA does not intend to pursue otherwise potentially responsible parties where equitable factors do not support seeking response actions or costs under CERCLA, including but not limited to:

1. Community water systems and publicly owned treatment works (POTWs);
2. Municipal separate storm sewer systems (MS4);
3. Publicly owned/operated municipal solid waste landfills;
4. Publicly owned airports and local fire departments; and
5. Farms where biosolids are applied to the land

([April 19, 2024 PFAS Enforcement Discretion and Settlement Policy Under CERCLA Memorandum](#)).

According to the EPA, the “designation of PFOA and PFOS as CERCLA hazardous substances does not require waste to be treated in any particular fashion, nor disposed of at any specific particular type of landfill. The designation also does not restrict, change, or recommend any specific activity or type of waste at landfills” ([EPA question and answer website](#)).



12.4 DEQ Associated PFAS Studies and Monitoring Efforts to Support the Action Strategy (DWR, DWM, DAQ, DMF)

DEQ, along with NCDHHS, began investigating the presence of GenX and other PFAS identified in the Cape Fear River in June 2017. Many of the divisions within DEQ have worked tirelessly to monitor surface water, groundwater, drinking water and wastewater as well as fish tissue, air, rainwater and soils samples.

DEQ studies have assessed the magnitude and distribution of different types of PFAS across the state in drinking water supply rivers and reservoirs as well as some post-water supply treatment processing (finished drinking water). The studies detailed below started as early as 2018, when the development of sampling and analytical techniques were being developed. It is important to understand that over the six-year timeframe of these monitoring studies, our scientific understanding of human health impacts, as well as laboratory analytical techniques and laboratory capacity, have changed significantly. The initial studies looked at a smaller number of PFAS compounds with much higher laboratory minimum reporting limits (MRL) or practical quantitation limits (PQL), meaning the laboratory analysis were much less sensitive to the low levels of PFAS generally found in surface waters.

Surface water samples, as well as the many other matrices, were assessed at multiple laboratories, including private labs around the country, as well as by the EPA Region 4 Science and Ecosystems Support Division's Analytical Services Branch laboratory and the DWR chemistry laboratory in Raleigh. In 2020, DWR expanded the Organic Chemistry Branch to include the capability of analyzing PFAS allowing for increased analytical capacity and lower detection levels. PFAS results are reported in parts per trillion (ppt), which is equivalent to nanograms per liter (ng/L).

Over the last several years EPA has worked with laboratories across the country to develop the best PFAS testing methods. All drinking water PFAS analyses completed by DEQ between 2022 and 2024 assess the concentration of 57 PFAS analytes using test *method 537.1*. EPA updated the original 537 method introduced in 2009, which was previously used extensively as the approved drinking water PFAS method for the EPA Unregulated Contaminant Monitoring Rule (UCMR) cycle 1 through 3 ([Table 12-11; Unregulated Contaminant Monitoring Rule Methods](#)).

As of January 31, 2024, EPA completed analytical Method 1633, which includes 40 PFAS compounds in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate and fish tissue ([Table 12-11](#)). In December 2024, EPA modified 1633 to what is now [Method 1633A](#) to address various minor editorial issues and as clarifies several technical concerns identified in the previous version. The EPA is required to codify the Method 1633A in the Federal Register through their rulemaking process before Method 1633A can be used for Clean Water Act (CWA) compliance monitoring. According to the EPA, Method 1633A is currently a valid analytical method for general water quality assessment purposes.

DWR revising rule [15 A NCAC 02H .0804](#) (d)(19) (*Parameters For Which Certification May Be Requested*) to include PFAS to the list of parameters that DWR can certify laboratories to use the EPA methods for testing and certifying PFAS results. This rule became effective on September 1, 2024. For more information see the [Certification Rules and Regulations webpage](#).

Table 12-11: EPA Testing Methods for PFAS Laboratory Analysis.

Date	EPA Test Method Number and Usage	Links
2009	Drinking water methods 537 for PFAS UCMR3 study	Link
2019	Drinking water methods 533 for PFAS UCMR5 study	
2020	Drinking water methods 537.1, Rev 2.0 for PFAS UCMR5 study Relies on solid phase extraction and LC/MS/MS (Liquid Chromatography/Tandem Mass Spectrometry)	Link
January 31, 2024	EPA recommends use of test Method 1633: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS, a method to test for 40 PFAS compounds in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate and fish tissue.	Link EPA website
December 2024	EPA Method 1633A: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS Note: The method is not nationally required for CWA compliance monitoring until the EPA has promulgated it through rulemaking, the EPA recommends it now for use in individual permits. Expected to be published in the Code of Federal Regulations within a few months (40 CFR 136). Method 1633A, supersedes all previous versions, addresses various minor editorial issues as well as clarifies several technical concerns identified in the previous Method 1633 version.	Link EPA website

During this same time period, the EPA changed the human health advisory levels, lowering the concentrations in which human health could be affected. In 2018, the EPA’s health advisory in finished drinking water was 70 ppt for PFOA and PFOS, or a combination of the two (PFOA + PFOS). On June 15, 2022, EPA updated their interim health advisory in finished drinking water for PFOA and PFOS to 0.004 and 0.02 ppt respectively. They also established final health advisories for GenX at 10 ppt and for PFBS at 2,000 ppt ([EPA, 2022](#)). Health Advisory levels identify the concentration of a compound in drinking water below which adverse health effects in the most sensitive populations are not anticipated to occur over a specific exposure duration. A health advisory value is not a legally enforceable federal standard and is subject to change as additional information becomes available. On April 10, 2024, EPA also released the Final PFAS National Primary Drinking Water Regulation for six PFAS (discussed in the detail above in section [12.3.8.2](#); [Table 12-10](#)).

DWR’s emerging compound strategy is focused on expanding our knowledge of impacts from PFAS and GenX contamination on groundwater, public water supplies and surface water. The goal is to better understand the extent of contamination in the Cape Fear River Basin and across the state, so DEQ can identify and better support those that need assistance in providing safe drinking water and to take action to reduce and eliminate the discharge of PFAS compounds.

DEQ began studying the impacts of PFAS on the environment and on resources DEQ is charged with protecting. Many of the studies done within DEQ are briefly described below. DEQ is continuing to research and study this issue, and readers are advised to get the most up-to-date information from DEQ’s website as there are continued efforts to identify and mitigate sources of PFAS. Findings from these studies have guided DEQ’s actions and regulatory responses and continues to guide the development of regulatory strategies to protect the environment and public health. These studies support the DEQ Action

Strategy for PFAS and the continued commitment to protecting the residents of NC by addressing the threat of PFAS contamination.

12.4.1 Surface Water - Instream Surface Water Monitoring of Lakes/Reservoirs and Rivers/Streams

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water

There were several surface water studies completed by DWR's Intensive Survey Branch (ISB) to characterize the potential presence and concentrations of PFAS contaminants between 2018 and 2023. Due to the growing concerns about public health impacts, ISB focused their efforts on collecting surface water samples in water-supply (WS) watersheds and at stations closest to raw water intakes in public drinking water reservoirs in the Cape Fear River Basin and at other reservoirs across the state. This section will focus on the Cape Fear River Basin results.

It is important to remember when reviewing the studies below that the method detection limit (MDL) or practical quantitation limit (PQL) has changed with improved analytical techniques and assessment methods. Early studies did not allow for low level detection of most PFAS compounds.

All the analytical data presented in the surface water section reflects levels of target analytes detected in untreated surface waters, not levels found in finished drinking water. These results demonstrate the widespread distribution of detectable PFAS in public lakes and reservoirs throughout the Cape Fear River Basin.

12.4.1.1 2018 Study to Characterize the Presence of PFAS Compounds in Cape Fear River Basin Public Water Supply Reservoirs and Jordan Lake Watershed Water Supply Reservoir Study

As part of the normal Ambient Lake Monitoring Program (ALMP), the Intensive Survey Branch (ISB) conducts sampling and monitoring for various chemical and physical parameters in reservoirs and lakes throughout North Carolina's 17 major river basins on a rotating five-year cycle. Due to heightened concerns about emerging contaminants, ISB conducted a special study in 2018 as part of their Cape Fear River Basin assessment to characterize the potential presence and concentrations of 23 different PFAS compounds (*Table 12-12*) in 17 drinking water reservoirs at sites closest to raw water intakes (*Table 12-13* and *Figure 12-5*).

Due to limited analytical capacity at the EPA Region 4 Science and Ecosystems Support Division's Analytical Services Branch laboratory, one sample was collected per site for this study. The results indicated that Perfluorooctane sulfonate (PFOS) was detected in two reservoirs. The two detections were observed in the upper portion of the Cape Fear River Basin, in Cane Creek Reservoir (76 ppt) and Lake Brandt (68 ppt) (*Table 12-13* and *Figure 12-5*). It is important to note that in 2018, the laboratory's minimum reporting limit (MRL) were higher than those generally utilized in subsequent years (*Table 12-12*). MRL is defined by the EPA as the "analyte concentration that corresponds to the lowest demonstrated level of acceptable quantitation." For example, the PFOS specific MRL for this study was 39 ppt, therefore a non-detectable concentration in 2018 did not allow DEQ to determine if the 23 PFAS related compounds were potentially present at lower levels than those reported in *Table 12-12* (MRL's ranged between 39 ppt and 160 ppt).

See the ISB Cape Fear River Basin 2023 PWS Study below for a study with PQL's in the range of about 2 ppt (section 12.4.1.5).

Table 12-12: 2018 Cape Fear River Basin Special Study PFAS Compounds Tested by EPA and the Minimum Reporting Limit (MRL).

Compound Name		MRL	Compound Name		MRL
PFBA	Perfluorobutanoate	79	PFBS	Perfluorobutanesulfonate	39
PFPeA	Perfluoropentanoate	39	PFPeS	Perfluoropentanesulfonate	39
PFHxA	Perfluorohexanoate	39	PFHxS	Perfluorohexanesulfonate	39
PFHpA	Perfluoroheptanoate	39	PFHpS	Perfluoroheptanesulfonate	39
PFOA	Perfluorooctanoate	39	PFNS	Perfluorononanesulfate	160
PFOS	Perfluorooctane sulfonate	39	FOSA	Perfluorooctanesulfonamide	39
PFTTrDA	Perfluorontridecanoic acid	79	N-MeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid	39
PFDoA	Perfluorododecanoic acid	160	HFPO-DA/GenX	Propanoic acid, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)	39
PFUdA	Perfluoroundecanoic acid	79	8:2 FTS	8:2 fluorotelomersulfonate	79
PFDA	Perfluorodecanoic acid	39	6:2 FTS	6:2 fluorotelomersulfonate	79
PFNA	Perfluorononanoic acid	160	4:2 FTS	4:2 fluorotelomersulfonate	39
PFDS	Perfluorodecane sulfonate	39			

MRL (minimum reporting limit) is defined by the EPA as the "analyte concentration that corresponds to the lowest demonstrated level of acceptable quantitation"

All the analytical data presented in the 2018 study report reflected levels of target analytes detected in untreated surface waters, not levels found in finished drinking water. At the time of the 2018 study, the EPA health advisory levels were 70 ppt for PFOA and PFOS, or a combination of the two. EPA updated the proposed human health advisories in June 2022 to 0.004 ppt for PFOA and 0.02 ppt for PFOS. In March 2023, EPA released draft national primary drinking water standards and in April 2024 finalized these standards as the maximum contaminate level (MCL) of 4.0 ppt for each compound (current EPA PQL; see section 12.3.8.2 above for more detailed information). In June 2022, EPA also included final health advisories for GenX at 10 ppt and PFBS at 2000 ppt ([EPA website](#)).

Please see the final 2019 report for specific details of this study (*DWR WSS, ISB April 1, 2019a Report*).

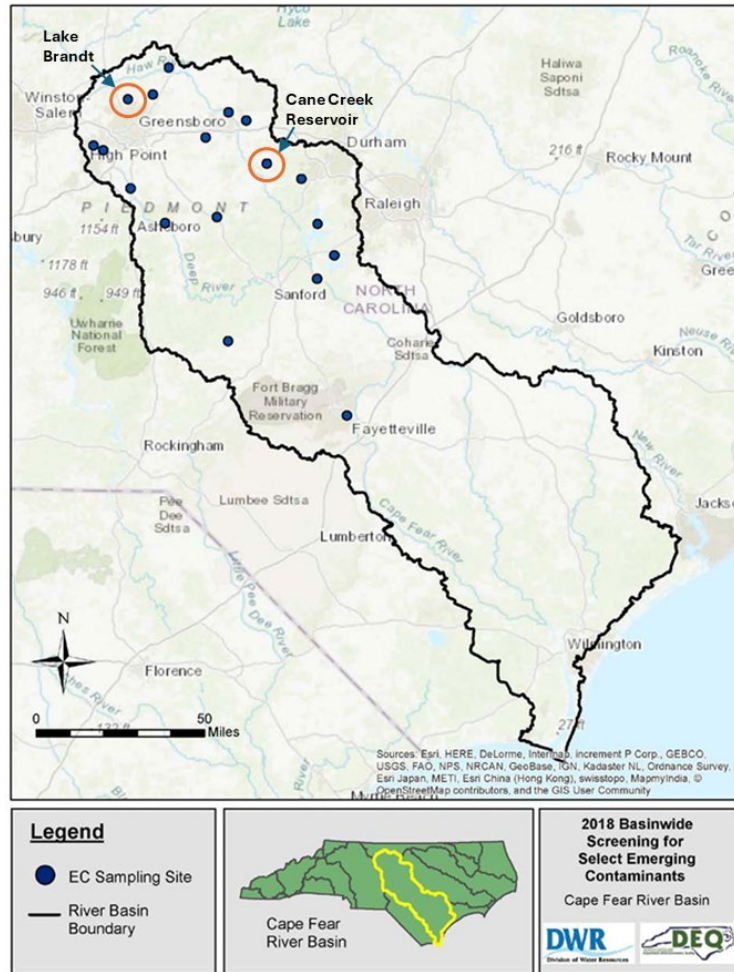
Table 12-13: 2018 Cape Fear River Basin Selected Special PFAS Study Lake Sites with PFOS Results.

Waterbody Name	Subbasin – HUC 8#	ISB Station ID	Lake/Reservoir Station Location	PFAS Identified
Glenville Lake	Upper Cape Fear River - 03030004	CPF138B	At dam near Fayetteville NC	*
Harris Lake	Upper Cape Fear River - 03030004	CPF126A6	At SR1915 near Corinth NC	*
Buckhorn Dam on Cape Fear River	Upper Cape Fear River - 03030004	CPFBDL2	Buckhorn Dam Lake upstream of dam	*
University Lake	Haw River - 03030002	CPFUL6	At dam near Chapel Hill NC	*
Cane Creek Reservoir	Haw River – 03030002	CPFCCR6	At dam near Oaks NC	76 ppt PFOS on 5/3/18
Graham-Mebane Reservoir	Haw River - 03030002	CPFGMR4	At dam near Haw River NC	*
Stony Creek Reservoir/ Lake Burlington	Haw River - 03030002	CPFSCR4	At dam near Carolina NC	*
Carthage City Lake	Deep River - 0303003	CPF113R	At dam near Carthage NC	*
Turner Reservoir	Deep River - 0303003	CPFTR01	At dam near Siler City NC	*
Lake Mackintosh	Haw River - 03030002	CPF038N	At dam near Alamance NC	*
Reidsville Lake	Haw River - 03030002	CPF002A2	At dam intake near Reidsville NC	*
Sandy Creek Reservoir	Deep River - 0303003	CPFSC1	At dam near Ramseur NC	*
Lake Townsend	Haw River - 03030002	CPFLT8	At dam near Greensboro NC	*
Randleman Lake	Deep River - 0303003	CPFRD4	At Water Intake	*
Lake Brandt	Haw River – 03030002	CPF007B	At dam near Hillsdale NC	68 ppt PFOS on 7/12/18
High Point Lake	Deep River – 0303003	CPF089E4	High Point Lake above Deep R.	*
Oak Hollow Lake	Deep River - 0303003	CPF089D5	At dam near High Point	*

See [April 1, 2019 ISB study report](#) for data specific information. Perfluorooctane sulfonate or Perfluorooctane sulfonic acid (PFOS).

*EPA laboratory Minimum Reporting Limits (MRL) were rather high in 2018, for example: PFOS MRL was 39 ppt. Reported as less than MRL for all 28 compounds.

Figure 12-5: 2018 Cape Fear River Basin Selected Special PFAS Study Lake Sites Map



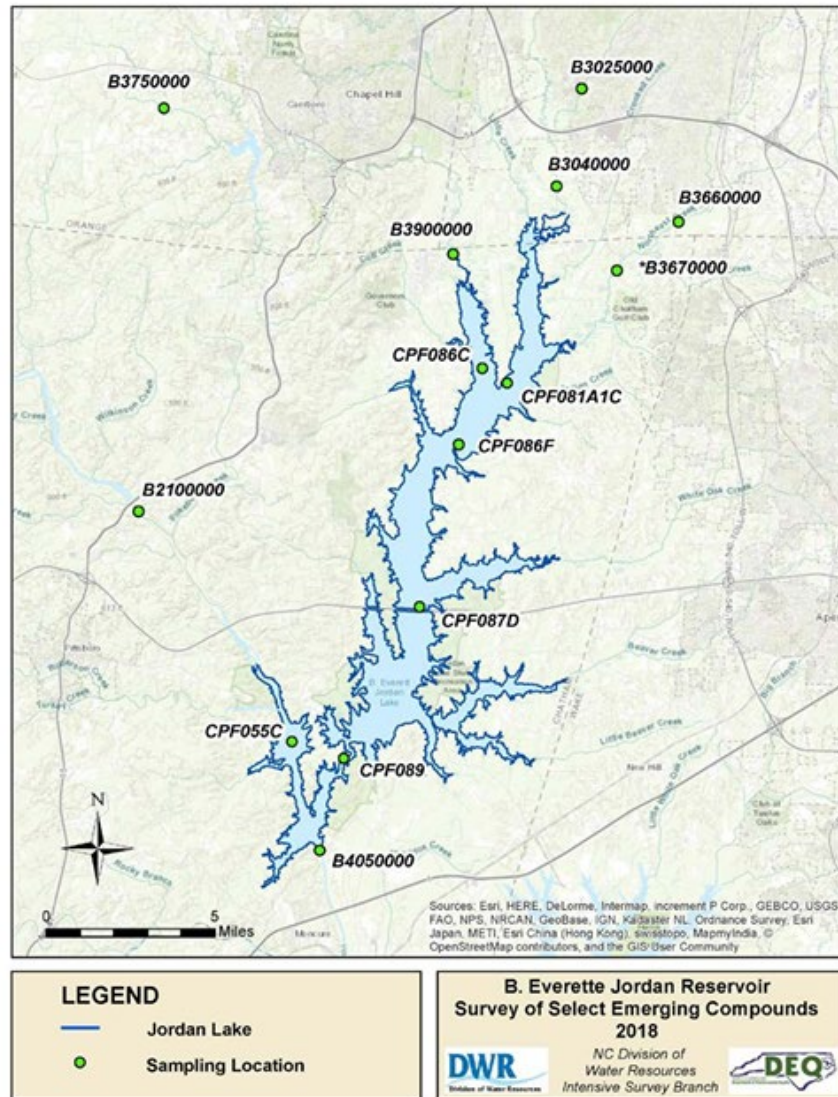
Jordan Lake Watershed Study

In 2018, a second more extensive sampling effort was also conducted in B. Everett Jordan Reservoir (Jordan Lake) and the immediate surrounding watershed, which included the major tributaries, Haw River, New Hope Creek and Morgan Creek ([Figure 12-6](#) and [Table 12-14](#)). It is estimated that 90% of the annual flow into Jordan Lake comes from the Haw River subwatershed (DWR-ISB, 2014). New research has shown that under certain conditions, river flow from the Haw River can flow upstream (up-lake flow) into the New Hope Creek arm of the lake (NC Collaboratory [Interim Report, 2018](#) and NC Collaboratory [Final Report, 2019](#)).

The sampling sites for this portion of the special study were selected to provide information concerning potential PFAS compounds in Jordan Lake and its watershed and their relation to drinking water and wastewater treatment plants. Six stations were sampled in January 2018 with station B367000 on Northeast Creek used instead of B3660000 for this one sampling event due to accessibility issues ([Figure 12-6](#)). Station B3660000 is downstream of the Durham County Triangle wastewater treatment plant

(NC0026051) and was subsequently monitored for the remainder of the study along with seven additional stations (*Table 12-14*). All sites were sampled once a month through June 2018, with station B3750000 on Phils Creek serving as a subwatershed not influenced by any permitted dischargers.

Figure 12-6: 2018 Cape Fear River Basin Jordan Lake and Watershed Special PFAS Study Sites Map



The same 23 PFAS compounds with similar MRLs were assessed for this study (*Table 12-12*). Of the 23 compounds selected, seven were found at or above the 2018 reported MRL on at least one occasion, these included PFOA, PFOS, PFBA, PFHpA, PFHxA, PFHxS and PFPeA (*Table 12-14* and *Table 12-15*). Over the course of the study, all seven of these compounds were found in the Haw River at sites B2100000 and the Haw River arm of Jordan Lake at site CPF055C. Three of the compounds were also detected at the most downstream Haw River station below Jordan Lake dam (B4050000). One or more of these compounds were detected at lake stations CPF0087D and CPF089 in the lower New Hope Creek arm which can be influenced by flow from the Haw River as well as upper New Hope Creek arm. Station B3040000

in New Hope Creek, just above the lake had a single detection of PFBA (40 ppt) in June and multiple detections of PFBA and PFPeA at B3660000/B3670000 in Northeast Creek ([Table 12-15](#)).

Table 12-14: 2018 Cape Fear River Basin Jordan Lake and Waters Special PFAS Study Monitoring Sites

Station ID	Station Location	Number of Samples	PFAS Identified*
CPF086C	Jordan Lake at Mouth of Morgan Creek near Farrington	5	ND
CPF081A1C	Jordan Lake at Mouth of New Hope Creek	5	ND
CPF086F	Jordan Lake near Farrington NC	5	ND
CPF087D	Jordan Lake at Mouth of White Oak Creek near Seaforth	6	PFBA
CPF089	Jordan Lake near Merry Oaks	5	PFOS, PFHpA, PFHxA, PFPeA
CPF055C	Jordan Lake Haw River Arm above Stinking Creek near Pittsboro	6	PFOA, PFOS, PFBA, PFHpA, PFHxA, PFHxS, PFPeA
B2100000	Haw River at SR 1713 near Bynum	6	PFOA, PFOS, PFBA, PFHpA, PFHxA, PFHxS, PFPeA
B3900000	Morgan Creek at SR 1726 near Farrington	6	ND
B3040000	New Hope Creek at 1107 near Blands	6	PFBA
B3660000	Northeast Creek at SR 1100 near Nelson	5	PFBA, PFPeA
B3670000	Northeast Creek at SR 1102 near RTP	1	PFBA, PFPeA
B3025000	Third Fork Creek at NC 54 near Durham	5	ND
B3750000	Phils Creek near Calvander	5	ND
B4050000	Haw River below Jordan Lake dam	5	PFHpA, PFHxA, PFPeA

*EPA laboratory Minimum Reporting Limits (MRL) were rather high in 2018, for example: PFOS MRL was 39 ppt. ND is not detected above the MRL for all analytes tested.

Table 12-15: PFAS Compounds Detected above the Testing Minimum Reporting Limit (MRL) in 2018 Cape Fear River Basin Jordan Lake Watershed Special Study (January – June 2018; Table 4 from report)

Station ID/ Analyte	B210000	B3040000	B3660000 *B3670000	B4050000	CPF055C	CPF087D	CPF089
PFBA (ng/L)	1/3/18 54 6/13/18 83	6/13/18 40	1/3/18* 55 2/21/18 48 4/11/18 42 5/9/18 160 6/13/18 41		1/3/18 59	6/13/18 42	
PFHpA (ng/L)	1/3/18 100 2/21/18 62 3/22/18 46 5/9/18 53 6/13/18 280			4/11/18 52	1/3/18 210 2/21/18 130 4/11/18 86 5/9/18 57 6/13/18 42		2/21/18 50 3/22/18 55 4/11/18 43
PFHxA (ng/L)	1/3/18 170 2/21/18 79 5/9/18 98 6/13/18 350			2/21/18 42 3/22/18 48 4/11/18 67	2/21/18 100 3/22/18 38 4/11/18 78 5/9/18 66 6/13/18 56		3/22/18 82 5/9/18 57
PFHxS (ng/L)	1/3/18 71				1/3/18 56		
PFOA (ng/L)	1/3/18 90 5/9/18 43 6/13/18 46				1/3/18 62		
PFOS (ng/L)	1/3/18 590				1/3/18 94 2/21/18 41 6/13/18 46		2/21/18 98
PFPeA (ng/L)	1/3/18 130 2/21/18 65 5/9/18 71 6/13/18 260		1/3/18* 45 5/9/18 45 6/3/18 49	4/11/18 42	1/3/18 150 2/21/18 56 4/11/18 52 5/9/18 50 6/13/18 59		2/21/18 45 3/22/18 56 5/9/18 47

The Haw River subwatershed exhibited the widest variety and relative concentrations of the target analytes as well as greatest frequency of detections above the 2018 MRLs. There are multiple wastewater treatment plants and industrial sources in the Haw River watershed that could have contributed to those elevated levels.

Please see the 2019 report for specific details of this study (DWR ISB April 1, 2019b Report, [Identification of select emerging compounds in B Everett Jordan Reservoir, Haw River arm watershed, and New Hope Creek arm watershed](#)).

12.4.1.2 2020 Study of Emerging Compounds in B. Everett Jordan Lake

In 2020, while DWR's ISB was evaluating nutrient-related conditions in Jordan Lake, additional samples were collected to monitor for the presence of 28 different per- and poly-fluorinated alkyl substances (PFAS) as part of an initiative to provide baseline emerging compound data for public drinking water supply reservoirs. Samples were collected as surface grabs (0.15m) at five stations over seven months from June through December 2020 (*Figure 12-7*; PFAS station symbol are the green circles with black dot in the center). Samples were analyzed by the DWR central chemistry laboratory in Raleigh.

Analytical results for PFAS indicated the presence of several PFAS analytes above the laboratory practical quantitation limit (PQL) of 2.0 ppt at each of the five stations during each monthly sampling event. Of the 28 PFAS compounds selected for this study, the following 12 were found at or above the PQL on at least one occasion: PFOA, PFOS, 6:2FTS, PFBS, PFBA, PFHpA, PFHxA, PFHxS, PFNA, PFPeS, PFHpS and PFPeA (*Table 12-16* and *Figure 12-8*).

Figure 12-8 shows the combined PFOS plus PFOA and total quantifiable PFAS concentrations at each station. These results demonstrate widespread distribution of detectable PFAS in Jordan Lake in 2020. The total quantifiable PFAS concentrations exceeded 70 ppt at station CPF055C in the Haw River arm of Jordan Lake below the Town of Pittsboro's drinking water intake on five occasions (June–October 2020; *Figure 12-8*).

At the time of this report, the EPA health advisory in finished drinking water was 70 ppt for PFOA and PFOS, or a combination of the two (PFOA + PFOS).

See appendix 2 of the ISB report for specific 2020 Jordan Lake PFAS analyte concentration data (NC DWR [ISB July 26, 2021 report](#)).

Figure 12-7: B. Everett Jordan Lake 2020 and 2021 Monitoring Stations (from [2021 DWR-ISB Report](#)).

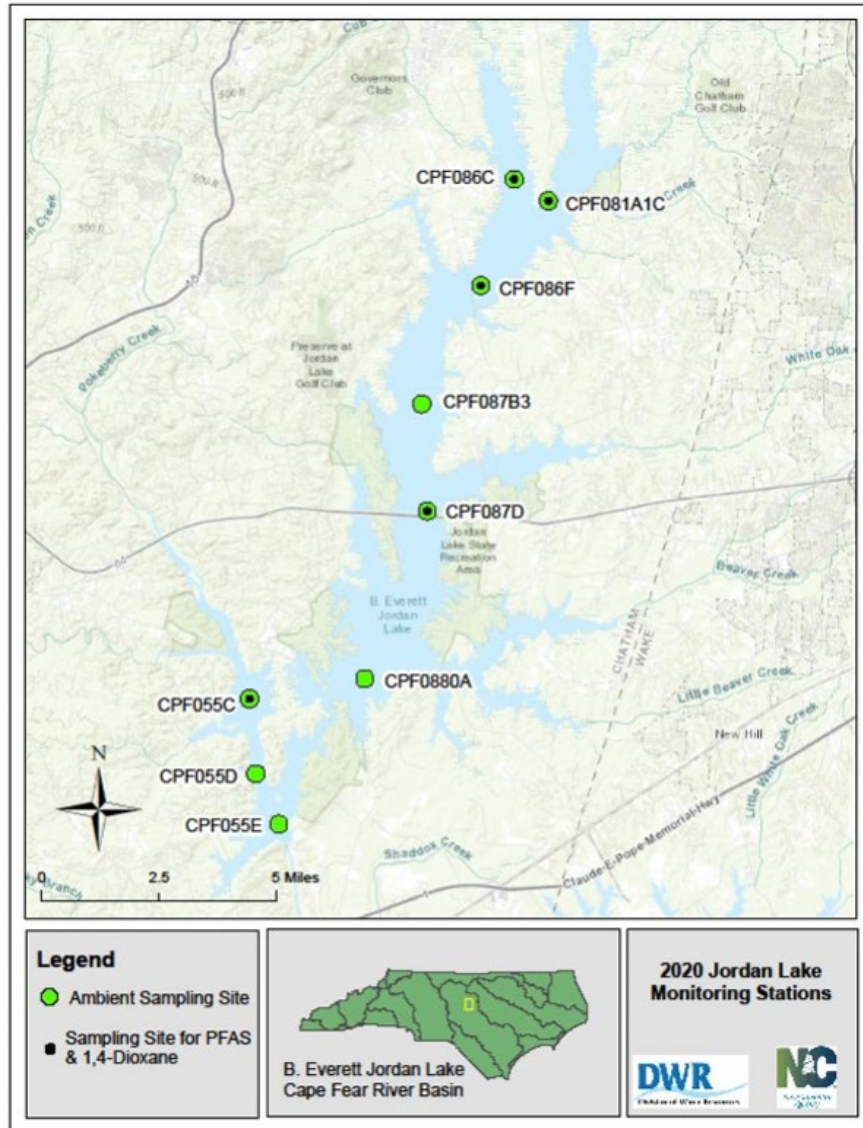
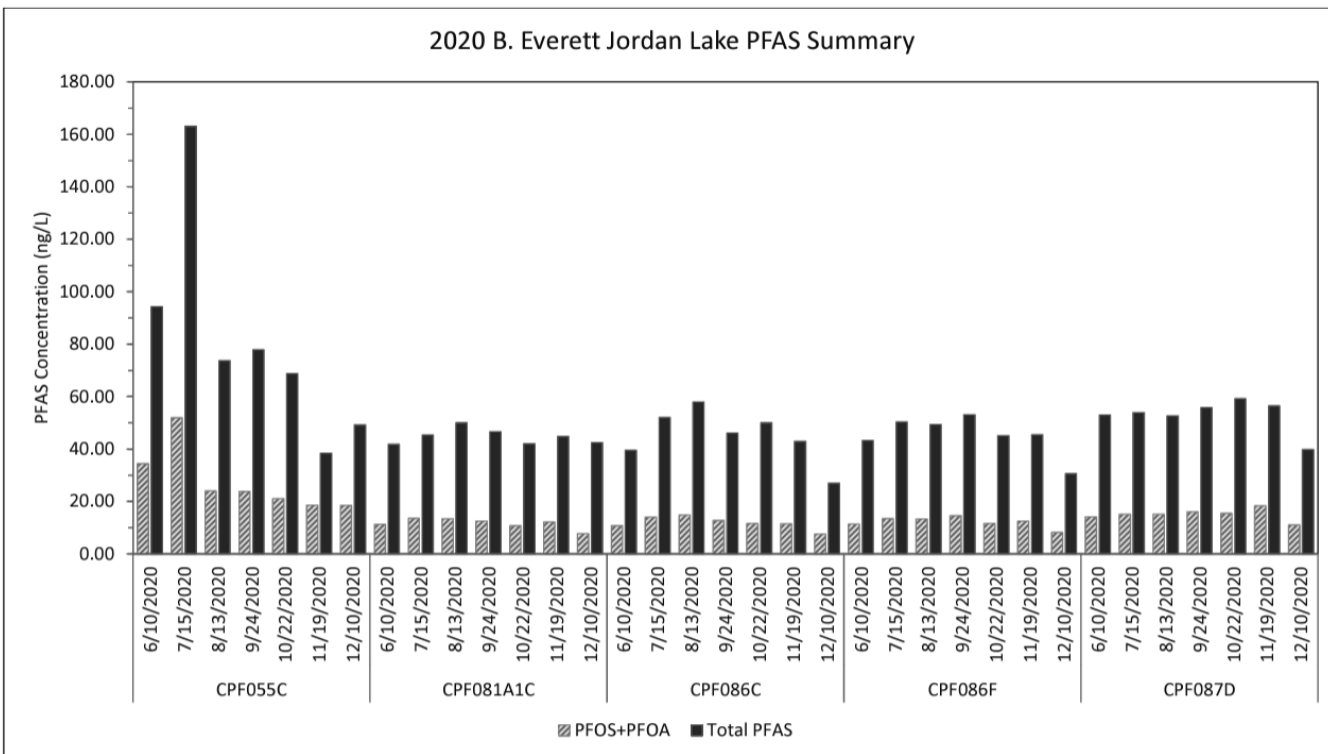


Table 12-16: List of PFAS Compounds Found in Jordan Lake in 2020.

Abbreviation	Compound Name	Abbreviation	Compound Name
PFBA	Perfluorobutanoate	PFBS	Perfluorobutanesulfonate
PFPeA	Perfluoropentanoate	PFPeS	Perfluoropentanesulfonate
PFHxA	Perfluorohexanoate	PFHxS	Perfluorohexanesulfonate
PFHpA	Perfluoroheptanoate	PFHpS	Perfluoroheptanesulfonate
PFOA	Perfluorooctanoate	PFOS	Perfluorooctanesulfonate
PFNA	Perfluorononanoate	6:2 FTS	6:2 fluorotelomersulfonate

For full list of 28 PFAS compounds tested, see appendix 1 in the [2021 DWR-ISB Report](#).

Figure 12-8: Per- and Poly-fluorinated alkyl concentrations at Jordan Lake Stations. Only values greater than the PQL (2 ppt) are present. (From [2021 DWR-ISB Report](#)).



12.4.1.3 2021 Study of Emerging Compounds in B. Everett Jordan Lake

In 2021, while DWR’s ISB was evaluating nutrient-related conditions in Jordan Lake, additional samples were collected to monitor for the presence of 28 different per- and poly-fluorinated alkyl substances (PFAS) as part of an initiative to provide continued baseline emerging compound data for this public drinking water supply reservoirs. Samples were collected as surface grabs (0.15m) at five stations over 10 months from March through December 2021. The five stations sampled include CPF055C in the Haw River arm, CPF087D near the mouth of White Oak Creek in the lower New Hope Creek arm, and in the upper New Hope Creek arm of Jordan Lake, stations CPF086F near Farrington, CPF086C at the mouth of Morgan Creek and CPF081A1 at the mouth of New Hope Creek (these stations are included on the 2020 monitoring map above [Figure 12-7](#); PFAS Stations are those with the black dot in the center of the green symbols). Samples were analyzed by the DWR central chemistry laboratory in Raleigh at a PQL of 2 ppt.

Of the 28 PFAS compounds selected for this study, 17 were found above the PQL on at least one occasion and eight compounds (highlighted in green) were found at each station, at each sampling event with a few exceptions ([Table 12-17](#)).

Jordan Lake exhibited the greatest diversity of target analytes at stations CPF055C (15) in the Haw River arm and CPF086C (17) in the upper New Hope Creek arm at the mouth of Morgan Creek ([Table 12-17](#)). Station CPF055C exhibited the highest single event total quantifiable PFAS concentrations at 139.0 and 137.7 ppt ([Figure 12-9](#)). Station CPF086C exhibited the third highest total quantifiable PFAS concentration for a single sampling event (121.4 ppt in December). The Haw River arm of Jordan Lake (CPF055C) had the

highest total quantifiable PFAS concentrations at each sampling event except in December 2021 (*Figure 12-9* and *Figure 12-10*). The Haw River arm also consistently had the highest PFOA and PFOS concentrations with readings ranging between 11.0 and 15.0 ppt and 13.0 and 22.2 ppt, respectively (*Figure 12-10*). The remaining four stations all had their highest PFOA reading in December which ranged from 7.3 to 8.6 ppt (*Figure 12-9*). All of the stations tested in Jordan Lake in 2021 exceeded the 2024 draft water-supply standards for PFOA and PFOS (*Figure 12-9* and *Table 12-17*). A unique set of PFAS compounds were found mainly at the Haw River arm station (CPF055C) and the Morgan Creek station (CPF086C) in August 2021 (*Table 12-17*).

Table 12-17: List of 17 PFAS Compounds Identified in Jordan Lake in 2021 with Number (#) of Positive Hits and Maximum Concentrations.

PFAS Abbreviation	Compound Name	Water Supply - ¹ Proposed Surface Water Standards (ppt)	Station CPF055C Haw River		Station CPF087D Lower New Hope		Station CPF086F Upper New Hope		Station CPF081A1C Upper New Hope		Station CPF086C Upper New Hope	
			#	Max ppt	#	Max ppt	#	Max ppt	#	Max ppt	#	Max ppt
PFOA	Perfluorooctanoic acid	0.001	10	15	9	8.6	10	7.3	10	7.4	10	7.4
PFOS	Perfluorooctanesulfonic acid	0.06	10	22.2	9	9.9	10	7.7	10	7.8	10	7.5
PFBS	Perfluorobutanesulfonic acid	2,000	10	18	10	10	10	2.9	10	17	10	12
PFBA	Perfluorobutanoic acid	6,000	9	28	8	8.6	9	9.8	9	12	10	11
PFHxA	Perfluorohexanoic acid	3,000	10	21.5	9	11	10	3.0	10	13	10	12
PFHxS	Perfluorohexanesulfonic acid	10	10	6.5	8	3.3	8	3.1	9	3.1	9	3
PFHpA	Perfluoroheptanoic acid		10	9.2	8	5.9	8	5.6	9	6.2	9	5.8
PFPeA	Perfluoropentanoic acid		10	25.1	10	12	10	13	10	15	10	13
PFDoA	Perfluorododecanoic acid		1	3.4							1	3.5
PFTeDA	Perfluorotetradecanoic acid		1	2.8							1	5.5
PFTrDA	Perfluorotridecanoic acid		1	2.8							1	3.9
PFDoS	Perfluorododecane sulfonic acid		1	2.1							1	2.8
PFDS	Perfluorodecanesulfonic acid		1	2.4							1	2.1
PFHpS	Perfluoroheptanesulfonic acid		2	6.3	3	2.5	5	3.6	1	4.6	1	51
N-MeFOSAA	2-(N-Methylperfluorooctane-sulfonamido) acetic acid								1	2.9	1	2.8
N-EtFOSAA	2-(N-Ethylperfluorooctane-sulfonamido) acetic acid		1	2.5	1	2.5			1	2.3	1	4.0
11Cl-PF3OUds or 9Cl-PF3ONS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid or 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid		1	3.2							1	3.1
Total number of unique PFAS			16		10		9		11		17	

¹ Proposed NC surface water supply standards (May 31, 2024). See DWR [Classification and Standards website](#) for existing standards. Parts Per Trillion (ppt) is equivalent to ng/L.

