

PFAS (Per-and Polyfluoroalkyl Substances) The City and County of Broomfield

City and County of Broomfield Industrial Pretreatment Department
Leigha Gad

Agenda

PFAS Overview

City and County of Broomfield PFAS Permit Timeline

City and County of Broomfield Permit Sampling

Source Investigation Study Sampling and Inspections

Challenges

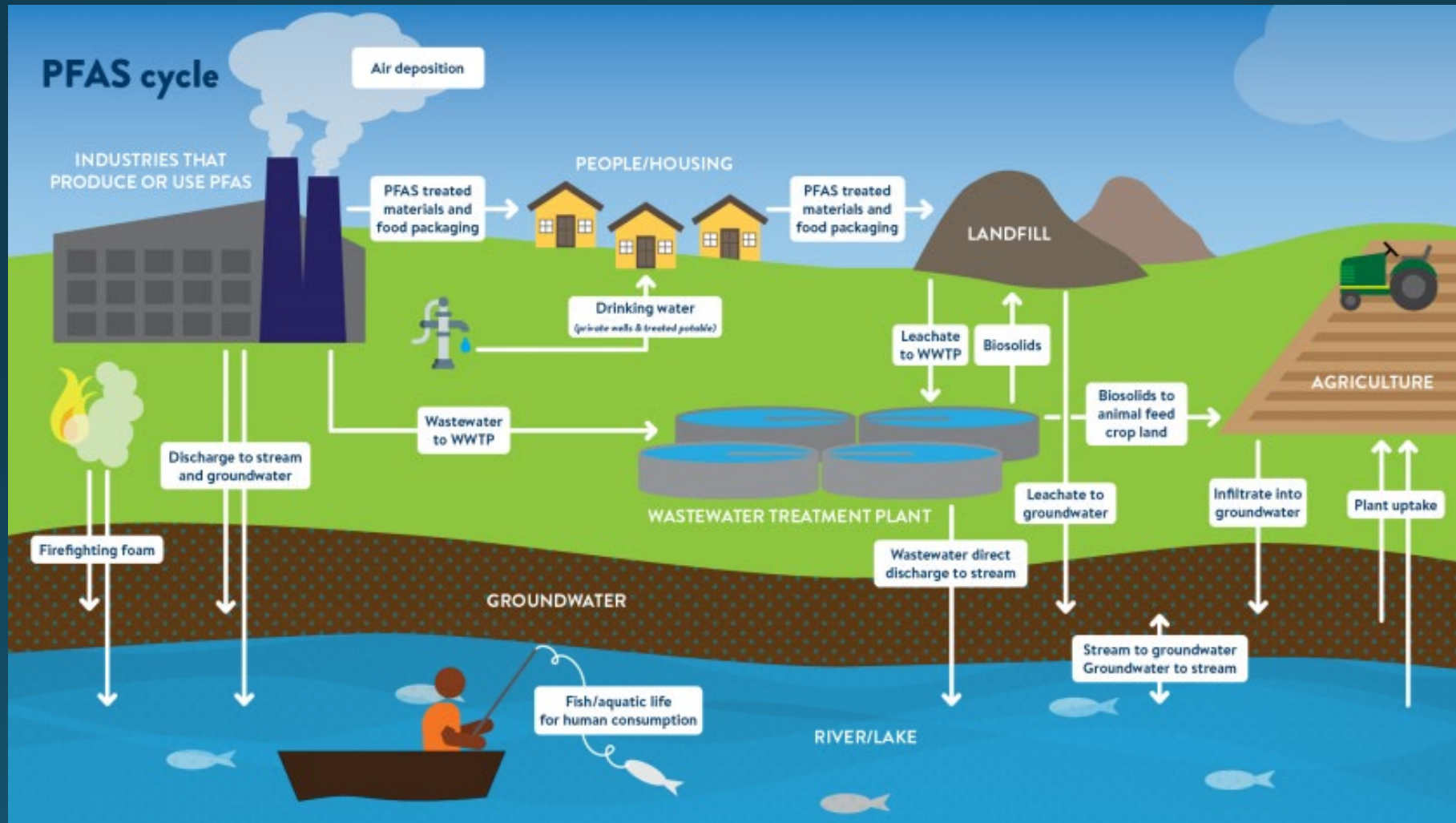
Current and Future of PFAS

What is PFAS?

