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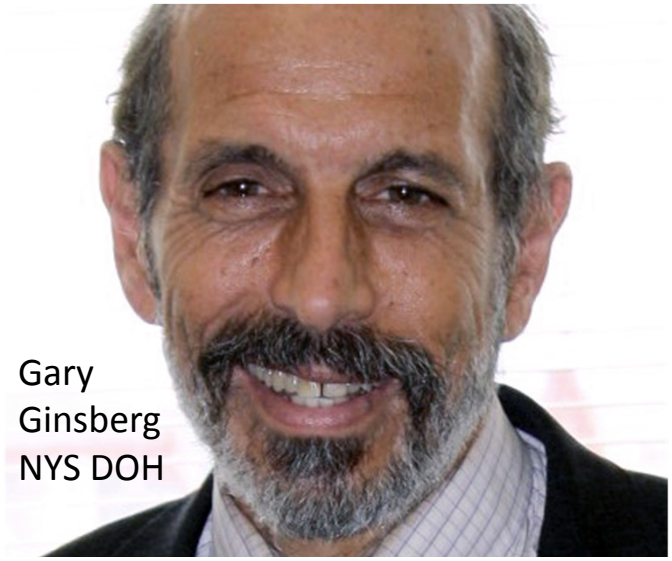
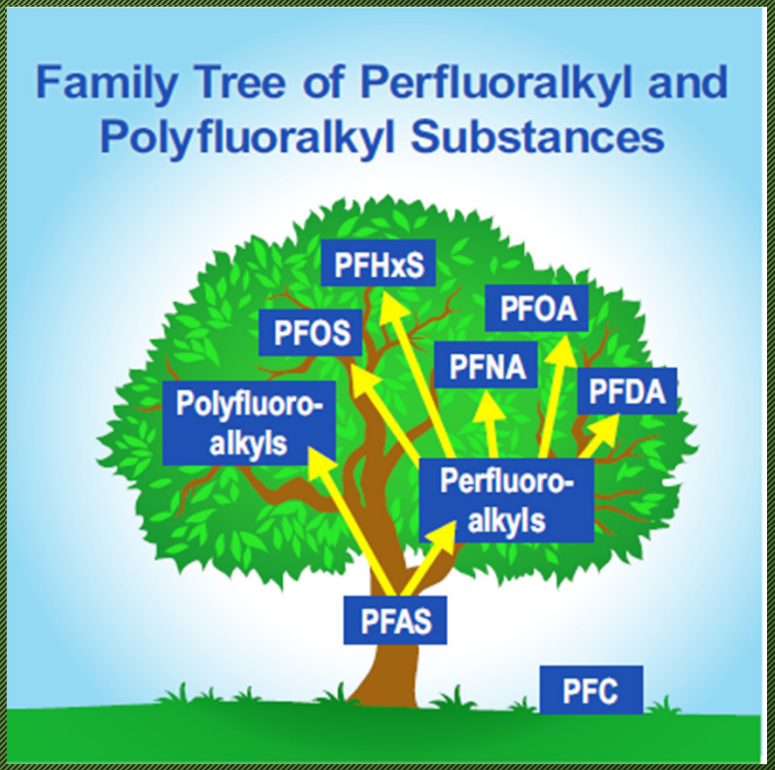

Gary
Ginsberg
NYS DOH

What are PFAS?

Environmental Advocates NY

- **PFAS** (per- and polyfluoroalkyl substances) are chemicals used in industry for their waterproof and flame retardant properties
- Commonly known as **"forever chemicals"** because they:
  - Persist in the environment
  - Accumulate in the human body
- Over **9,000** PFAS chemicals
- Highly mobile in water
- Linked to similar harmful health effects (kidney cancer, testicular cancer, low birth weight, high cholesterol, decreased vaccine response, preeclampsia, etc.)



Pennsylvania Department of Environmental Protection

Most Common Exposure Pathway

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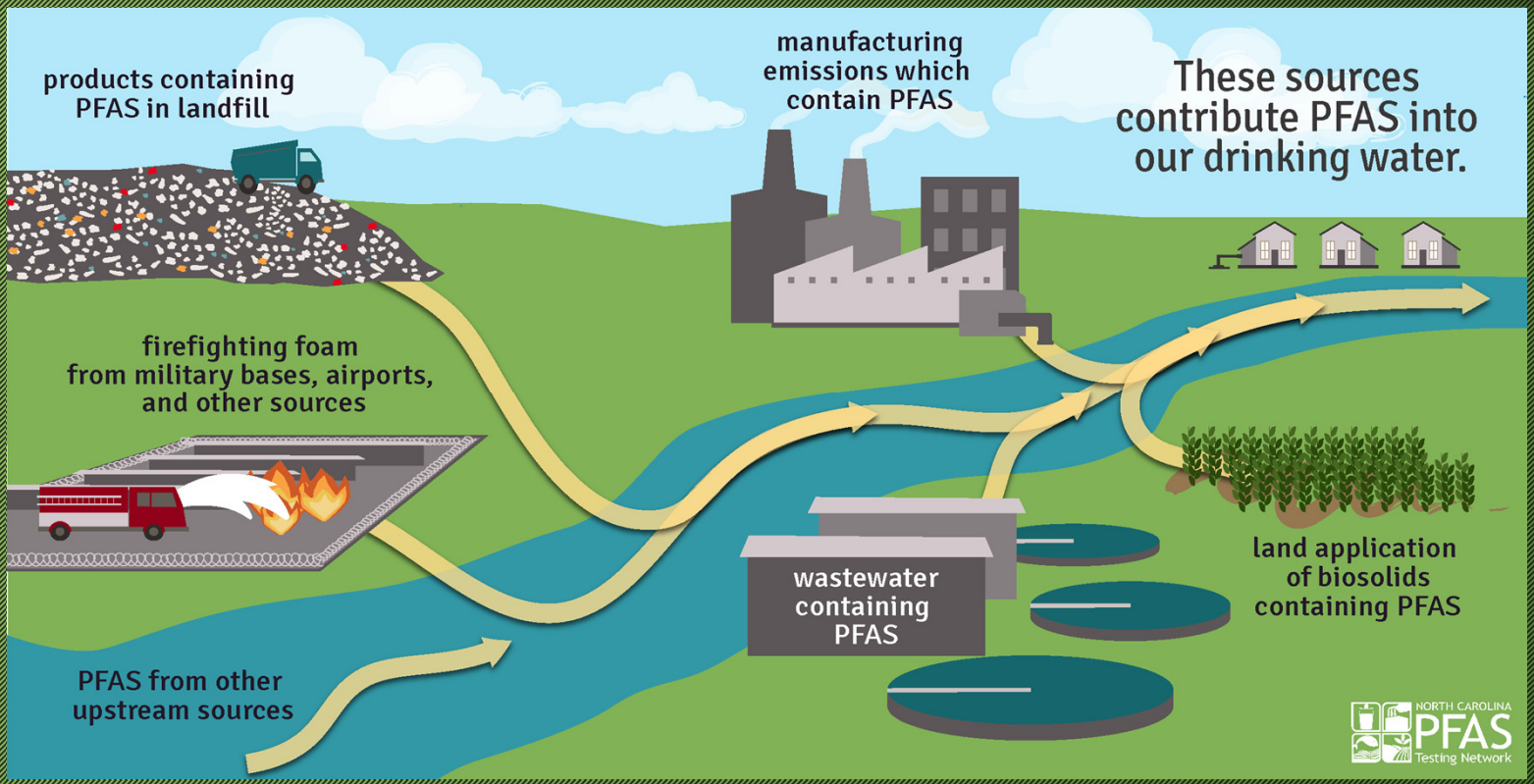