Figure 12-9: Jordan Lake 2021 Total Quantifiable PFAS, PFOA and PFOS Concentrations.

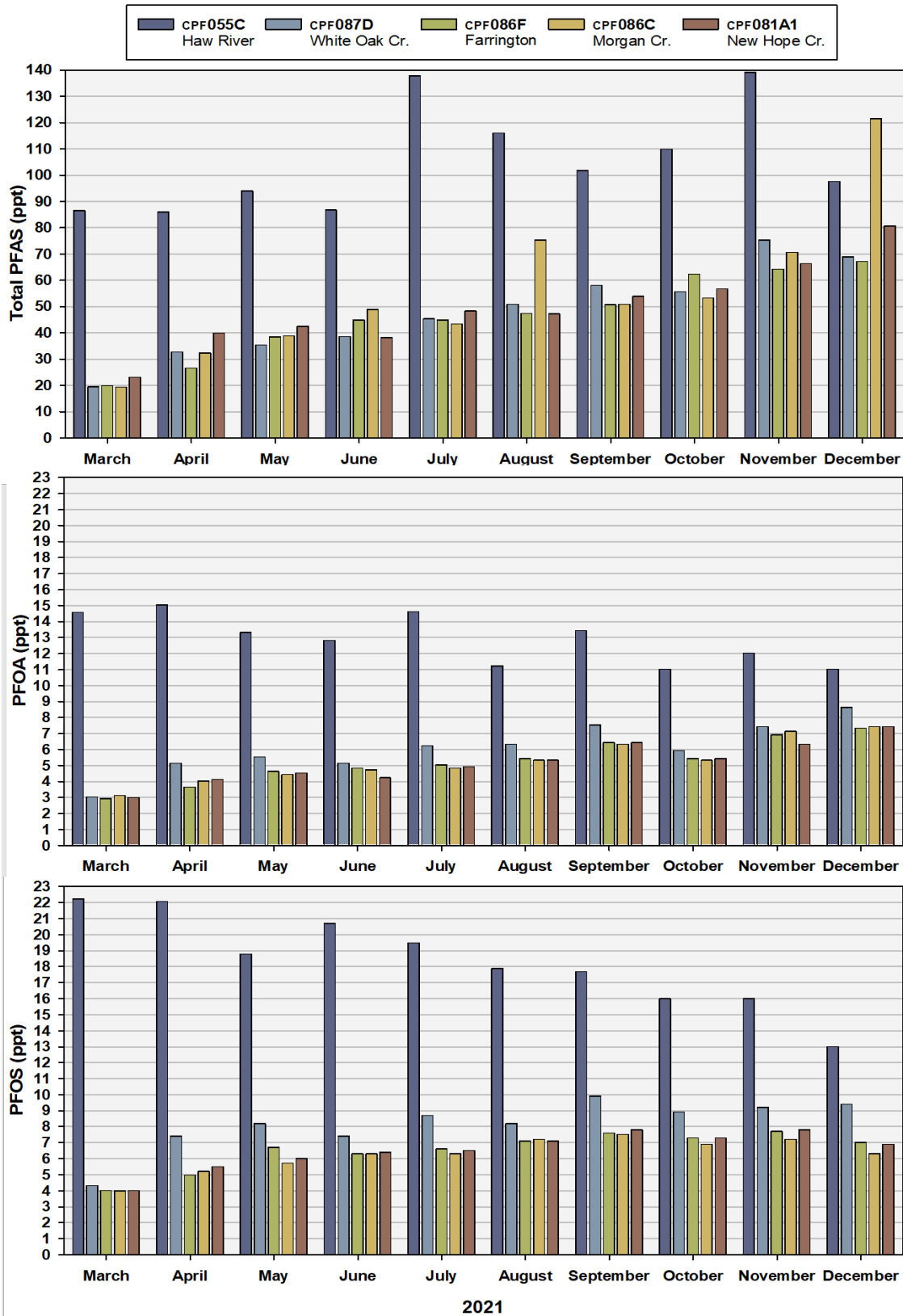
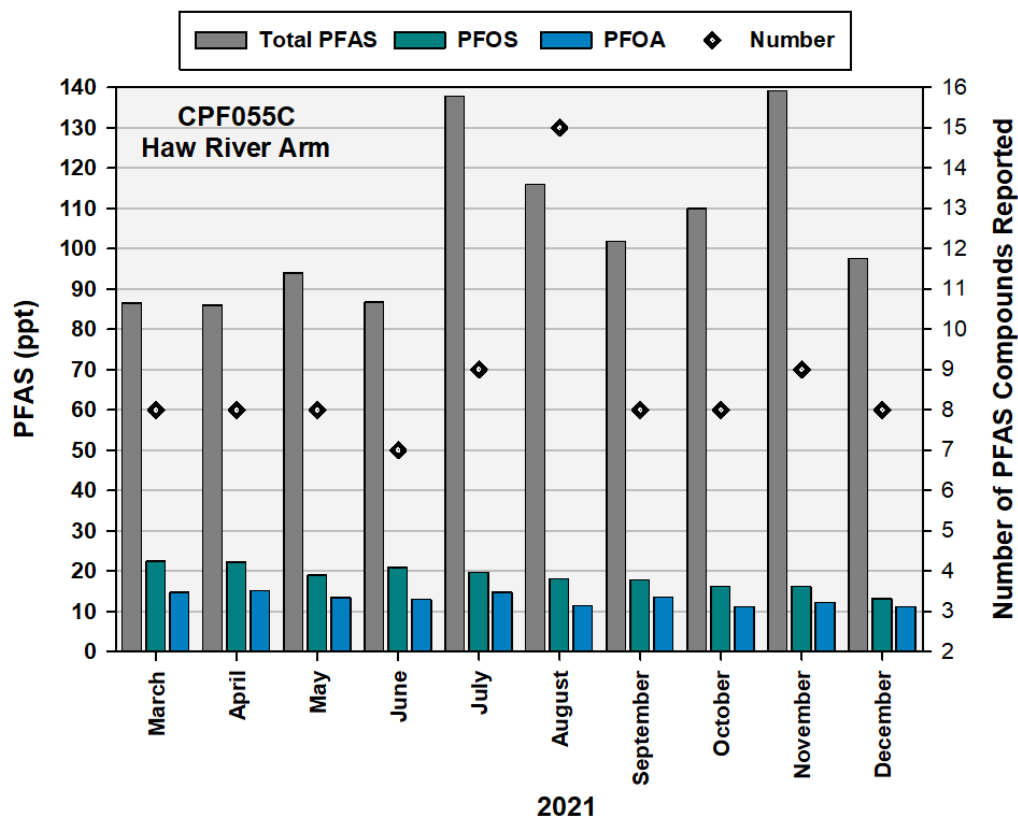


Figure 12-10: 2021 Haw River Arm of Jordan Lake Station CPF055C Total Quantifiable PFAS, PFOA, PFOS and Number of Different PFAS Compounds Recorded each Month.



The analytical results reported for Jordan Lake in 2021 reflect levels of target analytes detected in untreated surface waters, not levels found in finished drinking water. To see the list of the 28 PFAS compounds tested, and a table of the full PFAS results by station each month, see the DWR ISB 2021 [“Identification of Select Emerging Compounds in the Public Water Supply Reservoir Jordan Lake”](#) report (DWR, 2024a). About eight PFAS compounds appear to be consistently present throughout Jordan Lake, with the Haw River arm having a persistently higher concentration throughout 2021. Additional assessments are needed to understand the long-term persistence of these compounds in this system. DEQ has been working to identify potential sources of these compounds and eliminate them at the source.

12.4.1.4 2022 Study of Emerging Compounds in B. Everett Jordan Lake

In 2022, while DWR’s ISB was evaluating nutrient-related conditions in Jordan Lake, additional samples were collected to monitor for the presence of PFAS as part of a continuing initiative to provide baseline emerging compounds data for public drinking water supply reservoirs. Samples were collected as surface grabs (0.15m) at three stations over seven months in 2022 (January, March, April, September through December). The three stations sampled include CPF055C in the Haw River arm, CPF087D near the mouth of White Oak Creek in the lower New Hope Creek arm and at CPF086F near Farrington, North Carolina, in the upper New Hope Creek arm of Jordan Lake (these stations are included on the 2020 monitoring map above, [Figure 12-7](#)). The samples were analyzed by the DWR chemistry laboratory in Raleigh for 28 PFAS compounds and in December 2022 an additional 19 compounds were added, for a total of 47 different PFAS compounds (at PQL of 2 ppt) (see [2022 report](#) for specific PFAS compounds assessed; DWR, 2024b).

Of the PFAS compounds selected for this study, the following eight compounds were found above the PQL of 2.0 ppt at each station on each of the seven sampling events: PFOA, PFOS, PFBS, PFBA, PFHxA, PFHxS, PFHpA; PFPeA (*Table 12-18*; highlighted in green). Eleven other PFAS compounds were detected at one or more of the three lake stations during the 2022 sampling period (*Table 12-18*). These results demonstrate the widespread distribution of detectable PFAS in public water supply reservoirs.

Table 12-18: List of 19 PFAS Compounds Identified in Jordan Lake in 2022 with Number (#) of Positive Hits and Maximum Concentrations.

(The orange highlighted cells are the eight PFAS compounds and the 2024 proposed NC Surface Water Supply Standards for context relative to the concentrations observed in this study.)

PFAS Abbreviation	Compound Name	WS- ¹ Proposed Surface Water Standards (ppt)	Station CPF055C Haw R. Arm		Station CPF086F Upper New Hope Cr. Arm		Station CPF087D Lower New Hope Cr. Arm	
			#	Max ppt	#	Max ppt	#	Max ppt
PFOA	Perfluorooctanoic acid	0.001	7	17	7	9.8	7	13
PFOS	Perfluorooctanesulfonic acid	0.06	7	19	7	9.9	7	15
PFBS	Perfluorobutanesulfonic acid	2,000	7	52	7	20	7	15
PFBA	Perfluorobutanoic acid	6,000	7	18	7	17	7	17
PFHxA	Perfluorohexanoic acid	3,000	7	36	7	16	7	19
PFHxS	Perfluorohexanesulfonic acid	10	7	6.7	7	3.8	7	5
PFHpA	Perfluoroheptanoic acid		7	14	7	5.4	7	7.2
PFPeA	Perfluoropentanoic acid		7	38	7	17	7	22
PFHpS	Perfluoroheptanesulfonic acid		2	2.1	3	44	1	9.8
PFNA	Perfluorononanoic acid	9	1	2.0	0		1	2.2
6:2 FTS*	6:2 Fluorotelomer sulfonic acid		*		1*	2.0	1*	2.0
4:2 FTS	4:2 Fluorotelomer sulfonic acid		0		1	2.0	1	2.0
8:2 FTS	8:2 Fluorotelomer sulfonic acid		0		1	2.0	1	2.0
HFPO-DA (GenX)	Perfluoro-2-methyl-3-oxahexanoic acid	10	0		1	2.0	1	2.0
N-MeFOSAA	2-(N-Methylperfluorooctanesulfonamido) acetic acid		0		1	2.0	1	2.0
N-EtFOSAA	2-(N-Ethylperfluorooctanesulfonamido) acetic acid		0		1	2.0	1	2.0
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid		0		1	2.0	1	2.0
11Cl-PF3OUdS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid		0		1	2.0	1	2.0
ADONA	4,8-Dioxa-3H-perfluorononanoic acid		0		1	2.0	1	2.0

¹Proposed NC surface water supply standards ([March 2024 - WQC presentation](#)). See DWR [Classification and Standards website](#) for existing standards. Parts Per Trillion (ppt) is equivalent to ng/L.

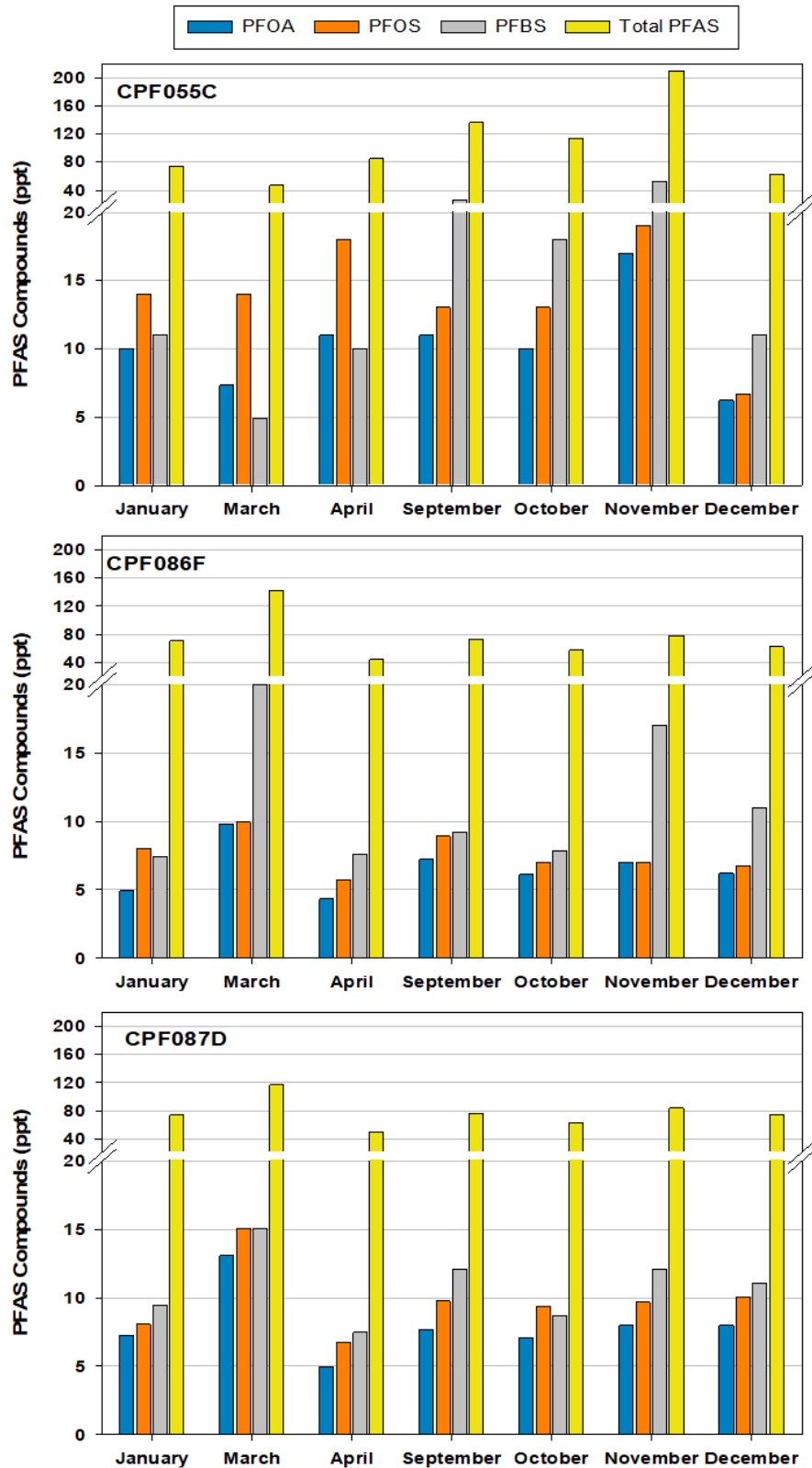
The highest PFAS concentrations occurred in the New Hope Creek arm in March and in the Haw River arm in November 2022 (*Figure 12-11*). Station CPF055C in the Haw River arm exhibited the single highest 2022 total quantifiable PFAS concentration of 209.6 ppt in November, with the highest PFOA (17 ppt), PFOS (19 ppt), and PFBS (52 ppt) detected at CPF055C that month (*Table 12-18* and *Figure 12-11*). The complete 2022 PFAS results data tables can be found in the [2022 Jordan Lake Report](#) (DWR, 2024b).

The eight PFAS compounds considered for potential surface water standards development in 2024 are highlighted in orange in *Table 12-18* with the proposed standards shown for context relative to the concentrations observed in this study. The only PFAS compounds identified in Jordan Lake above the proposed water supply surface water standards were PFOA and PFOS (*Table 12-18* and *Figure 12-11*).

This study highlighted the ubiquitous nature and distribution of many of these emerging compounds throughout Jordan Lake. Eight of the PFAS compounds, however, were only identified in the New Hope Creek arm on a single occasion in December of 2022. The source of these specific PFAS compounds are unknown but appears to be more transient than the other seven compounds found at each sampling event in 2022. All 19 of the PFAS compounds detected over this study period were assessed at each station and for each of the seven sampling events. None of the additional 19 PFAS compounds added in December were detected above the PQL.

It is important to note that all the analytical data identified in Jordan Lake reflect levels of target analytes detected in untreated surface waters, not levels found in finished drinking water.

Figure 12-11: 2022 Surface Water PFOA, PFOS, PFBS and Total Quantifiable PFAS Concentrations in Jordan Lake. (Note X-Axis Scale Break).



12.4.1.5 2023 Study of Emerging Compounds in B. Everett Jordan Lake

In 2023, DWR's ISB continued to collect PFAS samples each month (January through December) while evaluating nutrient-related conditions in Jordan Lake. Samples were collected as surface grabs (0.15 m). The three stations sampled include CPF055C in the Haw River arm, CPF087D near the mouth of White Oak Creek in the lower New Hope Creek arm and at CPF086F near Farrington, North Carolina, in the upper New Hope Creek arm of Jordan Lake (these stations are included on the 2020 monitoring map above, [Figure 12-7](#)). The samples were analyzed by the DWR chemistry laboratory in Raleigh for 47 different PFAS compounds (at PQL of approximately 2 ppt) (see [2023 Jordan Lake report](#) for specific PFAS compounds assessed; DWR 2024c).

Of the 47 PFAS compounds selected for this study, 28 distinctive PFAS compounds were detected in Jordan Lake above the PQL on at least one occasion ([Table 12-19](#)). This included nine additional PFAS compounds not identified in 2022 ([Table 12-19](#); highlighted in gray). All of but two of these nine newly detected PFAS compounds were only detected at station CPF087D in the lower New Hope Creek arm of Jordan Lake. Similar to 2022, the same eight PFAS compounds were found above the PQL at each station, on each sampling event: PFOA, PFOS, PFBS, PFBA, PFHxA, PFHxS, PFHpA; PFPeA ([Table 12-19](#); highlighted in green). PFHpS was also found about half the time at each station. These results continue to demonstrate the widespread distribution of these nine specific detectable PFAS throughout Jordan Lake watershed ([Figure 12-12](#), [Figure 12-13](#) and [Table 12-19](#)).

The Haw River arm of Jordan Lake generally had the highest overall detectable PFAS concentration each month except for January and February ([Figure 12-13](#)). Station CPF055C in the Haw River arm exhibited the single highest 2023 total quantifiable PFAS concentration of 153 ppt in December, with the highest PFOS (26 ppt) and PFBS (27 ppt) concentrations that same month and highest PFOA (16 ppt) concentration in May ([Figure 12-12](#), [Figure 12-13](#) and [Table 12-19](#)).

The highest total quantifiable PFAS concentrations in the New Hope Creek arms occurred in February ([Figure 12-13](#)). This higher total quantifiable PFAS concentration of 94 ppt at the lower New Hope Creek arm station (CPF087D) occurred in February which corresponds with a unique set of PFAS compounds that are not generally found at detectable levels at the other two Jordan Lake stations. On February 8, 2023, 26 different PFAS compounds were identified at the lower New Hope Creek station CPF087D. In contrast, nine PFAS compounds were detected at the upper New Hope Creek station CPF086F and eight at the Haw River arm station CPF055C. A table with all of the sampling results for this study is available in the [2023 final report](#). At the lower New Hope Creek arm station (CPF087D) the highest PFOA (6.8 ppt) concentration occurred in July and October and the highest PFOS (10 ppt) concentration in October, while the highest PFOA (6.2 ppt) and PFOS (9.2 ppt) concentrations at the upper New Hope Creek arm (CPF086F) both occurred in August ([Figure 12-12](#)).

The eight PFAS compounds proposed for surface water quality standards (2024) are highlighted in orange in [Table 12-19](#) with the proposed standards shown for context relative to the concentrations observed in this study. The only PFAS compounds identified in Jordan Lake above the 2024 proposed water supply surface water standards were PFOA and PFOS and all 12 readings at each of the three stations were above the proposed standards of 0.001 for PFOA and 0.06 ppt for PFOS ([Figure 12-12](#)).

Table 12-19: List of 28 PFAS Compounds Identified in Jordan Lake in 2023 with Number (#) of Positive Hits and Maximum Concentrations. (The orange highlighted cells are the eight PFAS compounds and the 2024 proposed NC Surface Water Supply Standards for context relative to the concentrations observed in this study.)

PFAS Abbreviation	Compound Name	WS- ¹ Proposed Surface Water Supply Standards (ppt)	Station CPF055C		Station CPF086F		Station CPF087D	
			#	Max ppt	#	Max ppt	#	Max ppt
PFOA	Perfluorooctanoic acid	0.001	12	16	12	6.2	12	6.8
PFOS	Perfluorooctanesulfonic acid	0.06	12	26	12	9.2	12	10
PFBS	Perfluorobutanesulfonic acid	2,000	12	27	12	11	12	12
PFBA	Perfluorobutanoic acid	6,000	12	26	12	9.3	11	8.3
PFHxA	Perfluorohexanoic acid	3,000	12	26	12	13	12	12
PFHxS	Perfluorohexanesulfonic acid	10	12	8.0	12	3.6	12	3.6
PFHpA	Perfluoroheptanoic acid		12	9.7	12	5.7	12	4.3
PFPeA	Perfluoropentanoic acid		12	26	12	13	12	11
PFHpS	Perfluoroheptanesulfonic acid		6	3.7	6	35	7	6.0
PFNA	Perfluorononanoic acid	9	1	2.1	0		1	2.0
PFPeS	Perfluoropentanesulfonic acid		1	1.8	0		1	2.0
PFDA	Perfluorodecanoic acid		1	2.2	0		1	2.0
PFUnA	Perfluoroundecanoic acid		0		0		2	2.0
PFDoA	Perfluorododecanoic acid		0		0		2	2.7
PFDS	Perfluorodecanesulfonic acid		0		0		2	2.1
PFTeDA	Perfluorotetradecanoic acid		0		0		2	2.5
PFNS	Perfluorononanesulfonic acid		0		0		1	2.0
PFTTrDA	Perfluorotridecanoic acid		0		0		1	2.4
PFDoS	Perfluorododecane sulfonic acid		0		0		2	2.0
6:2 FTS	6:2 Fluorotelomer sulfonic acid		0		0		1	2.0
4:2 FTS	4:2 Fluorotelomer sulfonic acid		0		0		1	2.0
8:2 FTS	8:2 Fluorotelomer sulfonic acid		0		0		1	2.0
HFPO-DA (GenX)	Perfluoro-2-methyl-3-oxahexanoic acid	10	0		0		1	2.0
N-MeFOSAA	2-(N-Methylperfluorooctanesulfonamido) acetic acid		0		0		2	2.0
N-EtFOSAA	2-(N-Ethylperfluorooctanesulfonamido) acetic acid		0		0		2	2.0
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid		0		0		1	2.0
11Cl-PF3OUdS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid		0		0		2	2.2
ADONA	4,8-Dioxa-3H-perfluorononanoic acid		0		0		1	2.0

¹ Proposed NC surface water supply standards ([May 31, 2024](#)). See DWR [Classification and Standards website](#) for existing standards. Parts Per Trillion (ppt) is equivalent to ng/L.

Figure 12-12: 2023 Surface Water PFOA, PFOS, and PFBS (PFAS Specific) Concentrations in Jordan Lake.

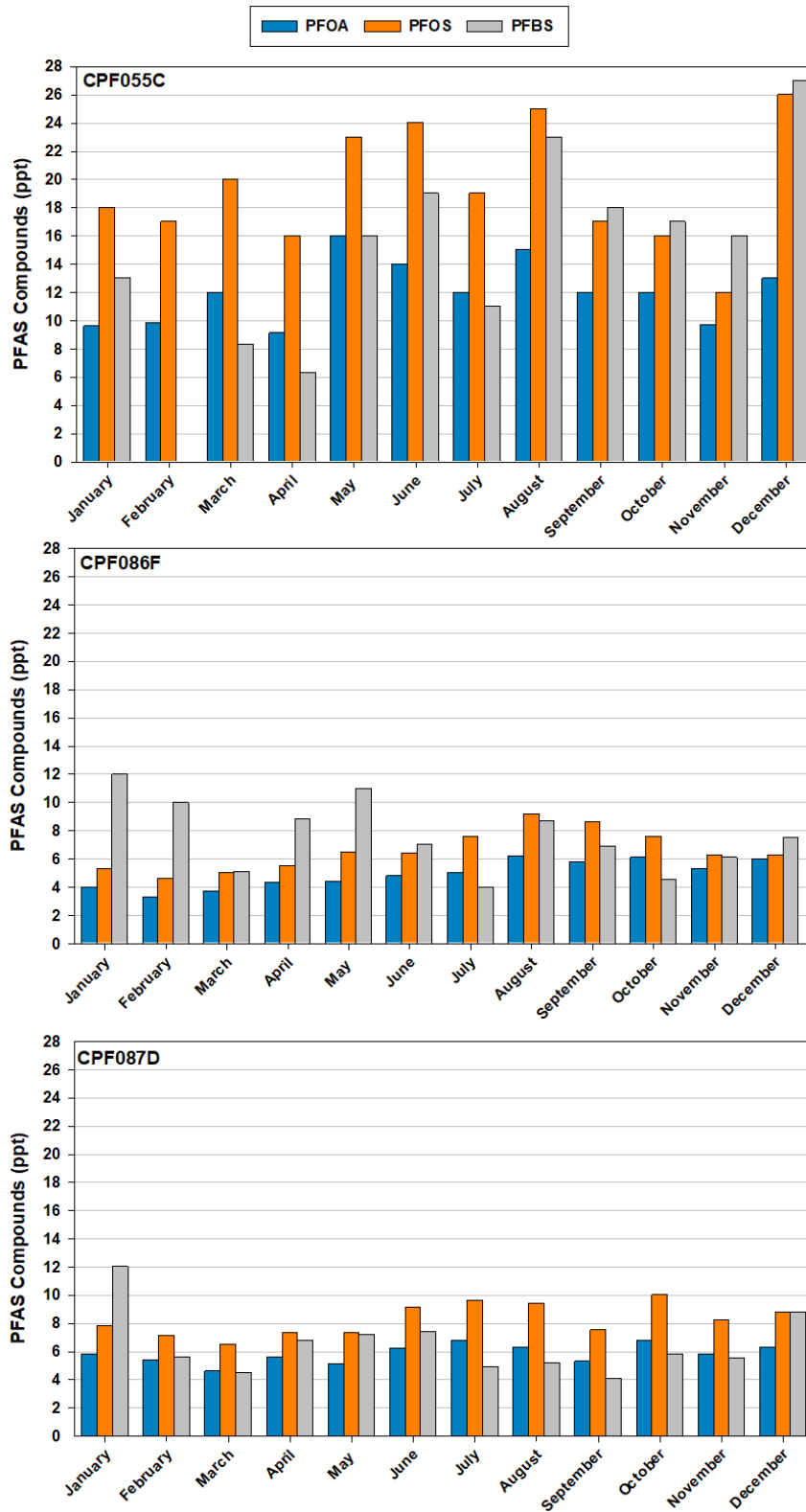
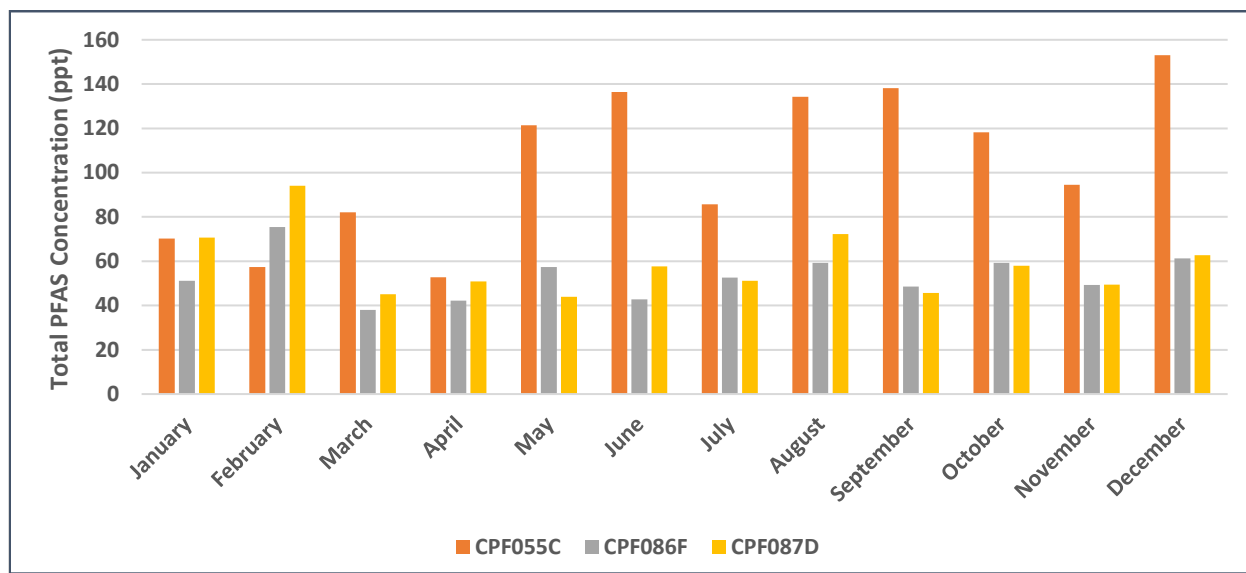


Figure 12-13: 2023 Jordan Lake Monthly Total Quantifiable PFAS Monitoring Concentrations.



This study once again highlighted the ubiquitous nature and distribution of many of these PFAS compounds throughout Jordan Lake. Sixteen of the PFAS compounds, however, were only identified in the lower New Hope Creek arm in February or in February and August of 2023. The source of these specific PFAS compounds is unknown but appears to be more transient in nature. Looking at the land uses near the lower New Hope Creek arm station (CPF087D), there is a marina and several boat launches in the White Oak Creek cove that are located very close to the monitoring station that could be a potential source of PFAS compounds. PFAS compounds are often found in gelcoats, waterproof coatings, sails, paint and varnishes, sealants, solvents and water-based adhesives, marine hardware like latches and cleats as well as in fire-fighting foam (Glüge et al., 2020). All 47 of the PFAS compounds were assessed at each station and for each of the 12 sampling events. It is important to note that all analytical data presented reflect levels of target analytes detected in untreated surface waters, as opposed to finished drinking water.

The complete 2023 Jordan Lake PFAS Report and data tables can be found in the [2023 Jordan Lake Report](#) (DWR, 2024c).

12.4.1.6 2023 Study of Emerging Compounds in Cape Fear River Basin Reservoirs other than Jordan Lake

In response to the rising interest in the public health effects associated with per- and polyfluoroalkyl substances (PFAS), the Intensive Survey Branch (ISB) conducted a special study alongside their Ambient Lakes Monitoring Program (AMLMP) to characterize the presence and concentrations of PFAS compounds in public drinking water supply reservoirs of the Cape Fear River Basin. For five months between May and September 2023, ISB tested surface water samples for 47 different per- and polyfluoroalkyl substances (see 2023 ISB Basin report Appendix 2 for complete list) at Ambient Lakes Monitoring stations nearest to the surface water intake of 15 public water supply reservoirs in the Cape Fear River Basin ([Table 12-20](#) and [Figure 12-14](#)).

Table 12-20: Cape Fear River Basin Water Supply Reservoir Stations Assessed for PFAS in 2023.

Waterbody Name	ISB Station ID	Subbasin – HUC 8 #	Class	Public Water Supply	PWS ID
Lake Mackintosh	CPF038N	Haw River - 03030002	WS-IV	City of Burlington	NC0201010
Reidsville Lake	CPF002A1	Haw River - 03030002	WS-III	City of Reidsville	NC0279020
Lake Brandt	CPF007B	Haw River - 03030002	WS-III	City of Greensboro	NC0241010
Lake Townsend	CPFLT8	Haw River - 03030002	WS-III	City of Greensboro	NC0241010
Lake Burlington/Stony Creek Reservoir	CPFSCR4	Haw River - 03030002	WS-II	City of Burlington	NC0201010
Graham-Mebane Reservoir	CPFGMR4	Haw River - 03030002	WS-II	City of Graham	NC0201015
Cane Creek Reservoir	CPFCCR6	Haw River - 03030002	WS-II	Orange Water & Sewer Authority	NC0368010
University Lake	CPFUL6	Haw River - 03030002	WS-II	Orange Water & Sewer Authority	NC0368010
High Point Lake/City Lake	CPF089E4	Deep River - 0303003	WS-II	City of High Point	NC0241020
High Point Res./Oak Hollow Lake	CPF089D5	Deep River - 0303003	WS-IV	City of High Point	NC0241020
Randleman Reservoir	CPFRD4	Deep River - 0303003	WS-IV	Piedmont Triad Regional	NC3076010
Sandy Creek Reservoir	CPFSC1	Deep River - 0303003	WS-III	Town of Ramseur	NC0276020
Turner Reservoir	CPFTR01	Deep River - 0303003	WS-III	Town of Siler City	NC0319010
Buckhorn Dam Lake (Cape Fear River)	CPFBDL1	Upper Cape Fear River - 03030004	WS-IV	City of Sanford	NC0353010
Glenville Lake	CPF138B	Upper Cape Fear River - 03030004	WS-IV	Fayetteville PWC	NC0326010

Samples were collected as surface grabs (0.15m) and analyzed by the DWR chemistry laboratory in Raleigh for 47 different PFAS compounds (at PQL of approximately 2 ppt). The summary for 2023 Jordan Lake reservoir monitoring was discussed above, however the summer results are included in the tables and figures below for comparison purposes.

Of the 47 PFAS compounds tested in 2023, 21 different PFAS compounds were found above the detectable laboratory practical quantitation limit (PQL) (*Table 12-21*). Analytical results indicated the presence of at least one PFAS analyte above the laboratory PQL in each reservoir during each sampling event (*Figure 12-15* and *Table 12-22*). It is important to note that all analytical data presented in this study reflect levels of target analytes detected in untreated surface waters, as opposed to finished drinking water. It is also important to note that the PQLs used in the 2023 basin study were much lower than in the first assessment completed in the Cape Fear River Basin drinking water reservoirs in 2018, when the analytical methods were still in development (results described above, section 12.4.1.1).

Figure 12-14: Map of 2023 Cape Fear River Basin Public Water Supply Reservoir PFAS Sampling Stations

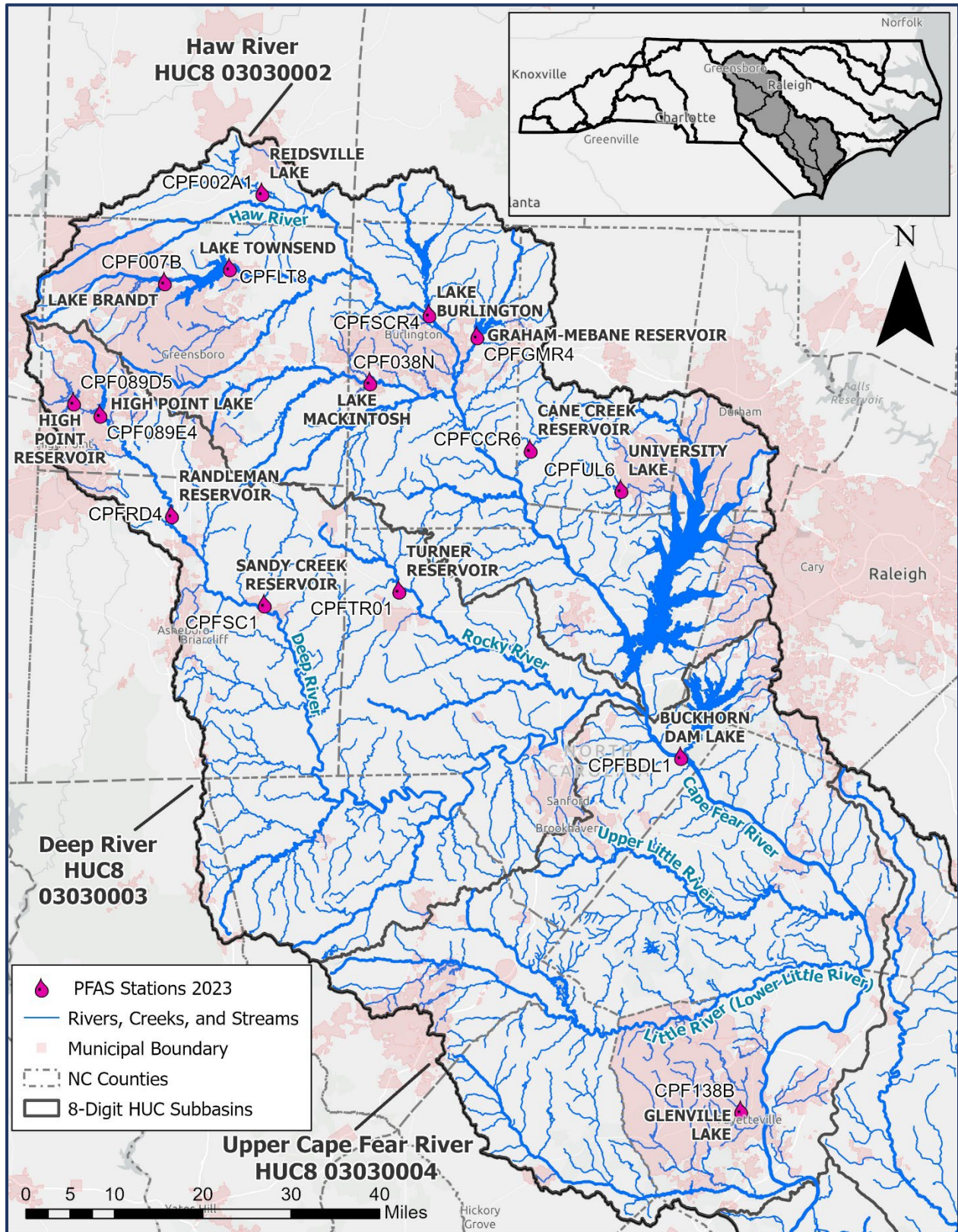


Table 12-21: List of 21 PFAS Compounds Identified in Cape Fear River Basin Surface Water Reservoirs in 2023 with Proposed Surface Water Supply Standards for Eight Compounds. (See 2023 Report for Complete Table of 47 PFAS Tested and Individual Reservoir Results.)