- The per- and polyfluoroalkyl substances (PFAS) are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water. PFAS can be in a variety of products. These include clothing, furniture, adhesives, food packaging, AFFF foam, and non-stick cooking surfaces. There are now over 9,000 PFAS compounds.
- PFAS are a concern because they:
 - do not break down in the environment.
 - can move through soils and contaminate water sources.
 - bio accumulate in fish and wildlife.
 - potential to cause adverse health effects.



PFAS Water Cycle



The City and County of Broomfield (CCOB) Permit Timeline for PFAS

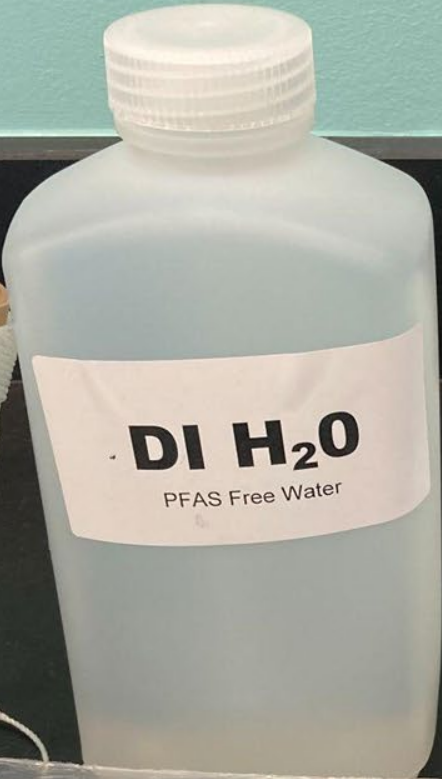
- **January 2020**- CCOB permit was reissued.
- **August 2020**-Completed the Colorado Department of Public Health and Environment (CDPHE) PFAS Survey.
- **May 2021**-Notification of potential permit modifications for wastewater permits to include PFAS monitoring.
- **August 2021**-CCOB received a call that the CCOB permit will implement PFAS monitoring. Draft public notice and commenting period took place.
- **November 2021**-CCOB permit was officially reopened to include PFAS monitoring.
- **January 2022**-CCOB CDPS Permit went into effect for PFAS sampling at the Effluent and Reuse Effluent.
 - Sampling 25 PFAS Parameters with the most current method (537 modified water method)
- The permit modification included a PFAS Source Identification Study. Due June 30, 2024.
 - “Submit final study results summarizing PFAS influent and effluent data to date, analyzing temporal trends or patterns in the data, and identifying sources of PFAS to the facility. Source investigations could include identifying potential sources, evaluation source control options, industrial user inventories, or other investigations.”
- **August 2022**-Notification of another permit modification occurred to now include 40 PFAS parameters and to implement the new draft 1633 method.
 - CCOB submitted comments by 9/12/22, so our permit is currently under review from CDPHE.

City and County of Broomfield Permit Sampling

- Locations: Effluent and Reuse
- Sample Collection: Bailer and direct outfall grab
- Blanks: Equipment Blank (Bailer) and Field Blank for each location, PFAS Free Water
- Clothing: 100% Cotton shirt, jeans, steel toe boots, and no personal care products containing PFAS
- Analysis: EPA 537 Modified Water Method, now to be switched to the draft 1633 method
- Parameters: 25 PFAS parameters and a sum equation of 7 parameters, now to be switched to 40 PFAS parameters
- Duration: Monthly monitoring January 2022-December 2023
- Report: Monthly DMR

