



AAPCA Fall Business Meeting  
September 26, 2023  
Emerging Compounds and Air Quality  
NC DAQ and DEQ Experience



# *Topics to Cover Today*

- Focus on PFAS Issues
  - A Brief History (6 Years @ Chemours)
  - NC DEQ's Strategic Plan
  - Current PFAS Related Activities within DAQ and DEQ

# *PFAS – Important Considerations*

## Per- and Polyfluoroalkyl Substances:

- Different definitions of PFAS
- Inconsistencies between definitions / families of PFAS compounds
- Fluorinated organic chemistry is energetic and complex
- Extremely strong bond between fluorine and carbon
- What is emitted may not be what is measured in the environment (e.g., a “terminal acid”)

You may not know whether you are using or emitting a PFAS

# *Chemours and PFAS*

## A Brief History

- NC DEQ PFAS journey began in 2017 when “GenX” (HFPO-Dimer Acid) was found in the Cape Fear River
- Potential sources identified
- Air emissions characterized
- Consent Order entered; deposition monitoring and remediation activities began
- <https://deq.nc.gov/news/key-issues/genx-investigation>

# *DAQ and Chemours Timeline*

- Cape Fear River water sampling results announced June 2017 and found in water supply for Wilmington, NC area
- Began tracing the source(s) of GenX back upstream to Chemours
- Chemours WWTP NPDES permit suspended (transporting wastewater offsite)
- Began well sampling program around the plant. Distribution of contaminated wells looked much like the wind rose for the location
- Determined that well contamination wasn't caused strictly by groundwater migration