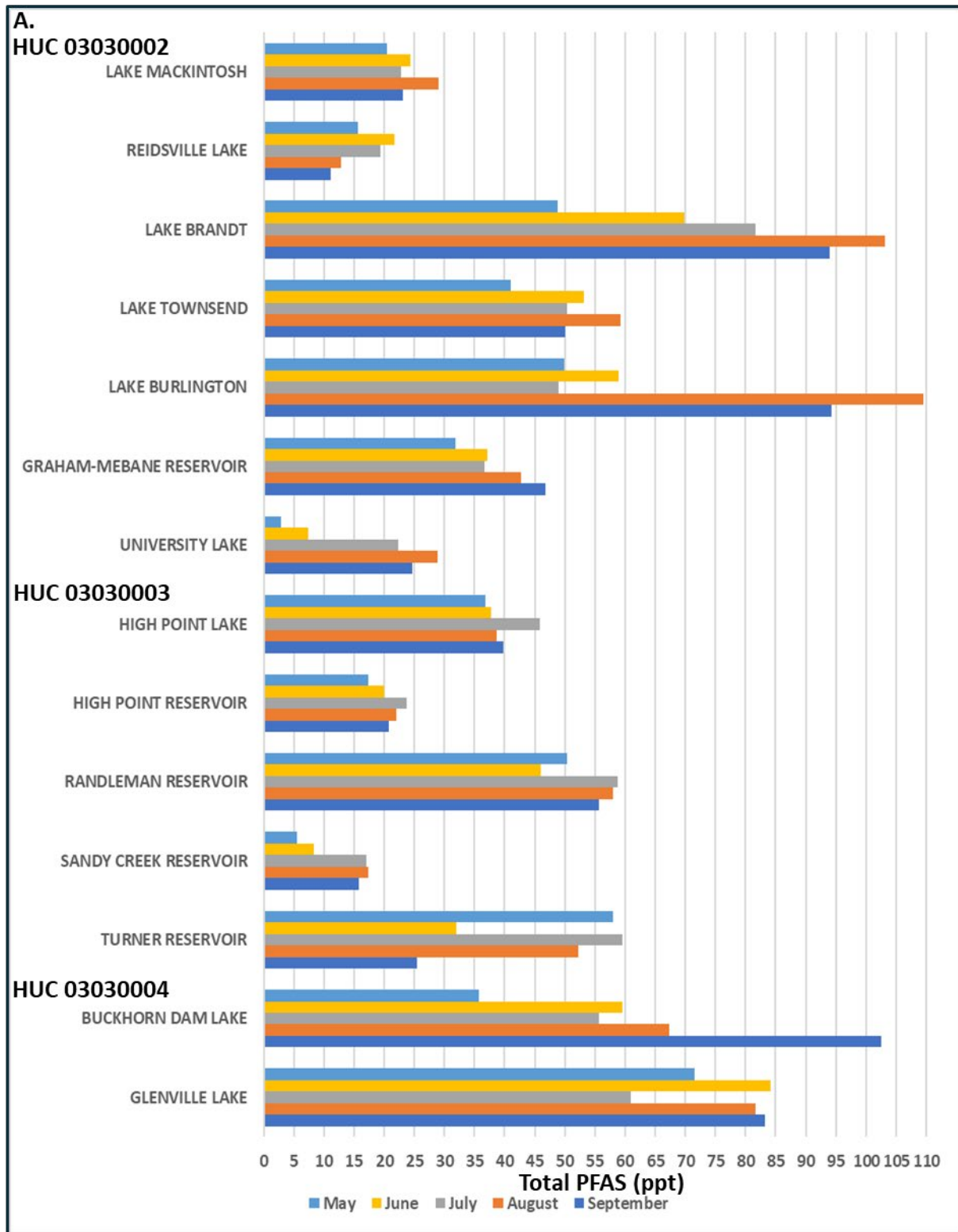
PFAS Abbreviation	Compound Name	WS- ¹ Proposed Surface Water Supply Standards (ppt)	PFAS Abbreviation	Compound Name
PFOA	Perfluorooctanoic acid	0.001	PFHpA	Perfluoroheptanoic acid
PFOS	Perfluorooctanesulfonic acid	0.06	PFPeA	Perfluoropentanoic acid
PFBS	Perfluorobutanesulfonic acid	2,000	PFHpS	Perfluoroheptanesulfonic acid
PFBA	Perfluorobutanoic acid	6,000	PFPeS	Perfluoropentanesulfonic acid
PFHxA	Perfluorohexanoic acid	3,000	6:2 FTS	6:2 Fluorotelomer sulfonic acid
PFHxS	Perfluorohexanesulfonic acid	10	N-EtFOSAA	2-(N- Ethylperfluorooctanesulfonamido) acetic acid
PFNA	Perfluorononanoic acid	9	PMPA	Perfluoro-2-methoxypropanoic acid
HFPO-DA (GenX)	Perfluoro-2-methyl-3-oxahexanoic acid	10	PFO2HxA	Perfluoro (3,5-dioxahexanoic) acid
PFTeDA	Perfluorotetradecanoic acid		PFMOAA	Perfluoro-2-methoxyacetic acid
PFDoS	Perfluorododecane sulfonic acid		PFESA-BP2 (Nafion Byproduct 2)	7H-Perfluoro-4-Methyl-3,6-Dioxaoctanesulfonic Acid
PFTrDA	Perfluorotridecanoic acid			

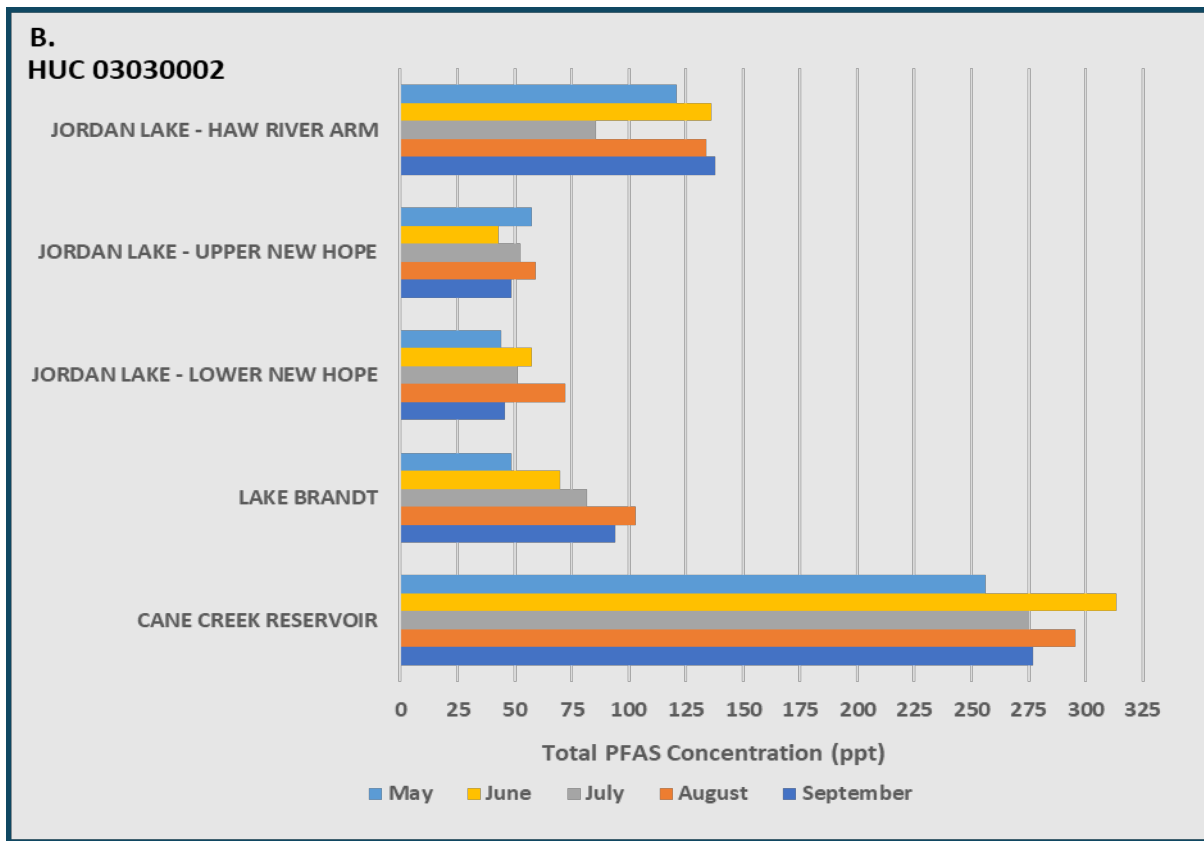
¹Proposed NC surface water supply standards ([May 31, 2024](#)).

The lower New Hope Creek arm of Jordan Lake (CPF087D) had the greatest array of targeted analytes with 17 different PFAS compound identified in August 2023, when several unique PFAS compounds were detected (data discussed above). For the non-Jordan Lake reservoir monitoring throughout the basin, Glenville Lake (CPR138B) had the greatest diversity in September with 13 different PFAS compounds accounting for a total of 83.2 ppt total quantifiable PFAS concentration (*Table 12-22*).

Sandy Creek Reservoir and University Lake had the lowest number of different PFAS compounds detected as well as the lowest total quantifiable PFAS concentrations in the watershed. The lowest total quantifiable PFAS concentrations of 2.9 ppt and 5.5 ppt were detected in May at University Lake and Sandy Creek Reservoir respectively (*Table 12-22*). These are the only two reservoirs that had any non-detectable PFOA and PFOS concentrations on at least one occasion in 2023 (*Table 12-22*).

Figure 12-15: Cape Fear River Basin Drinking Water Reservoir Monthly Total Quantifiable PFAS Concentrations in ppt; A.) Water Supply Reservoir Stations by HUC, Except for Cane Creek Reservoir B.) Cane Creek Reservoir with Jordan Lake Stations and Lake Brandt for Scale Perspective





The Cane Creek Reservoir consistently had the highest total quantifiable PFAS concentrations in each of the five months sampled ranging between 227 ppt in September to 313 ppt in June (*Figure 12-15* and *Table 12-22*). The high June total quantifiable PFAS concentration also corresponds to the highest PFOA (86 ppt) and PFOS (110 ppt) concentrations detected during the summer 2023 basin study. Cane Creek Reservoir and three other PWS reservoirs also had high concentrations of PFHxS (Perfluorohexanesulfonic acid) throughout the summer sampling season (*Table 12-22*). See the [2023 Cape Fear River Basin PFAS report](#), Table 2 for a complete set of data results by date and station (DWR, 2024d). The direct source of the high PFAS concentrations in the Cane Creek subwatershed (030300020503) are unknown at this time. There are no direct point source discharges in the Cane Creek subwatershed. There are however many City of Burlington residual land application fields in the watershed.

DEQ has investigated biosolids as a possible source of PFAS compounds to surface waters. For comparison, PFAS concentrations in Cane Creek Reservoir were higher than those found in the Haw River arm of Jordan Lake which generally has the highest instream PFAS concentrations in Jordan Lake Reservoir (*Table 12-22*). Based on the results of this 2023 lakes assessment, a special study in the Cane Creek Reservoir is recommended; this watershed is a good candidate for studying the fate and transport of PFAS between biosolids application fields, groundwater and drinking water supplies.

Table 12-22: Cape Fear River Basin Summer 2023 PFAS Drinking Water Reservoir Monitoring. Includes number of different PFAS Compounds Detected, Total Quantifiable PFAS Concentration (ppt) and PFOA and PFOS Specific Concentration (ppt) for each Summer Month Assessed.

Lake or Reservoir	Station #	May				June				July				August				September				High PFHxS Detected
		# Analytes	Total PFAS	PFOA	PFOS	# Analytes	Total PFAS	PFOA	PFOS	# Analytes	Total PFAS	PFOA	PFOS	# Analytes	Total PFAS	PFOA	PFOS	# Analytes	Total PFAS	PFOA	PFOS	
Jordan Lake-Haw River Arm	CFP055C	10	121	16	23	9	136	14	24	9	85.7	12	19	9	134	15	25	9	138	12	17	
Jordan Lake-Upper New Hope Arm	CFP086F	9	57.4	4.4	6.5	8	42.8	4.8	6.4	9	52.6	5.0	7.6	9	59.3	6.2	9.2	8	48.6	5.8	8.6	
Jordan Lake-Lower New Hope Arm	CPF087D	8	44	5.1	7.3	9	57.6	6.2	9.1	8	51.1	6.8	9.6	17	72.2	6.3	9.4	8	45.6	5.3	7.5	
Lake Mackintosh	CPF038N	5	20.4	4.2	8.7	6	24.3	4.8	9.6	5	22.8	5.0	10	7	29	4.8	11	6	23.1	4.5	8.7	
Reidsville Lake	CPF002A1	4	15.6	2.4	3.7	8	21.7	2.5	4.1	5	19.4	2.3	4.3	4	12.9	2.4	3.8	4	11.2	2.5	4.2	
Lake Brant	CPF007B	8	48.8	3.8	19	10	69.8	3.9	25	10	81.6	4.4	27	10	103	5.1	43	11	94	4.8	36	*
Lake Townsend	CPFLT8	7	41.1	3.1	17	9	53.2	3.3	20	9	50.3	3.4	18	10	59.2	3.3	23	9	50	3.0	18	*
Lake Burlington/Stony Creek Res.	CPFSCR4	8	49.9	12	16	9	58.9	12	18	8	49	11	15	11	110	24	32	11	94.3	21	28	
Graham-Mebane Reservoir	CPFGMR4	7	31.9	6.1	6.9	8	37.1	5.4	7.0	7	36.7	6.7	7.5	8	42.7	6.9	8.3	9	46.8	6.7	7.8	
Cane Creek Reservoir	CPFCCR6	11	256	76	93	12	313	86	110	11	276	78	100	11	295	81	110	11	227	73	96	*
University Lake	CPFUL6	1	2.9	ND	2.9	4	7.4	ND	ND	4	22.3	2.4	3.6	6	28.9	2.2	3.5	8	24.7	2.4	3.9	
High Point Lake/City Lake	CPF089E4	8	36.8	3.4	10	8	37.7	3.7	8.9	8	45.9	4.3	11	8	38.7	3.6	9.2	8	39.7	3.7	9.0	
High Point Res./Oak Hollow Lake	CPF089D5	7	17.4	2.5	3.9	7	20	2.5	4.0	8	23.7	2.9	4.4	7	22.1	2.6	5.6	7	20.8	2.6	3.9	
Randleman Lake	CPFRD4	8	50.3	4.8	10	8	46	4.8	8.8	8	58.8	6.0	11	8	58	5.7	11	8	55.6	5.3	9.9	
Sandy Creek Reservoir	CPFSC1	2	5.5	2.5	3.0	3	8.4	ND	ND	5	17	2.8	4.1	6	17.3	3.5	4.5	5	15.8	3.1	4.1	
Turner Reservoir	CPFTR01	9	58	4.4	11	7	32	4.2	5.9	8	59.5	4.2	9.5	7	52.2	4.1	11	6	25.5	3.1	7.6	
Buckhorn Dam Lake	CPFBDL1	8	35.8	4.8	7.9	8	59.5	7.2	11	8	55.7	7.3	12	8	67.4	8.1	13	9	102.6	10	16	
Glenville Lake	CPF138B	9	71.5	6.8	25	11	84.1	8.0	24	11	61	5.4	17	11	81.7	7.0	21	13	83.2	6.6	21	*

ND – Not Detected above the PQL; * High levels of PFHxS concentrations reported in several samples over the five month sampling period.

See [2023 Cape Fear River Basin Water Supply Reservoir Sampling Report](#) for each sampling event results (report Table 2) (DWR, 2024d).

The highest value for each column is **bolded**.

These results demonstrate the widespread distribution of detectable PFAS in drinking water reservoirs in the Cape Fear River Basin. Additional long-term monitoring would be needed to evaluate the persistence of these compounds. The majority of the public water supply (PWS) facilities are taking part in the EPA Fifth Unregulated Contaminant Monitoring Rule (UCMR5) study, which requires PWS facilities to participate in monitoring for 29 different PFAS compounds in their finished drinking water. The results are reported to the State and EPA. The UCMR5 is discussed in detail below in section [12.4.2.4](#).

[12.4.1.7 Foam Study](#)

Since 2020, DWR has responded to reports by residents and DWR staff who observe unusual surface water foam (SWF) appearing on streams and rivers following rain events. Some samples were found to contain elevated levels of PFAS. It was also reported that the corresponding surface water samples collected around and under the SWF contained considerably lower levels of PFAS.

Foam on water is a common natural occurrence when rainfall and wind mix up fatty substances and gases from decomposing plants and animals. The buildup of organic compounds change the physical nature of the water, enabling SWF to form.



The NCDHHS recommends avoiding contact with all SWF as a precaution, especially for children and pets, and to immediately wash with soap and water any skin or clothing that comes into contact with foam. Pets should be thoroughly rinsed off with clean water. See [NCDHHS PFAS webpage](#) for more human health-related information.

DEQ initiated two preliminary statewide surveys to quantify the presence of surface water foams at the DWR's routine water quality monitoring stations in October and September 2021 and at the Division of Marine Fisheries (DMF) coastal recreational beach monitoring sites in July through September 2022.

The surveys found SWF at 14% of DWR monitoring stations and 36% of the DMF stations. The surveys found that only small number of stations, about 3% of DWR and 6% of the DMF stations with surface foam accumulations large enough to sample SWF (fill a gallon bag; [Managing Emerging Compounds in Water/PFAS Foam Information website](#)).

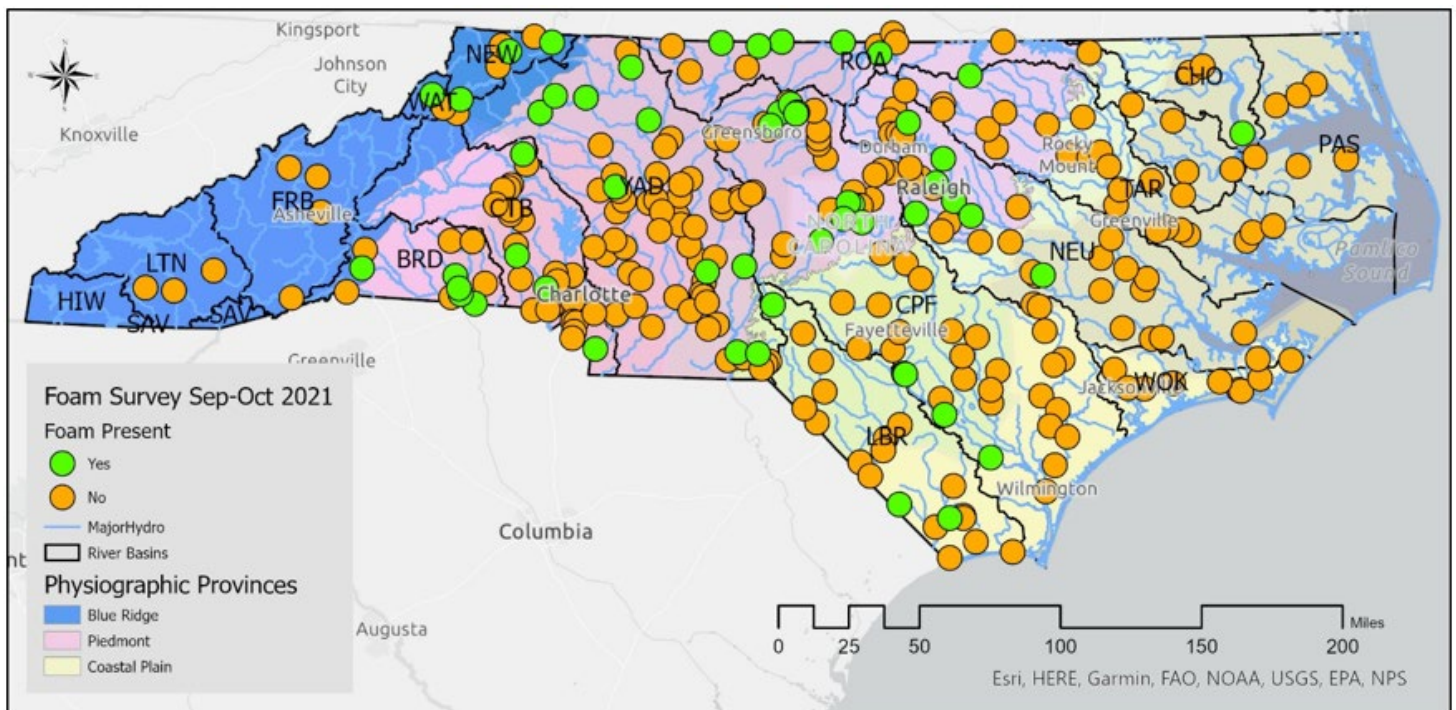


The DWR study included 500 separate observational surveys at 299 unique statewide monitoring locations over the two months study period in 2021 ([Figure 12-16](#); 200 stations had multiple observations). The monitoring programs included in the DWR study were the Ambient Lakes Monitoring Program (ALMP), Ambient and Random Ambient Monitoring Systems (AMS/RAMS), Biological Assessment Branch (BAB) Benthic Macroinvertebrate Community Assessment Program, and Monitoring Coalition Program (MCP), as well as sites being monitored for other DWR special studies. No water or foam samples were collected for this study.

Out of 500 foam surveys conducted statewide, there were 69 observations of foam (Figure 12-16), yielding a 14% frequency of foam presence. Data were compared across North Carolina's three distinct physiographic provinces, including the Coastal Plain, Piedmont and Blue Ridge (NCGS, 2015; Figure 12-16 and Figure 12-17). Most surveys were recorded within the Piedmont (occupies about 45% of the area of the state), with foam presence (17%) similar to the overall occurrence frequency. A lower frequency (approximately 6%) was observed in the Coastal Plain. Based on a limited number of surveys in western NC, Blue Ridge foam frequency was higher (25%) and occurred primarily in the northwest corner of the NC mountain region.

SWF may occur less frequently in the Coastal Plain than in other ecoregions, possibly due to generally slow moving, low gradient streams and rivers. Conversely, there may be higher foam frequency in mountain streams and rivers, where high gradient rocky substrates introduce more aeration into faster flowing surface waters.

Figure 12-16: Geographic Distribution of NC DWR Surface Water Foam Survey Observations (Sept. – Oct. 2021).



The DMF [Recreational Water Quality Program](#) samples water for the presence of enterococcus bacteria at public access swimming locations throughout the coastal portion of the state. The program was designed to notify the public when bacteriological standards for safe bodily contact are exceeded. The stations assessed for the presence of SWF were 30 of the Tier 1 Atlantic Ocean stations, 10 from each of the northern, central and southern regions (Figure 12-18). Tier 1 stations are classified as areas used daily during swimming season, April through September, and are sampled weekly for enterococcus bacteria.

Figure 12-17: NC Surface Water Foam Presence and Absence Counts and Proportions by Physiographic Province.

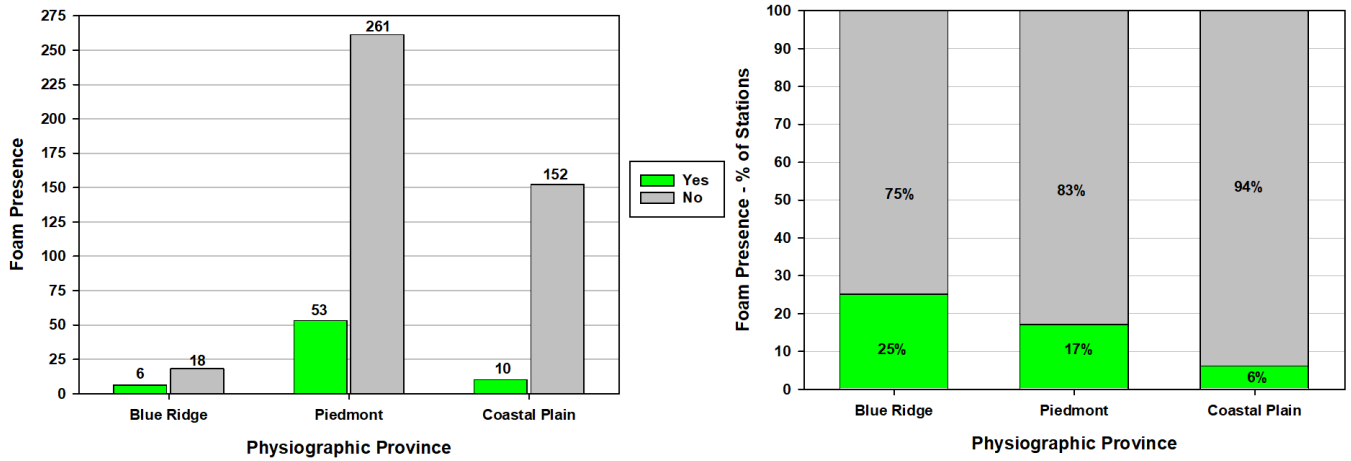
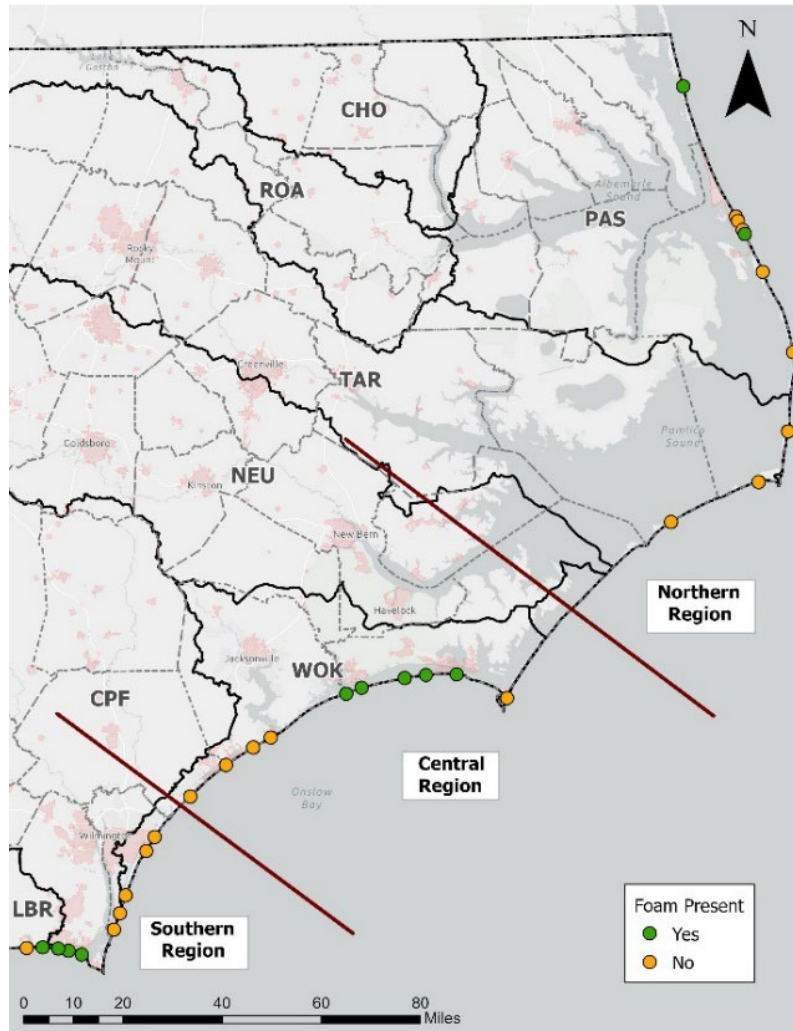
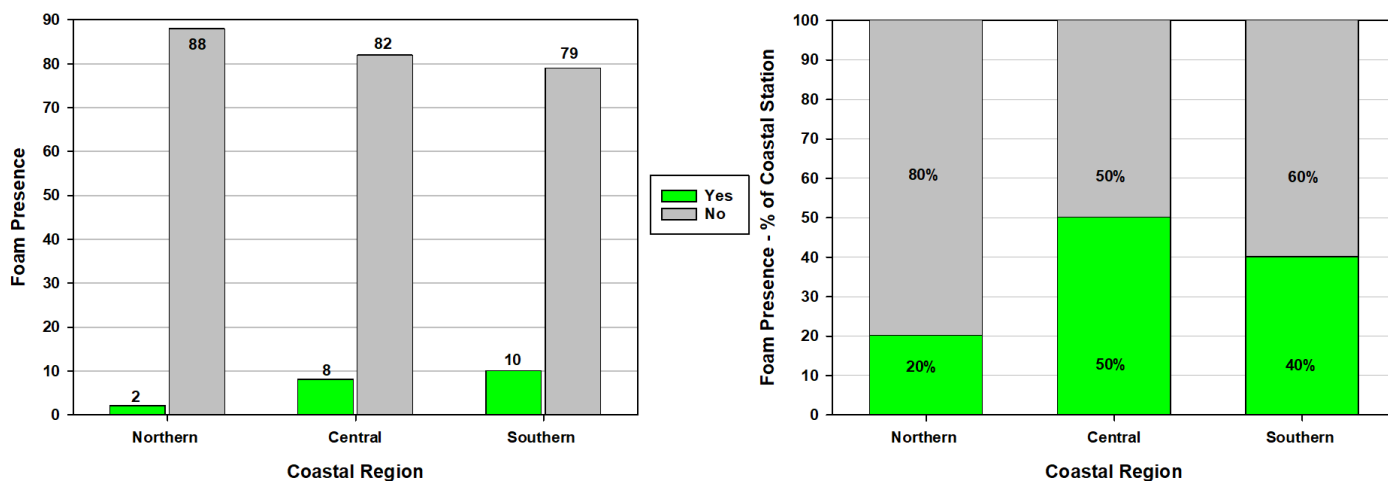


Figure 12-18: Geographic Distribution of NC DMF Atlantic Ocean Access Point Surface Water Foam Survey Observations (July- September 2022).



DMF completed an SWF survey nine times at each of the 30 stations between July 11 and September 7, 2022 (station S18 was only surveyed 8 times). There was a total of 269 surveys completed with 20 recorded observable SWF (7.4% total; *Figure 12-19*). The northern region has two stations (20%) with SWF detected, the central region had five stations (50%) and the southern region had four stations (40%) for a total of 36% for all 30 coastal Atlantic Ocean stations with detectable SWF at least one time during the study (*Figure 12-19*). However, only two stations or 6% had foam accumulation large enough to sample.

Figure 12-19: NC Surface Water Foam Presence and Absence Counts and Proportions by Coastal Regions (DMF's Atlantic Ocean Access Stations).



Laboratory analysis is the only way to determine if SWF contains any PFAS compounds. EPA is developing approved sampling methods for testing PFAS in SWF ([Method 1633A](#)). DWR is collaborating with EPA and other states to assist in developing an effective collection and testing protocols.

As additional test methods, site monitoring and new scientific data become available at the federal and state levels, DEQ will provide updates on the occurrences of PFAS in SWF and take appropriate actions to protect surface water for recreational uses as well as for aquatic life and wildlife resources.

12.4.2 Drinking Water – Surface Water Sources

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water
- ☑ Cleaning Up Existing Contamination

Public water supply (PWS) systems supply drinking water to 9,300,000 North Carolinians and visitors. A total of 459 PWS systems receive source water from surface water bodies across the state, of which 96 are located in the Cape Fear River Basin. The State of North Carolina relies on groundwater for 77% of community water systems.



Since 2019, several drinking water supply studies have been initiated within DEQ, universities and the NC Collaboratory, in an attempt to understand the extent to which PFAS contaminants are currently impacting drinking water sources across North Carolina. These studies have assessed which type of PFAS compounds are found, at which concentrations, the magnitude of the issue and the distribution of the most relevant PFAS compounds across the state in drinking water supply rivers and reservoirs. Several studies also included assessments of treated drinking water. As previously noted, the development of sampling and analytical techniques along with improved method detection limits have changed greatly over the timeframe of these reported studies. The understanding of protective human consumption levels has also changed.

Since 2019, DEQ has been working with public water systems on multiple assessments of PFAS levels in drinking water systems across the state with the goal of preparing for the PFAS rule that was published on April 26, 2024. In 2023 and 2024, DEQ also utilized federal funding under the Bipartisan Infrastructure Law to help address contamination, including funding designated specifically for small, rural and underserved communities.

On March 14, 2023, EPA announced the proposed new drinking water maximum contaminant levels for six PFAS chemicals and on April 10, 2024, release the final approved standards for five individual PFAS compounds and set a Hazard Index (HI) level for two or more of four PFAS compounds as a mixture ([Table 12-10](#)). The National Primary Drinking Water Regulations (NPDWR) are legally enforceable drinking water standards that apply to public water systems.

EPA estimates that this action will reduce PFAS exposure for approximately 100 million people across the United States and prevent thousands of deaths, and tens of thousands of thousands of illnesses due to drinking contaminated water. More information is also available on the EPA's [NPDWR website](#), [EPA fact sheet](#) and DEQ's website [Understanding PFAS](#). As of May 2025, EPA announced its intent to partially rescind the regulations and reconsider the regulatory determination for PFHxS, PFNA, HFPO-DA/GenX and the Hazard Index mixture of these three PFAS plus PFBS (see EPA [website](#) and section [12.3.9.2](#) above for more information). As of September 2025, these regulations are still as originally approved.



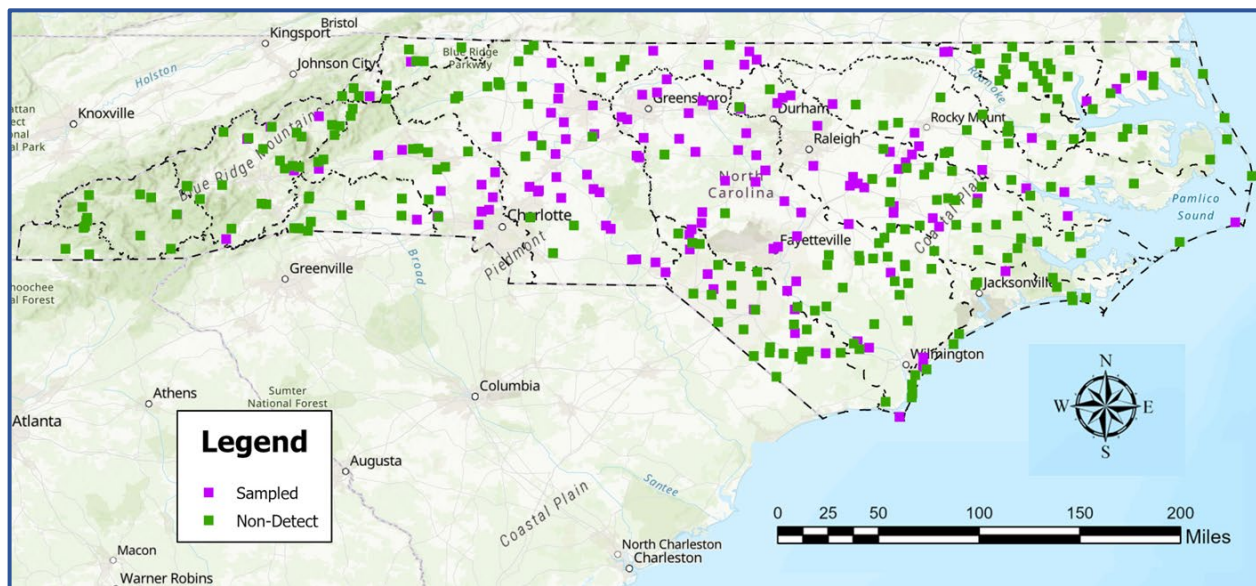
DEQ is working with public water systems across the state to provide technical assistance and funding where appropriate, as they prepare for compliance with the MCLs.

12.4.2.1 NC PFAS Testing Network Drinking Water Study

The [2019 PFAS Testing \(PFAST\) Network study](#) is a collaboration among North Carolina universities to document the presence of PFAS and understand the impacts on the environment and our health. The first round of monitoring included samples from surface water intakes and groundwater wells from 376 counties and municipal drinking water sources (raw water) across North Carolina and targeted 47 PFAS compounds ([Figure 12-20](#)). See the [PFAS Testing Network 2021 NC legislative final report](#) for a complete set of results. Twenty systems had a total quantifiable PFAS concentration at or above the 2021 EPA health advisory level for PFOA and PFOS of 70 ppt (ng/L), 71 systems had summed concentrations (PFOA + PFOS) in the range of 10-70 ppt, and 285 systems had summed concentrations below 10 ppt ([2021 legislative report](#)). Of the 10 systems with the highest total quantifiable PFAS concentrations, nine were in the Cape Fear River Basin. In follow-up sampling efforts, the report noted that PFAS concentrations varied widely between sampling efforts, especially in surface water drinking water sources that received variable inputs from upstream PFAS discharges.

The report identified sources of PFAS in drinking water to include the Chemours Fayetteville industrial site, aqueous film forming foam (AFFF) used in firefighting applications, municipal wastewater discharge and runoff from fields that received biosolids.

Figure 12-20: NC Collaboratory 2019 PFAS Raw Water Sampling Locations. Green Symbols Denote Locations with Non-Detectable PFAS and Pink Symbols Denote Locations with Detectable PFAS Concentrations.



12.4.2.2 2022 DWR Public Water Supply Section - PFAST Subset Resampling Effort

In late 2022, DEQ performed three months of sampling at 50 municipal and county water systems that were selected from the 376 systems monitored during the [2019 PFAS Testing \(PFAST\) Network study](#). Each of the systems monitored in 2019 that had PFOA and/or PFOS detections above 4 ppt and/or had GenX above 10 ppt was included in the subset of systems to be sampled again in 2022. The number of systems meeting the three conditions for selection was 50. Each system was tested monthly over the course of three consecutive months, both raw and treated water were sampled for a total of six samples per system (plus duplicates and field blanks).