Source Investigation Sampling

- Locations: Influent, 6 Domestic Areas, 4 Industrial Areas, 2 Airport Areas, and 3 Discharging Industries
- Sample Collection: Bailer and portable sampler
- Blanks: Equipment Blank (Bailer or portable sampler) and Field Blank for each location, PFAS Free Water
- Clothing: 100% Cotton shirt, jeans, steel toe boots, and no personal care products containing PFAS
- Analysis: EPA 537 Modified Water Method, now to be switched to the draft 1633 method
- Parameters: 25 PFAS parameters and a sum equation of 7 parameters, now to be switched to 40 PFAS parameters
- Duration: Bi-Monthly sampling events for the CDPHE PFAS Grant and then re-evaluate more sampling
- Report: Source Investigation Study to the State due June 30, 2024



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Disposal of this product is the
responsibility of the user and
should be in compliance with
all applicable local, state,
federal and international
regulations.

ICIS Code	Effluent Parameter	Effluent Limitation		Monitoring Requirements	
		Daily Maximum	30-day Average	Frequency	Sample Type
51521	Perfluorooctanoic Acid [PFOA], ng/l	Report	Report	Monthly	Grab
51522	Perfluorobutanoic Acid [PFBA], ng/l	Report	Report	Monthly	Grab
51525	Perfluorooctanesulfonamide [PFOSA (or FOSA)], ng/l	Report	Report	Monthly	Grab
51623	Perfluoropentanoic acid [PFPeA], ng/l	Report	Report	Monthly	Grab
51624	Perfluorohexanoic acid [PFHxA], ng/l	Report	Report	Monthly	Grab
51625	Perfluoroheptanoic acid [PFHpA], ng/l	Report	Report	Monthly	Grab
51626	Perfluorononanoic acid [PFNA], ng/l	Report	Report	Monthly	Grab
51627	Perfluorodecanoic acid [PFDA], ng/l	Report	Report	Monthly	Grab
51628	Perfluoroundecanoic acid [PFUnA (or PFUdA)], ng/l	Report	Report	Monthly	Grab
51629	Perfluorododecanoic acid [PFDoA], ng/l	Report	Report	Monthly	Grab
51630	Perfluorotridecanoic acid [PFTrDA (or RFTriA)], ng/l	Report	Report	Monthly	Grab
51631	Perfluorotetradecanoic acid [PFTeDA (or PFTA or PFTeA)], ng/l	Report	Report	Monthly	Grab
51643	2-[N-ethylperfluorooctanesulfonamido] acetic acid [NEtFOSAA], ng/l	Report	Report	Monthly	Grab
51644	2-[N-methylperfluorooctanesulfonamido] acetic acid [NMeFOSAA], ng/l	Report	Report	Monthly	Grab
52602	Perfluorobutanesulfonic acid [PFBS], ng/l	Report	Report	Monthly	Grab
52603	Perfluorodecanesulfonic acid [PFDS], ng/l	Report	Report	Monthly	Grab
52604	Perfluoroheptanesulfonic acid [PFHpS], ng/l	Report	Report	Monthly	Grab
52605	Perfluorohexanesulfonic acid [PFHxS], ng/l	Report	Report	Monthly	Grab
52606	Perfluorooctanesulfonic acid [PFOS], ng/l	Report	Report	Monthly	Grab
52607	4:2 Fluorotelomer sulfonic acid [4:2 FTS], ng/l	Report	Report	Monthly	Grab
52608	6:2 Fluorotelomer sulfonic acid [6:2 FTS], ng/l	Report	Report	Monthly	Grab
52609	8:2 Fluorotelomer sulfonic acid [8:2 FTS], ng/l	Report	Report	Monthly	Grab
52610	Perfluoropentane sulfonic acid [PFPeS], ng/l	Report	Report	Monthly	Grab
52611	Perfluorononane sulfonic acid [PFNS], ng/l	Report	Report	Monthly	Grab
52612	Hexafluoropropylene oxide dimer acid [Gen-X (or HFPO-DA or HPFA-DA)], ng/l	Report	Report	Monthly	Grab
87006	PFAS Sum, ng/l*	Report	Report	Monthly	Calculated