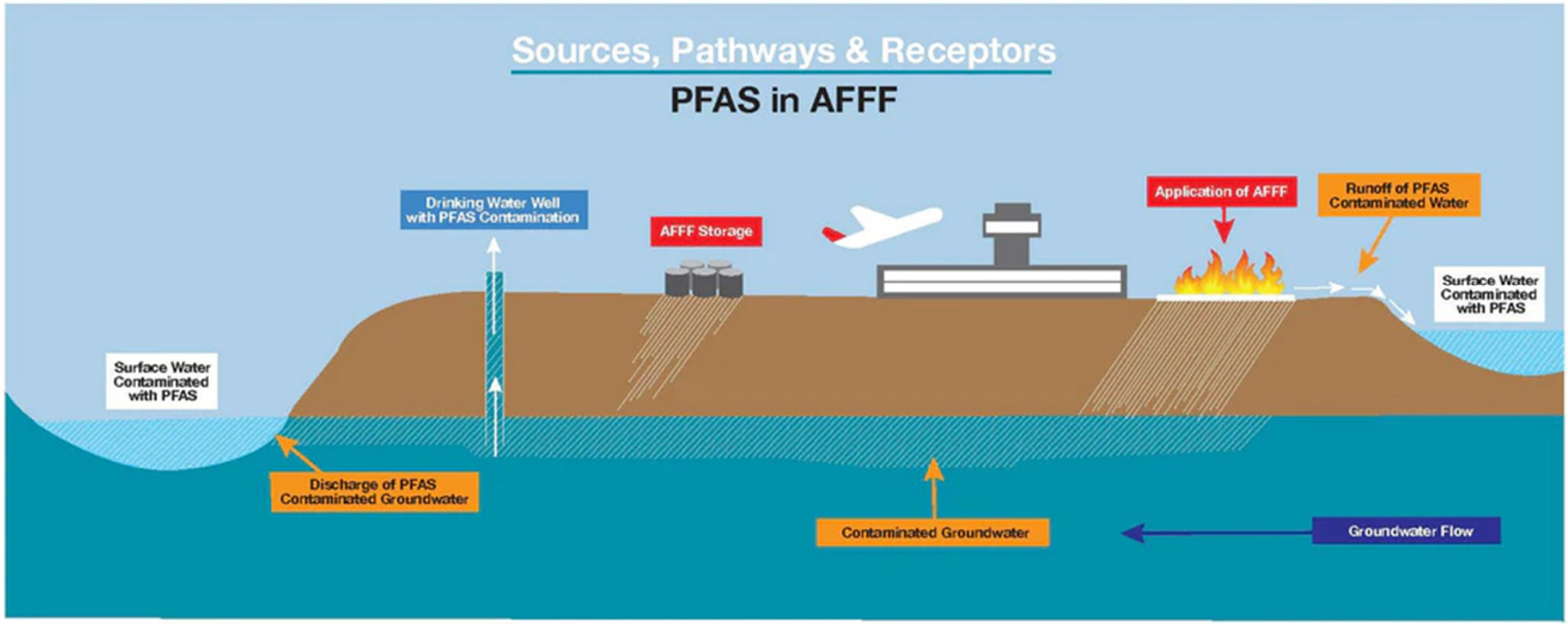

PFAS = Per - and Polyfloroalkyl Substances AFFF = Aqueous Film - Forming Foam

SCS ENGINEERS

PFAS Regulations in New York

Environmental Advocates NY

- Bans on PFAS in firefighting foam and food packaging
- Maximum Contaminant Levels (MCLs) of 10 parts per trillion (ppt) for PFOA and 10 ppt for PFOS in drinking water
  - **2** out of **9,000** chemicals
- Ban on the incineration of PFAS firefighting foam in Cohoes, NY

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New York State Drinking Water Standards for the Emerging Contaminants PFOA and PFOS

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PFAS Pathways of Human Exposure