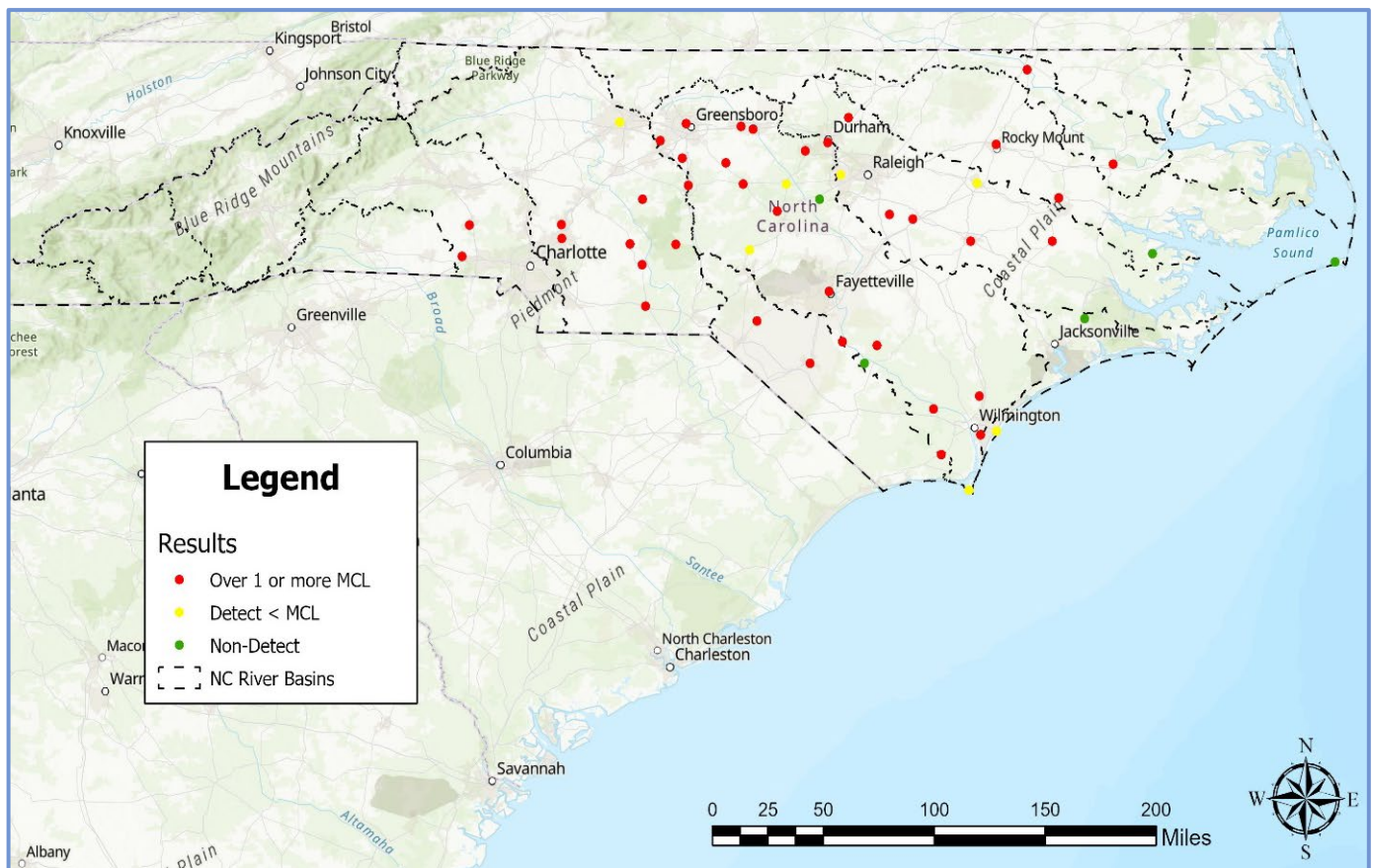
All PFAS analyses performed by DEQ between 2022 and 2024 assess the concentration of 57 PFAS analytes using [method 537.1 \(Unregulated Contaminant Monitoring Rule Methods\)](#).

Thirty-eight of the 50 systems retested had one or more of the regulated six contaminants above the MCL and/or HI of 1 (*Table 12-10* and *Figure 12-21*). Those results were provided to the water systems and are available [online](#).

A summary of the 2022 sampling campaign shows:

- 45 systems (90%) with PFAS detected
- 38 systems (76%) exceeded MCLs and/or HI=1
- 44 systems (88%) had PFBS detections, none of which exceeded the MCL of 2,000 ppt
- 43 systems (86%) had PFOA detections, 27 of which (54%) exceeded the MCL of 4 ppt
- 43 systems (86%) had PFOS detections 33 of which (66%) exceeded the MCL of 4 ppt
- 43 systems (86%) had PFHxS detections of which 3 systems (6%) exceeded the MCL of 10 ppt
- 24 systems (48%) had PFNA detections, none of which exceeded the MCL of 10 ppt
- 19 systems (38%) had GenX detections, 2 of which (4%) exceeded the MCL of 10 ppt
- 9 systems (18%) exceeded the HI=1
- 50 systems (100%) had PFPrA detections followed by 47 (94%) and 46 (92%) PFBA and PFPeA detections respectively

Figure 12-21: DWR 2022 Public Water Supply PFAS Sampling Results.



12.4.2.3 2023 DWR Public Water Supply Section - Small Water System Testing

In 2023, DEQ sampled hundreds of smaller water systems to better assess the levels of PFAS in drinking water on a statewide basis (*Figure 12-22*). 2023 sampling included 534 smaller privately owned systems which included:

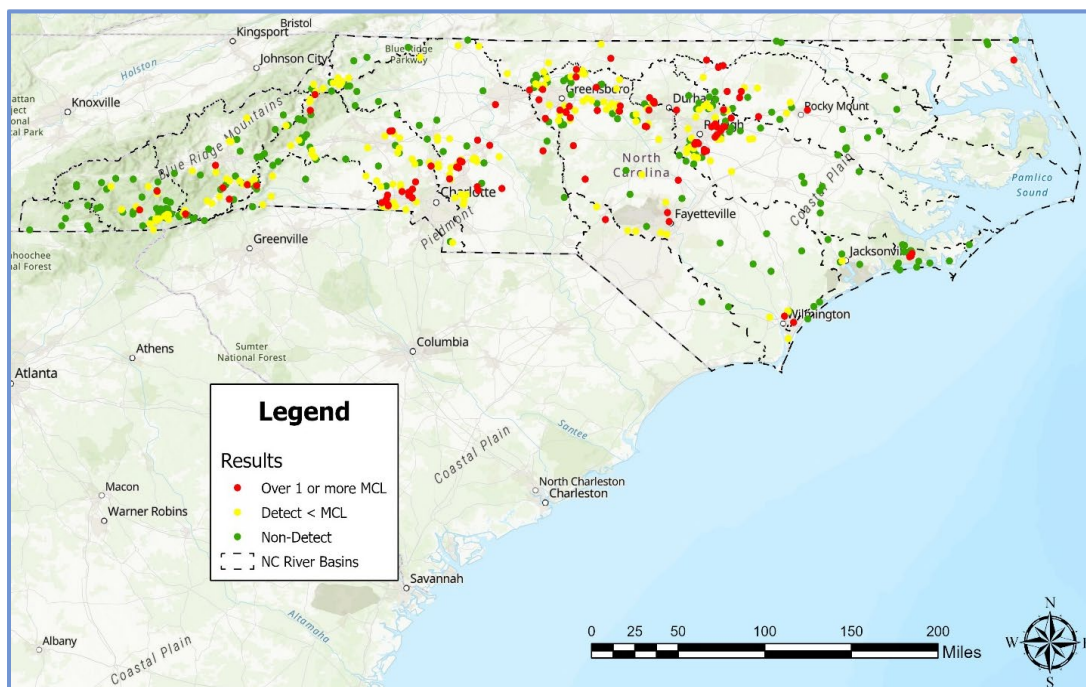
- Privately owned community water systems
- Privately owned school and daycare non-transient non-community water systems
- Three systems previously sampled by the PFAST Network as requested by the Secretaries' Science Advisory Board (SSAB)

The 2023 DEQ sampling campaign assessed PFAS concentration for one water sample per public water supply system at the entry point to the distribution system.

A summary of 2023 DEQ sampling campaign shows:

- 371 systems (69%) had PFAS detections
- 163 systems (31%) had no PFAS detections
- 107 systems (20%) exceeded MCLs and/or HI=1
- 68 systems (13%) exceeded the PFOS MCL of 4 ppt
- 92 systems (17%) exceeded the PFOA MCL of 4 ppt
- 12 systems (2%) had HI > 1
- 17 systems (3%) exceeded the PFHxS MCL of 10 ppt
- No system exceeded the PFNA or GenX MCL of 10 ppt
- No system exceeded the PFBS Health Based Water Concentration of 2,000 ppt
- 233 systems (44%) had PFPeA detections followed by 232 (43%) and 231 (43%) PFBS and PFOA detections, respectively

Figure 12-22: DWR 2023 Public Water Supply PFAS Sampling Results.



12.4.2.4 UCMR5 (Unregulated Contaminant Monitoring Rule)

The Safe Drinking Water Act (SDWA) requires that once every five year the EPA issues a list of unregulated contaminants to be monitored by public water supply systems. The Fifth Unregulated Contaminant Monitoring Rule (UCMR5) requires sampling for 29 PFAS compounds and lithium during a 12-month period from January 2023 through December 2025 (EPA, 2023). All large (serve > 10,000 people) and small (3,300 to 10,000 people) systems must monitor for the 30 contaminants and a subset of public water supply systems that serve fewer than 3,000 people were also randomly selected to monitor. Surface water, groundwater under the direct influence of surface water, mixed sources and groundwater systems are included. EPA continues to be responsible for all analytical costs associated with monitoring of systems serving 10,000 or fewer people. Statewide, there are 298 public water supply systems participating in the UCMR5 (Table 12-23 and Figure 12-23). Sixty-six are in the Cape Fear River Basin with data available on the EPA [UCMR5 Data Finder webpage](#).

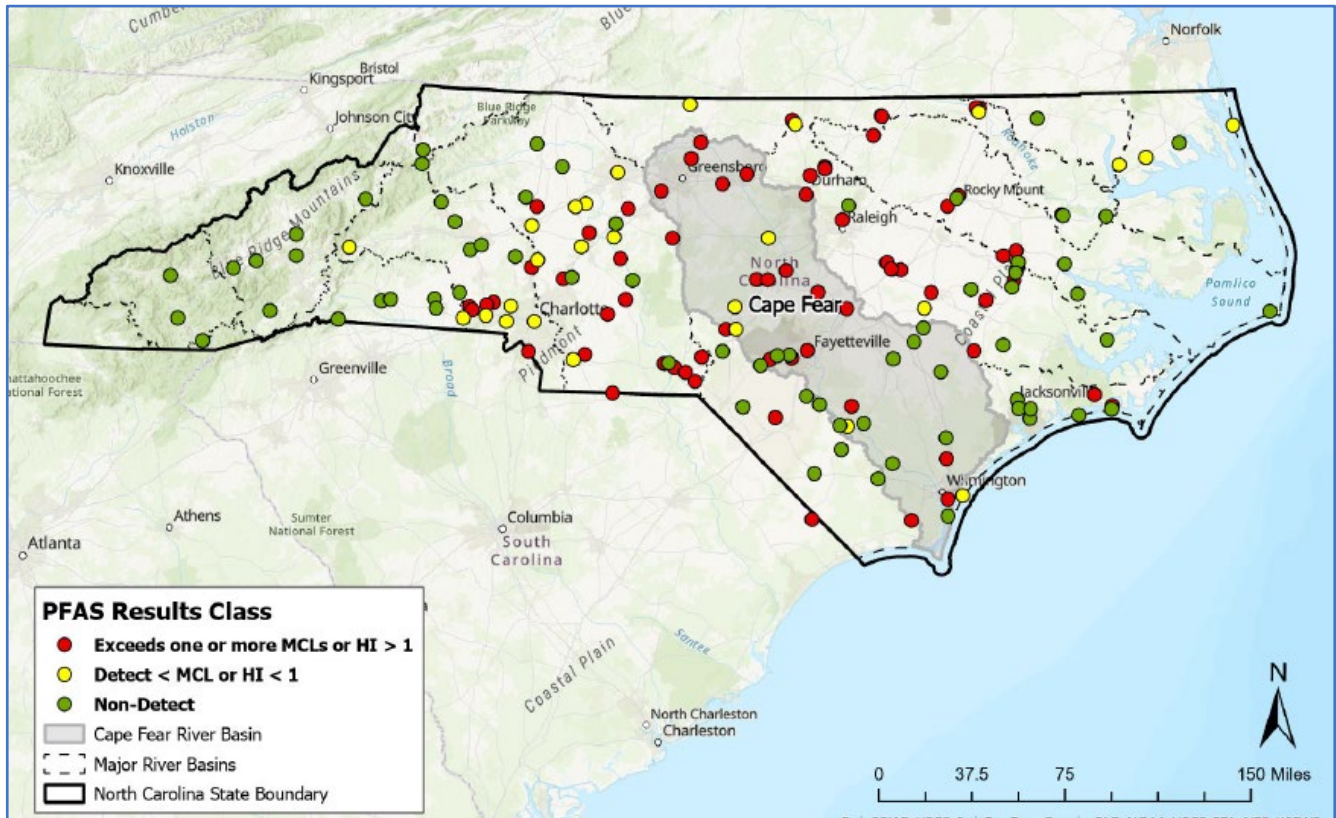
Table 12-23: North Carolina Water Systems Requiring UCMR5 Monitoring.

NC Basin	No. of Systems	NC Basin	No. of Systems	NC Basin	No. of Systems
Broad	8	Hiwassee	1	Pasquotank	12
Cape Fear	66	Little Tennessee	5	Roanoke	9
Catawba	38	Lumber	17	Tar	19
Chowan	5	Neuse	43	White Oak	15
French Broad	16	New	3	Yadkin	41
Total number of PWSs monitoring in NC = 298					

An EPA UCMR5 [January 2025 data summary](#) report is available on the EPA [UCMR5 website](#). This report provides an extensive review of the data collected through 2024 which represents about 66% of the total results that the EPA expects to receive. The data presented shows that PFAS co-occur as mixtures in drinking water systems. To date, 65% of sampling locations with at least one PFAS result at or above the UCMR5 MRL have results for multiple PFAS at or above the UCMR5 MRL(s).

The UCMR5 data will provide the EPA and other interested parties with scientifically valid data on the national occurrence of these contaminants in drinking water. This data will improve an understanding of the frequency and concentration levels found and helps the EPA, states and tribes to develop better protective actions and supports scientifically based decision-making to protect public health.

Figure 12-23: North Carolina UCMR5 PFAS Public Water Supply Monitoring Results, January 2023 through September 2025.



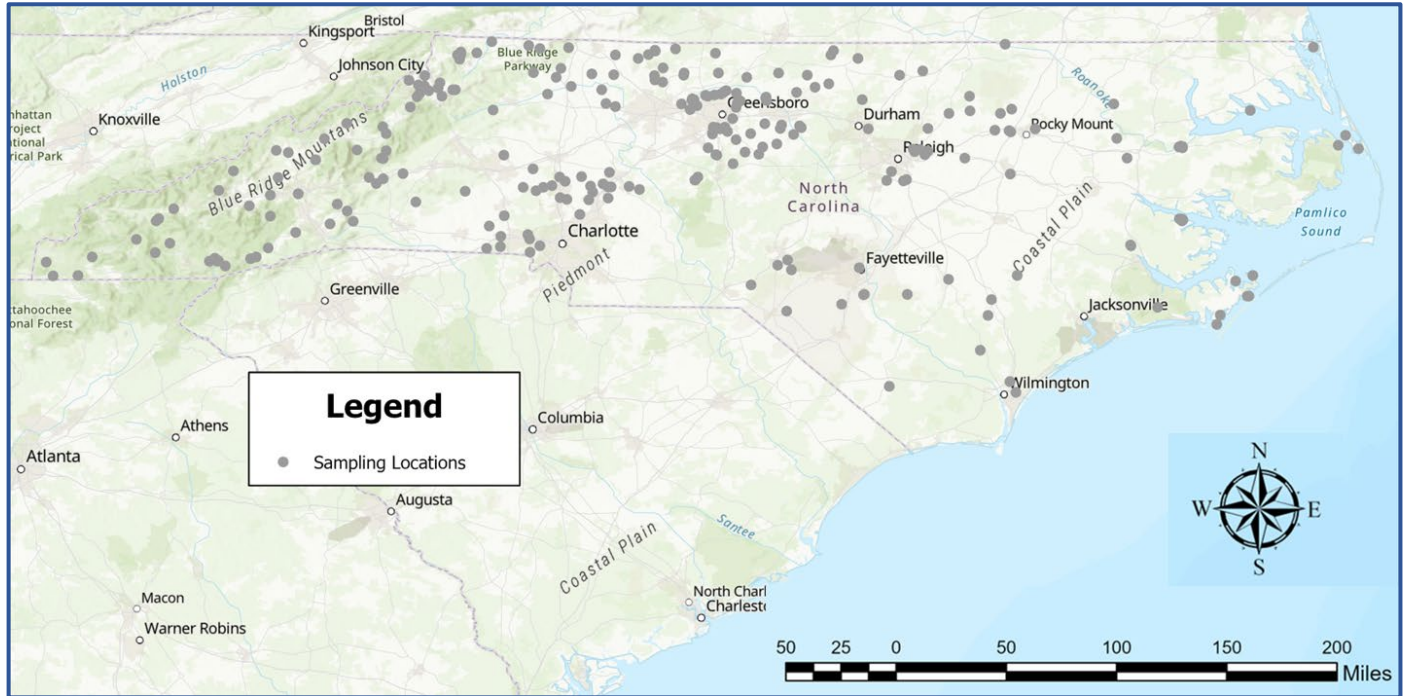
12.4.2.5 2024 DWR Public Water Supply Section - Water System Testing

Between January and July 2024, DEQ sampled another set of smaller drinking water systems to continue the assessment of PFAS in drinking water on a statewide basis (Figure 12-24). As with the other sampling campaigns performed by the PWS Section, samples were collected at the entry point (i.e. after water treatment and at a point of entry into the drinking water distribution system).

A total of 287 smaller privately owned systems, schools and daycares were offered sampling. These included:

- All remaining community and non-transient non-community (NTNC) water systems not previously sampled by PWS or part of any of the previous sampling campaigns;
- 256 systems were sampled for the first time. One sample was collected for each system at one entry point;
- Additionally, 21 systems that were previously sampled, that had results above MCLs or HI>1 and had more than one entry point were re-sampled.

Figure 12-24: DWR 2024 Public Water Supply PFAS Potential Sampling Locations.

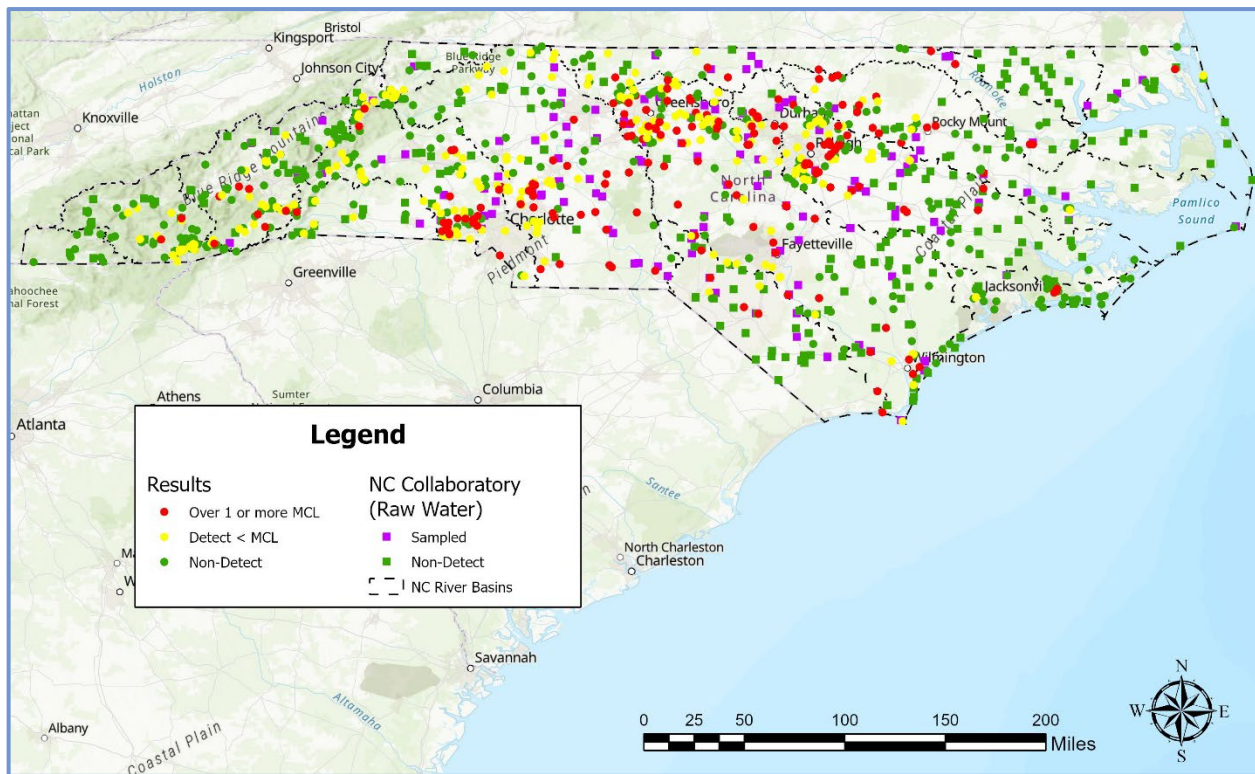


12.4.2.6 DWR Public Water Supply Section - Drinking Water Supply Summary

A general overview of all data currently available for North Carolina highlights is included in the following (Figure 12-25):

- As of May 10, 2024, based on single sample results, approximately 22% of systems have results greater than an MCL or HI.
- PFOS (235 systems corresponding to approximately 13% of exceedances) and PFOA (284 systems corresponding to approximately 15% of exceedances) are currently the most prominent contaminants above MCL.
- Currently approximately 1 % of the systems initially sampled have one or more HI higher than 1.
- Currently approximately 1 % of the systems initially sampled have a PFHxS result that exceeds the MCL. No system has PFBS above the Health-Based Water Concentration of 2,000ppt.
- Only between 0 and 0.5 % of the systems initially sampled have a GenX result greater than the MCL.
- No systems initially sampled have PFNA results greater than the MCL.
- Multiple PFAS compounds other than the six compounds in the proposed regulation are currently detected at various concentrations.

Figure 12-25: Overall Summary of NC Drinking Water PFAS Sampling Result from all Available Studies to Date along with the 2019 Collaboratory Raw Water Sample Locations.



As of May 10, 2024, approximately 350 water systems have a result that exceeds one or more of the PFAS MCLs or the HI.

The April 2024 National Primary Drinking Water Regulations provided public water systems with five years, until 2029, to comply with the maximum contaminant levels. In May 2025, EPA announced its intention to extend the compliance deadline by two years, to 2031 (as of September 2025, this extension has not been formally finalized). DEQ, however, has been working with public water systems to prepare for the regulation and assess PFAS levels in drinking water systems across the state. In 2023, DEQ sampled more than 530 small public water systems, those serving at least 15 connections or 25 individuals, to assess PFAS levels across the state. That effort followed the sampling in late 2022 at 50 municipal and county water systems. Thirty-eight municipal water systems sampled in 2022 had detections above the new MCLs. Those results are discussed in detail above as well as available on the [DEQ PFAS Sampling of Public Water Systems website](#).

As of May 10, 2024, more than 340 small systems had detections that exceed the MCLs. Many water systems have also conducted sampling on their own or as part of the federal UCMR5 program.

DEQ is working with systems to provide technical assistance and funding opportunities to reduce PFAS and install treatment. DEQ's [Division of Water Infrastructure](#) is utilizing federal funding under the Bipartisan Infrastructure Law to help address PFAS contamination, including funding designed specifically for small, rural and underserved communities, as well as the [Drinking Water State Revolving Fund](#).

DEQ has also launched a [PFAS Treatment System Assistance Program](#) to help support North Carolina residents with PFAS contamination in their private water wells when there is no designated responsible party that provides

alternate drinking water. More detailed information is provided below on these funding opportunities (section [12.3.3](#)).

DEQ is taking a whole-of-department approach to protect communities by identifying, reducing and remediating PFAS pollution. DEQ has proposed state groundwater and surface water standards to complement the federal MCLs. Regulating PFAS discharge and reducing the amounts that enter drinking water sources will also lessen the need for treatment at the drinking water systems to comply with the new EPA approved National Primary Drinking Water Regulation MCLs.

12.4.3 Drinking Water – Groundwater Sources

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water
- ☑ Cleaning Up Existing Contamination

12.4.3.1 *Groundwater Private Well Testing in Bladen, Cumberland, Harnett, Hoke, Robeson and Sampson counties*

In July 2017, DEQ directed Chemours to sample 14 groundwater monitoring wells located at the Chemours facility and not used for public purposes. Thirteen of the 14 industrial wells had detections of GenX in violation of state groundwater standards. Based on those results, DEQ and NCDHHS initiated a plan to start testing private wells of residents nearest the facility on Sept. 15, 2017. In February 2019, the Consent Order directed Chemours, among other things, to determine the extent of the PFAS contamination related to the Fayetteville Works site and provide replacement water supplies to affected residents in Bladen, Cumberland, Robeson and Sampson counties. DEQ will continue to direct Chemours to expand its sampling until the edge of the contamination plume is found. More details pertaining to the Chemours Consent Order is provided in section [12.3.2](#) above.

In March 2025, at DEQ's direction, Chemours significantly expanded sampling eligibility for PFAS contamination in private drinking water wells around the Fayetteville Works plant to include portions of Harnett and Hoke counties ([DWM website](#)). Approximately 150,000 additional residences [have now become eligible](#) for private well testing in the expanded area, which includes significant portions of Cumberland, Bladen, Robeson, Sampson, Hoke and Harnett counties.

DEQ urges eligible residents to have their wells tested to find and reduce exposure to PFAS contamination (DEQ [GenX Investigation website](#)). DEQ developed an informational private drinking water well sampling flyer in both English and Spanish called "[Questions about the well sampling process?](#)" If you live near the Chemours Fayetteville Works facility, call Chemours at 910-686-1101 to have your drinking water well sampled or for more information.

12.4.3.2 *Groundwater Private Well Testing in Brunswick, Columbus, New Hanover and Pender Counties*

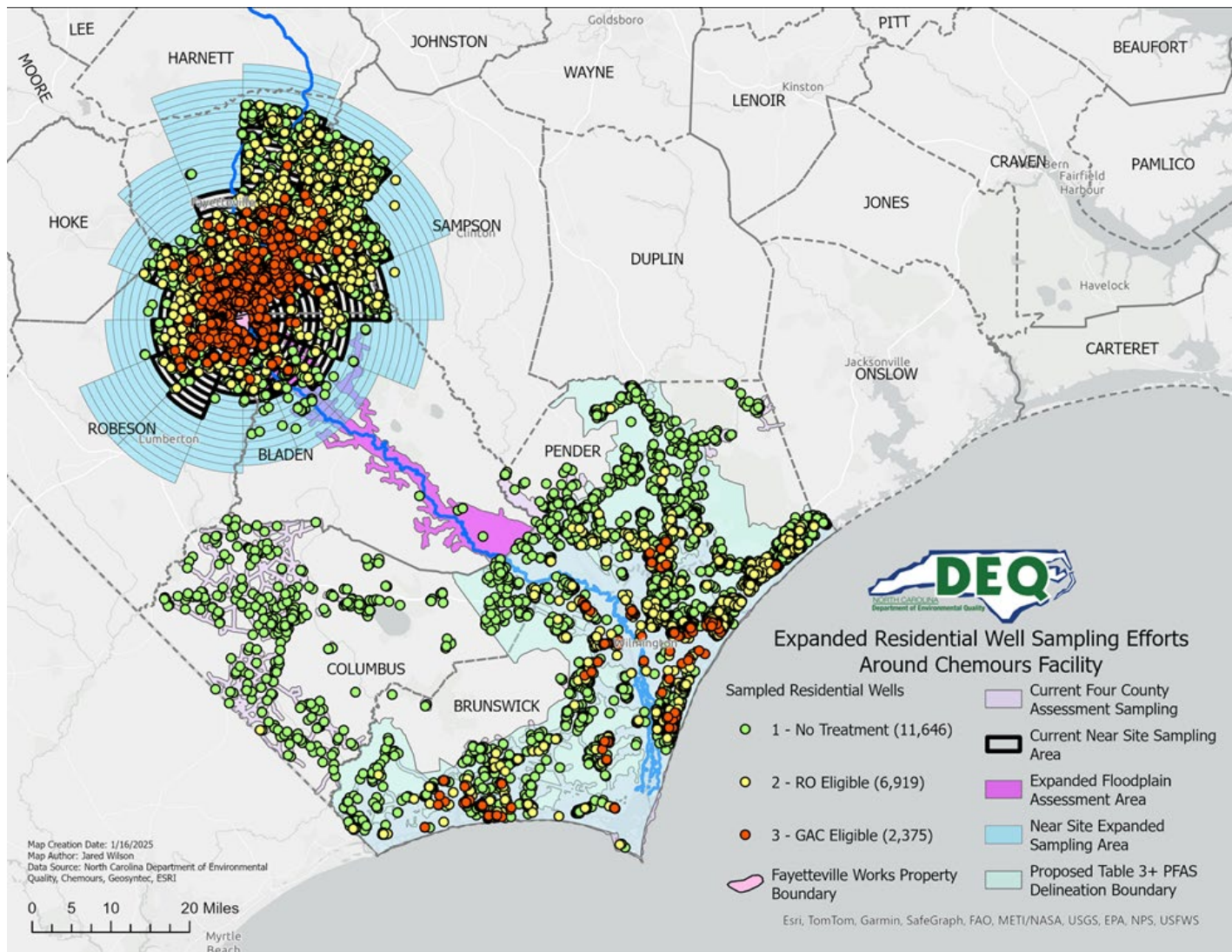
At DEQ's direction, Chemours expanded sampling for PFAS contamination in private drinking water wells in New Hanover, Brunswick, Columbus and Pender counties. The expansion of the testing area beyond the counties closest to the Chemours Fayetteville Works facility came after an extensive review of the many study results including the floodplain PFAS analysis and floodplain mapping as well as the [Chemours 2022 updated interim sampling and drinking water plan](#). As of November 2023, more than 14,000 additional residences may qualify for sampling. For more information on well sampling eligibility criteria in the lower Cape Fear River area, please visit the DEQ [Well Sampling Information website](#). Residents interested in having their wells sampled should call Chemours at 910-678-1100 or complete [Chemours online form](#).

According to Chemours, as of December 31, 2024, there are 34,789 addresses that have been screened for sample eligibility, and 11,823 met the criteria. See section 12.3.2 above for sampling eligibility and related monitoring results. For the most up to date numbers see the latest quarterly progress report on the [Chemours Consent Order Compliance website](#).

In September 2025, DEQ again expanded PFAS contamination sampling eligibility area for private wells in additional portions of New Hanover, Brunswick, Columbus and Pender County. Approximately 14,000 additional residence are now eligible for private well testing in the expanded area (9/3/2025 [expanded area map](#)). Additional information about well sampling for residents in this four-county area is available on the [DEQ website](#).

A DEQ overall summary, (Figure 12-26) shows the private wells tested as of December 2024 in the 10 county area by Chemours, near their Fayetteville Works facility and downstream. The map identifies 6,919 residential wells eligible for Reverse Osmosis (RO; yellow dots), 2,375 wells eligible for Granulated Activated Carbon (GAC; red dots) and 11,646 well (green dots) that did not exceed the levels requiring treatment for the Chemours specific compounds (PFAS compounds listed in Attachment C).

Figure 12-26: Map of the Chemours Private Well Testing as of December 31, 2024.



12.4.3.3 DEQ Private Well Testing near Sampson County and other Landfills.

As part of DEQ's overall assessment of PFAS, all solid waste sanitary landfills include PFAS analysis of their regular groundwater, surface water, underdrains and leachate samples. Preliminary results at the Sampson County Disposal LLC landfill led DEQ to initiate offsite residential wells sampling to ensure residents within 2,000 feet of the landfill have safe drinking water.

The Sampson County Disposal landfill average total quantifiable PFAS concentrations were:

- Groundwater Well 82-01 = 3,628 ppt
- Groundwater Well 82-02 = 6,477 ppt

On November 16, 2023, DEQ held a community information meeting to inform residents of the opportunity to test their drinking water wells for presence of PFAS compounds (see presentation [here](#)).

DEQ sampled 30 private drinking water wells around the landfills between October and December 2023 using EPA test method 1633, which includes testing for Chemours signature compounds listed in their Consent Order Attachment C ([Table 12-4](#)).

- 8 of the 30 wells had no detectable PFAS concentrations
- 22 of the 30 wells tested had detectable PFAS compounds tested
- 7 of the 30 wells had PFOA and/or PFOS at concentration above the EPA's maximum contaminant level of 4 ppt
- 7 well had concentrations of PFOA and/or PFOS below the EPA's maximum contaminant level of 4 ppt
- No wells had PFBS, PFHxS, PFNA or HFPO-DA (GenX) compounds at levels above the EPA hazard index (HI) of 1 (HI explained in [Table 12-10](#)).

In December 2024, a Consent Decree was entered into between the Environmental Justice Community Action Network (EJCAN) and Sampson County Disposal LLC (SCD) and its parent and affiliated companies. This agreement will ultimately result in the Sampson County Landfill achieving EPA MCLs for PFOA, PFOS, HFPO-DA/Gen-X, PFHxS, and PFNA-for their two Gravity Groundwater Intercept (GGI) system outfalls and for proposed discharge from its leachate treatment reverse osmosis system (Consent Decree December 5, 2024, *Environmental Justice Community Action Network v. GFL Environmental Inc.; Sampson County Disposal LLC; Waste Industries, USA, LLC; Waste Industries LLC; Black Creek Renewable Energy LLC*. section B - Treatment of PFAS Discharges & Treatment Standards). The Consent Decree also addresses other community environmental concerns as reported on the [EJCAN webpage](#). DEQ is working with the Sampson County Disposal landfill to fulfill the permitting needs as outlined in the Consent Decree and as required by the Clean Water Act.

It has been determined that the high levels of PFAS contamination (five Chemours signature PFAS) are the result of Sampson County Disposal accepting Chemours Fayetteville Works solid waste. Sampson County Disposal has worked with DEQ since 2019 to understand and address potential environmental impacts associated with PFAS containing waste and has taken additional measures to address those impacts. As a result, Sampson County Disposal requested a Special Order by Consent (SOC; [EMC SOC WQ S25-002](#)) for the landfill. NC Administrative Code, Title 15A, Subchapter 02L, Groundwater Classifications and Standards, requires that corrective action be taken by any person who has conducted or controlled an activity which has resulted in a discharge of contamination and/or which has caused an exceedance of applicable groundwater standards. The SOC went out for public notice on September 24, 2025, and will be effective November 15, 2025 ([DEQ December 2025 press release](#)).

Sampson County Disposal operates a Gravity Groundwater Intercept (GGI) system which is comprised of a series of trenches that intercept and gravity drain groundwater underneath some of the lined landfill cells to sumps, which connect via a discharge line to outfalls that discharge into Bearskin Swamp. A review of all of the PFAS data collected by Sampson County Disposal and DWM have found the groundwater containing PFAS chemicals, and as such, requires an NPDES permit to discharge to Bearskin Swamp. Compliance with the SOC will require Sampson County Disposal to complete installation and operation of a groundwater remediation treatment system, reduce PFAS discharge levels by 90%, and to submit a NPDES application. The SOC specifies a timelines to achieve phased in PFAS reductions, starting with the completed installation of a treatment system capable of treating at least 0.4 MGD by November 15, 2025 [SOC compliance schedule in paragraph 2(a)]. The schedule includes a 50% reduction of baseline discharge levels by January 14, 2026, and a minimum of 90% by April 14, 2026. The SOC will expire on December 15, 2028, or upon issuance of a final NPDES permit, whichever is sooner.

While mitigation efforts at Sampson County Disposal landfill is well underway, DEQ is still working to understand the potential impacts from landfills and possible PFAS contamination across the state. DEQ is utilizing the data from the solid waste sanitary landfill PFAS monitoring requirements established in March 2023 to identify landfills in need of action (see section [12.3.7](#) for details).

On November 21, 2024, DEQ's Division of Waste Management sent Robeson County Landfill in St. Paul's NC, a Notice of Regulatory Requirements (NORR) for contaminant assessment and cleanup letter ([link to DEQ letter](#)). Following the requirements of the DWM March 13, 2023, memorandum which requires that all groundwater, surface water, and leachate samples collected at solid waste sanitary landfills after July 1, 2023, analyze for PFAS (see section [12.3.7](#) for specific details), it was discovered that their November 2023 and May 2024 monitoring results exceeded the 15A NCAC 02L .0202 (c) IMAC groundwater standards for HFPO-DA/GenX, PFHxS, PFNA, PFOA and PFOS.

All landfills are required to protect human health and the environment through monitoring, assessing, and taking effective, timely corrective action when evidence of potential contamination is found at the facility. As a result of their elevated PFAS concentrations, Robeson County landfill was required to take several actions. These included submission of an updated receptor survey/site assessment report, implementing a monitoring program, the development of a corrective action plan and implementation of the plan upon DEQ Secretary approval. A receptor survey must include an inventory and map of all identifiable drinking water wells, irrigation wells, springs and surface waters, including public water supply surface waters used as potable water and intake locations with 1,500 feet of the property boundary (survey [link](#)).

On July 25, 2025, the Robeson County Landfill corrective action plan ([PFAS Assessment Work Plan](#)) was approved by DEQ. The primary objective of the work plan is:

1. To monitor and characterize the presence and concentration of PFAS compounds in groundwater at the landfill and any potential offsite receptors identified in the receptor survey.
2. To identify potential PFAS migration pathways associated with landfill operations to determine the potential or existence of offsite PFAS migration in groundwater or surface water.
3. To provide data to support future corrective actions, if necessary, to mitigate PFAS impacts and/or reduce ongoing contamination sources.

According to their approved plan, five new groundwater monitoring wells will be installed at select locations across the landfill property to fill existing data gaps in the monitoring network (21 existing wells) and improve spatial coverage across key areas of interest. Two surface water samples will be collected along with samples from the borrow pit and the borrow pit outflow. The receptor survey identified 21 private groundwater wells

within the 1,500-foot radius of the landfill which will be sampled if permission allows. The assessment work plan also indicates that four leachate samples will be collected during the investigation. Depending on the results of the study, the radius could be extended beyond the initial 1,500-foot radius. The Robeson County landfill assessment work plan indicates that a report of the findings should be sent to DWM in December 2025.