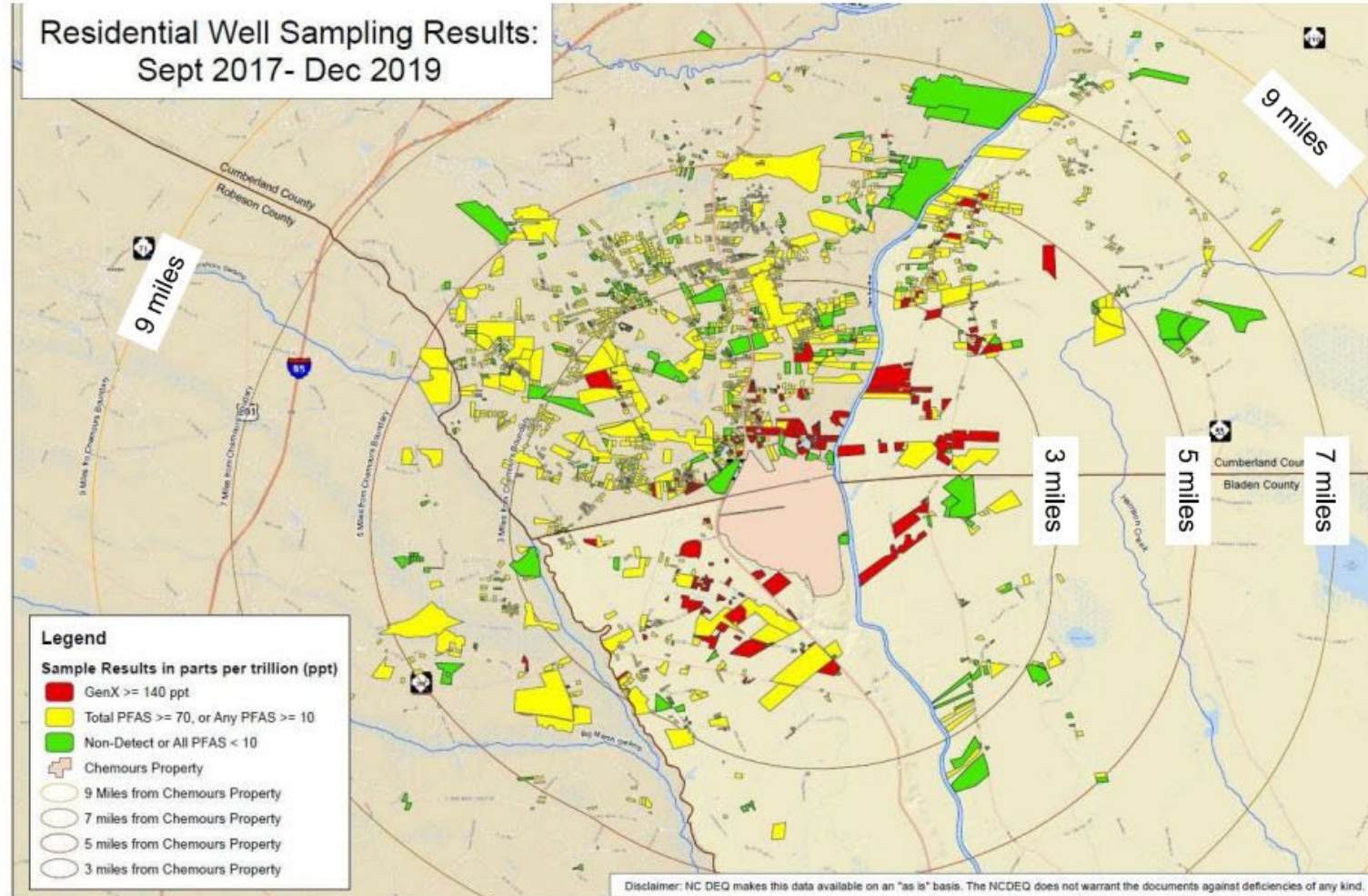




# *Chemours Fayetteville Works*



# Well Sampling Results

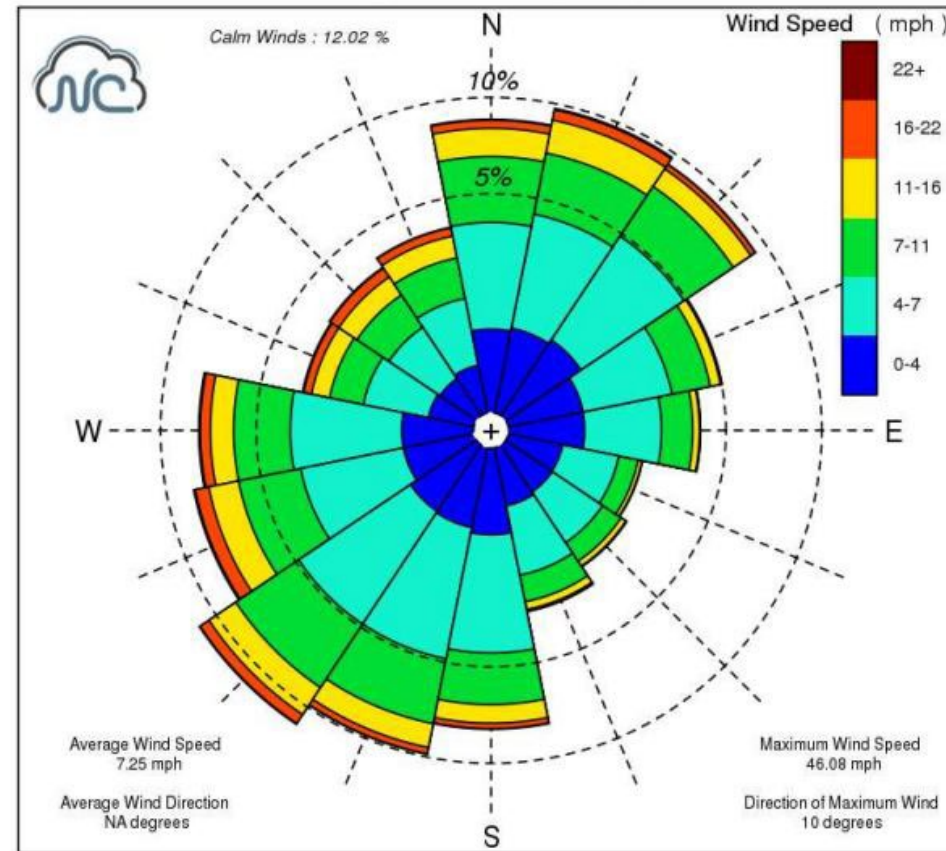




# Wind Rose for Fayetteville Airport

## Division of Air Quality

Wind Rose for Fayetteville Airport (KFAY)  
Jan. 10, 1998 to Sep. 29, 2017



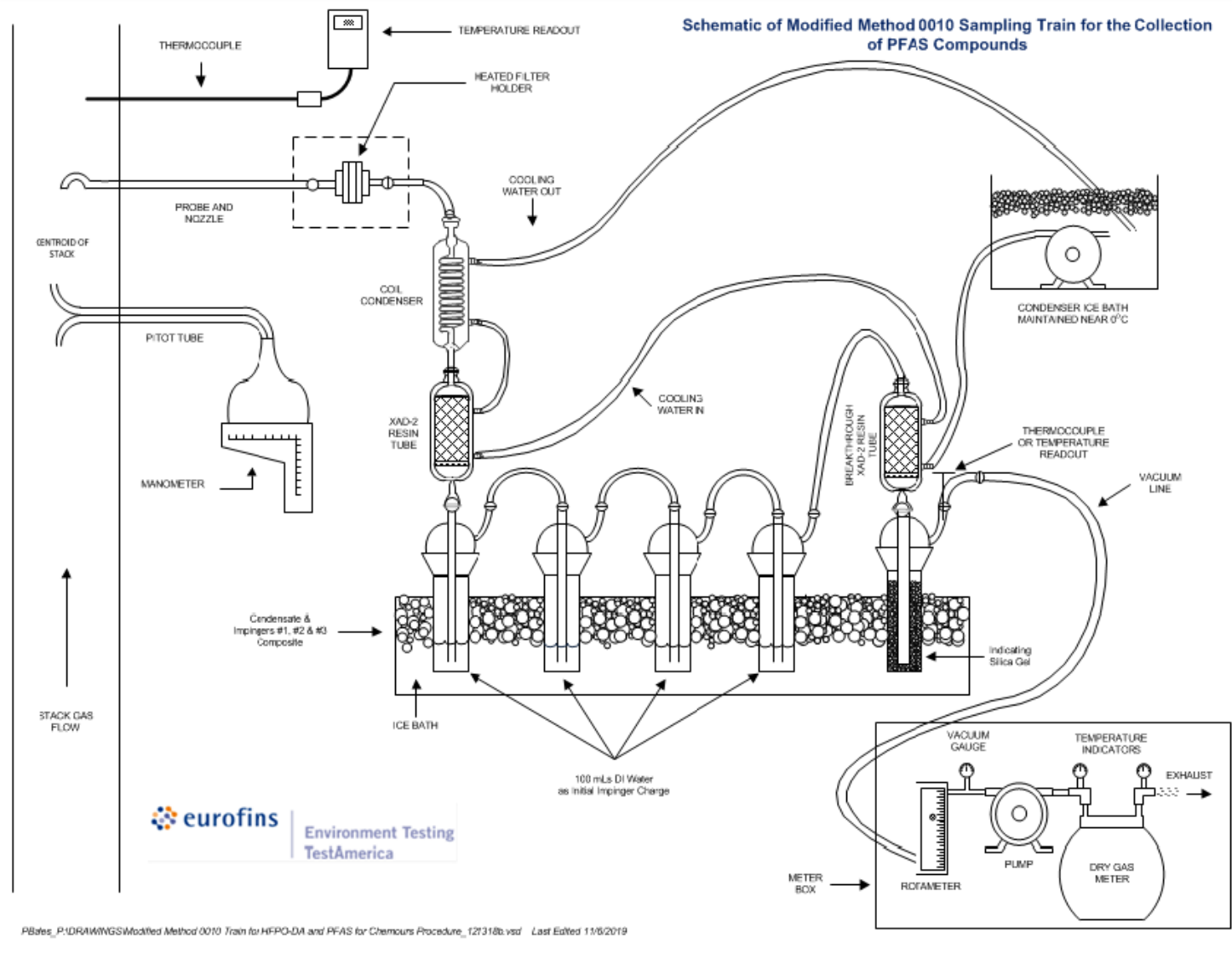


## *DAQ and Chemours Timeline (cont'd)*

- DAQ got involved in the investigation in October 2017
- Reviewed Chemours emission inventory for previous years (3.3 lbs GenX/year)
- Began working with Chemours and US EPA to select a method to measure GenX
- Selected SW-846 Method 0010 (modified) as the measurement technique
- First feasibility demonstration of test methodology in January 2018



# Modified SW-846, Method 0010 (OTM-45)



# *GenX Testing Modification*

- Modified to add XAD-2 Resin trap
- GenX (13252-13-6) and Acid Fluoride (2062-98-8) form is captured
- No easy way to determine carboxylic acid from acid fluoride form
- Shorter sample run times (high concentrations)
- Found GenX from all emissions sources
- Estimated more than 2300 lb/yr (not 3.3)
- Tested at least one source/production campaign throughout the year except October