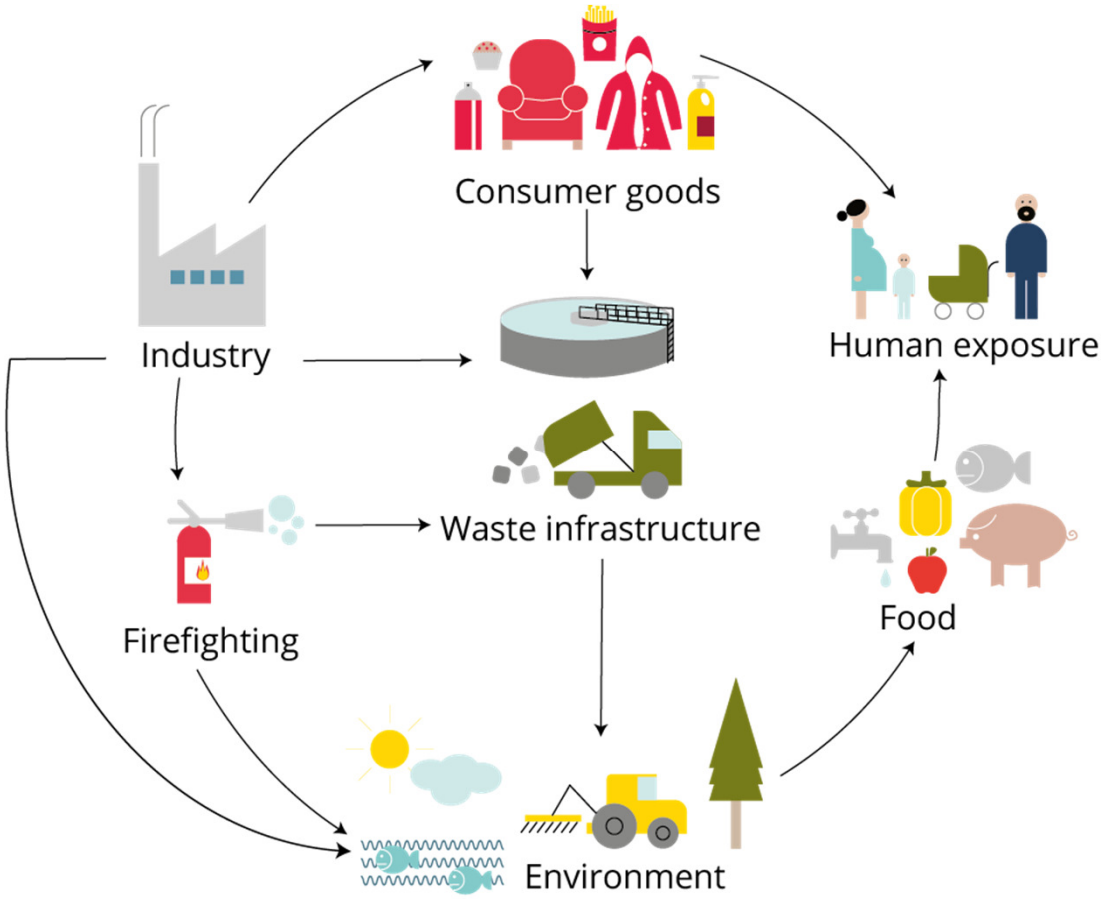

Figure from European Union, 2019l
PFAS stands for Perfluoroalkyl Substances

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Background

- New York State adopted new drinking water standards in August 2020
- Maximum contaminant levels (MCLs) set enforceable limits for contaminant levels in drinking water
- New MCLs are:
  - **PFOA, PFOS - 10 parts per trillion (ppt)**
  - 1,4-Dioxane - 1 parts per billion (ppb)
- MCLs promulgated with input from the NYS Drinking Water Quality Council (DWQC)
  - DWQC provided recommendations to DOH on emerging contaminants
  - MCLs consider health-based and risk management factors

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Considerations for Setting MCLs

- The contaminant may cause adverse health effects in people
- The contaminant occurs, or is likely to occur, in public water systems (PWSs) frequently, and at levels of potential public health concern
- Regulating the contaminant provides meaningful opportunity for health risk reduction
- It is feasible to regulate the contaminant by monitoring and detection, water treatment, and other considerations

MCL Considerations

MCLs are set based on health-based and risk management considerations to make them protective and actionable

Health-Based

- Identify most sensitive health effect levels in most sensitive species (cancer/non-cancer studies)
- Consider human exposure factors
- Derive health-protective drinking water concentration

Risk Management

- Levels of detection
- Best available treatment and feasibility
- Consistent with MCL-setting for other chemicals

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Implementation/Monitoring

- Public supplies required to begin monitoring within 60 days of publication of the final reg
  - Quarterly monitoring thereafter
  - Phased in based upon system size with smallest systems having longer time
    - Systems 10,000 or more within 60 days of adoption
    - Systems 3,300-9,999 within 90 days of adoption; and
    - Systems less than 3,300 must begin within 6 months of adoption

MCL Violation

- An exceedance defined as detection above MCL based upon average of initial and confirming sample
- Notification requirement by water supply w/in 30 days to customers
- Compliance schedule established to meet the MCL
  - Submit an action plan proposing compliance as quickly as possible, dependent upon solution, e.g.,
    - Advanced oxidation process for 1,4-dioxane
    - Granular activated carbon for PFOA/PFOS
    - Development of alternative source

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MCL Violation

- Enforcement process involving LHD and PWS.
- LHD issues Notice of Violation (NOV) with compliance steps
  - Deadline for public notice (Tier 2 – 30 days);
  - Compliance timelines established by LHD; and
  - Description of any additional monitoring, if appropriate.
- Data code entered into Safe Drinking Water Information System (SDWIS) that indicates the system is in violation and tracks enforcement actions.