*The PFAS sum is calculated based on the following equation:

$$PFAS\ Sum\ (ng/l) = [PFOA]\ (ng/l) + [PFOSA]\ (ng/l) + [PFNA]\ (ng/l) + ([NEtFOSAA]\ (ng/l) * 0.85) + ([NMeFOSAA]\ (ng/l) * 0.88) + [PFOS]\ (ng/l) + ([8:2\ FTS]\ (ng/l) * 0.78)$$

CIS Code	Effluent Parameter	Effluent Limitation		Monitoring Requirements	
		Daily Maximum	30-day Average	Frequency	Sample Type
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52606	Perfluorooctanesulfonic acid [PFOS], ng/l	Report	Report	Monthly	Grab
52607	4:2 Fluorotelomer sulfonic acid [4:2 FTS], ng/l	Report	Report	Monthly	Grab
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87006	PFAS Sum, ng/l*	Report	Report	Monthly	Calculated
51641	N-ethyl perfluorooctanesulfonamidoethanol [NEtFOSE], ng/l	Report	Report	Monthly	Grab
51642	N-methyl perfluorooctanesulfonamidoethanol [NMeFOSE], ng/l	Report	Report	Monthly	Grab
52624	Perfluoro-3-methoxypropanoic acid [PFMPA], ng/l	Report	Report	Monthly	Grab
52629	Perfluoro(2-ethoxyethane)sulfonic acid [PFEEESA], ng/l	Report	Report	Monthly	Grab
52632	Perfluorododecanesulfonic acid [PFDoS], ng/l	Report	Report	Monthly	Grab
52636	4,8-Dioxa-3H-perfluorononanoic acid [ADONA], ng/l	Report	Report	Monthly	Grab
52638	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid [9CL-PF3ONS], ng/l	Report	Report	Monthly	Grab
52639	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid [11CL-PF3OUDS], ng/l	Report	Report	Monthly	Grab
52641	N-methyl perfluorooctanesulfonamide [NMeFOSA], ng/l	Report	Report	Monthly	Grab

52642	N-ethyl perfluorooctanesulfonamide [NEtFOSA], ng/l	Report	Report	Monthly	Grab
52626	Nonafluoro-3,6-dioxaheptanoic acid [NFDHA], ng/l	Report	Report	Monthly	Grab
**	Perfluoro-4-methoxybutanoic acid [PFMBA], ng/l	Report**	Report**	Monthly	Grab
**	3-Perfluoropropyl propanoic acid [3:3 FTCA], ng/l	Report**	Report**	Monthly	Grab
**	2H,2H,3H,3H-Perfluorooctanoic acid [5:3 FTCA], ng/l	Report**	Report**	Monthly	Grab
**	3-Perfluoroheptyl propanoic acid [7:3 FTCA], ng/l	Report**	Report**	Monthly	Grab

*The PFAS sum is calculated based on the following equation:

$$PFAS\ Sum\ (ng/l) = [PFOA]\ (ng/l) + [PFOSA]\ (ng/l) + [PFNA]\ (ng/l) + ([NEtFOSAA]\ (ng/l) * 0.85) + ([NMeFOSAA]\ (ng/l) * 0.88) + [PFOS]\ (ng/l) + ([8:2\ FTS]\ (ng/l) * 0.78)$$

This calculation is performed for each sampling event, and the resulting daily maximum and 30-day average results shall be reported on the discharge monitoring report submitted for the monthly monitoring period.