It is yet to be determined if the PFAS compounds identified in the monitoring results from 2023 and 2024 at the landfill are directly from Chemours solid waste disposal at the landfill or from regional deposition/contributions directly from the Chemours Fayetteville works facility. If the landfill is found to be the source of PFAS contaminants, the landfill will be required to treat and remediate for onsite contamination as well as to provide local private residence whose private water supply wells have been impacted by PFAS from the landfill with treatment technologies to make their water safe for consumption.

DEQ is in the process of working with all Solid Waste sanitary landfills across the state to determine if the presence of PFAS compounds are a concern and has a plan in place to study and address PFAS contamination to protect the environment and human health. DEQ is prioritizing landfills that likely received solid waste from Chemours since they have a higher likelihood of containing elevated PFAS in their leachate, which could impact groundwater and surface water. In addition, DEQ is also prioritizing Solid Waste sanitary landfills with elevated concentrations of PFAS in groundwater that has potential to impact offsite receptors.

12.4.4 Groundwater Monitoring Well Network

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water

The state of North Carolina relies on groundwater for approximately 50% of its drinking (potable) water use. In addition, the state has thousands of agricultural and industrial groundwater users.

The Groundwater Resources Branch (GWRB) collects groundwater quality data throughout the state from the Division of Water Resources (DWR) Monitoring Well Network (MWN). The MWN consists of 696 groundwater wells at 238 sites across North Carolina (Figure 12-27). These wells range in age from less than a year to more than 50 years old. A typical well site in the Coastal Plain may have several wells, each screened in one of the different aquifers at that location (Figure 12-28). Most monitoring well sites in the Piedmont and Mountain regions of the state have only one well in the basement rock/saprolite aquifer system.



Figure 12-27: Groundwater Management Branch Monitoring Well Network (MWN) Statewide Map. (Cape Fear River Basin outlined in thick gray line).

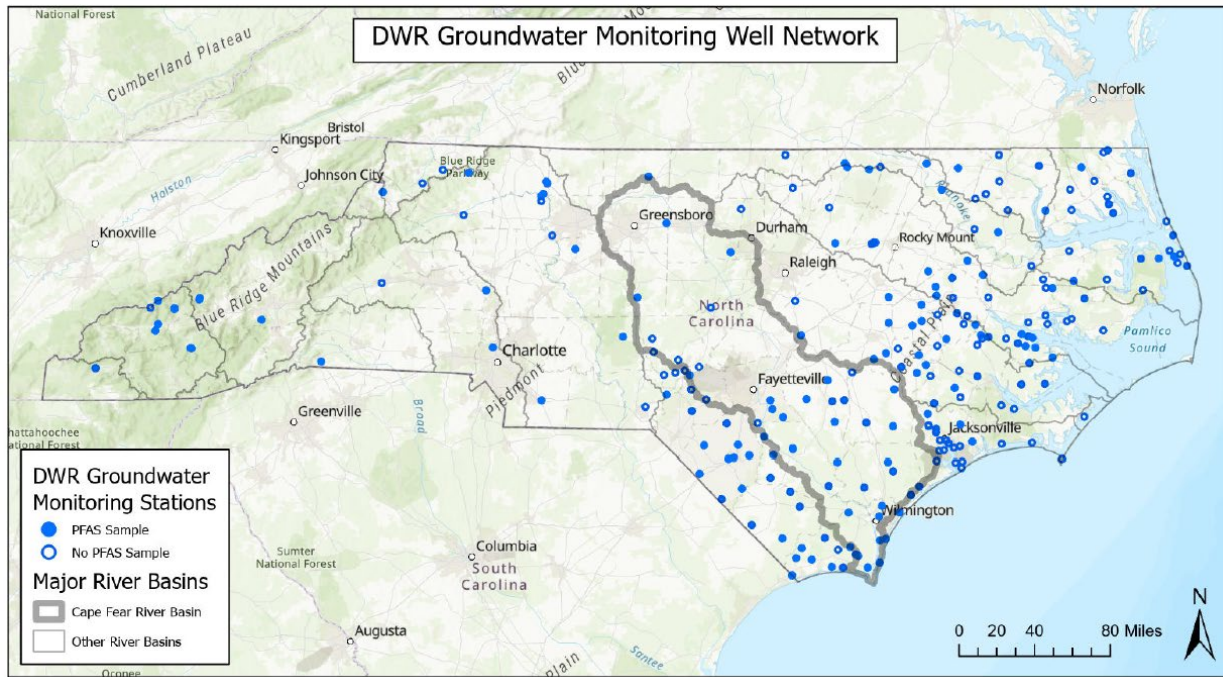
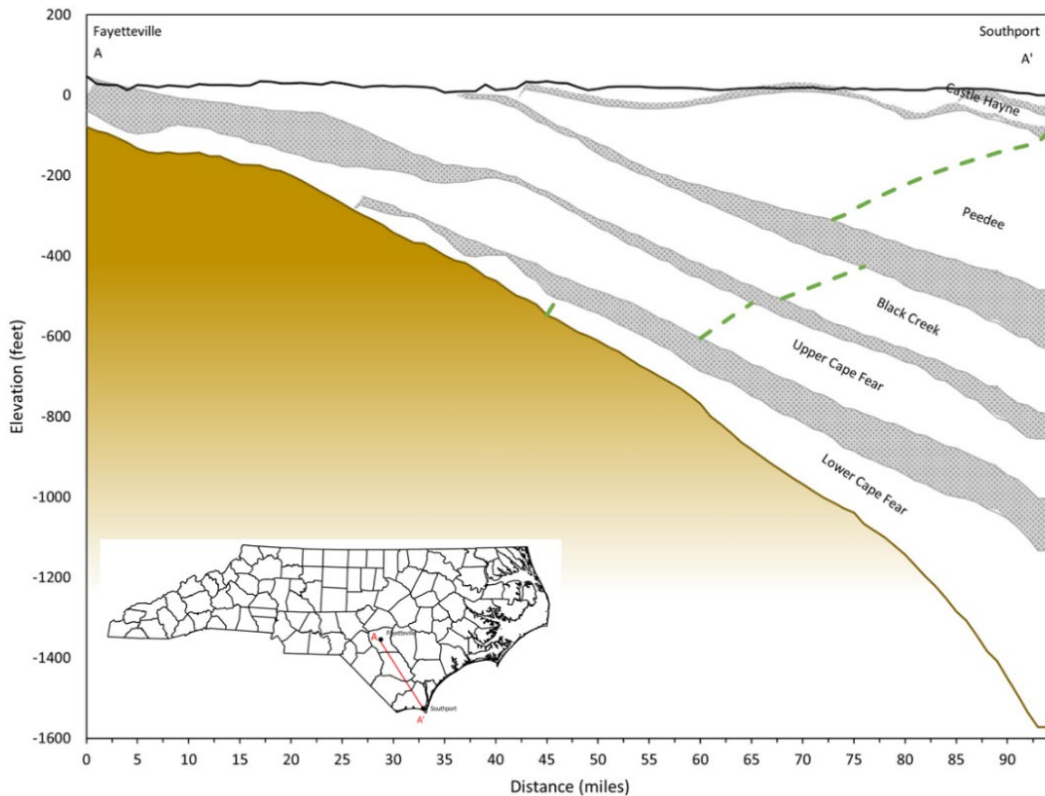


Figure 12-28: Hydrogeologic Cross Section Through the Central Coastal Plain Showing the Cretaceous Aquifers and Confining Beds between Fayetteville and Southport NC. (Note: The Green Dash Line Denotes the Saltwater Boundary to the East.)



Typically, these wells are in areas where groundwater quality is unlikely to be influenced by industry or other land-use practices. This, along with the MWN's broad geographic and geologic coverage, provides an excellent opportunity to conduct a detailed characterization of ambient or background, groundwater quality from both deep and shallow aquifer systems throughout the state. A long-term sampling project is underway to collect groundwater quality data from the entire network. In recent years, interest in the occurrence and distribution of per- and polyfluoroalkyl substances (PFAS) in groundwater has increased significantly, especially in the lower region of the Cape Fear River Basin.

12.4.4.1 Cape Fear River Basin Ambient Groundwater Monitoring Well Network PFAS Testing

In July 2019, GWRB began testing the MWN groundwater wells for PFAS samples in the lower region of the Cape Fear River Basin. This effort focused on 91 wells at 35 of the 39 MWN stations in the Cape Fear River Basin. The remaining four monitoring stations were not sampled due to poor well construction or due to private ownership.

Results from this sampling show that PFAS are prevalent throughout most of the lower part of the Cape Fear River Basin and particularly in shallow aquifers, where anthropogenic inputs are more likely to occur, rather than in deeper confined aquifers. PFAS of particular interest are PFOA and PFOS, which are now regulated in drinking water at the federal level (*Table 12-10*). The four additional PFAS compounds proposed for regulation using the hazard index, as described above, as well as the PFAS compounds listed in the February 2019 Chemours Consent Order Attachment C (*Table 12-4*) were tested for in each well.

The PFAS testing found many of the background wells in the lower Cape Fear River Basin with detectable PFAS concentrations. The results found included (*Table 12-24; Figure 12-29*):

- PFOA detected above the EPA Maximum Contaminant Level of 4 ppt in 17 wells at 11 monitoring stations in seven counties in the basin.
- PFOS detected above the EPA Maximum Contaminant Level of 4 ppt in 10 wells at 10 monitoring stations in five counties in the basin.
- PFHxS detected above the EPA Maximum Contaminant Level of 10 ppt in 2 wells at 2 monitoring stations in two counties in the basin.
- GenX detected above the EPA Maximum Contaminant Level of 10 ppt in 4 wells at 4 monitoring stations in four counties in the basin.
- GenX, PFBS, PFNA, and PFHxS combined detected above the hazard index (HI) maximum contaminant level (MCL) of 1 (unitless) in five wells at five monitoring stations in five counties in the basin.
- Chemours Consent Order - Attachment C PFAS compounds were detected in 18 wells at 14 monitoring stations in counties counties in the basin. Nine wells at seven monitoring stations in five counties in the basin showed at least one of the PFAS compounds > 10 ppt, while total quantifiable PFAS concentrations > 70 ppt was detected in seven wells at five monitoring stations in four counties in the basin.

Table 12-24: DWR GWRB Groundwater Monitoring Well Network (MWN) PFAS Testing Summary Results for Cape Fear River Basin and Statewide (Cape Fear River Basin not included in statewide totals) as of May 2025.

PFAS Compound	Concentration or Hazard Index^ (HI)	# of MWN Stations	# of Wells	# of Counties
Cape Fear River Basin				
PFOA	> 4 ppt	11	17	7
PFOS	> 4 ppt	10	10	5
PFNA	> 10 ppt	0	0	0
PFHxS	> 10 ppt	2	2	2
HFPO-DA/GenX	> 10 ppt	4	4	4
GenX, PFBS, PFNA, PFHxS	HI > 1 (unitless)	5	5	5
Consent Order Attachment C compounds (14 total)*	Detected	14	18	7
	At least one compound > 10 ppt	7	9	5
	Total concentration > 70 ppt	5	7	4
Statewide – Not Including Cape Fear River Basin				
PFOA	> 4 ppt	21	25	12
PFOS	> 4 ppt	22	22	14
PFNA	> 10 ppt	0	0	0
PFHxS	> 10 ppt	3	3	3
HFPO-DA/GenX	> 10 ppt	1	1	1
GenX, PFBS, PFNA, PFHxS	HI > 1 (unitless)	5	6	5
Consent Order Attachment C compounds (14 total)*	Detected	37	46	20
	At least one compound > 10 ppt	10	12	5
	Total concentration > 70 ppt	2	3	2
*2019 Consent Order – Attachment C PFAS testing list at the end (page 46)				
^PFAS Hazard Index (HI) weights the relative concern of each PFAS species using the formula $HI = \frac{[GenX]}{10} + \frac{[PFBS]}{2000} + \frac{[PFNA]}{10} + \frac{[PFHxS]}{10}$.				
See GWRB PFAS Dashboard for data.				

12.4.4.2 Statewide (Outside of Cape Fear River Basin) Ambient Groundwater Monitoring Well Network PFAS Testing

Upon completion of the Cape Fear River Basin sampling initiative, GWRB shifted their focus to sampling MWN stations across the entire state of North Carolina. This work was completed in early 2024.

A summary of results from the statewide sampling, not including the Cape Fear River Basin, are as follows. Over 296 wells at 129 monitoring stations have been sampled for this project.

The PFAS testing found many of the background wells across North Carolina with detectable PFAS concentrations. The results found included ([Table 12-24](#); [Figure 12-29](#)):

- PFOA detected above the EPA Maximum Contaminant Level of 4 ppt in 25 wells at 21 monitoring stations in 12 counties.
- PFOS detected above the EPA Maximum Contaminant Level of 4 ppt in 22 wells at 22 monitoring stations in 14 counties.
- PFHxS detected above the EPA Maximum Contaminant Level of 10 ppt in three wells at three monitoring stations in three counties.

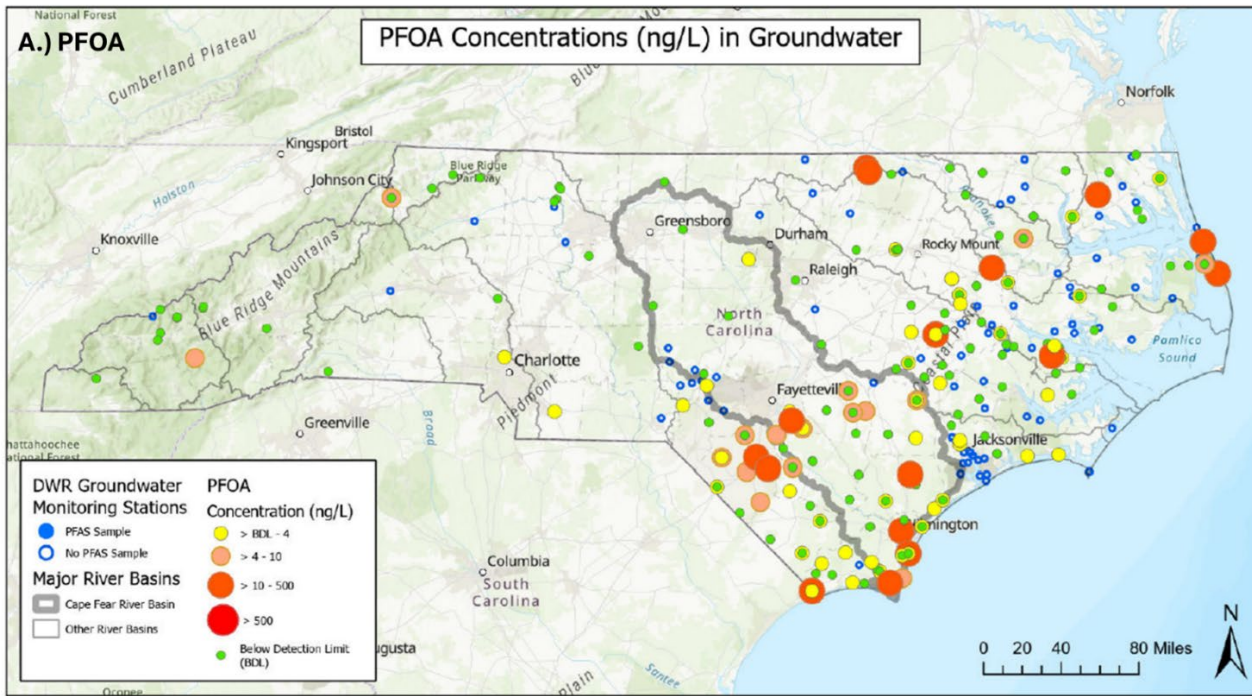
- GenX detected above the EPA Maximum Contaminant Level of 10 ppt in one well at one monitoring station in one county.
- GenX, PFBS, PFNA, and PFHxS combined detected above the hazard index (HI) proposed maximum contaminant level (MCL) of 1 (unitless) in six wells at five monitoring stations in five counties.
- Chemours Consent Order - Attachment C PFAS compounds were detected in 46 wells at 37 monitoring stations in 20 counties. Twelve wells at 10 monitoring stations in five counties showed at least one PFAS > 10 ppt, while total quantifiable PFAS concentrations > 70 ppt was detected in three wells at two monitoring stations in 2 counties.

Complete results are available for viewing and downloading from our [Ambient Groundwater Quality Monitoring Network Application](#), [Ambient Groundwater PFAS Dashboard](#), [Groundwater Data Webpage](#) and [Emerging Compounds in Water Groundwater Sampling](#) website.

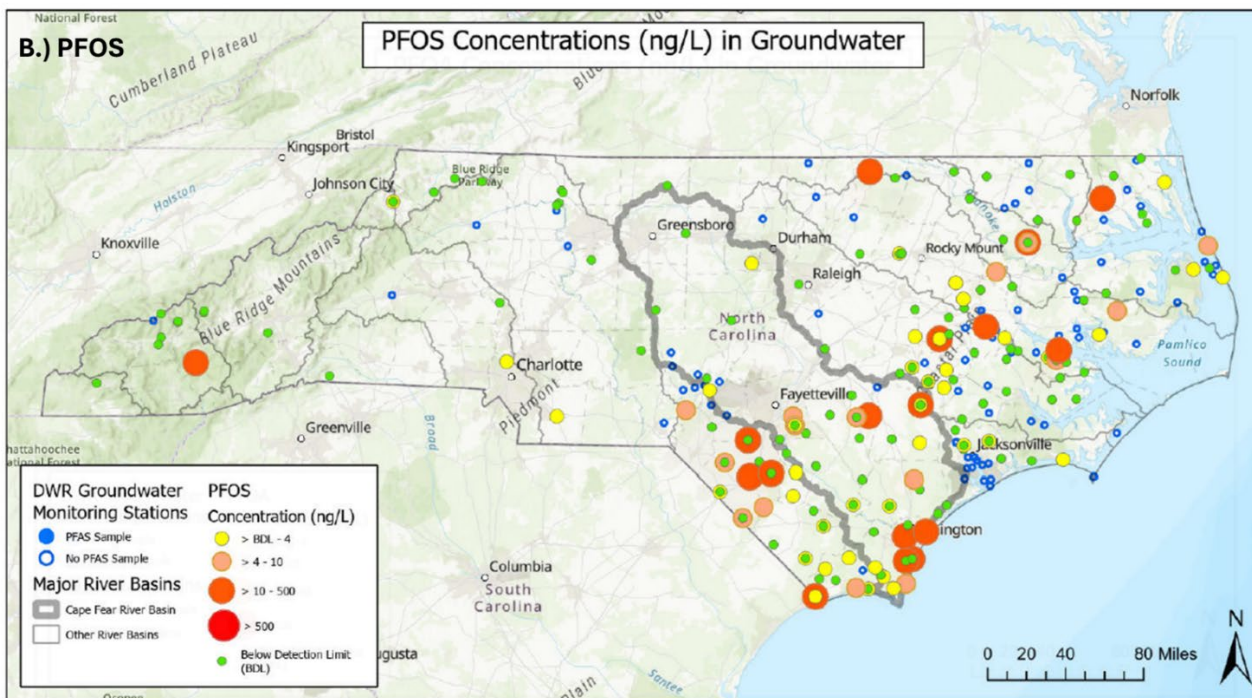
A full report on findings of the statewide groundwater PFAS sampling project will be completed in 2025.

Figure 12-29: Groundwater Management Branch, Monitoring Well Network (MWN) Statewide PFAS Results. (Cape Fear River Basin outlined in wide gray line).

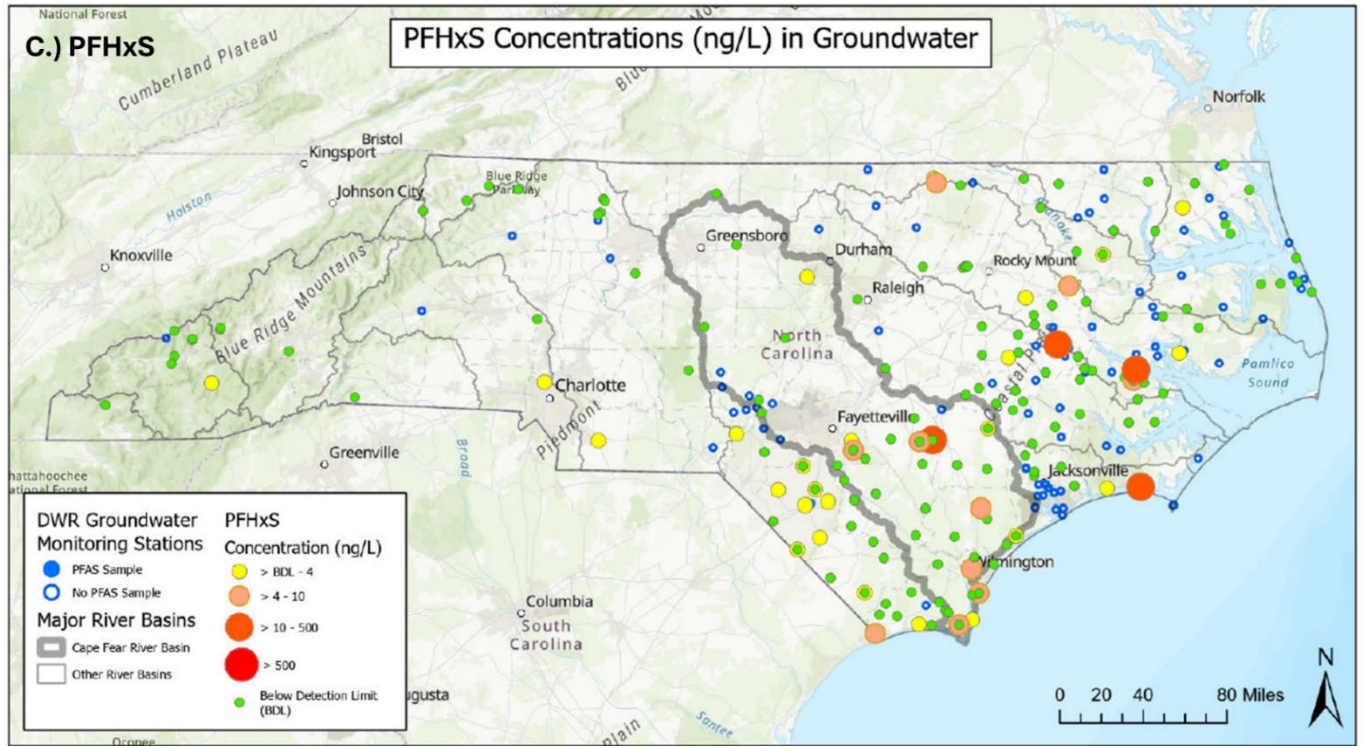
A.) Statewide and Cape Fear River Basin - PFOA Results;



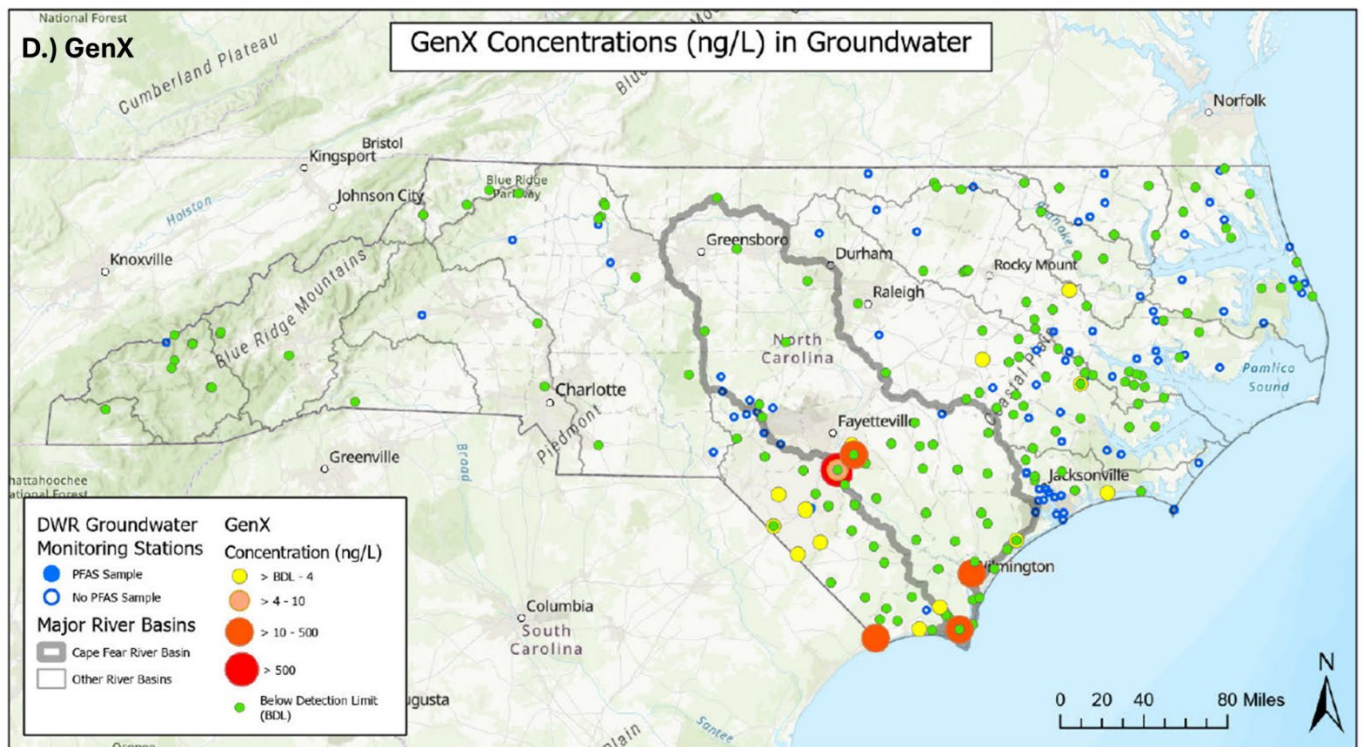
B.) Statewide and Cape Fear River Basin - PFOS Results;



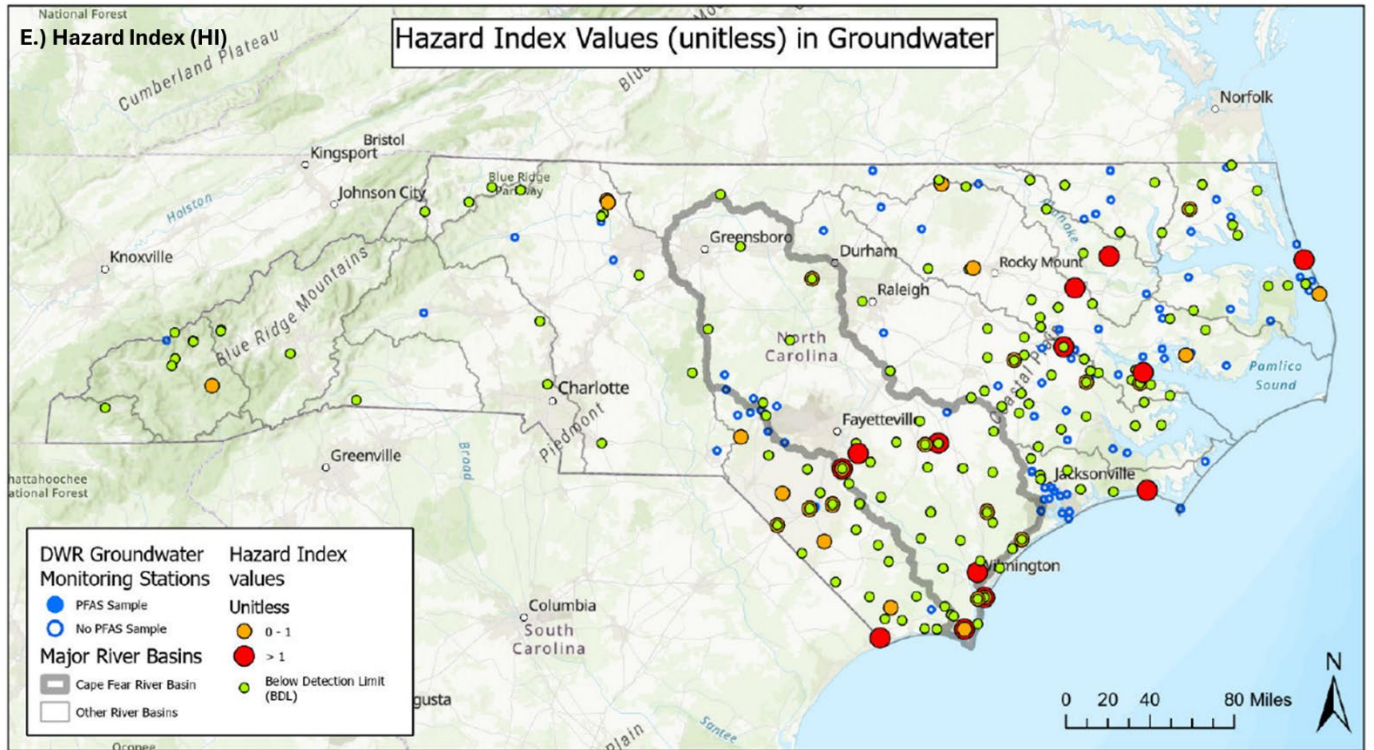
C.) Statewide and Cape Fear River Basin - PFHxS Results;



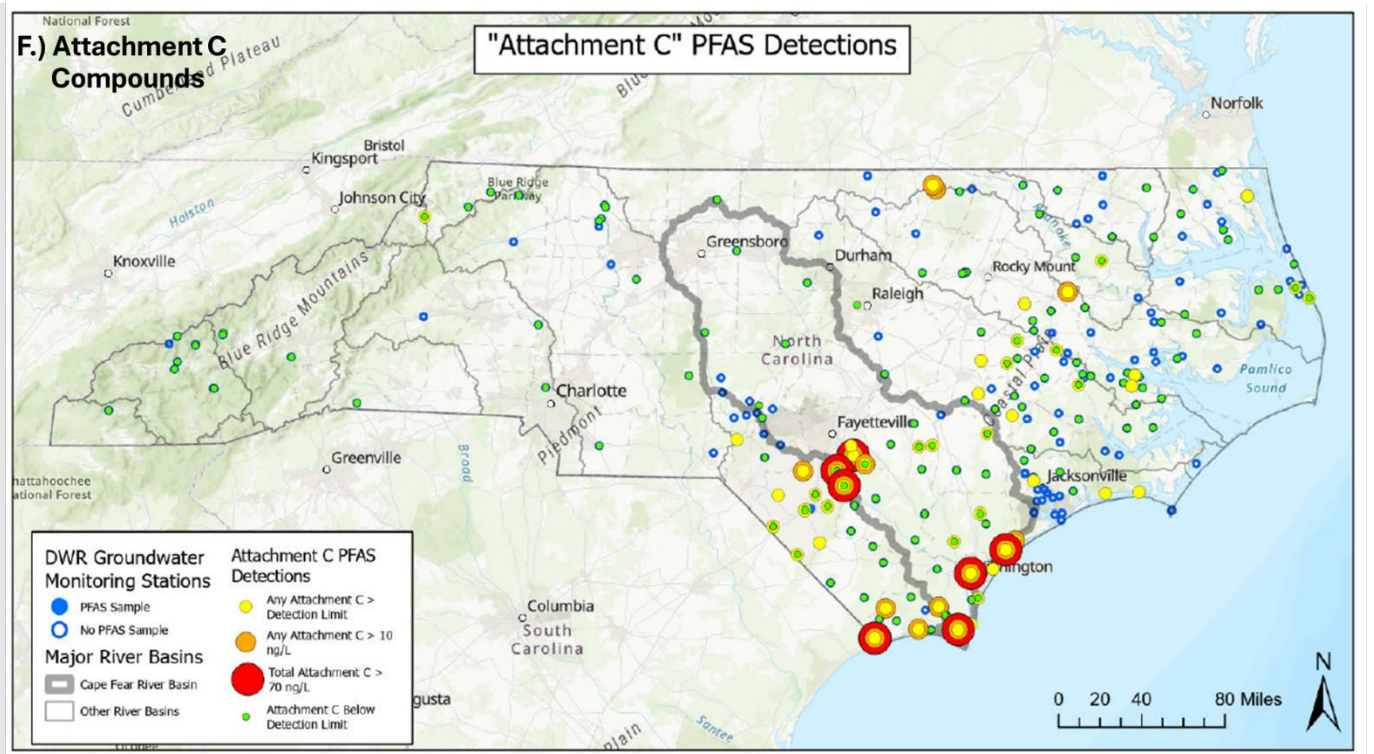
D.) Statewide and Cape Fear River Basin – GenX Results;



E.) Statewide and Cape Fear River Basin - GenX, PFBS, PFNA, PFHxS/Hazard Index (HI) Results;



F.) Statewide and Cape Fear River Basin - Total Chemours Consent Order Attachment C Compound Results.



12.4.5 Wastewater

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water
- ☑ Cleaning Up Existing Contamination

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into Waters of the United States which is authorized under the Clean Water Act (CWA). The NPDES program in DEQ's Division of Water Resources (DWR) is responsible for the issuance of wastewater discharge permits. This process includes determining the quality and quantity of treated wastewater that the receiving stream can assimilate. Additional NPDES program details are available in Chapter 3 and section 12.3.6.

As stated above, Publicly Owned Treatment Works (POTWs) are not specifically designed to reduce or eliminate emerging contaminants from their waste streams. This is most efficient and cost-effectively addressed at the source. Most emerging contaminants that pass through treatment plants are generally not removed or only partially removed. Some can be removed as part of the biosolid waste fraction. This is discussed in greater detail below (section 12.4.5.2). Tracking PFAS and other emerging compounds to their industrial source is the primary action needed to help eliminate these contaminants before they can enter our surface water or groundwater resources. The DWR NPDES pretreatment program is focused on providing assistance to POTWs with the goal of preventing pass-through, interference or other adverse impacts to their facility, its workers or the environment. There are about 600 Significant Industrial Users (SIUs) which discharge industrial wastewater to more than 125 POTWs throughout the State of North Carolina ([Table 12-9](#)).

12.4.5.1 PFAS Testing from Publicly Owned Treatment Works, Industrial Dischargers and Groundwater Remediation Sites

In 2019, as part of screening for PFAS in NPDES facilities, 28 POTWs that have pretreatment programs and that discharge to the Cape Fear River Basin were asked to sample influent (incoming wastewater stream) samples for PFAS for three consecutive months. DWR selected POTWs that receive wastewater from industrial sources that were likely to contain one or more PFAS compounds. Due to the absence of an EPA-approved methodology available for the wastewater method at the time, NPDES facilities participating in the 2019 screening conducted sampling using LC-MS/MS with isotope dilution, a method considered compliant with the Department of Defense. The number of PFAS compounds analyzed varied between 21 and 43 depending on the laboratories used for assessment. There is a [Managing Emerging Compounds in Water website](#) and an [Emerging Compound Facility Sampling interactive map](#) available to see results (PDF of data is available [here](#)). Of the 28 POTWs, Columbus County WWTP was not discharging in 2019 and the Town of Burgaw collection system discharged through the Wallace Regional WWTP which captured their PFAS contribution to the Cape Fear River Basin. Total influent PFAS, and total influent PFOS + PFOA concentrations from each of the POTWs which participated in the screening are shown in [Figure 12-30](#). [Figure 12-31](#) shows the top six PFAS compounds found in municipal waste with pretreatment programs tested in this study. PFPeA made up 28.2% of the total quantifiable PFAS concentrations (excluding Sanford due to their unique concentration of 6:2 FTS reported coming into their facility).

Figure 12-30: Cape Fear River Basin POTWs 2019 study (A.) Maximum Reported Total Quantifiable PFAS Concentrations and (B.) Maximum Reported PFOS + PFOA Concentrations.