More Information

Fact sheet about new MCLs from DOH
www.health.ny.gov/environmental/water/drinking/drinkingwaterprogram.htm

About PFOA and PFOS in the environment from DEC
www.dec.ny.gov/docs/water_pdf/emergingcontaminants.pdf

Per- and Polyfluoroalkyl Substances (PFAS) and Your Health
www.atsdr.cdc.gov/pfas/index.html

Questions

- Health risk and effects: email btsa@health.ny.gov
- PWS water treatment and compliance: email bpwsp@health.ny.gov

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Monitoring Deadlines

- Sample collection must begin by:
  - > 10,000 population – October 25, 2020
    - **151 systems**
  - 3,300 – 9,999 – November 25, 2020
    - **167 systems**
  - <3,300 – February 25, 2021
    - **3,242 systems**
- This does not mean all samples will be collected by this date, and it does not mean that all data will be available for regulatory review by these dates.

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PFOA/PFOS: Health Effects (Human Studies)

Human studies provide additional weight of evidence:

- Consistent effects with animal studies
- Show associations between elevated PFOA or PFOS in blood (serum levels) and health effects
  - Provides supportive qualitative information for relevant human effects; insufficient quantitative information
- Still being researched in many scientific studies
- DOH is part of a national PFAS multisite health study to learn more about PFAS human health effects

Messages about Exposure Reduction

- All MCL exceedances require actions by the water supplier to reduce levels on a strict compliance schedule
  - When notification states *water does not pose a significant health risk*, DOH determined no additional interim measures are needed as water systems take action to reduce exposure
  - If notification recommends that people not use water for drinking/food preparation, DOH determined the exceedance considerably reduces protections built into standards
  - People are informed about where to get more information and steps they can take

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PFOA/PFOS Health Effects (Animal Studies)

Animals Studies: Strongest Evidence

- Laboratory animals: Several health effects reported
- High exposures (high levels, long-term exposure) at levels well above those in drinking water

Non-cancer

- liver
- immune system
- impaired fetal growth and development

Cancer

- Rats only: lifetime studies, high exposure
- PFOA**:** testicular, liver and pancreas
- PFOS**:** liver and thyroid gland
- PFOA and PFOS have not been tested for cancer in other species
  - US EPA: *suggestive evidence of carcinogenic potential*.

Significant differences in how rodents and humans process chemicals in their bodies

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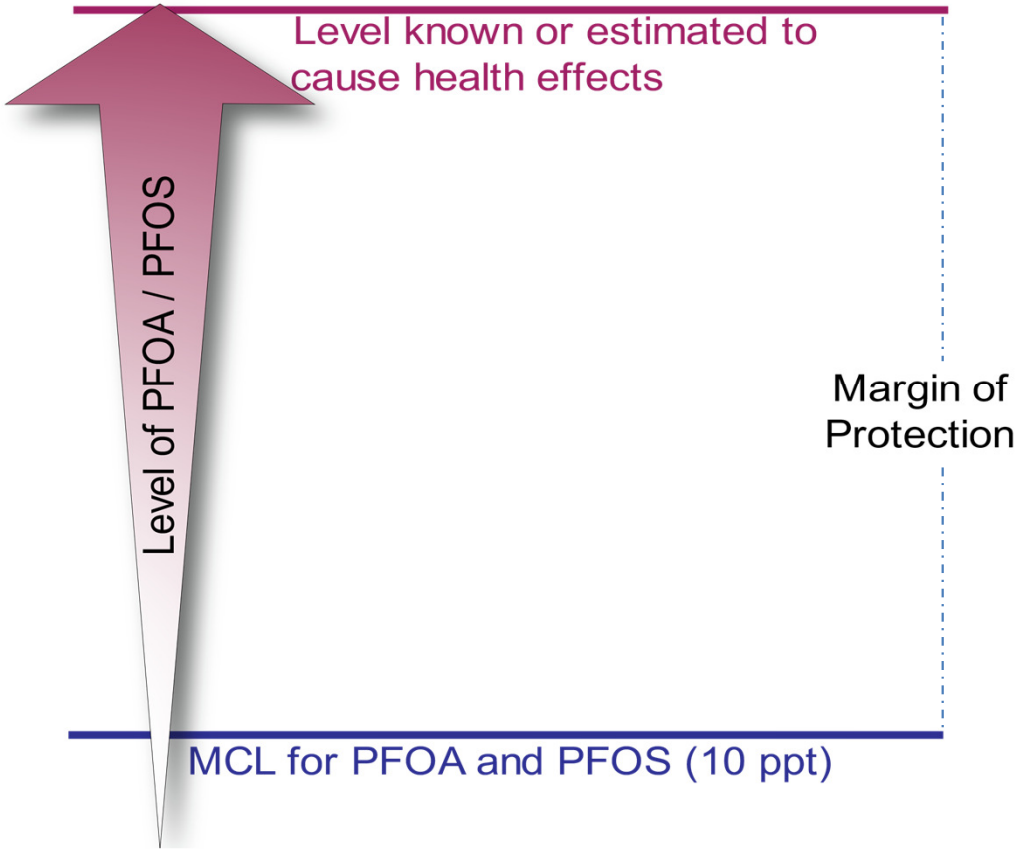
MCL Exceedances and Health Risks

- MCLs are set at levels well below those that are known or estimated to cause health effects
- Because MCLs are set at levels with a large margin of protection, an exceedance of an MCL does not signal an immediate health risk; it signals the need for water systems to take actions to reduce exposures.

PFOA / PFOS Example: MCL is a Signal to Reduce Exposure, Not a Trigger for Health Effects



- MCLs set well below levels known or estimated to cause health effects
- All PWSs must take actions when MCLs are exceeded
- The difference between the MCL and the level known or estimated to cause health effects is "**margin of protection**"
- As the levels of PFOA / PFOS in drinking water increase above the MCL, the margin of protection is reduced, and more interim actions are recommended to reduce short-term exposures

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Department of
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Conservation

New York's Ongoing Response to Emerging Contaminants

Martin Brand, Deputy Commissioner
Office of Remediation and Materials Management

July 13, 2021

Emerging Contaminants

- Emerging contaminants such as perfluorinated substances (PFAS) and 1,4–Dioxane have been found in groundwater and drinking water throughout the U.S.