**Note the division does not currently have EPA ICIS codes for the following 4 parameters:

Perfluoro-4-methoxybutanoic acid [PFMBA], ng/l
3-Perfluoropropyl propanoic acid [3:3 FTCA], ng/l
2H,2H,3H,3H-Perfluorooctanoic acid [5:3 FTCA], ng/l
3-Perfluoroheptyl propanoic acid [7:3 FTCA], ng/l

Source Investigation Surveys/Inspections

- CCOB IPP started to send out PFAS specific industrial wastewater questionnaires to permitted industries.
- Questions in the survey:
 - AFFF Foam, “B” class foam
 - Type of business (covering IPP IU classification and including some PFAS specific processes)
 - Aware of any effluent discharge from the facility of PFAS
 - Use of any products specifically from the vendors: “Dow, CHEM-GUARD, 3M, and Dupont”
- Providing an Education pamphlet with survey
- Inspections
 - Depending on the response, inspections will occur



PFAS

(Per- and polyfluoroalkyl substances)

HOW THIS IMPACTS YOU:

PFAS chemicals are a rising topic across the country. The City and County of Broomfield's Industrial Pretreatment Program is working to identify, study, and determine the presence of PFAS chemicals in Broomfield's wastewater. By filling out a questionnaire about your business, this will help us have a better understanding of the sources of PFAS chemicals within the City and County of Broomfield.



WHAT IS PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a diverse group of human-made chemicals used in a wide range of consumer and industrial products. They are often referred to as the "forever" chemicals, because of their carbon-fluoride bonds. There are thousands of PFAS chemicals identified. PFAS chemicals are resistant to grease, oil, water, and heat. PFAS chemicals are used in a variety of applications as noted in the image above.

WHAT WE KNOW:

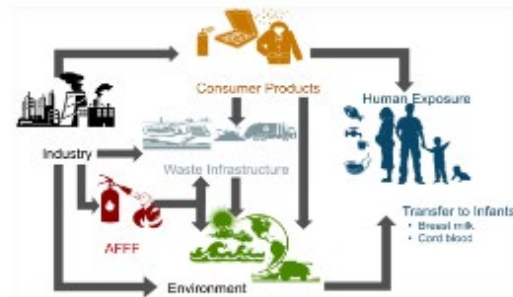
PFAS chemicals are widely used, long lasting chemicals, components of which break down very slowly over time.

Because of their widespread use and their persistence in the environment, many PFAS chemicals are found in the blood of people and animals all over the world and are present at low levels in a variety of food products and the environment.

PFAS chemicals are found in water, air, fish, and soil at locations across the world.

Build up (bioaccumulate) in fish and wildlife.

Scientific studies have shown that exposure to some PFAS chemicals in the environment may be linked to harmful health effects in humans.



For additional information, please visit <https://www.epa.gov/pfas>.

Preliminary Data

- PFAS is present in CCOB wastewater.
- CCOB IPP has performed 4 sampling events to date for the Source investigation study (January-April) and the US Forest Service.
- Not all 25 parameters are present in CCOB wastewater.
 - Usually the same 9 parameters
- CCOB has found most PFAS has been found in industrial areas and not in the domestic areas.
- CCOB has higher PFAS results in collection system, lower PFAS results at the wastewater plant. (influent highest: 10ppt)
- Effluent has higher PFAS results than the Influent (Effluent Avg: 12ppt).
- Effluent and Reuse results are very similar.
- Airport has not discharged any AFFF Foam, but we are getting high results of PFAS.
- Some PFAS constituents are parent compounds and are potentially breaking down into other PFAS constituents.

Source Investigation Sampling/Data US Forest Service

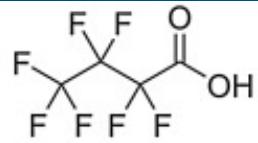
- The US Forest Service Department is a facility located at JeffCo Airport that has fire retardant on site. Fueling and fire retardant filling processes-most planes go out of state.
- US Forest Service stated they had no PFAS in any of their fire retardant products in 2020.
- US Forest Service had an illicit discharge in August.
 - Amount: 110 gallons of mixed retardant with another 1,000 gallons of water
- IPP sampled for local limits and PFAS.
- PFAS results came back with about 5 parameters and the highest result was 28ppt.