# *OTM 45 Sample Train in Use*





# *OTM 45 Sampling Train in Use*





# *Early Sampling Challenges*



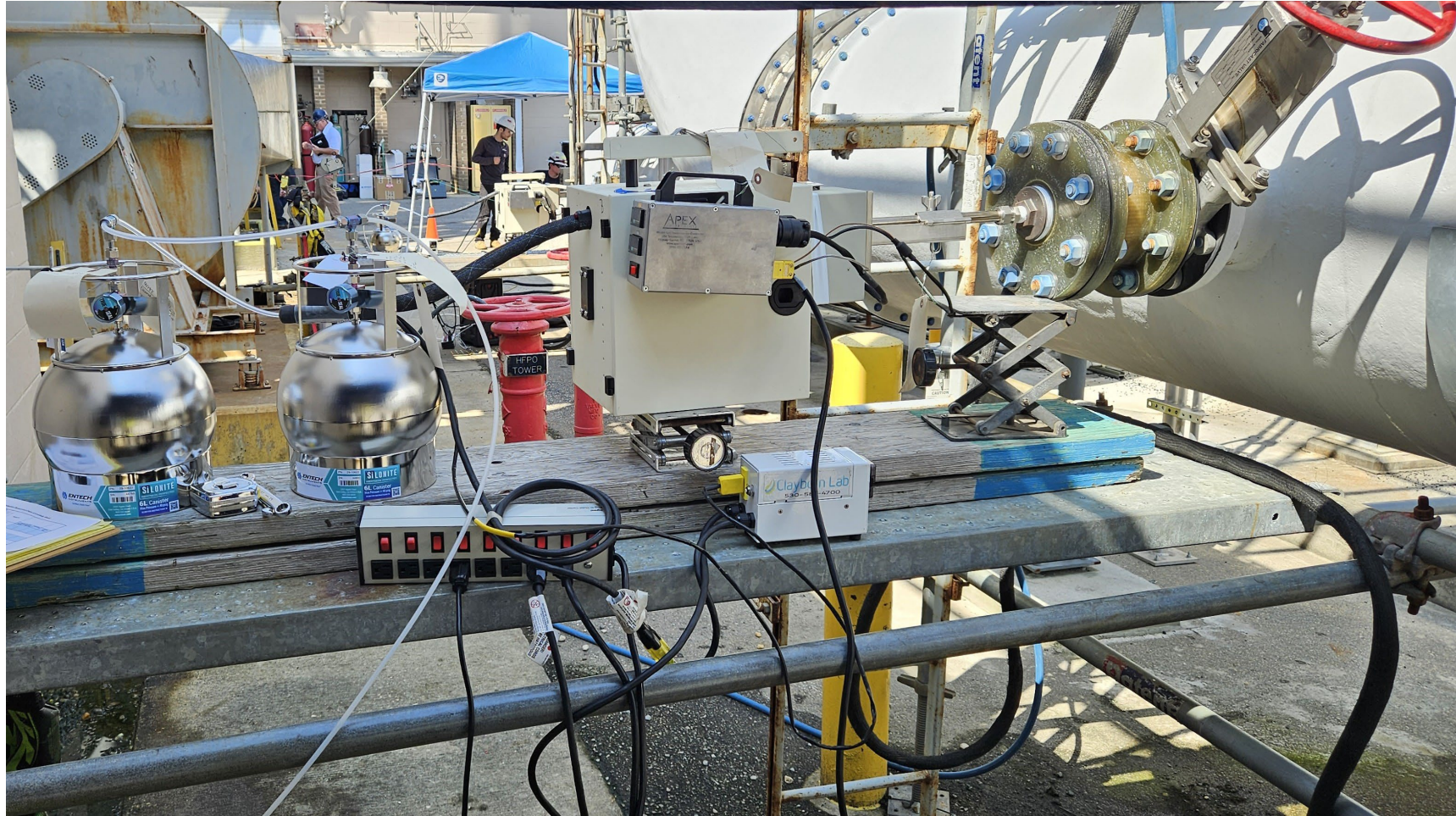


# *OTM-50 Under Development*

- Currently under development by EPA ORD
- Primarily based upon Method TO-15A with evacuated canisters
- Method currently uses impingers to manage moisture and acid gases (limits to nonpolar volatile PFAS)
- GC/MS analytical technique
- Currently targeting ~30 C<sub>1</sub> – C<sub>8</sub> PFAS
- Researching different configurations



# *OTM-50 Sample Train*



# *Consent Order*

- PFAS are unregulated emerging compounds (air)
- NC DEQ had the ability to regulate PFAS because of contaminated groundwater
- Air pathway was demonstrated through rainwater analysis (wet deposition)
- Chemours began controlling additional sources with additional controls beginning May 2018
- Final consent order February 26, 2019. Codified interim control requirements and 99.99% control of PFAS by no later than 12/31/2019
- Thermal oxidizer designed and installed during 2019. Began operation on 12/27/2019
  - “Dress rehearsal test” conducted on 1/3-4/2020
  - “Compliance test” conducted 2/28-29/2020
  - Annual Thermal Oxidizer Test (most recent February 2023)
- Consent Order requirements incorporated into Title V permit





# *Thermal Oxidizer System at Night*



Department of Environmental Quality



# *PFAS – Lessons Learned*

## **Emissions Characterization Challenges**

### Processes

- Understanding the chemistry
- Fate and transport in the environment

### Quantification

- Testing methodology is limited
- Analytical methods are limited
- Analytical standards are limited

# *NC DEQ's Strategic Plan*

PFAS are included under the Emerging Pollutants portion of the Strategic Plan

Focus on:

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



# *NC DEQ's Strategic Plan and DEQ Actions*

PFAS are included under the Emerging Pollutants portion of the Strategic Plan:

- Looking at source categories that may release PFAS
- Prioritizing sources /categories to examine
- Evaluating cross-media impacts
- Requesting information with respect to PFAS use / release (Questionnaire)
  - Promoting awareness of uses or sources
  - PFAS may not be listed in safety data sheets
- Acknowledgement of existence or absence of PFAS (3-D's: Disclosure, data, dialog)

• NC DEQ Strategic Plan 2023-25  
*Department of Environmental Quality*



# *Example PFAS Disclosure Permit Condition*

- **Disclosure of Information Relating to Emissions of Fluorinated Chemicals [15A NCAC 02Q .0308(a); 15A NCAC 02Q .0309(b)]**
- The Permittee shall have an ongoing duty to disclose the presence of materials containing fluorinated chemicals at the facility that have the potential to result in the emission of fluorinated chemicals to the environment. Such disclosures shall be in writing and submitted to the Regional Office Supervisor within thirty days of the Permittee becoming aware of such information, unless such information has already been disclosed to DAQ by the Permittee. The disclosure shall describe the identity, quantity, and use of such material to the extent known. DAQ may require the permittee to conduct analysis or testing of fluorinated chemical emissions as necessary to properly evaluate emissions sources at the facility. As used in this condition, the term “fluorinated chemicals” includes but is not limited to per- and polyfluoroalkyl substances (PFAS).