- In New York, emerging contaminants are impacting public water supply systems and private drinking wells in numerous communities including:
  - Hoosick Falls, Petersburgh, Newburgh, and on Long Island.

New York's Response

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New York's Response

Absent federal leadership, New York's response to water quality issues has been immediate and extraordinary.

- January 2016: New York is first state to regulate PFOA as a hazardous substance followed by regulation of PFOS and other compounds in April 2016.
- Gov. Cuomo established Water Quality Rapid Response Team and Drinking Water Quality Council to address drinking water issues statewide.

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New York State Actions

- **Clean Water Infrastructure Act:** $5 billion for water quality and response
- **Statewide survey of 2,500 entities** where emerging contaminants may be present (e.g., airports, fire training centers, industry)
- **Evaluation of groundwater at 1,400 legacy sites** (SSF and brownfields) for PFAS and 1,4-Dioxane
- **Inactive Landfill Initiative:** Investigation of 2,000 landfills for potential drinking water impacts
- **Investigation and remediation:** Providing clean water, alternative water supplies, and treatment systems statewide

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New York State Actions

- NYS established stringent drinking water MCLs for PFOA, PFOS and 1,4-Dioxane in 2020
- Watershed and source water assessments and sampling of upstate groundwater public water systems
- Legislation and regulations limiting use of certain emerging contaminants in consumer products
- Banned use of PFAS containing Fire Fighting Foam during training, and removal and disposal of PFAS-containing foam from fire departments and emergency agencies
- Lawsuit against manufacturers of AFFF

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New York State Actions: Next Steps

- Establish Soil Cleanup Objectives for PFOA and PFOS
- Issue guidance values for PFOA/PFOS in groundwater and surface water
- Press federal government to designate PFAS as CERCLA hazardous substances; develop national drinking water standards
- Consider regulation of other PFAS substances with DOH
- Work with other agencies, academia, and technical associations to perform R&D guidance and policy
- Assess and address potential sources of contamination, research potential new cleanup techniques

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Thank You

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PFAS Treatment

July 13, 2021

Evaluating Potable Water Treatment Options

PFAS in drinking water above standards?

Step 1 – Information gathering. Remedial Engineers and/or regulators will require records and information for the water supply system such as:

- Well construction information, well production rates, and historical and current production records;
- Current and historical water quality data;
- Facility plans, piping and instrumentation diagrams, and existing equipment arrangements;
- Pump information (age, size, and capacity); and
- Schedules and plans for any planned infrastructure or maintenance projects.

Evaluating Potable Water Treatment Options (con't)

Step 2 – Concept and Pilot Testing

- **Most common and effective option for potable water treatment of PFAS is Granulated Active Carbon. Ion Exchange may be better (and cheaper) but is currently not approved by NYS.**
- **Factors such as flow rates, number of customers, number of water supply wells and locations, presence of existing treatment systems, and source of water (surface water or groundwater) will affect size and type of system installed.**
- **Pilot test will be performed in MOST cases to verify proof of concept.**
- **When can system be turned off? Must be evaluated to understand $$$.**

Evaluating Potable Water Treatment Options (con't)

Step 3 – Design, Procurement, Installation, and Operations and Maintenance

- Streamlining procurement is recommended (avoid delays).
- Identify public outreach requirements and commitments.
- Cost estimating to determine funding.
- Evaluate location (winterization requirements) and utilization of existing staff for O&M.
- Verification sampling and analysis, carbon change, system rental, and O&M labor are the big $ drivers.

PFAS Treatment Technologies – Water

Commonly Used and Proven Technologies:

- Activated Carbon
  - Regeneration feasible
  - Less effective for shorter chain PFAS
  - Competitive adsorption from contaminants and organic carbon, more $$$

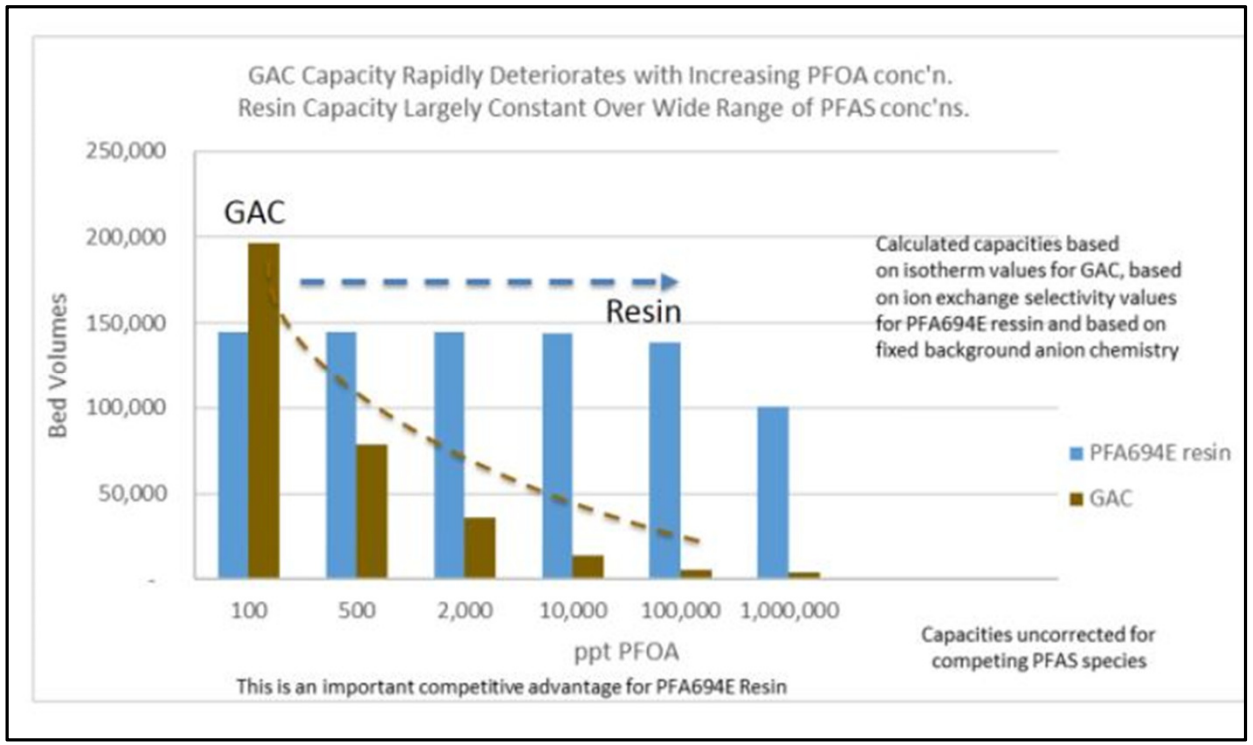
- Ion Exchange Resins
  - Pretreatment may be required.
  - Regeneration brine disposal issues
  - Not currently approved by NYSDOH for potable water.