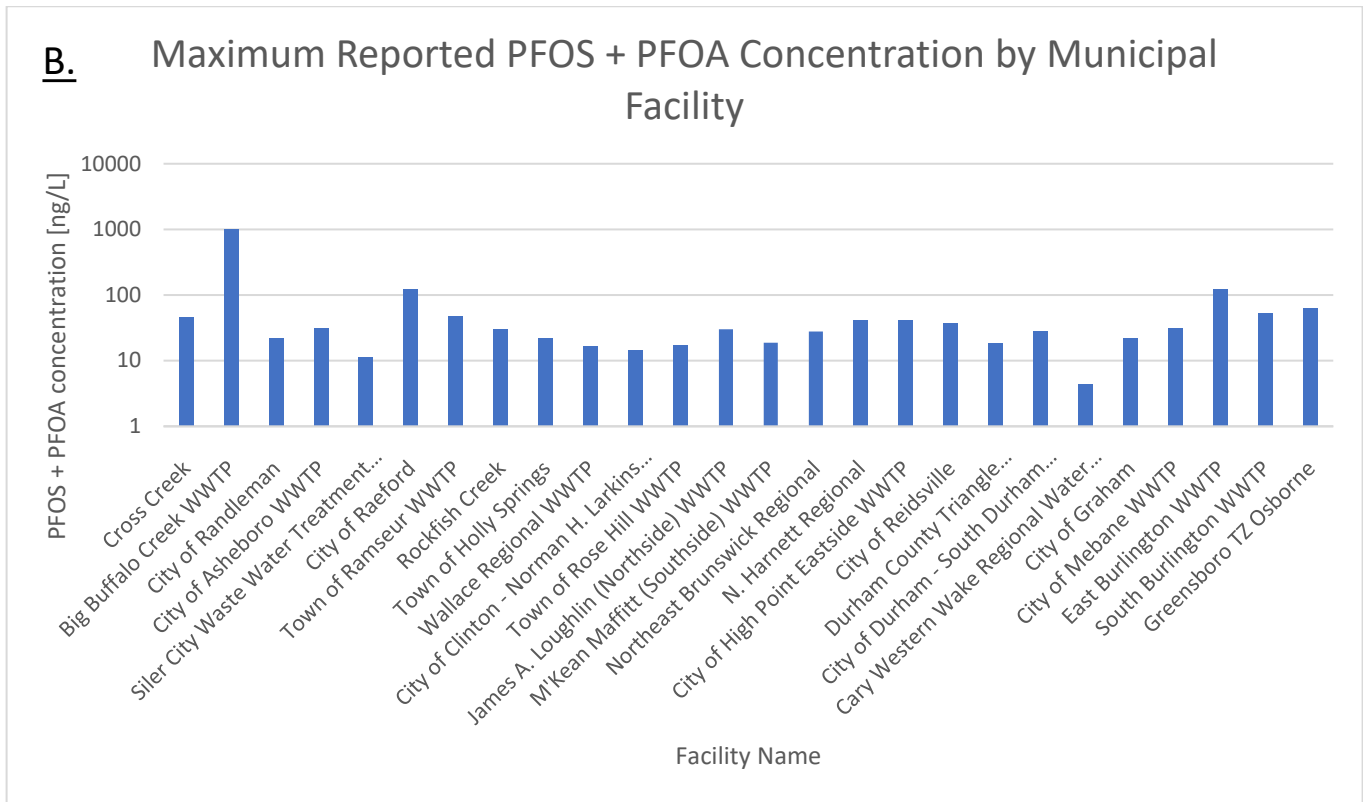
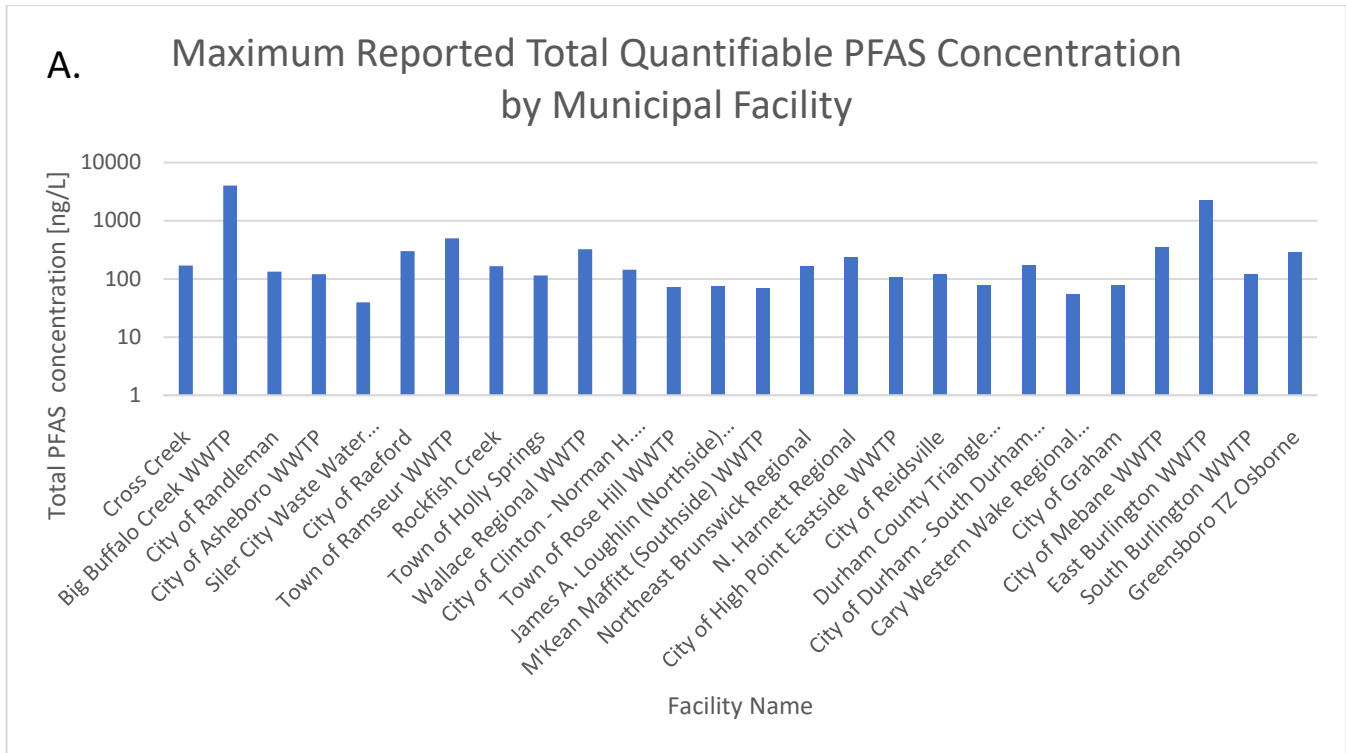
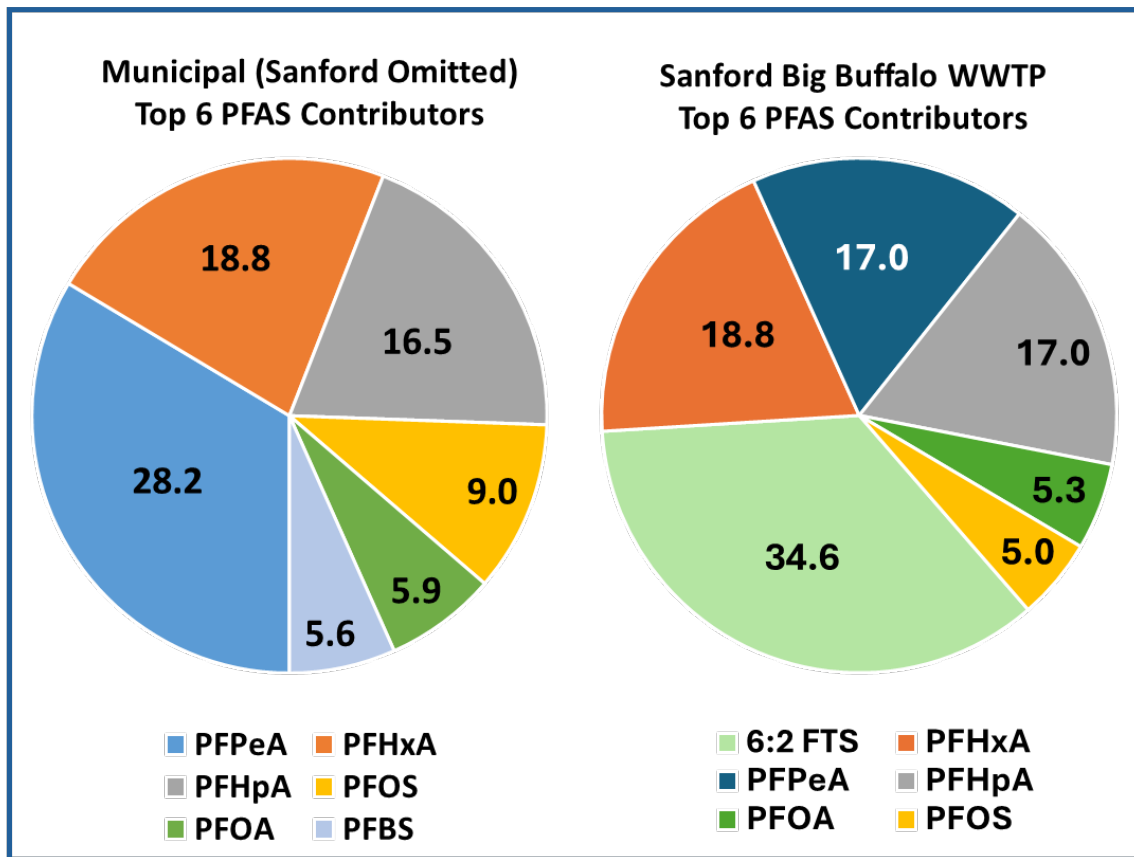


Figure 12-31: 2019 NPDES Study - Top Six POTWs PFAS Compounds Identified in Influent with Percent of Total Quantifiable PFAS. Sanford Big Buffalo Pulled Out into Separate Pie Chart.



In addition to POTWs with pretreatment programs, wastewater effluent discharge samples from eight selected industries sites were taken over a three-month period starting in October 2019. DWR required sampling at these facilities because they were one of the industry types that are historically linked to the discharge of one or more of the PFAS compounds. Additional sampling was requested from several industrial facilities to better assess typical concentration levels and possible impacts to water supplies. The sampling results from this study are available on the [Emerging Compounds Facility Sampling Map](#) (PDF of data is available [here](#)) located on the DEQ [website](#). Total effluent PFAS and total effluent PFOS + PFOA concentrations from each of the industrial dischargers which participated in the screening are shown in [Figure 12-32](#). [Figure 12-33](#) shows the top six PFAS compound found in industrial facilities participating in this study. Like the municipalities, the industrial effluent contained significant levels of PFPeA, PFHxA and PFHpA with 35.6% 20.1% and 17.2% of the total Quantifiable PFAS concentrations respectively.

Figure 12-32: Cape Fear River Basin Industrial Discharger 2019 study (A.) Maximum Reported Total Quantifiable PFAS Concentrations and (B.) Maximum Reported PFOS + PFOA Concentrations.

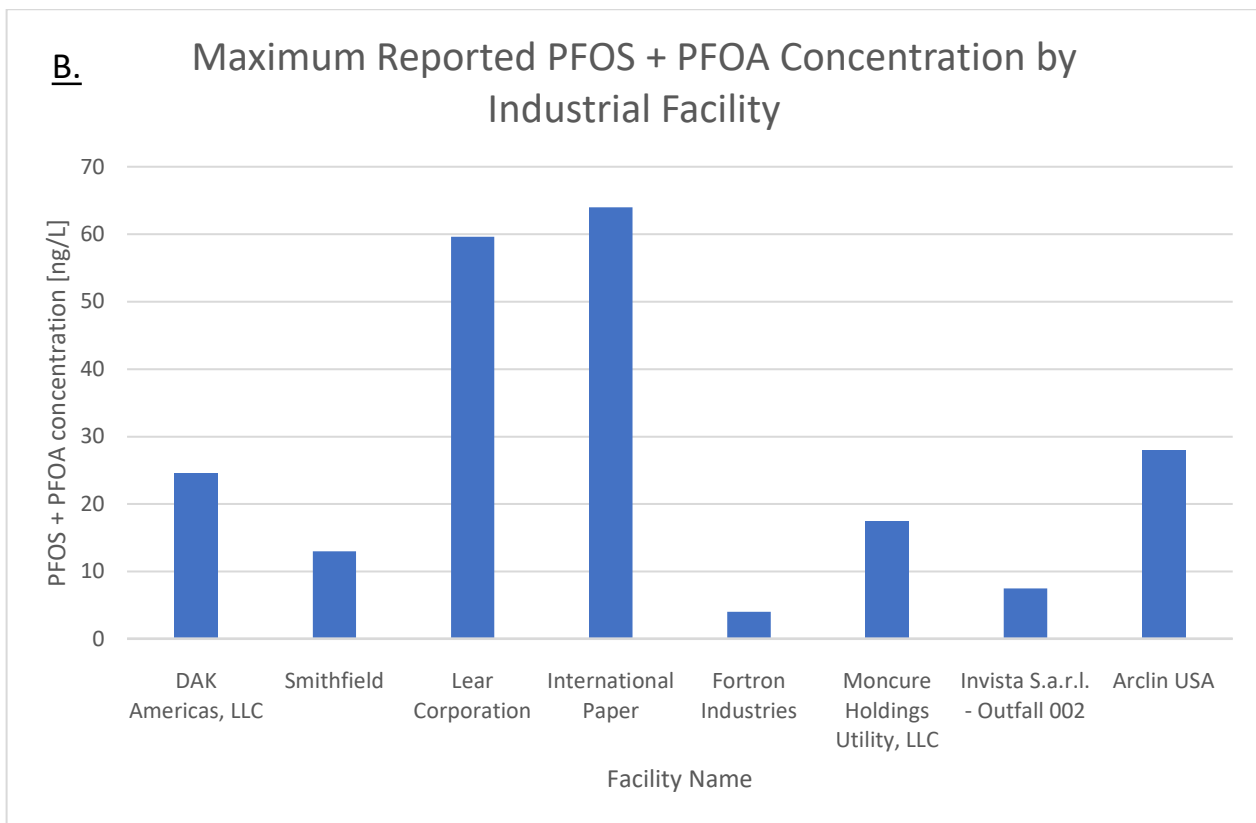
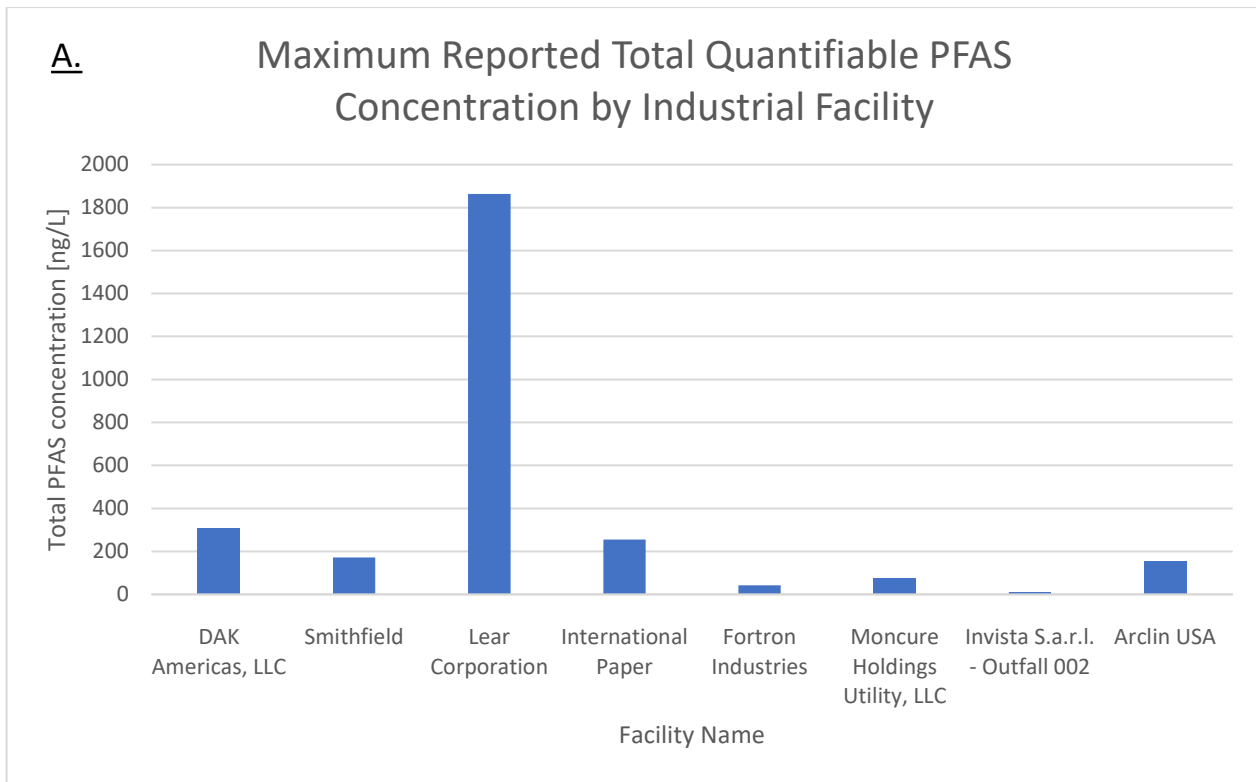
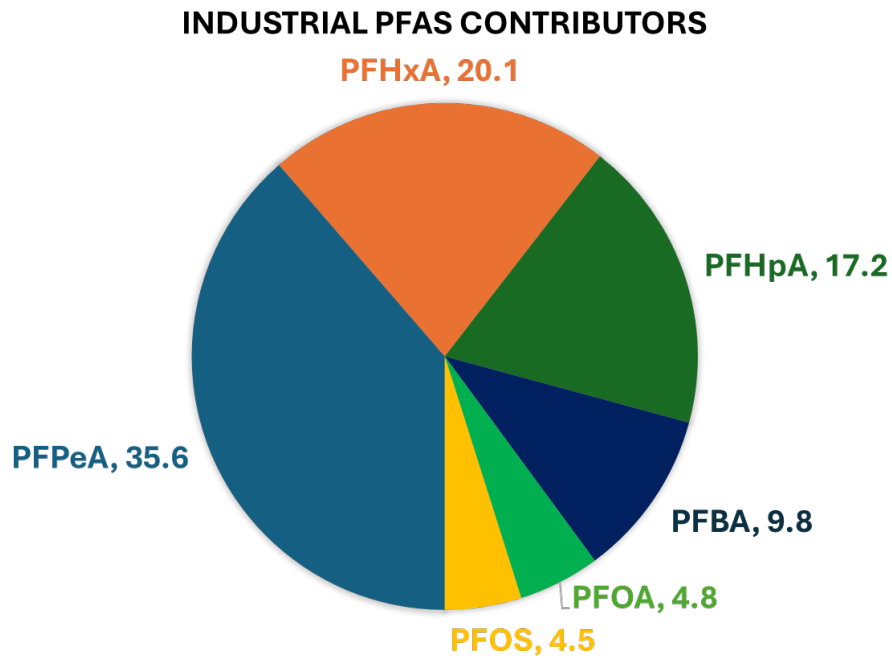


Figure 12-33: 2019 Industrial Effluent Study - Top Six PFAS Compounds Identified in Effluent with Percent of Total Quantifiable PFAS.



Since this study, many municipal and industrial dischargers have actively worked to reduce PFAS in their discharge. Lear Corporation has since implemented a PFAS free product line and are collecting PFAS samples from its process wastewaters to confirm they are PFAS free.

DWR continues to investigate potential sources of PFAS compounds in state waters and is using this information to help guide additional actions to protect downstream water supplies.

DWR NPDES is adding PFAS monitoring requirements to industrial dischargers and POTWs with pretreatment programs containing SIUs known or suspected to discharge PFAS. Monitoring requirements and frequencies are described above in the NPDES Actions to address contamination in section 12.3.6.

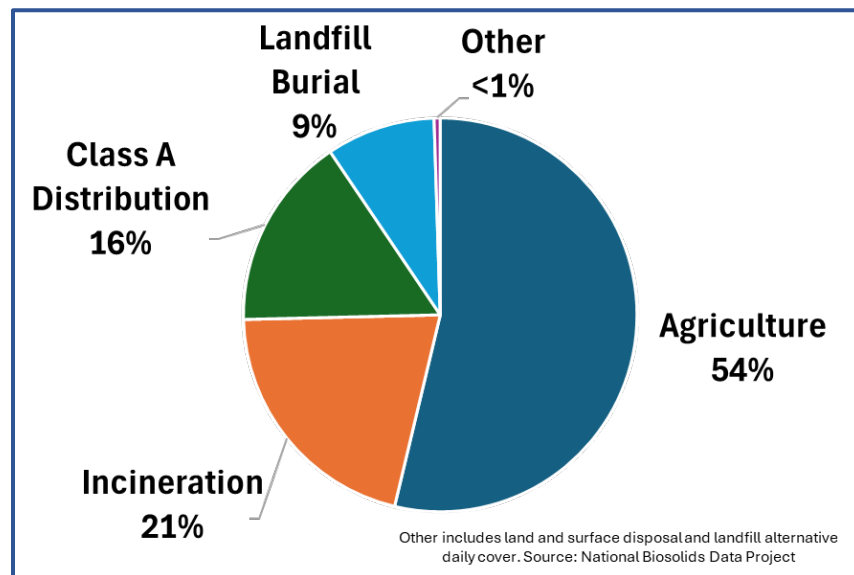
12.4.5.2 Biosolids Testing

Biosolids are treated sewage sludge that meets EPA’s stringent pollutant and pathogen requirements for use as a soil conditioner or fertilizer. In contrast to raw sewage sludge, biosolids have undergone processes to significantly reduce pathogens and other contaminants to safe levels, allowing for beneficial reuse applications like land application on agricultural land, forests, parks, and lawns (Figure 12-34). All biosolids are expected to have been treated to meet the requirements in the EPA’s regulation entitled, “Standards for the Use or Disposal of Sewage Sludge,” promulgated at 40 C.F.R. Part 503.

The DWR [Non-Discharge Branch](#) is responsible for permitting and compliance of residual land application facilities and their biosolid application fields. Most municipal wastewater facilities in NC utilize residual land application sites as a beneficial reuse of their biosolid waste. Other biosolid disposal options also include incineration, landfilling or other forms of surface disposal (Figure 12-34).

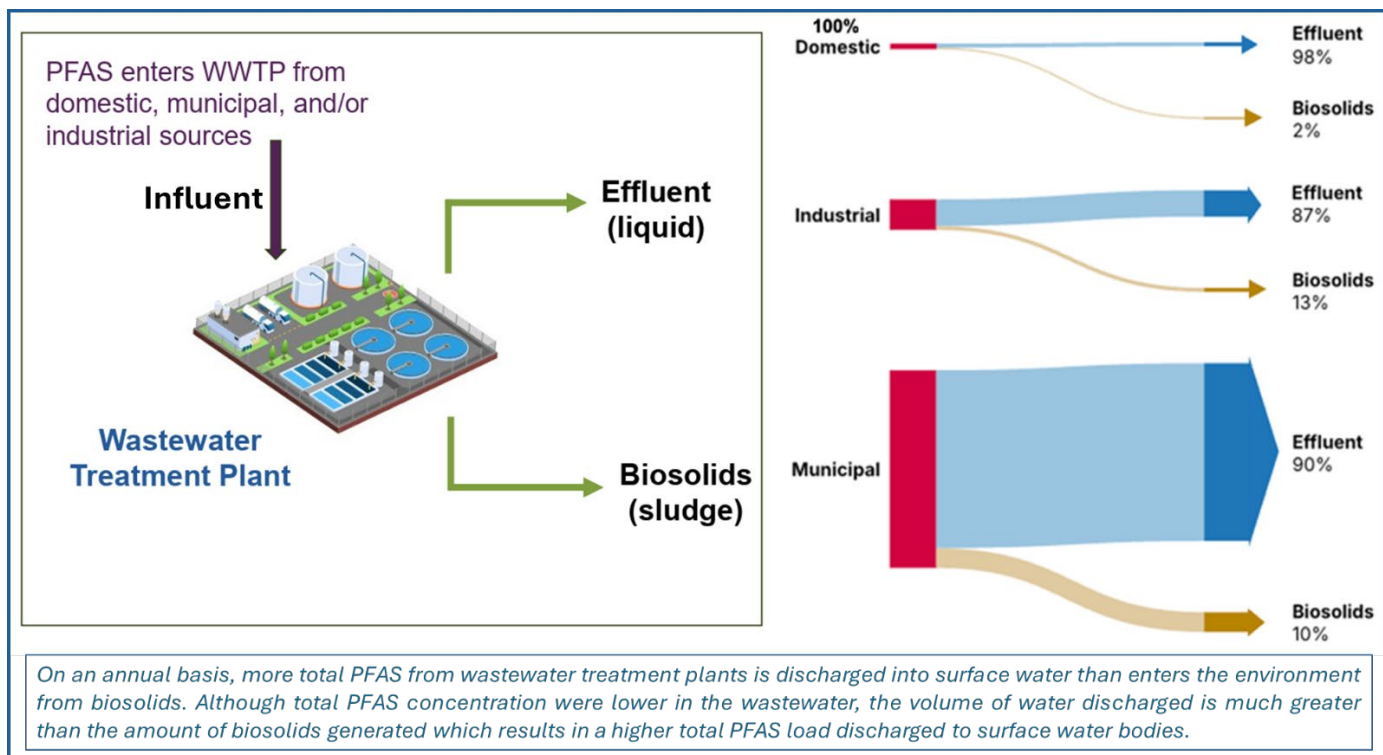
As part of DEQs extensive PFAS source investigation occurring throughout NC, a pilot study was conducted in 2023 to assess biosolids and land application of biosolids as a potential source of PFAS to groundwater and surface waters in the state.

Figure 12-34: North Carolina Biosolids and Disposal in 2018 (Total 129,000 dry metric tons).



Wastewater treatment plants do not generate PFAS as part of the treatment process but receive PFAS into their treatment plant from their customers, including domestic households and significant industrial users (SIUs) (Figure 12-35). General waste treatment processes reduce nutrients and bacteria but most plants do not have technology in place to reduce or eliminate PFAS compounds. Common biosolid treatment processes also do not reduce PFAS in biosolids, therefore PFAS is present in both the wastewater treatment plant effluent and in the biosolids (Figure 12-35). The concentration of PFAS in biosolids is higher in treatment plants that serve industrial customers or SIUs (Sheets, 2021). US studies have shown that the most common PFAS compounds detected in biosolids are PFOS (<10 to 1,000 ppb) and PFOA (1 to 240 ppb) (Venkatesan and Halden, 2013 and Sheets, 2021). Partitioning of PFAS compounds into the different waste streams is largely driven by electrostatic forces and hydrophobic (will not mix with water) partitioning generally resulting in longer chain PFAS compounds in the solid phase (biosolids) and the shorter chain PFAS compounds in the liquid phase (effluent) (Schultz et al., 2006; Chen et al., 2018; Kim Lazcano et al., 2020; Zhang et al., 2013).

Figure 12-35: Wastewater Treatment Plant General PFAS Passthrough Schematic and Estimated Mass of PFAS Leaving Wastewater Treatment Plans Sampled in NC (Estimated on an Annual Basis; [DEQ 2023 Biosolid Study](#)).



Biosolids may contain significant levels of polyfluorinated precursor compounds that may transform after land application to more persistent perfluoroalkyl acids (Sepulvado et al., 2011; Lazcano et al., 2020). Due to surface application, maximum PFAS concentrations in biosolid amended soils are generally found in the upper soil layers; from there, they may be mobilized by leaching through the [vadose zone](#), runoff, volatilization or uptake by plants and soil organisms (Hamid and Li, 2016; Sepulvado et al., 2011; Gottschall et al., 2017; Venkatesan and Halden, 2013).

DEQ's Non-Discharge Branch permits three different classes of biosolids - Class A residuals, Class B residuals, and Surface Disposal Units. Class A biosolids meet the highest standards of treatment, which mean strict regulatory limits for pollutants like pathogens, and as a result, land application is not site-specific. Class B biosolids have less stringent pathogen reduction requirements but still are protective and require site-specific usage with specific restrictions on application. Although rarely practiced in North Carolina, biosolids can also be placed in lined Surface

Vadose Zone diagram from Soils Matter, Get the Scoop! (published by the Soils Science Society of America (SSA))

Scientists call the region between the soil surface and the groundwater table the vadose zone. The vadose zone contains "the living skin" of our planet and many activities - like food production and water movement - take place in the vadose zone. Credit: Markus Flury/SSSA staff

<https://soilsmatter.wordpress.com/2023/05/01/what-is-the-vadose-zone/>

Disposal Units for final disposal – in this case, they are not utilized for conditioning the soil or fertilizing crops.

A DEQ PFAS pilot study to investigate PFAS in wastewater treatment plants and biosolids was conducted in the spring and summer of 2023 at 37 wastewater treatment facilities, a small subset of the 1,043 permitted NPDES discharge facilities in North Carolina. Influent, effluent and biosolid grab samples were collected in either one or two sampling events at each facility over the study period (*Figure 12-36*).

Figure 12-36: 2023 Biosolid PFAS Sampling Study. The First Row of Pictures Include Sampling Taken at a Wastewater Facility (Influent, Effluent and Biosolid Samples) and the Second Row of Pictures are from Samples Taken at a Residual/Biosolid Application Field.



The facilities were selected for the study based on size (highest permitted flow), nature of the Significant Industrial Users (SIUs) contributing discharge, review of existing PFAS data, and three operating characteristics:

- Three (3) treatment plants that receive 100% domestic (residential and some commercial facilities) wastewater with no industrial contributions,
- Eight (8) industrial wastewater treatment plants that primarily treat industrial flows, and
- Twenty-six (26) municipal wastewater treatment plants that receive a combination of wastewater from significant industrial users, commercial establishments, and residential sources.

In addition to the treatment facilities, soil was sampled from 19 land application fields that receive biosolids from wastewater treatment plants, operating under 17 different non-discharge permits; two samples of finished compost were also collected from a distribution facility. The application fields were selected based on their history of biosolids application and were categorized as receiving biosolids from predominantly industrial (3 fields), municipal (13 fields), or mixed (3 fields) sources. For each field, a composite soil sample was collected from a representative section of each field (~1 acre); each composite sample was comprised of 10-15 cores (0-6 inches deep) that were thoroughly mixed. Contributions to soil from other potential sources of PFAS contamination such as background levels in rainfall, atmospheric deposition, or pesticide applications were not evaluated for this preliminary study (*Figure 12-36*).

All samples were analyzed by GEL Laboratories LLC in Charleston, SC using modified EPA Method 537.1 for 57 PFAS compounds. This test method was utilized instead of 1633A to determine if any Chemours signature PFAS compounds were in the soil.

Groundwater samples were also collected once at Pasour Mountain Groundwater Monitoring and Research Station. Groundwater was collected from two wells, one upgradient of a land application field, and one downgradient of the field. The application field was included in the aforementioned application field sampling.

Summary findings from this study include ([DEQ Study: PFAS in wastewater and biosolids](#), 2023):

- PFAS were detected in all facilities sampled, and across all sample types (wastewater, biosolids, soil, and compost) with the exception of the two groundwater samples, which had no PFAS detections.
- PFAS concentrations in wastewater influent and effluent varied widely, particularly in municipal systems.
- Average Total PFAS concentrations in influent and effluent for the three domestic wastewater plants were generally lower than average levels found in municipal and industrial facilities.
- The majority of WWTPs had influent and effluent detections above 4 ppt for PFOA and/or PFOS; 4 ppt represents the federal maximum contaminant level in drinking water for these two compounds, but at this time there are no federal or North Carolina state water quality criteria or standards for PFAS in surface water.
- It is estimated 87-98% of the Total (quantifiable) PFAS entering wastewater treatment plants in this study are discharged to surface water in effluent, and 2-13% entering wastewater treatment plants in this study are removed with biosolids ([Figure 12-35](#)).
- PFOS was detected in biosolids with concentrations consistent with levels found in other states (NC: 3-256 ppb, US: 0.4-990 ppb)
- PFOS was detected in all soil samples collected from the land application fields.

Next steps:

DEQ will engage with land application operators and permittees as well as continue discussions with other states, The Environmental Council of States (ECOS), and the EPA regarding best management practices for biosolids and the next steps going forward. DEQ will continue to work with stakeholders to identify PFAS sources in wastewater discharges, promote strategies to reduce PFAS in wastewater from permitted industrial dischargers, respond to concerns about PFAS, and support informed regulatory decision-making.

DEQ is collaborating with academic experts and local utilities to investigate potential impacts of land application of biosolids on nearby private drinking water wells; these efforts will advance the scientific understanding of PFAS exposure associated with land application of biosolids.

On January 14, 2025, the EPA released a draft Sewage Sludge Risk Assessment for PFOA and PFOS for public comment and accepted written comments through August 14, 2025 ([EPA website](#)). “The draft risk assessment reflects the agency’s latest scientific understanding of the potential risks to human health and the environment posed by the presence of PFOA and PFOS in sewage sludge that is land applied as a soil conditioner or fertilizer, surface disposed or incinerated.” Once finalized, “the risk assessment will provide information on risk from use or disposal of sewage sludge and will inform the EPA’s potential future regulatory actions under the Clean Water Act” ([April 17, 2025, Federal Register](#)). For more information see EPA’s [Risk Assessment of Pollutants in Biosolids website](#).

12.4.5.3 Chemours Outfall Testing

Since 2017, DEQ has taken decisive actions to require Chemours to significantly reduce the release of PFAS contamination into North Carolina’s water, air and soil. DEQ issued NPDES permits and completed a Consent Order for Chemours Fayetteville Works site to address the need to reduce their discharge of PFAS into these matrices as well as added environmental monitoring requirements to confirm the reduction and elimination of PFAS into the environment. Chemours permits and Consent Order can be found on the DEQ [Chemours Permit Information](#) and [Consent Order](#) webpages. There are three NPDES permits that cover the discharge and monitoring requirements for the Chemours Fayetteville Works site, these include NC0003573, NC0090042 and NC0089915 (*Table 12-3* and *Figure 12-37*). *Table 12-3* shows the discharge outfall and monitoring requirements for each permit.

The monitoring data collected as part of Chemours NPDES permit requirements are reported in their monthly eDMR reports. Chemours permit NC0090042 was approved in September 2022, for the discharge of treated groundwater, stormwater and seeps which surfaces between their facility and the Cape Fear River. A barrier wall and extraction system were installed to intercept and treat contaminated groundwater and four main seeps prior to entering the Cape Fear River (see section 12.3.2 for more information on the barrier wall system). The installation of the barrier wall was completed on June 11, 2023, and as a result, the PFAS contaminated groundwater reaching the Cape Fear River should decline. 2024 is the first complete year that these remedies were fully operational.

As part of permit NC0090042, Chemours is required to monitor four transects along the Cape Fear River (*Table 12-25* and *Figure 12-37*; permit NC0090042, section A.(7.)).

Table 12-25: Chemours Permit NC0090042 Transect Monitoring Locations.

River Transect #	Cape Fear River Location	Station #		
		West side	Center	East side
Transect 1	North of Willis Creek	101	102	103
Transect 2	Adjacent to Chemours Fayetteville Works Site	201	202	203
Transect 3	Between Discharge Outfall 002 and Lock and Dam #3 (LD3)	301	302	303
Transect 4	Downstream of Outfall 003 (Below LD3)	401	402	403

Samples collected at ¼, ½, and ¾ of the distance across the river transect. Samples were collected using a peristaltic pump at the middle depth between the river surface and the bottom of the river at each sampling point. In 2024, all river transect locations were sampled on the same date, which minimized the fluctuation of river flow experienced in previous years. Chemours 2024 River Transect Report [Link](#).

The January 2025 “[Cape Fear River PFAS Outfall 004 NDES Permit River Transect Monitoring - 2024 Report](#)”, reported a decreasing trend between 2022 and 2024. The highest measured Total Table 3+ (17 compounds) concentrations decreasing from 56 ppt (ng/L) and 82 ppt in 2022 and 2023 respectively, down to 40 ppt in 2024 at transect 4 (data from report section 3.5).

Concentration graphs for the PFAS indicator parameters (GenX/HFPO-DA, PFMOAA and PMPA) are shown in *Figure 12-38* for quarter 4 (Q4; November 2024). For the 2024 Q4 transect monitoring, GenX concentrations ranged from non-detection levels (reported as 0 on the graphs) to 6.1 ppt, PFMOAA ranged from non-detection levels to 20 ppt and PMPA concentrations were non-detection levels at all three transects (*Figure 12-38*). The indicator PFAS were not detected above the analytical reporting limits in the most upstream Transect-1 north of Willis Creek. HFPO-DA/GenX was detected in all samples at Transect 2 to 4 (2.3 ppt to 5.3 ppt) except for the center sample at Transect 2. PFMOAA was detected in all samples at Transect 2 to 4 (2.3 ppt to 15 ppt). The

highest concentrations were found at Transect-4 and on the west side of the river (*Figure 12-38*). Chemours Fayetteville Works is located on the west side of the Cape Fear River. PFAS concentrations vary between river transects and between sampling events, particularly with changing river flow volumes. At lower river flows, as observed in 2024 Q2 and Q4 sampling events, inflow of PFAS compounds from transport pathways mix in lower volume of river water and consequently have higher concentrations (Chemours January 2025 Report). While the concentrations vary with changing river flows, the PFAS mass discharge (product of concentration and flow rate) remains relatively consistent.

In addition to the quarterly transects, Chemours monitors the Cape Fear River at Tar Heel Ferry Road Bridge (Tar Heel), approximately seven miles downstream of their facility. Tar Heel is a well-mixed location along the Cape Fear River and is sampled more frequently (twice weekly since 2020) than the quarterly river transects (Chemours [January 2025 Report](#)).

To evaluate concentration changes at Tar Heel, Chemours calculated the rolling four-quarter average concentrations for the Total Table 3+ (17 compounds) and the three PFAS indicator compounds (HFPO-DA/GenX, PFMOAA and PMPA). Prior to the groundwater extraction (Q1-2023), the concentrations decreased to a range from 74 ppt to 35 ppt, due to remedies implemented on site. After the groundwater extraction and barrier wall remedies were fully operational (Q3-2023), the concentrations continued to decline and ranged from 22 to 28 ppt (*Table 12-26*; Chemours [January 2025 Report](#)).

Table 12-26: Chemours Monitoring of the Cape Fear River at Tar Heel, Rolling Four Quarter Average Concentration of Chemours PFAS Indicator and Total Table 3+ Compounds (full table available in January 2025 Report).

Rolling Four-Quarter Period	Rolling Four Quarter Average Concentration (ng/L)			
	HFPO-DA/GenX	PFMOAA	PMPA	Total Table 3+ (17 Compounds)
Q2 2021 to Q1 2022	11.6	23.6	18.0	74.0
Q4 2023 to Q3 2024	2.9	7.0	6.1	21.9

Full table and graph available in Chemours [January 2025 Report](#).

Figure 12-37: Cape Fear River Transect Sampling Location (Map from Chemours January 2023 PFAS Outfall 004 NPDES Permit River Transect Monitoring – 2022 Report).