# *Interesting Headlines*

## **Toilet Paper May Be a Source of Cancer-Causing PFAS in Wastewater, Study Says**



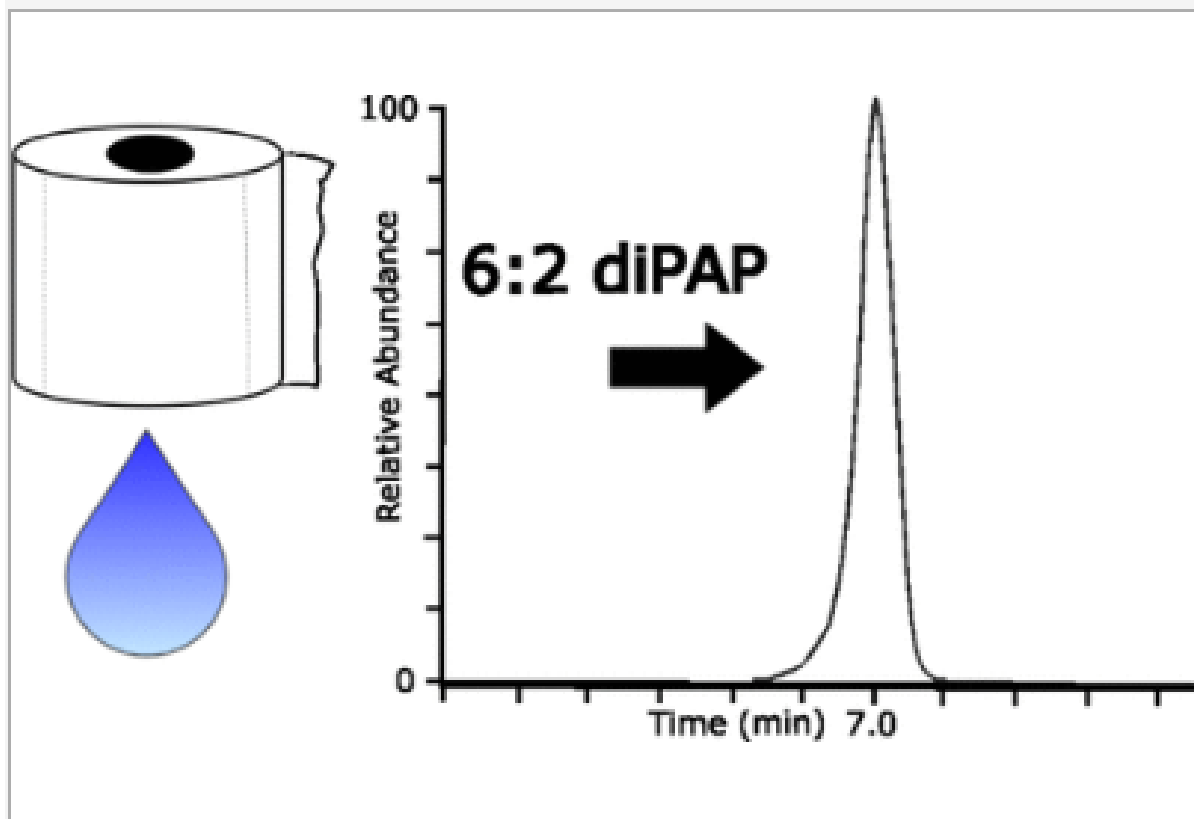
Researchers are concerned that toilet paper may be introducing harmful chemicals into wastewater systems. Science Photo Library / Getty Images

- **Researchers are reporting toilet paper may be releasing potentially harmful substances known as PFAS into wastewater systems.**
- **PFAS are found in paper products as well as cosmetics and cleansers.**
- **They say the chemicals are suspected of contributing to an array of health issues from cancer to infertility to liver disease.**