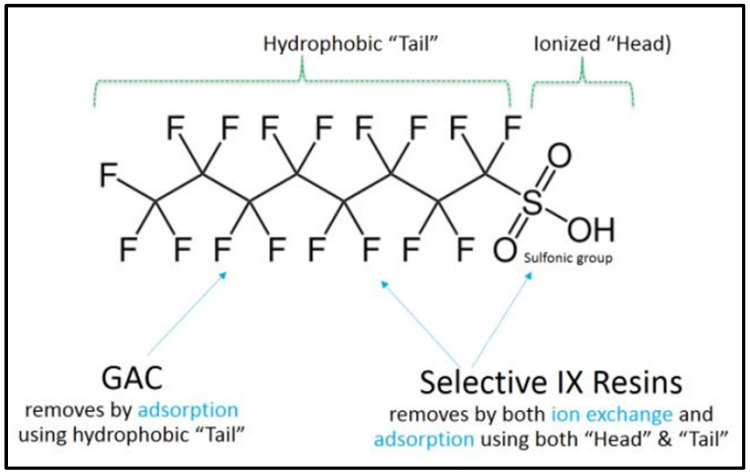
- Surface Active Foam Fractionation

GAC Filtration of PFAS

- Full-scale GAC systems have been successfully operational since the mid 2000s
- Short-chain adsorb less readily (more soluble) than long-chain
- Adsorption efficiencies are lessened by dissolved organic material (competition for adsorption sites)
- Seasonal changes in GAC should be anticipated for surface water sources
- Carbon can be regenerated; treated by incineration at >1,100^{o}C

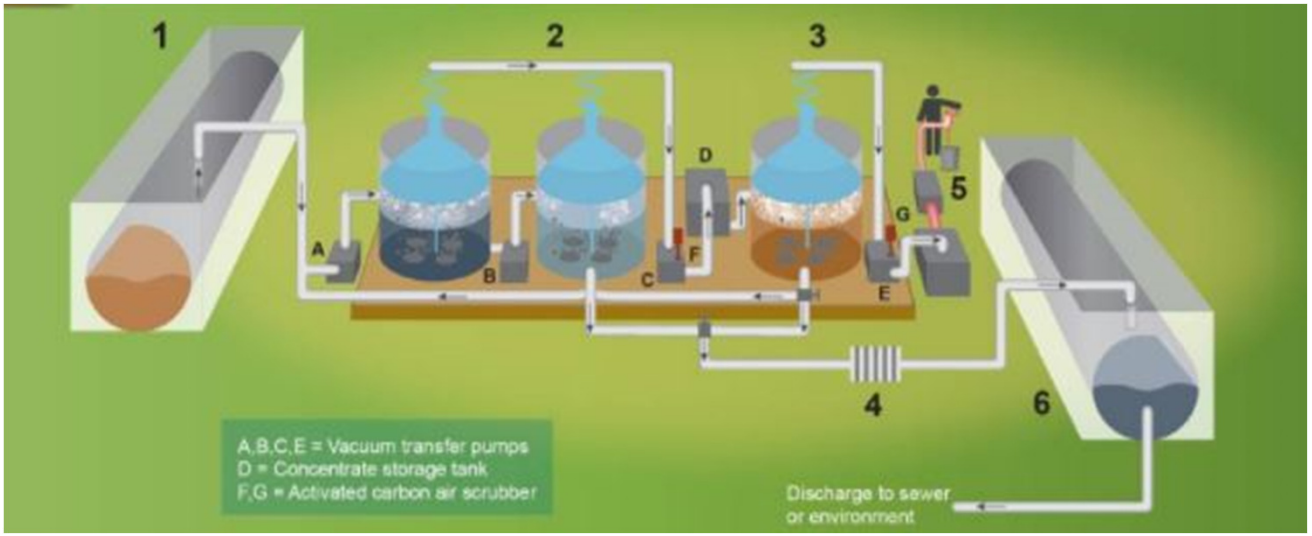
Ion Exchange Resins for PFAS Treatment





Surface Active Foam Fractionation (SAFF)

- Australian technology (OPEC Systems)
- Takes advantage of PFAS tendency to fractionate in bubbles
- Air is introduced into the column of PFAS contaminated water through a diffuser
- Bubble column rises to produce a contaminant rich foam on the surface
- Foam fraction is readily separated/extracted
- Significant sludge could be produced if water is high in dissolved solids



Questions?

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WATER CONTAMINATION

PFOA AND PFOS WATER CONTAMINATION & COST RECOVERY PROGRAM

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PFAS Background

What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s.

***

PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects.