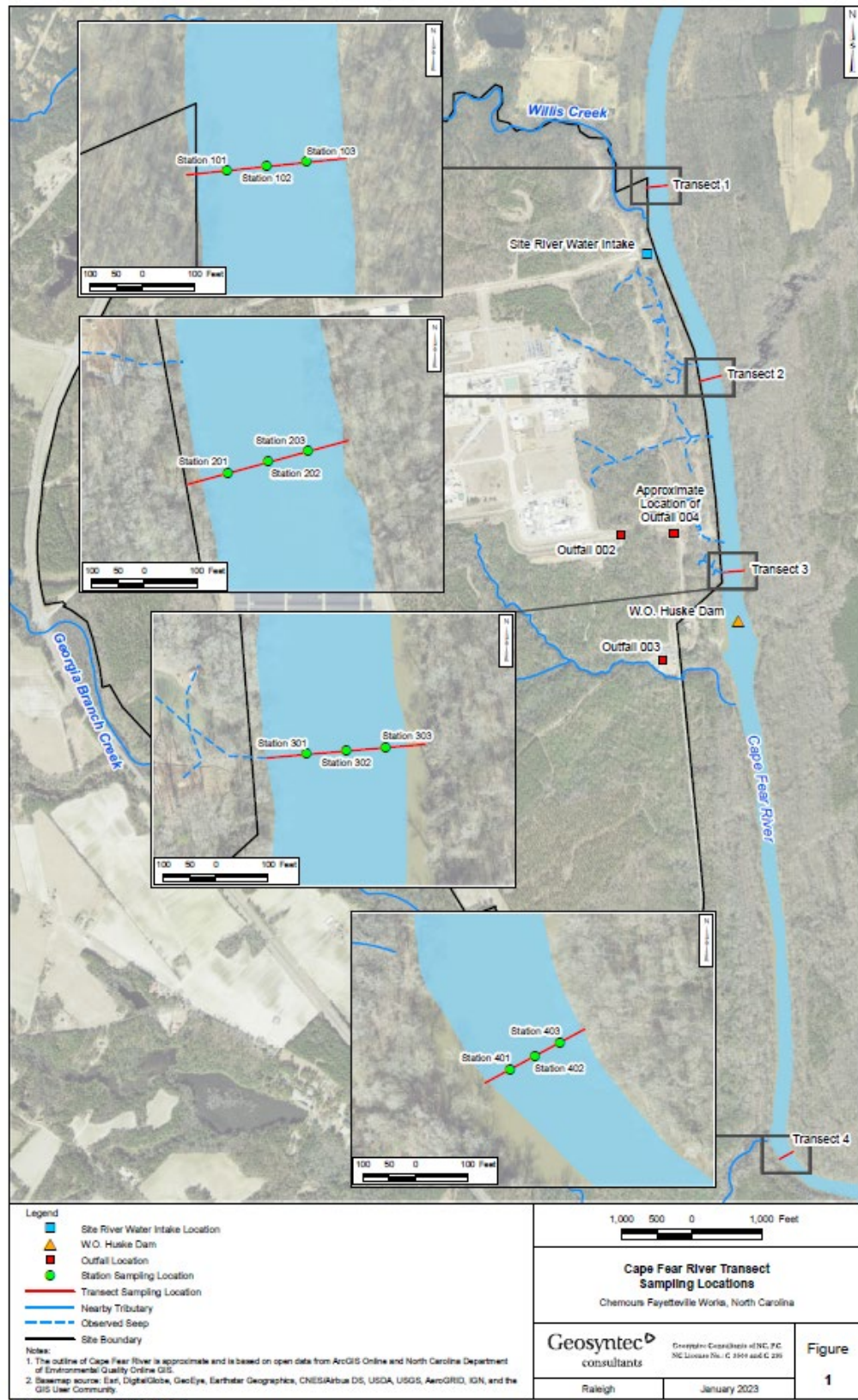
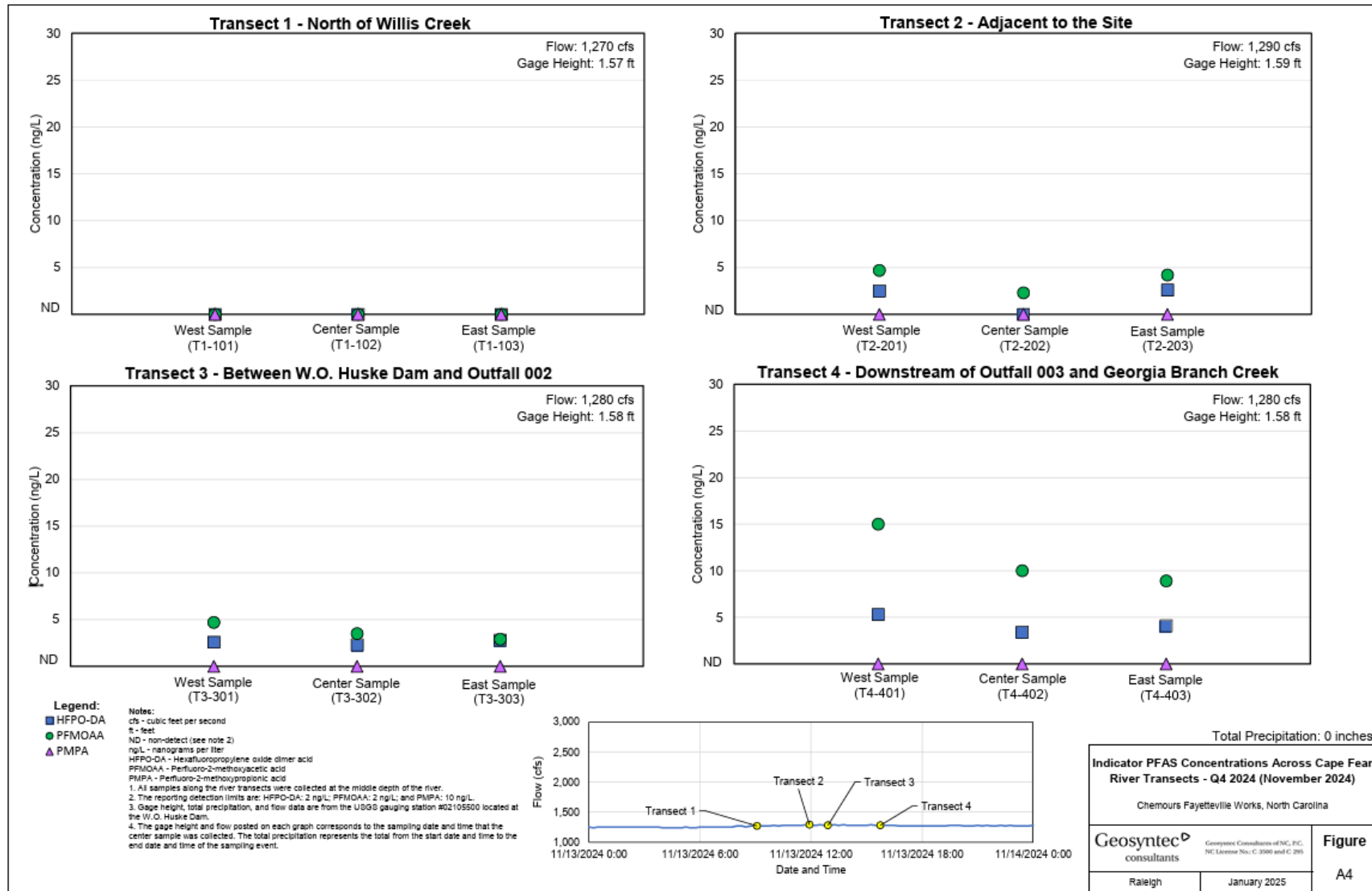


Figure 12-38: Chemours Permit 2022 Required Cape Fear River Transect Monitoring for Three Indicator PFAS Concentrations for Quarter 4 (November 2024). (Graphs from Chemours January 2025 PFAS Outfall 004 NPDES Permit River Transect Monitoring – 2024 Report).



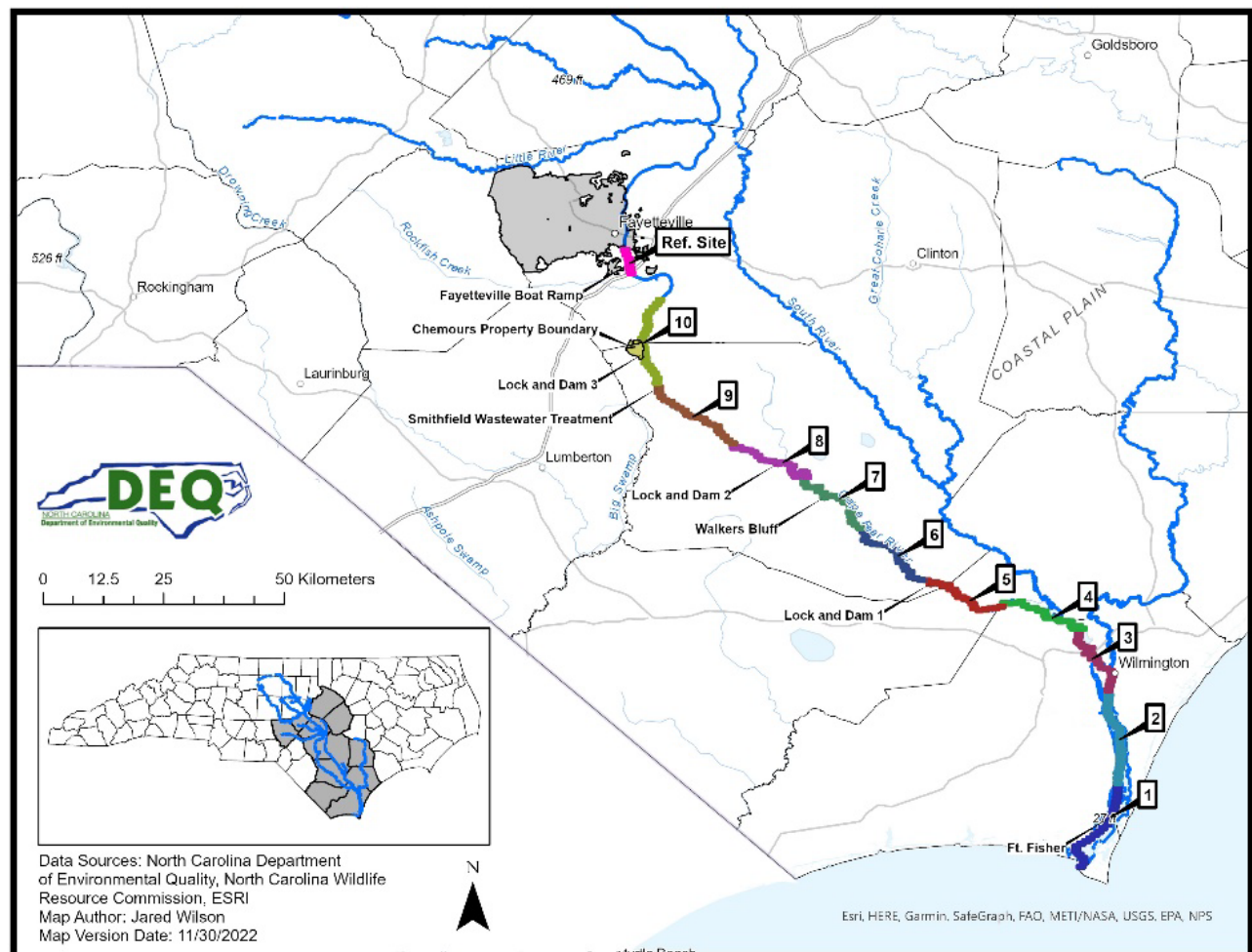
12.4.6 DEQ PFAS in Cape Fear River Fish and Water Project

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water

In the summer of 2022 and autumn of 2023, the North Carolina DEQ conducted a large-scale environmental sampling project that focused on fish and water in the Middle and Lower Cape Fear River. The fish and water samples were collected across 220 km of the river, to investigate the extent of PFAS contamination in a waterbody that serves as both a drinking water and recreational fishing resource for many North Carolinians (Figure 12-39). The fish species that were collected during this project were identified by the North Carolina Wildlife Resource Commission (NCWRC) as those that are most frequently caught and consumed in the Cape Fear region. The fish species targeted for this project were Largemouth Bass (*Micropterus nigricans*), Redear Sunfish (*Lepomis microlophus*), Bluegill Sunfish (*Lepomis macrochirus*), Blue Catfish (*Ictalurus furcatus*), Flathead Catfish (*Pylodictis olivaris*), Channel Catfish (*Ictalurus punctatus*), Red Drum (*Sciaenops ocellatus*), Black Drum (*Pogonias cromis*), Atlantic Croaker (*Micropogonias undulatus*), American Shad (*Alosa sapidissima*), Striped Bass (*Morone saxatilis*), Sheepshead (*Archosargus probatocephalus*), Southern Flounder (*Paralichthys lethostigma*), and Spotted seatrout (*Cynoscion nebulosus*).

Figure 12-39: DEQ Fish and Surface Water Collection Project Map (NCDEQ 2023).

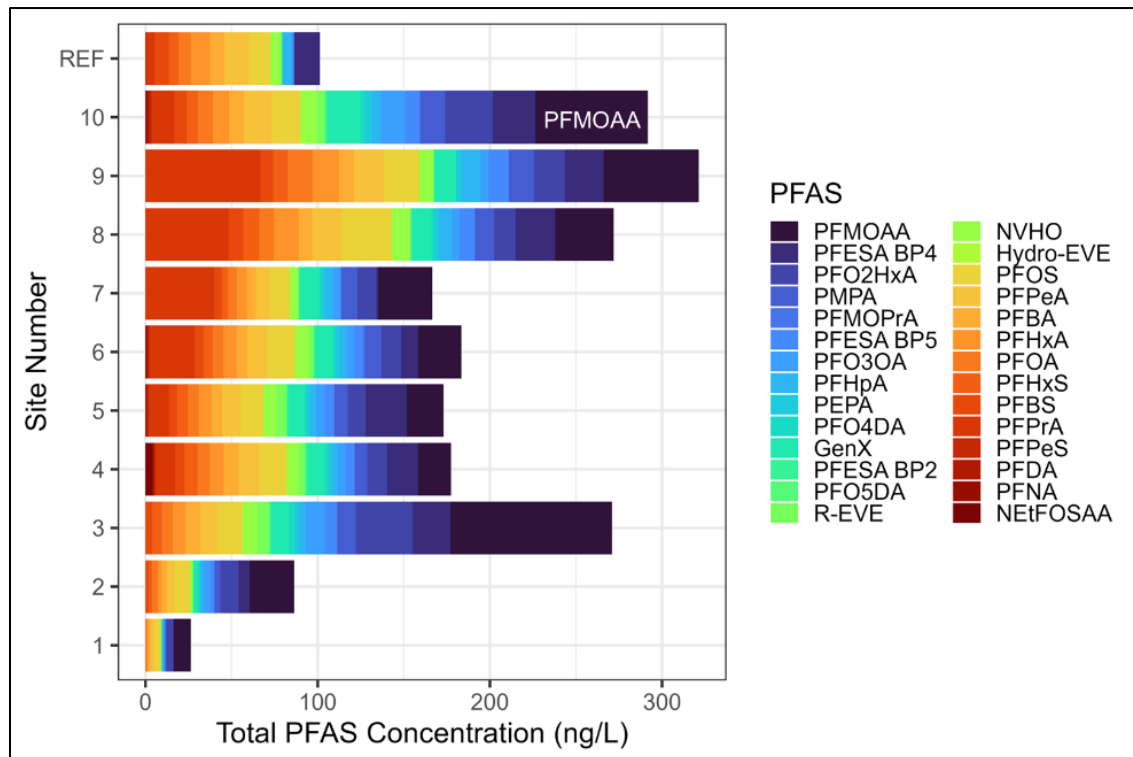


For each of the targeted species, five individuals of each species were collected at 20 km intervals throughout the 220 km length of the river that spans from the Fayetteville boat ramp, near the I-95 overpass, to the mouth of the Atlantic Ocean appropriate for each species' life history characteristics (NCDEQ 2023; *Figure 12-39*). River water samples were collected once daily during fish collection at each 20 km interval. Five of the eight 20 km intervals had only one water sample collected, as all five individuals of each species were collected at that interval in a single day. Three of the eight 20 km intervals required fish collection to occur in more than one day, so those three intervals have more than one water sample collected (*Figure 12-40*). The fish fillets were analyzed alongside water samples collected in situ for 56 different PFAS.

The goals of the study were:

- To examine the extent of the PFAS contamination in the Middle and Lower Cape Fear River.
 - In support of DEQ standards development to protect public health and NC's water resources.
- To better understand the bioaccumulation of PFAS in commonly consumed fish species.
 - In support of bioaccumulation factor (BAF) calculations for standards development.
- To collect fish tissue data to determine if consumption-related exposure is occurring.
 - In support of NCDHHS in the development PFAS-specific fish consumption advisories, if appropriate.

Figure 12-40: The mean concentration (ng/L or parts per trillion [ppt]) for the PFAS compounds that were detected in the Cape Fear River water samples collected in the Summer of 2022.



12.4.6.1 River Water Data

The water samples that were collected during the PFAS in Cape Fear River Fish and Water Project were observed to have 28 different PFAS compounds detected across the 220 km length of river (*Figure 12-39*). The two intervals closest to Wilmington, NC (intervals 5 and 4) had the greatest number of PFAS compounds detected, 26 of 28 PFAS observed. Interval 9 had the lowest number of PFAS compounds detected, 18 of 28 PFAS observed.

There were 12 globally ubiquitous PFAS compounds detected in the river water samples (PFOS, PFPeA, PFHxA, PFOA, NVHOS, PFBA, PFBS, PFHxS, NETFOSAA, PFPeS, PFDA, PFNA). There were no spatial trends observed across the eight 20 km intervals sampled, the mean concentrations of the globally ubiquitous PFAS varied throughout the 140 km length of river.

There were 16 Chemours-related PFAS detected in the river water samples (PFMOAA, PFPrA, PFESA BP4, PFO2HxA, GenX, PFESA BP5, PFHpA, PFO3OA, PEPA, PMPA, PFO4DA, PFO5DA, PFMOPrA, PFESA BP2, Hydro-EVE, R-EVE). The only Chemours-related PFAS compound that showed a spatial trend in the river water samples was PFMOAA, with decreasing mean concentrations from interval 10 (just below the facility) to interval 4 near Wilmington (*Figure 12-40*).

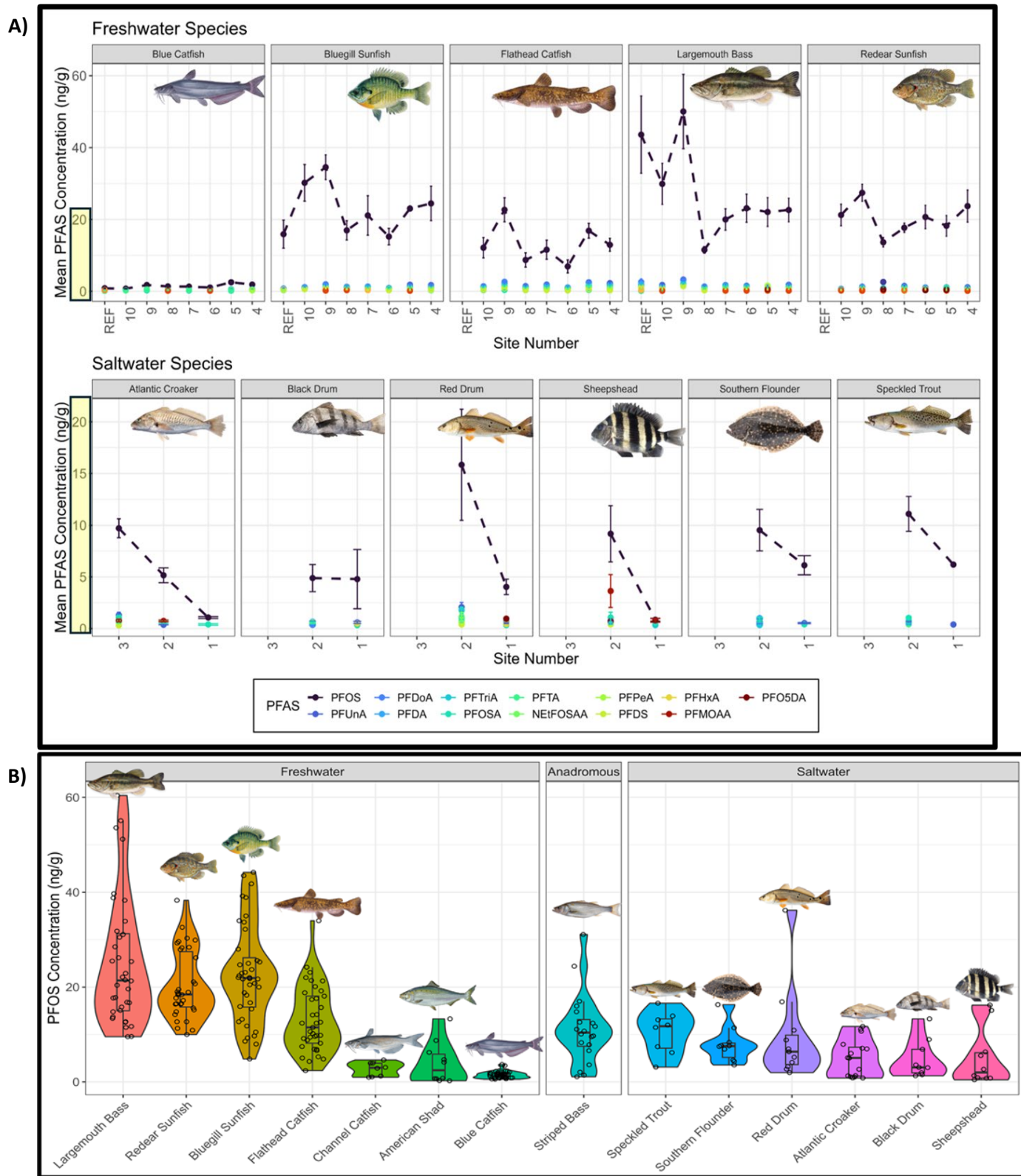
12.4.6.2 Fish Tissue Data

The fish tissue samples that were collected during the PFAS in Cape Fear River Fish and Water Project were observed to have 13 different PFAS compounds detected across the 220 km length of river (*Figure 12-41 A*). The most concentrated PFAS compound detected the fish tissue was PFOS for all species, the other 12 PFAS compounds (PFDA, PFDoA, PFHxA, PFTA, PFTriA, PFOSA, PFMOAA, PFO5DA, NETFOSAA, PFPeA, PFUnA, PFDS) were detected in concentrations approximately and order of magnitude lower than PFOS was detected.

As PFOS was the most concentrated PFAS compound detected in the fish tissue samples, PFOS concentration was compared within species and between each of the 20 km sampling intervals (*Figure 12-41 B*). All species had varying concentrations of PFOS observed at each 20 km interval, and there were no statistically significant differences in the PFOS concentrations between 20 km interval for any of the targeted freshwater species. Largemouth Bass had the greatest mean PFOS concentration, which was observed at interval 9. Blue Catfish had the lowest mean PFOS concentration observed, which was at interval 10. The saltwater species had statistically significant differences in the PFOS concentration for Red Drum, Sheepshead and Atlantic Croaker between the 2 intervals that were sampled for saltwater fish (intervals 1 and 2, also interval 3 for Atlantic Croaker).

PFOS had the highest concentration in fish tissue at every site, in all species examined. In effort to determine an environmental factor related to the PFOS concentrations detected in fish tissue, a Generalized Linear Model with the Gaussian distribution which included 20 km Interval (site), species, fish length (fork and total) and fish weight was conducted. The statistical analysis indicated that Species was the only significant indicator of PFOS concentration. The 20 km Interval (site), fish length (fork and total), and fish weight were not good indicators of PFOS concentration. Since the species was the most significant factor in predicting PFOS concentration in fish fillets, it is likely related to each species' diet and trophic position.

Figure 12-41: The mean concentration of each PFAS compound detected in the fish tissue samples collected in the summer of 2022 and autumn of 2023 in the Cape Fear River, separated by species that were sampled at multiple site locations(A). The violin plots* showing the range of PFOS concentrations in each of the 14 species collected (B). Fish tissue data is shown in ng/g or parts per billion.



12.4.7 DHHS Fish Consumption Advisories for PFOS

DEQ's Action Strategy Implementation

☑ Protecting Communities

Fish consumption advisories are based on human health advisory decisions from the North Carolina Department of Health and Human Services (NCDHHS) Division of Public Health (DPH). Any waterbody with a fish tissue consumption advisory exceeds the assessment criteria for fish consumption use designation and therefore is added to the 303(d) list of impaired waters. See the NC NCDHHS [website](#) for the most up-to-date fish consumption advisories and the list of fish species and consumption recommendations associated with each advisory.

On June 13, 2023, NCDHHS issued a fish consumption advisory for perfluorooctane sulfonic acid (PFOS) ([Table 12-27](#)): [NCDHHS press release](#). PFOS is one of the most widely used and studied chemicals in the group of PFAS chemicals. Scientific studies have shown that exposure to these compounds may be linked to harmful health effects in humans and animals. More information about health effects can be found on the [NCDHHS Clinical Memo](#) and [PFAS Factsheet](#) (NCDHHS 2023a). The fish consumption advisory pertains to fish collected between the Fayetteville boat ramp near the I-95 overpass, to the bluffs on the Cape Fear River near the I-140 overpass in Wilmington ([Table 12-27](#) and [Figure 12-42](#)). This most recent 2023 advisory will also be added to the 2026 IR and will ultimately impair portions of the upper and lower Cape Fear River mainstem.

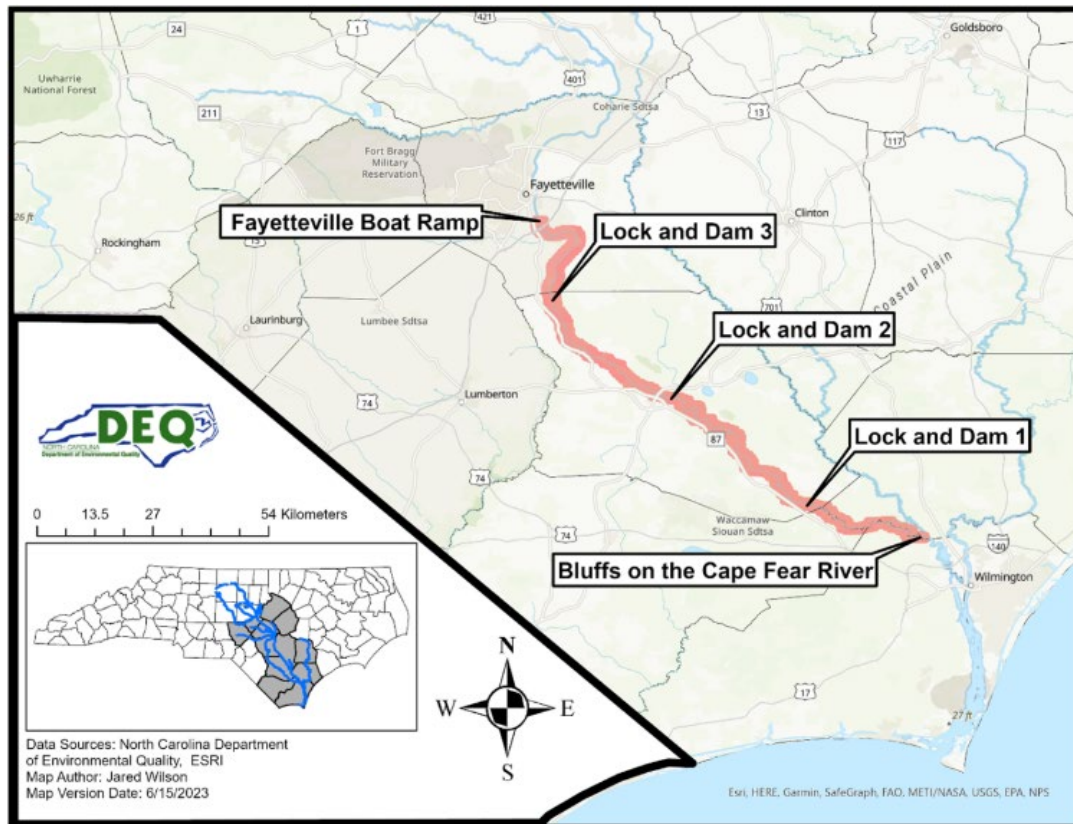
The freshwater fish fillet samples used to develop this advisory were analyzed for 56 different PFAS compounds. Of all PFAS measured, PFOS was the leading compound in fish tissue across all analyzed species collected from the Cape Fear River, with no statistical differences in PFOS concentration in fish tissue throughout this section of the river (NCDHHS [2023b](#)). The concentrations of PFOS observed in fish tissue combined with the updated reference dose for PFOS released by the EPA in March 2023 informed the decision for the PFOS fish tissue advisories in the middle and lower Cape Fear rivers (NCDHHS [2023c](#)). Both cancer and noncancer toxicological information published by the EPA was considered in issuing this advisory (NCDHHS [2023c](#)).

Table 12-27: NCDHHS PFOA Fish Consumption Advisory in the Middle and Lower Section of the Cape Fear River.

Freshwater Fish Species	Advisory for Women of Childbearing Age (15 to 44 years), Pregnant Women, Nursing Mothers and Children	Advisory for All Other Individuals
American Shad, Blue Catfish, Channel Catfish	No more than 1 meal per year, combined across all species.	No more than 7 meals per year, combined across all species.
Bluegill, Flathead Catfish, Largemouth Bass, Striped Bass, Redear	Do Not Eat	No more than 1 meal per year, combined across all species.

See NCDHHS Website for the Most up-to-date List of Advisories ([NCDHHS](#)). NCDHHS Website: <https://epi.dph.ncNCDHHS.gov/oe/fish/advisories.html#top>

Figure 12-42: PFOS Fish Tissue Advisory locations in the Middle and Lower Cape Fear River.



12.4.8 Floodplain Deposition Study DEQ's Action Strategy Implementation

- Protecting Communities
- Protecting Drinking Water

In 2021, DEQ performed a limited PFAS sediment characterization study to follow up on a 2020 Chemours required (Consent Order, Paragraph 11.2) study which was completed by Geosyntec. DEQ determined that Geosyntec sampled sediments where PFAS compounds were not likely to be found and/or used analytical methods that were not sensitive enough to detect several PFAS compounds unique to the Chemours Fayetteville Works site.

The Chemours study samples were collected from the mid-channel and banks of the Cape Fear River. These sampling areas were expected to have mostly larger grained sediment with lower Total Organic Carbon (TOC) values due to the high-water velocities. DEQ hypothesized that PFAS compounds would adsorb to organic carbon in sediments such that sediments with higher TOC values would have higher PFAS concentrations. DEQ sampling locations were selected in floodplains along the Cape Fear River which are commonly inundated during seasonal flooding, allowing fine-grained sediments to settle out of suspension from floodwaters.

Four sampling trips taken between January and August 2021 collected sediment samples from 10 locations (Tar Heel Ferry Boat Ramp to International Paper) within known floodplains along the Cape Fear River downstream of Chemours (*Figure 12-43*). Raven Rock State Park was chosen as the location to collect background PFAS data

upstream because this area was approximately 43 miles north of the Chemours Fayetteville Works site and thought to be outside of the known Chemours specific PFAS compounds aerial deposition area.

A composite of 5 surface sediment samples taken within a square meter plot were collected. These were collected from the top six inches of sediment. A separate single grab sample was collected at a depth of approximately 12 inches in the center of the square meter plot.

Sediment samples were analyzed by GEL laboratories for 55 PFAS compounds using a modified version of EPA method 537.1. The use of an analytical method with lower reporting limits for the Chemours specific PFAS compounds allowed for a much higher detection of the compounds in the DEQ study. The 55 PFAS compounds included 20 Chemours specific PFAS compounds which are often referred to as “Table 3+” compounds. Table 3+ PFAS compounds can be found in Attachment 3 of the October 2020, [Addendum to Consent Order](#) Paragraph 12 document. All 55 PFAS compounds test in this study can be found on the Sediment Study Results Table on the [2021 DEQ Sediment Study website](#).

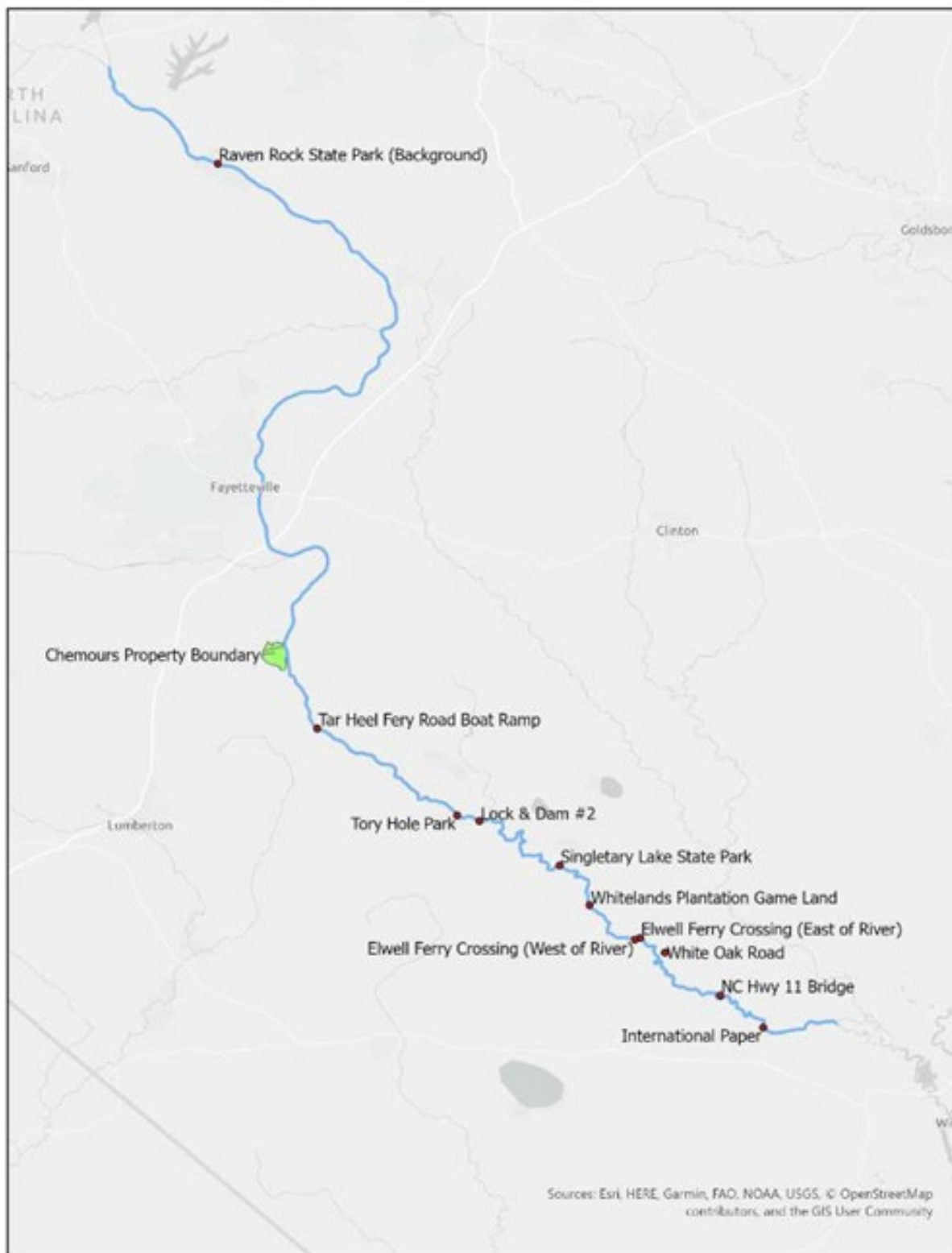
2021 Floodplain PFAS Sediment Study results include:

- The DEQ sediment study detected the Chemours specific PFAS compounds in more than 90 % of samples compared to the Geosyntec study where they detected these same compounds in 33 % of samples.
- The remaining legacy and other PFAS compounds tested (some of which are present at, but not unique to Chemours Fayetteville Works) were detected in 100 % of samples in both studies.
- The Chemours-specific PFAS compounds ranged from non-detectable at Raven Rocky State Park and Tarheel Ferry Boat Ramp to 31.3 ng/g (parts per billion) at International Paper.
- Total legacy and other PFAS ranged from 0.70 ng/g at White Oak Road to 39.0 ng/g at Elwell Ferry Road (East side of River).
- PFAS concentrations generally increased in areas with higher TOC values.
- When comparing the surface composite sample type to the deeper grab sample, there was no clear trend as to which type of sampling depth yielded higher PFAS concentrations.
- Surface soils that have higher concentrations of PFAS may indicate more recent PFAS deposition where subsurface sediment samples with higher concentration may indicate areas where PFAS deposition occurred at an earlier time point.
- These results indicate that it is important to collect both surface and subsurface sediment when characterizing PFAS in sediments.

The concern that sediment samples collected from within the banks of the Cape Fear River did not represent the overall PFAS impacts to sediments and that much of the PFAS-laden sediment would accumulate in the low-lying floodplains outside of the riverbanks was confirmed. The study results clearly demonstrated that PFAS adsorbs to finer grain sediments with higher organic content and that PFAS-laden sediments have been deposited downstream in the floodplain as result of years of flooding and severe weather events impacting the Cape Fear River.

The full [2021 PFAS Sediment Study Report](#) is available and includes graphical presentation of the results as well as the TOC assessment results.

Figure 12-43: DEQ Sediment Study Sampling Locations along the Cape Fear River (Copied from Figure 1 of the [2021 PFAS Sediment Study Report](#))



12.4.9 Air – Emissions and Deposition

DEQ's Action Strategy Implementation

- Protecting Communities
- Protecting Drinking Water
- Cleaning Up Existing Contamination

12.4.9.1 DAQ Background PFAS Atmospheric Monitoring Network

As part of the ongoing efforts to understand and track emerging compounds, the Division of Air Quality (DAQ) has established a background PFAS rainwater network to monitor for the presence of PFAS. There are seven background sites located near DEQ regional offices across NC (*Table 12-28* and *Figure 12-44*). These allows DAQ to monitor for PFAS deposition via air emissions (*Figure 12-45*). DAQ's annual PFAS background deposition reports are available [here](#) (through 2021) with a link to the updated weekly reports in Laserfiche. DAQ is in the process of developing a more robust and user-friendly tool to view PFAS deposition data ([DAQ Emerging Compounds website](#)).

Table 12-28: 2021 and 2024 DAQ Background PFAS Rainwater Monitoring Network Results. (Regional Offices with Territory in the Cape Fear River Basin are Highlighted in Orange.)