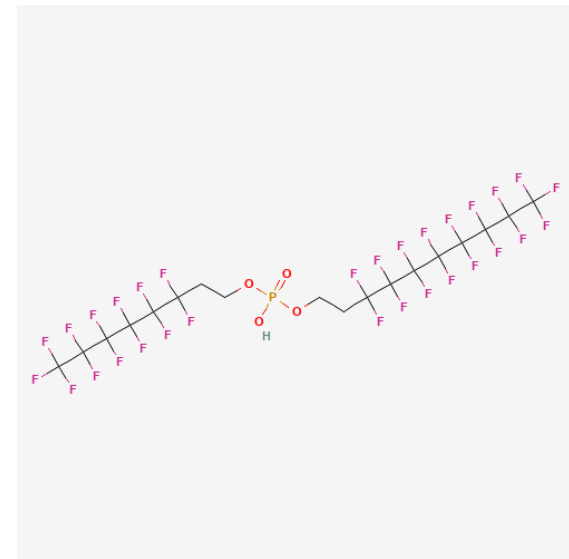




# Toilet Paper (6:2 Fluorotelomer Phosphate di-ester)



Polyfluoroalkyl  
phosphate  
diester  
(diPAP)



# Toilet Paper? Sludge and Biosolids



pubs.acs.org/journal/estlct

Letter

## Per- and Polyfluoroalkyl Substances in Toilet Paper and the Impact on Wastewater Systems

Jake T. Thompson, Boting Chen, John A. Bowden, and Timothy G. Townsend\*

Cite This: <https://doi.org/10.1021/acs.estlett.3c00094>

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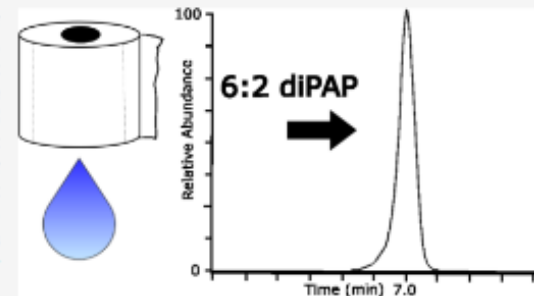
Metrics & More

Article Recommendations

Supporting Information

**ABSTRACT:** Here, we evaluate a perhaps unexpected contributor of per- and polyfluoroalkyl substances (PFAS) to our wastewater, an input anticipated at every wastewater treatment facility—toilet paper. In this study, both toilet paper and wastewater sludge were characterized to explore the magnitude of the potential PFAS loading into wastewater systems from toilet paper. In both toilet paper and wastewater sludge, 6:2 fluorotelomer phosphate diester (6:2 diPAP) was the most prevalent PFAS detected, and toilet paper usage was estimated to contribute from 6.4 to 80  $\mu\text{g}$ /person-year of 6:2 diPAP to wastewater–water systems. Our results suggest that toilet paper should be considered as a potentially major source of PFAS entering wastewater treatment systems.

**KEYWORDS:** 6:2 diPAP, biosolids, wastewater sludge, PFCA precursor, PFAS, paper





# *Other Example Areas of Concern*

- Landfill Gas – Release of PFAS containing gases as a direct emission or a degradation compound
  - Disposal of food packaging that has or may have PFAS
  - Processing and use of gas a renewable gas source. If PFAS is present, where does it go?
- Sewage Sludge Incineration – Release and destruction questions. See toilet paper example
- Greenfield / Mega Site Permitting Questions
  - Awareness of operations and processes that may (unknowingly) use PFAS or FOCs
- Processing spent activated carbon



# *DAQ Emerging Compounds Actions Coordination Contact Information*

Gary L. Saunders

DAQ Emerging Compounds (EC) Actions Coordinator

Permits Section

NC DEQ, Division of Air Quality

919-707-8413

[gary.saunders@deq.nc.gov](mailto:gary.saunders@deq.nc.gov)