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PFAS Exposure

PFAS are a group of man-made chemicals that have been in use since the 1940s and are (or have been) found in many consumer products like cookware, food packaging, and stain repellants, PFAS manufacturing and processing facilities, airports, and military installations, that use firefighting foams are some of the main sources of PFAS.

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PFAS Background

What are PFAS?

Environmental

Perfluoroalkyls are very stable compounds and are resistant to biodegradation, direct photolysis, atmospheric photooxidation, and hydrolysis (3M 2000; EPA 2008a; OECD 2002, 2007; Schultz et al. 2003). The chemical stability of perfluoroalkyls and the low volatility of these substances in ionic form indicate that perfluoroalkyls will be persistent in water and soil (3M 2000; Prevedouros et al. 2006).

***

[Indicating that the compounds do not easily chemically react with their environment or break down]

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PFAS Emissions

PFAS have been manufactured for more than 50 years where the substances PFOS and PFOA are part of a group of old-generation PFAS which will be used to a lesser extent in the future due to their potential hazards.

***

These hazards have resulted and will result in [litigation] and a number of [national] and international legislative bans worldwide.

Source: epa.gov

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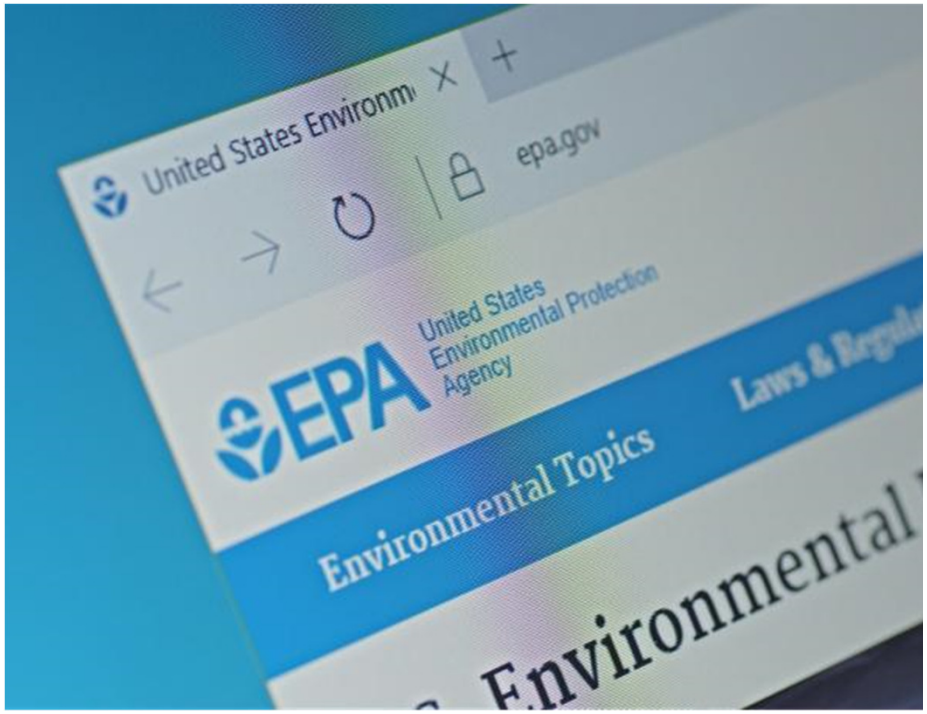
Why Are PFAS Bad?

Effects of Exposure per the Center for Disease and Control Prevention (CDC) and the Environmental Protection Agency (EPA)



CDC: PFAS are extremely persistent in the environment and resistant to typical environmental degradation processes.

CDC: PFOS and PFOA also persist in the human body and are eliminated slowly, with a half life of 2 to 9 years.

EPA: Exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes).

Citations
1. Olsen et al. 2007a
2. IARC 2017
3. EPA 2016e, 2016f

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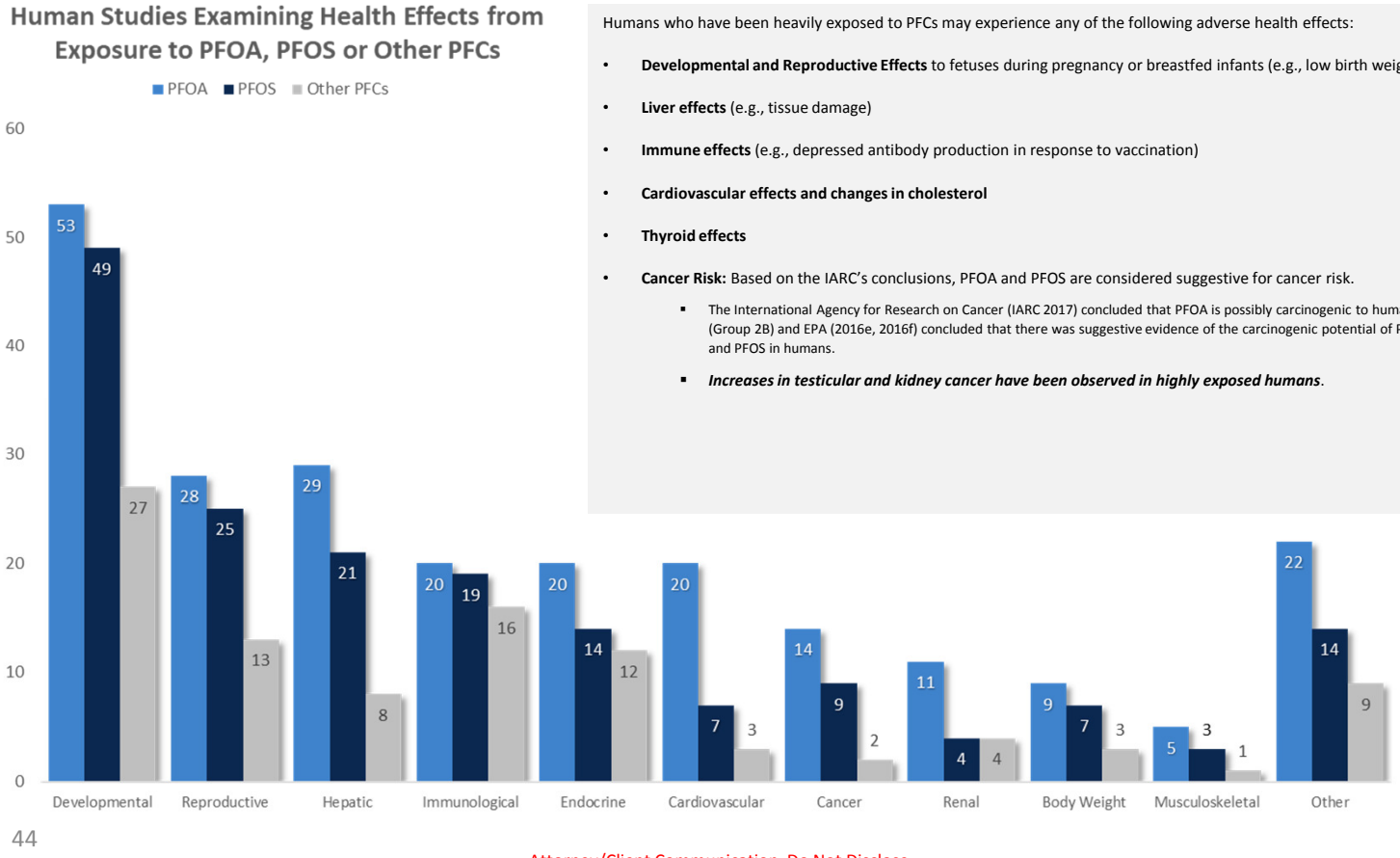
Why Are PFAS Bad?