2021 Regional Office	Station Name	Number of Samples in 2021	Number of Samples Positive for PFAS in 2021	2021 Compound and Concentrations (ppt)	Date Station Started
Ashville - ARO	AS	9	0	None Detected	11/20/2018
Fayetteville - FRO	CD	9	0	None Detected	10/24/2018
Mooresville - MRO	RK	9	1	March: PFOS- 2.2	03/12/2019
Raleigh - RRO	MB	39	5	Jan: EtFOSAA-2.1; Feb: EtFOSAA-2.7, MeFOSAA-3.21; June: EtFOSAA-3.7, MeFOSAA-2.2, 11Cl-PF3ONS-2.3, PFDoA-2, PFDS- 2.2;	04/24/2018
Washington - WaRO	PG	9	0	None Detected	02/12/2019
Wilmington - WiRO	EG	9	2	July: N-MeFOSAA-3.2, PFOA-5.1, PFOS-4.0 September: PFOS-2.3	01/08/2019
Winston Salem - WsRO	MN/ MH	9	1	October: PFBA-2.2	03/26/2018

[Link to 2021 Report](#)

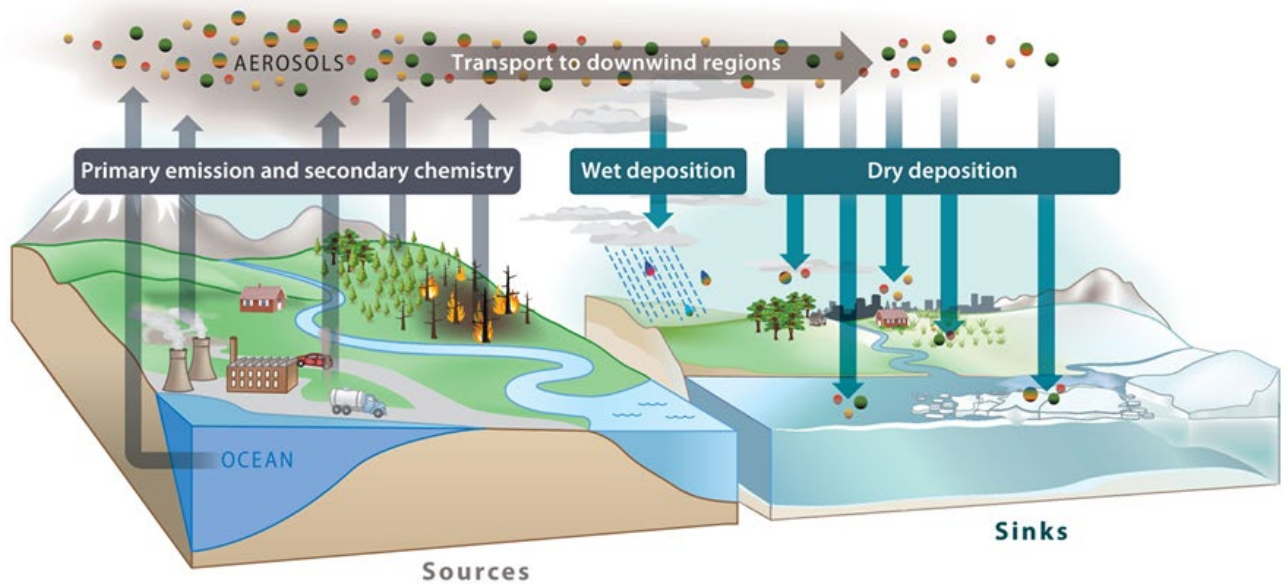
2024 Regional Office	Station Name	Number of Samples in 2024	Number of Samples Positive for PFAS in 2024	2024 Compound Detected
Ashville - ARO	AS	10	7	PFPrA, PFBA, PFNA
Fayetteville - FRO	CD	13	13	PFMOAA, PFPrA, PFBA
Mooresville - MRO	RK	13	10	PFMOAA, PFPrA, PFBA, PFOS
Raleigh - RRO	MB	96	58	PFMOPrA, PFMOAA, PFESA BP4, PFPrA, PFBA, 6:2 FTS
Washington - WaRO	PG	11	9	PFMOAA, PFPrA, PFBA
Wilmington - WiRO	EG	0	NA	NA

Winston Salem - WsRO	MH/ MN	11	9	PFMOAA, PFPrA, PFBA
2024 Data from DAQ; Compounds tested included: GenX, PMPA, PFMOPrA, PFMOAA, PFESA BP4, PFPrA, PFBA, PFHxA, PFOA, PFOS, 6:2 FTS				

Figure 12-44: DAQ Background PFAS Rainwater Monitoring Network Near the Seven DEQ Regional Offices Across North Carolina.



Figure 12-45: PFAS Air Deposition Schematic.



Farmer DK, et al. 2021
Annu. Rev. Phys. Chem. 72:375-97

12.4.9.2 Chemours GenX Emission Reductions and Monitoring

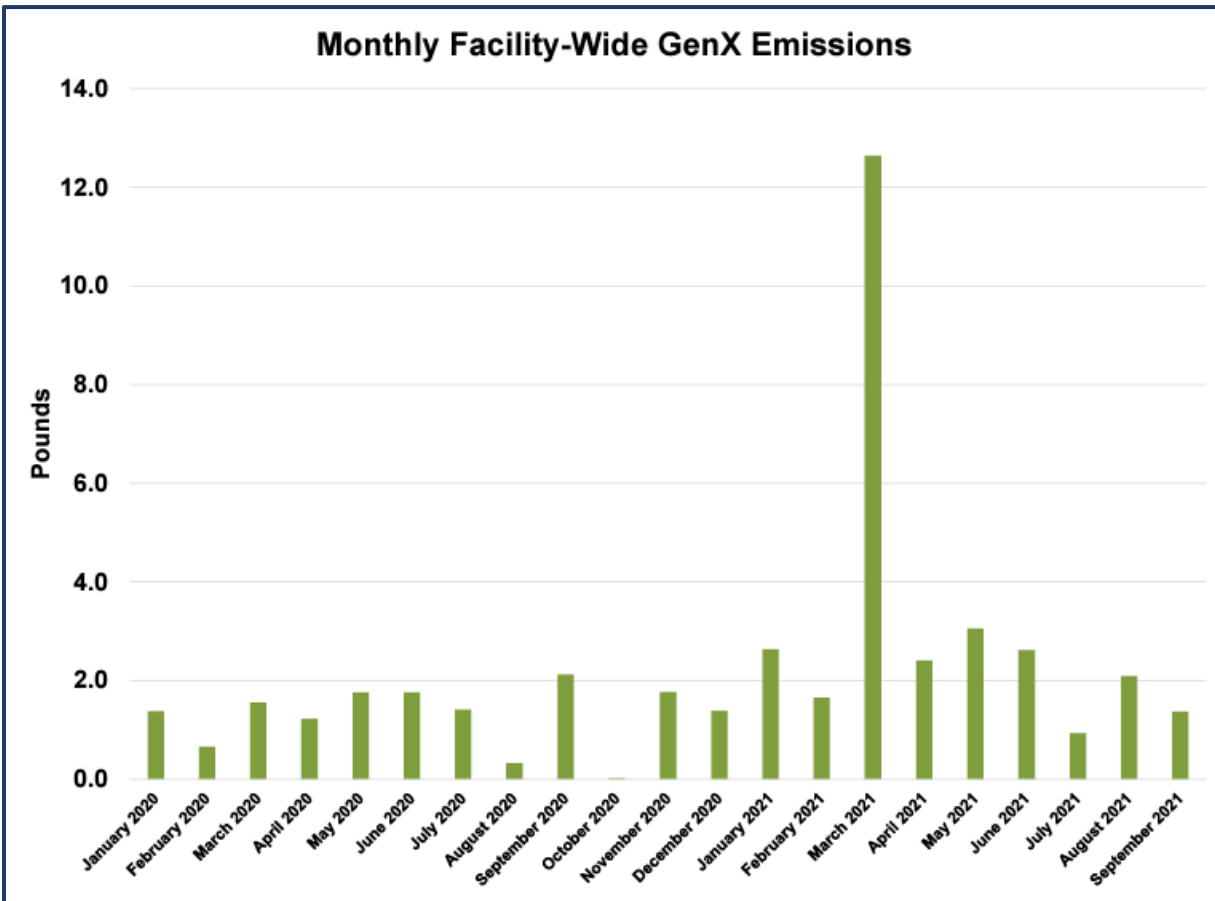
DAQ required Chemours Fayetteville Works facility to comply with GenX emission reduction milestones with an overall facility-wide annual air emissions of GenX compounds reduced by 99% by December 31, 2019, and for each consecutive 12-month period (*Table 12-29*). The reduction was based on the 2017 baseline emission of 2,302.7 pounds. Chemours received a GenX emission cap in their air quality permit of 23.027 pounds per year (12-month rolling sum emission limit). The reduction in atmospheric discharge was achieved using a thermal oxidizer/scrubber system which was installed and operational on December 27, 2019, and was designed to reduce GenX at a 99.99% control efficiency which was confirmed through stack testing in February 2020 and January 2021. DAQ confirmed the stack efficiency results. Emission Test Reports are submitted to DAQ and are available [here](#) (under Emission Test Reports yearly tabs). Chemours has contracted with an outside source testing company for on-site air emissions sampling.

Table 12-29: Facility-Wide Reduction Milestones for GenX Atmospheric Releases Relative to the 2017 Total Reported Emissions.

% Reduction from 2017 Total Reported Emissions	Date to Meet Milestone and for the Following 12 Month Period
82%	October 6, 2018
92%	December 31, 2018
99%	December 31, 2019
Consent Order – Section (ii) and C. Compliance Measures – Air Emissions	

For 2020, the facility reported a total GenX emission of 15.36 pounds total and for the first 14 months of operations demonstrated that, Chemours met their yearly rolling emissions cap of 23.027 pounds per year (*Figure 12-46*). However, in March 2021 the emissions were notably higher due to process issues upstream of a carbon absorption control device which resulted in higher emissions and exceedance of their 12-month rolling cap and resulted in an extended period of noncompliance. DAQ issued a notice of violation, which led to an enforcement case and civil penalty assessment.

Figure 12-46: Chemours Monthly Facility-Wide GenX Emissions for the First 21-Months of Thermal Oxidizer/Scrubber System Usage (From [Nov. 16, 2021 Presentation](#)).



12.4.9.3 DAQ Chemours Facility Near Field Atmospheric Deposition Monitoring

In January of 2018, DAQ installed atmospheric deposition monitoring devices and began sampling both wet and dry deposition of GenX from air emissions from the Chemours Fayetteville Works facility (Figure 12-46). The graph presented here shows data collected from five sites located between 1.0 and 2.1 miles from the center of the Chemours facility. The data shows a decline in the total (wet + dry deposition) GenX atmospheric deposition as Chemours achieved their emission reduction milestones between 2018 and the end of 2019 when they completed the installation of the thermal oxidation emission scrubber system (Table 12-29 and

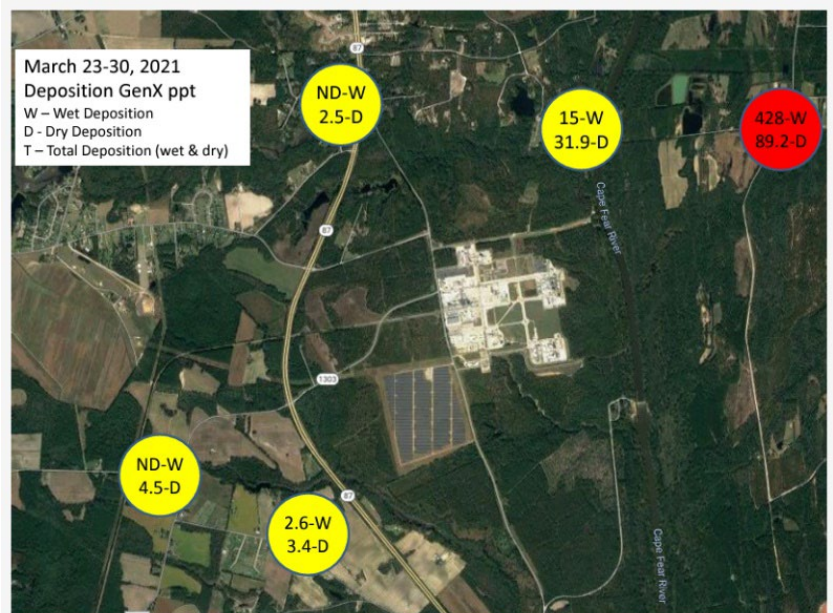


Figure 12-47). Several GenX deposition spikes were seen in February and March of 2021 which partially corresponded with the March 2021 emissions issue described above. Additional spikes were detected in 2023 (Figure 12-48). Weekly reports are available, and a mapping tool is being developed to improve access and visualization of the PFAS deposition data. The most current information is available on the [GenX Investigation website](#) and [Laserfiche](#).

Figure 12-47: Near Field DAQ Atmospheric Deposition Data for GenX at Monitoring Stations 1.0 to 2.1 Miles from the Center of the Chemours Facility 2018-2021 (From [Nov. 16, 2021 Presentation](#)).

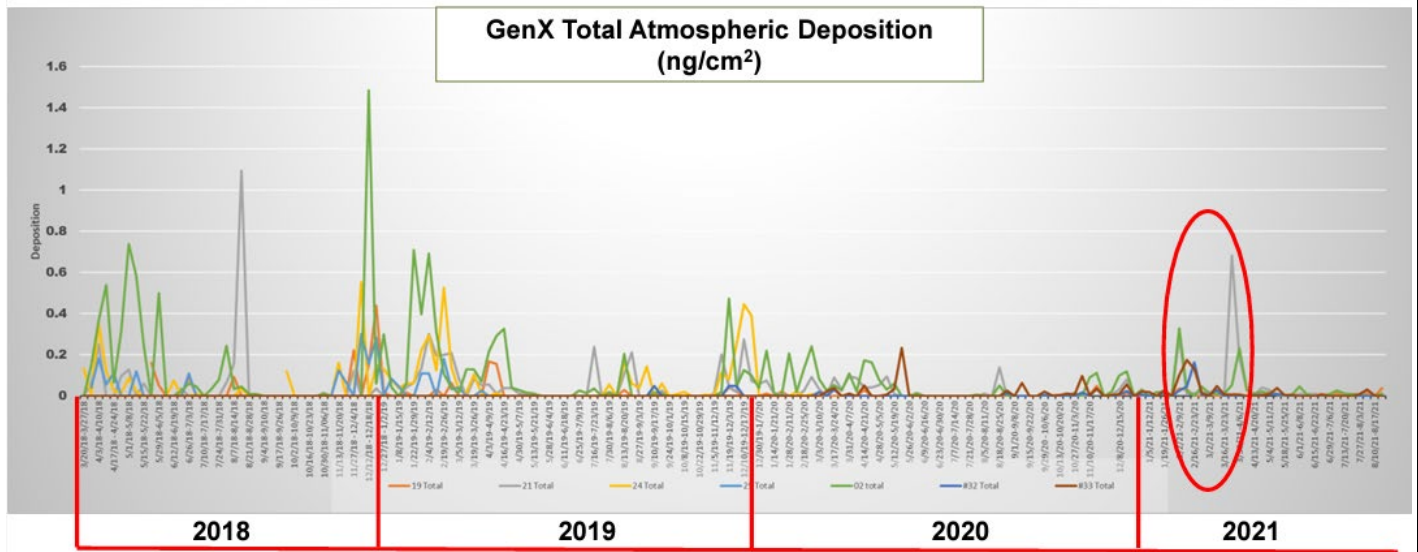
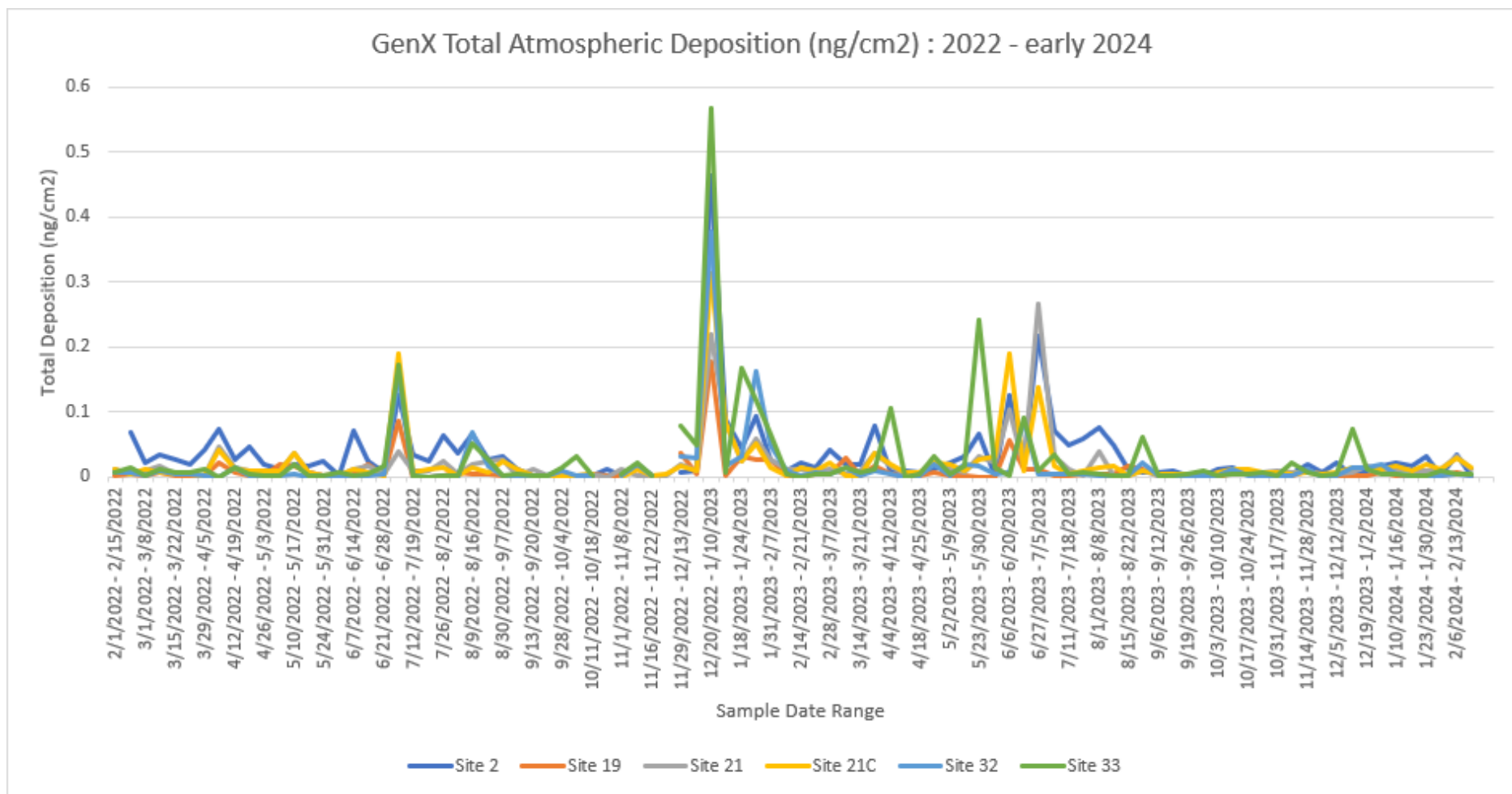


Figure 12-48: Near Field DAQ Atmospheric Deposition Data for GenX at Monitoring Stations 1.0 to 2.1 Miles from the Center of the Chemours Facility 2022- Early 2024.



12.4.10 DWR Regional Office Cape Fear River PFAS Monitoring

DEQ's Action Strategy Implementation

- ☑ Protecting Communities
- ☑ Protecting Drinking Water

DEQ and NCDHHS began investigating the presence of GenX in the Cape Fear River in June 2017. The Chemours facility in Fayetteville was identified as the company that produces the GenX chemical for industrial processes. The state's investigation focused on protection of public health and drinking water. Through actions by DEQ and the Consent Order, Chemours was required to stop the discharge of process wastewater, drastically reduce emissions and provide alternate water for thousands of households whose drinking water wells have been contaminated.

In June 2017, DWR's regional office was directed to begin sampling for GenX and other PFAS compounds onsite and downstream of the Chemours Fayetteville Works Facility ([Table 12-30](#) and [Figure 12-49](#)). Composite samples were collected twice weekly at the outfall 002 ([Figure 12-49](#)). Weekly grab samples were also taken from five downstream water treatment plants (WTP) on the Cape Fear River. Beginning in June 2019, the sampling frequency at the drinking water treatment plants were reduced to about once per month ([Table 12-30](#)). In February 2020, monthly sampling was initiated at William O. Huske Lock and Dam #3 (LD3) on the Cape Fear River downstream of Chemours. In May 2021, sampling also started on the Cape Fear River at Tar Heel Ferry Road and in January 2022 started on the Cape Fear River upstream of Chemours at the Hoffer water treatment plants raw river water intake and downstream at Lock and Dam #2 (LD2) near Elizabethtown ([Figure 12-49](#)). Currently (as of May 2025) the Fayetteville Regional Office (FRO) continues to collect PFAS samples at these locations ([Table 12-30](#) and [Figure 12-49](#)).

Table 12-30: List of PFAS Sampling Sites Tested By DEQ's Regional Offices. (Order of Site are Upstream to Downstream; Green Highlighted Stations are Surface Water Samples; Gray are Finished Drinking Water and Orange is wastewater)

Sampling Site/Facilities	Frequency	Water type/Matrix	Type of sample
Cape Fear River at the Hoffer WTP raw water intake	1/month	Surface Water/Intake	Grab
Chemours Outfall 002	2/week	Wastewater	72 hr Composite*
Cape Fear River at LD3 - B8300000	1/month	Surface Water	Grab
Bladen Bluff WTP	1/month	Finished Drinking Water	Grab
Cape Fear River at Tar Heel Ferry Rd.	1/month	Surface Water	Grab
Cape Fear River at LD2 – B8340000	1/month	Surface Water	Grab
Cape Fear Public Utility Authority WTP (CFPUA)	1/month	Finished Drinking Water	Grab
Brunswick Count WTP	1/month	Finished Drinking Water	Grab
Pender County WTP	1/month	Finished Drinking Water	Grab
International Paper WTP	1/month	Finished Drinking Water	Grab

*Composite sampler takes a 350 mL sample once every 3 hours. Chemours composite sample is collected twice per week, typically on Tuesday and Friday.

DWR PFAS samples were initially analyzed by several private, EPA and university laboratories. Samples were transitioned to DWR's chemistry laboratory in Raleigh once the technology and capacity allowed starting in about late 2020. The reported PQLs have also changed over this time period as described above. The most current (early 2025) data is available on an interactive dashboard on DEQ's [GenX Surface Water Sampling Sites](#) website. The Cape Fear River, Hoffer WTP raw river water intake documents the background PFAS concentrations upstream of the Chemours Fayetteville Works Facility ([Figure 12-49](#) and [Figure 12-50](#)).

Figure 12-49: Fayetteville Regional Office Cape Fear River Basin Monthly PFAS Special Study Sites, Upstream and Downstream of Chemours Fayetteville Works Facility.

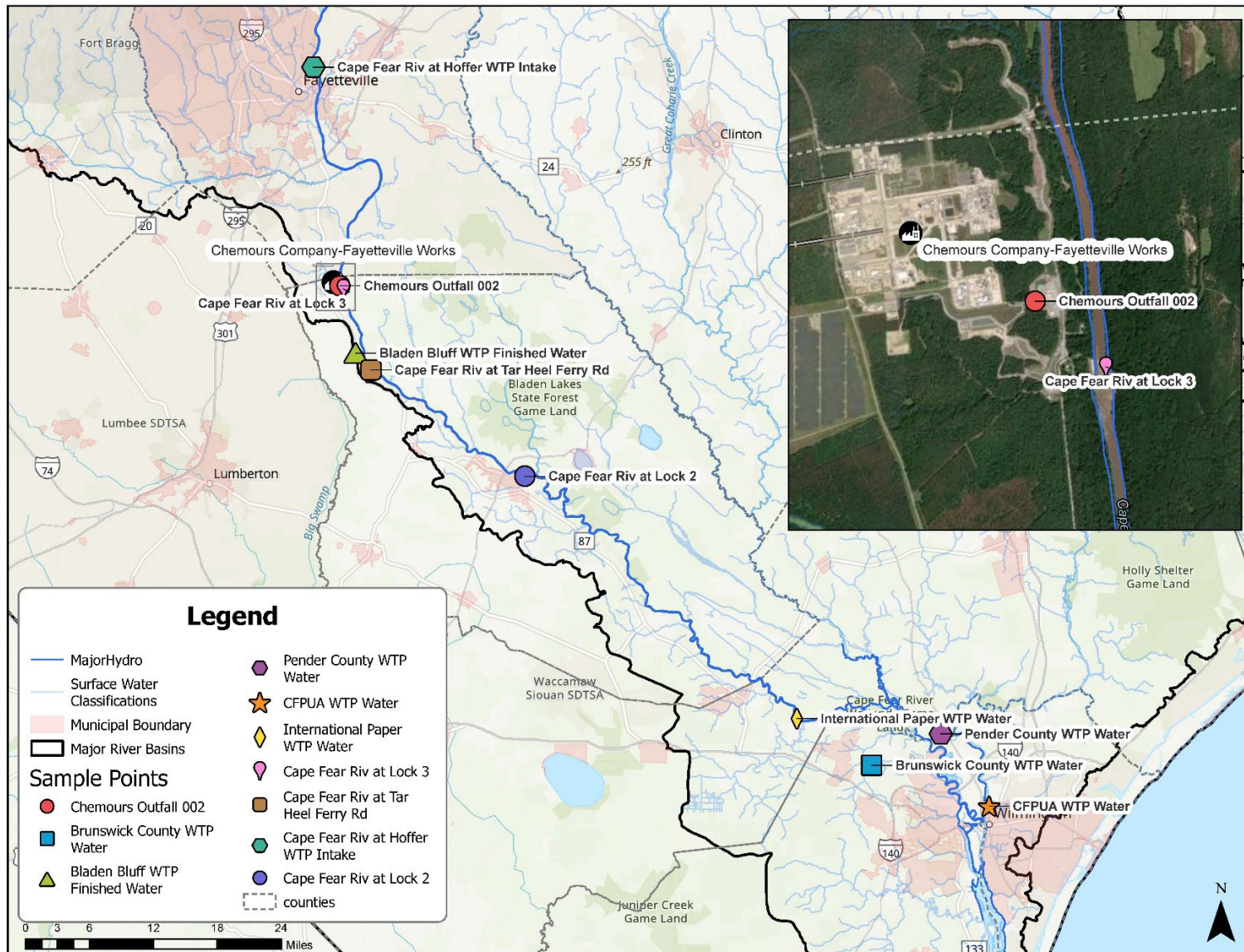
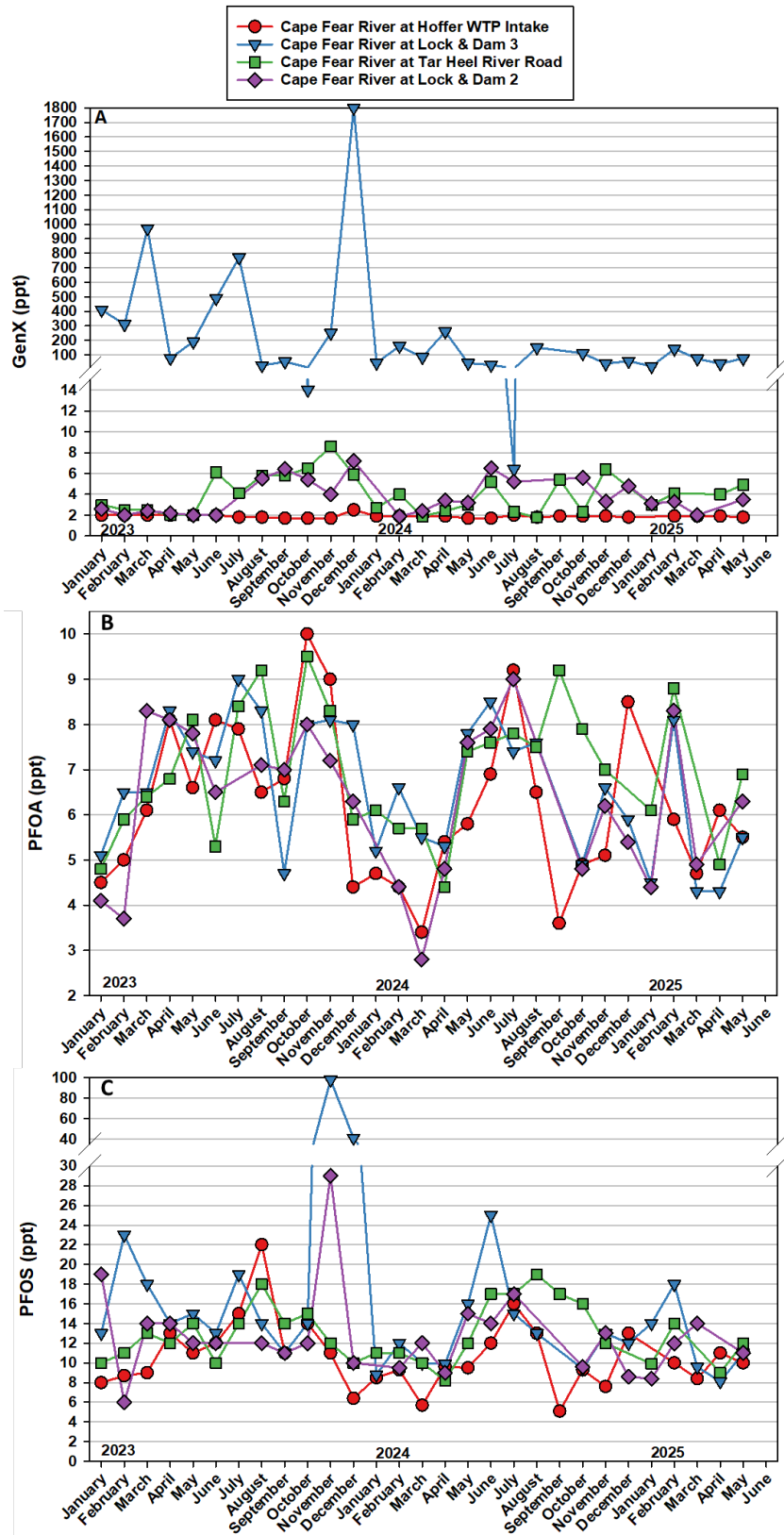


Table 12-31: 2023 and 2024 Summary Data for GenX, PFOA, and PFOS Collected by Fayetteville Regional Office. [Surface water/river sampling sites highlighted in Green and downstream water treatment plant facilities (finished drinking water) in gray and Chemours Outfall (wastewater) in Orange]

River Sampling Sites & WTP Facilities Finished Water	Test Year	GenX (ppt)				PFOA (ppt)				PFOS (ppt)			
		n/ n ¹ <PQL	Mean ²	Min	Max	n/ n ¹ <PQL	Mean ²	Min	Max	n/ n ¹ <PQL	Mean ²	Min	Max
Cape Fear River at Hoffer WTP Raw River Water Intake	2023	12/11	<PQL	<PQL	2.5	12/0	6.9	4.4	10.0	12/0	11.8	6.4	22.0
	2024	12/12	<PQL	<PQL	<PQL	12/0	5.7	34	9.2	12/0	9.9	5.1	16
Chemours Outfall 002	2023	98/0	94	14	1800	98/0	6.7	3.3	15.0	98/0	10.2	4.7	24.0
	2024	95/0	44	11	220	95/0	6.2	3.1	10.0	95/0	9.4	4.9	15.0
Cape Fear River at LD3	2023	12/0	447	14	1800	12/0	7.3	4.7	9.0	12/0	24.4	11.0	98.0
	2024	11/0	90	6.4	260	11/0	6.5	4.9	8.5	11/0	13.1	8.8	25.0
Bladen Bluff WTP	2023	11/0	4.2	2.9	6.2	11/0	4.7	3.0	6.4	11/0	4.1	3.3	5.0
	2024	12/3	4.2	<PQL	6.9	12/0	5.7	3.0	11.0	12/0	6.7	3.1	12.0
Cape Fear River at Tar Heel Ferry Road	2023	12/2	5.1	<PQL	8.6	12/0	7.1	4.8	9.5	12/0	12.8	10.0	18.0
	2024	11/1	3.6	<PQL	6.4	11/0	6.9	4.4	9.2	11/0	13.7	8.2	19.0
Cape Fear River at LD2	2023	11/3	4.5	<PQL	7.2	11/0	6.7	3.7	8.3	11/0	13.7	6.0	29.0
	2024	9/1	4.3	<PQL	6.5	9/0	5.9	2.8	9.0	9/0	12.0	8.6	17.0
CFPUA WTP	2023	12/8	2.3	<PQL	3.0	12/12	<PQL	<PQL	<PQL	12/12	<PQL	<PQL	<PQL
	2024	12/12	<PQL	<PQL	<PQL	12/12	<PQL	<PQL	<PQL	12/12	<PQL	<PQL	<PQL
Brunswick County WTP	2023	12/2	4.4	<PQL	7.2	12/0	5.7	3.1	7.9	12/0	10.1	5.5	15
	2024	12/4	4.9	<PGL	10	12/0	5.3	2.9	8.1	12/0	9.8	5.7	14.0
Pender County WTP	2023	12/1	3.3	<PQL	4.8	12/2	2.5	<PQL	3.1	12/1	2.7	<PQL	3.4
	2024	12/7	3.0	<PQL	4.3	12/2	2.6	<PQL	3.4	12/0	2.8	2.2	3.6
International Paper WTP	2023	12/2	3.5	<PQL	6.4	12/2	3.2	<PQL	7.2	12/1	3.9	<PQL	13
	2024	12/5	2.6	<PQL	3.8	12/9	2.2	<PQL	2.4	12/8	2.8	<PQL	4.4

n-total number of samples collected in 2023 or 2024
n¹<PQL – the number of samples below the analytical PQL.
Mean² – the mean only includes the sample values above the PQL.

Figure 12-50: Fayetteville Regional Office Monthly Monitoring of the Cape Fear River GenX, PFOA and PFOS Concentrations (ppt) between January 2023 and May 2025. A.) GenX Data (Note Y-axis break), B.) PFOA Data and C.) PFOS Data (Note Y-axis scale break).



The yearly 2023 and 2024 mean GenX, PFOA and PFOS concentrations for each sampling site are included in [Table 12-31](#). The highest yearly mean concentrations for GenX were found at the Chemours outfall 002 and just downstream in the Cape Fear River at the LD3 stations ([Table 12-31](#)). GenX concentrations were significantly lower at all the downstream Cape Fear River stations ([Figure 12-50 A](#)) as well as in all of the water treatment plants finish water samples ([Table 12-31](#)). GenX concentration upstream at the Hoffer WTP raw river water intake were generally below the analytical detection levels (<PQL). [Figure 12-50 A](#) shows the general decreasing concentration trend for GenX overtime in the Cape Fear River at LD3 as well as significant reductions in instream concentrations at the two lower Cape Fear River stations ([Figure 12-50 A](#)).

The PFOA and PFOS monthly and the yearly mean concentrations were similar at all the Cape Fear River stations including the upstream Hoffer WTP raw river water intake samples. There were a few exceptions, such as in November 2023 where PFOS concentrations were 11, 98, 12 and 29 ppt at the Hoffer WTP intake, LD3, Tar Heel Ferry Road and LD2 respectively ([Figure 12-50 B & C](#)). In 2023, the Cape Fear River at LD3 had the highest yearly mean PFOA (7.3 ppt) and PFOS (24.4 ppt) and in 2024, the Cape Fear River at Tar Heel Ferry Road had the highest yearly mean PFOA (6.9 ppt) and PFOS (13.7 ppt) concentrations ([Table 12-31](#)). In the 2023 and 2024 timeframe of this study, the Cape Fear River at the Hoffer WTP intake station had the highest recorded PFOA concentration (10 ppt) and LD3 had the highest PFOS concentration (98 ppt) ([Table 12-31](#)). This data and others collected throughout the Cape Fear River watershed clearly demonstrate that PFOA and PFOS as well as other PFAS compounds are coming from many different sources throughout the basin.

The finished drinking water PFAS concentrations were generally lower than the concentrations at outfall 002 and in the mainstem Cape Fear River. There were also several samples below the reported PQL's in the finished drinking water samples ([Table 12-31](#)). All the PFAS samples taken in 2024 from the Cape Fear Public Utility Authority (CFPUA) water treatment plant finished water were reported as below the analytical detection levels (<PQL) ([Table 12-31](#)). This indicates that the granular activated carbon (GAC) filters installed are successfully removing PFAS compounds at their Sweeney Water Treatment facility ([CFPUA PFAS testing website](#)).

Research studies revealed that various PFAS contaminants within the Cape Fear River could not be removed using existing conventional treatment methods of coagulation, sedimentation, dual-media filtration, and chloramination. Many of the public water supply utilities in the Cape Fear River Basin have taken the initiative to upgrade their treatment works to remove PFAS compounds in order to supply finished drink water to their customers below the National Primary Drinking Water Regulations MCLs (see section 12.3.9.2).

For example, the Cape Fear Public Utility Authority (CFPUA), the primary provider of drinking water for Wilmington and New Hanover County, installed granular activated carbon (GAC). CFPUA took about two years to examine the best treatment options and settled on a \$43 million project to construct GAC contactors at their Sweeney Water Treatment facility. The GAC contactors hold about 3 million pounds of GAC and came online in October 2022. This technology costs approximately \$5 million per year to operate and maintain effective treatment (CFPUA communication, October 2025).

Brunswick County Public Utilities is another example, after completing a study and pilot testing, the data drove the decision to add Low Pressure Reverse Osmosis (LPRO) to remove PFAS contaminants. The existing conventional facilities are being expanded to treat 45 MGD in order to produce a minimum of 36 MGD through the LPRO units. This project includes an treatment plant expansion from 24 to 45 MGD, construction of a discharge pipeline and a LPRO system for a total projected cost of \$167.3 million (Brunswick County communication).

12.4.11 Others

12.4.11.1 USGS PFAS Dashboard

The US Geological Survey scientists created an interactive map/dashboard tool to help the public understand their risk of exposure to PFAS contaminants ([USGS PFAS Dashboard](#)). Their interactive tool allows the user to view data from a recently published USGS study on PFAS in tap water as well as learn where PFAS sources are near their community. The study suggested “that at least 45% of the nation’s tap water may have one or more types of PFAS. This study also suggest that these chemicals are more likely to be detected near urban areas and PFAS sources like airports and wastewater sites” (Stephanie Gordon, [2023 USGS video](#); Smalling et al., 2023).

12.4.11.2 DEQ and NCDHHS Human Health-Related Resources

The DEQ website provides many links to state and federal resources about GenX, PFOA and PFOS. These can be found [here](#). The NCDHHS Division of Public Health also has a [PFAS website](#) with human health-related information and links to additional resources. NCDHHS also maintains a [GenX website](#) specific to GenX in the lower Cape Fear River Basin.

12.5 Conclusions and Path Forward

Under DEQ’s [Action Strategy for PFAS](#), DEQ is taking a whole-of-department approach to protect communities by identifying, reducing and remediating PFAS pollution. DEQ’s regulatory divisions are requiring PFAS information from new facilities and industries and adding permit conditions as appropriate to address PFAS wastewater discharges to require disclosure of data and additional monitoring. DEQ and our economic development partners work together to proactively address emerging contaminants early in the business recruitment and expansion efforts.

Each investigation and study enhances our understanding of PFAS, enabling more informed actions to protect communities, drinking water supplies, and the environment. This growing body of knowledge will help prevent future contamination and enhances the effectiveness of remediation efforts. Reducing PFAS contamination at the source is the most effective strategy to protect human health and the environment while minimizing the financial burden to downstream utilities and ratepayers. Collaborative efforts with researchers, dischargers, and industrial producers are advancing the development of the most effective treatment solutions. New and emerging treatment technologies are being implemented at solid waste facilities, centralized wastewater treatment plants, and industrial operations to mitigate PFAS impacts.

DEQ is working within our authority to understand and address PFAS in a multimedia approach. DEQ continues to work with the Environmental Management Commission to develop PFAS-related watershed protection measures for all designated uses by identifying, reducing, and remediating PFAS pollution. As progress is made, updated information can be found on the [DEQ Emerging Compounds website](#).



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