Adverse Health Effects in Humans



Humans who have been heavily exposed to PFCs may experience any of the following adverse health effects:

- **Developmental and Reproductive Effects** to fetuses during pregnancy or breastfed infants (e.g., low birth weight)
- **Liver effects** (e.g., tissue damage)
- **Immune effects** (e.g., depressed antibody production in response to vaccination)
- **Cardiovascular effects and changes in cholesterol**
- **Thyroid effects**
- **Cancer Risk:** Based on the IARC's conclusions, PFOA and PFOS are considered suggestive for cancer risk.
  - The International Agency for Research on Cancer (IARC 2017) concluded that PFOA is possibly carcinogenic to humans (Group 2B) and EPA (2016e, 2016f) concluded that there was suggestive evidence of the carcinogenic potential of PFOA and PFOS in humans.
  - ***Increases in testicular and kidney cancer have been observed in highly exposed humans***.

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PFOA/PFOS
Contamination
Where did it come from?
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PFAS Contamination

Where did they come from?

PFOA/PFOS Manufacturers

PFOA was produced by eight major US companies, including:

- Arkema
- Asahi
- Ciba
- Clariant
- Daikin
- DuPont
- 3M/Dyneon (primary producer)
- Solvay Solexis

PFOS was solely produced by one company in the United Sates: 3M

AFFF Manufacturers

PFOS-based aqueous film-forming foam (AFFF) was produced by six manufacturing companies, including:

- Ansul
- Chemguard
- DuPont
- Dynax
- Kidde
- Solberg

Together these companies have formed the Firefighting Foam Coalition (FCC) to represent the industry's interests on issues related to the environment.

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AFFF Background

How are AFFFs used?

- In the military and in airports across the country, PFCs were most commonly used in firefighting foams, referred to as **Aqueous Film-Forming Foam (AFFF).**
- The foam and film layers act to separate oxygen from the fuel surface and are therefore able to stop the chemical reaction from burning.
- Military and airport personnel have practiced putting out fires with AFFF at numerous Fire/Crash Training Areas located at airports and military bases nationwide.

Military Specification (MILSPEC)

AFFF is either 3% or 6% by volume in a solution of water.

MILSPEC AFFF is used to extinguish Class B (flammable liquid) fuel fires.

Oftentimes, this training occurred in **burn pits**, recognizable by a blackened, repeatedly-burned airplane frame at the center of an unlined dirt pit.

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AFFF Training

While all fire fighting requires training, **putting out fuel fires via AFFF requires more rigorous *[and repeated]* training** due to the complicated nature of the equipment used and various techniques of application.

***

The repetitive nature of AFFF training can lead to increased likelihood of contamination to the nearby environment.

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Causes of Action

The sovereigns assert several causes of action.
The claims include, among others:

- **negligence,**
- **public and private nuisance,**
- **trespass,**
- **defective product design,**
- **failure to warn, and**
- **restitution/unjust enrichment.**
- **In the event PFAS become a listed hazardous substance under CERCLA, we could include this cause of action to recover under 107(a)(4)(B).**

In addition, some of the sovereigns assert various statutory claims against the product manufacturers, including violation of consumer protection statutes, and state environmental statutes, and fraudulent transfer laws.

The State would be entitled to the reimbursement for all costs attributable to the remediation and abatement of PFAS contamination, including: (a) damages for destruction or loss of natural resources, including costs of assessing the damages; (b) capital and operation and maintenance (O&M) costs for treatment systems to remove the contaminants; (c) past and future sampling/monitoring costs of the State's natural resources at and around the sites; (d) costs to clean up contaminated sites to prevent further groundwater supply contamination; and (e) punitive Damages.

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LaBella has been at the forefront of investigating and remediating PFAS across NYS, working with the NYSDEC, county, municipal, and landfill clients to evaluate and, if necessary, remediate sites with PFAS impacts. LaBella has also assisted clients with addressing PFAS in drinking water—designing and installing PFAS treatment for small scale residential point of entry treatment systems (POETs) as well as large-scale municipal drinking water treatment and distribution systems.