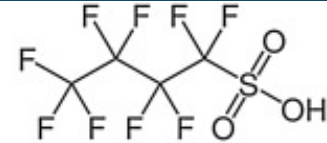
Challenges

- Money/budget-
 - \$300 per sample for the current method (537 modified)
 - Draft 1633 method estimated \$600 per sample
 - \$60,000 for 3 sampling events at 15 location sites, includes samples and blanks
- Time-Sampling/Prep, Data Processing/Entry, Research
 - Personell spend about 50% of our time on PFAS
- Resources- Time, money, and people
- Learning Curve
 - Lack of regulations and information
 - Policy 20-1
- Products that contain these PFAS constituents
 - An industrial user checked for PFAS
- PFAS constituent names





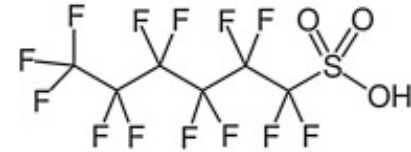
Perfluorobutanoic acid (PFBA)



Perfluorobutane sulfonic acid (PFBS)



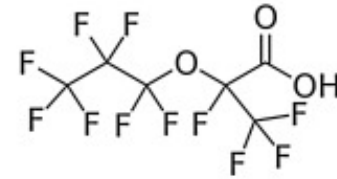
Perfluoroheptanoic acid (PFHpA)



Perfluorohexane sulfonic acid (PFHxS)



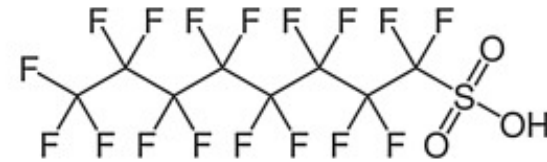
Perfluorooctanoic acid (PFOA)



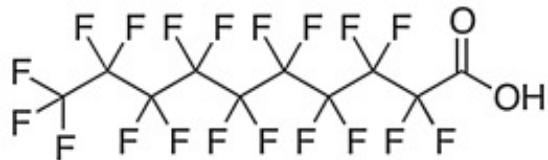
Hexafluoropropylene oxide dimer acid (HFPO-DA or GenX)



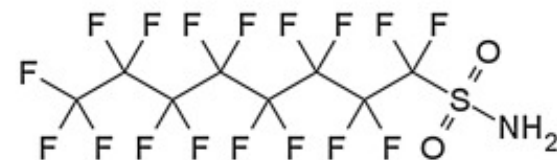
Perfluorononanoic acid (PFNA)



Perfluorooctane sulfonic acid (PFOS)



Perfluorodecanoic acid (PFDA)



Perfluorooctanesulfonamide (PFOSA)

Challenges Continued

- Sampling challenges:
 - Safety
 - Aware of surroundings
 - Contamination
- Contract Lab-testing delays
 - Issues with sending samples out (FedEx)
- EPA 537 Water Modified Method is the current approved wastewater method
 - Draft 1633 method is set to be approved by Fall 2022/Summer 2023??
 - Similar to the current method
- Data
 - Dilution factors with the current 537 method for wastewater samples
 - 5x-100x dilution
 - Reporting limit over 200 ng/L

Current and Future of PFAS

- There are still many questions and research to be done about PFAS.
- EPA will designate certain PFAS as Hazardous Substance under CERCLA by Summer 2023
- Current EPA Health Advisory Limit for drinking water was recently changed from 70ppt to:
 - Interim updated health advisory for PFOA = 0.004 ppt
 - Interim updated health advisory for PFOS = 0.02 ppt
 - Final health advisory for GenX chemicals = 10 ppt
 - Final health advisory for PFBS = 2,000 ppt
- Potential regulatory requirements:
 - Stormwater
 - Groundwater
 - Drinking water (UCMR-5)
 - Biosolids
 - Coming to wastewater permits in 2023.



Current and Future PFAS Recent Experience

- On May 11, 2022 there was an airplane crash from Jeffco Airport.
- AFFF foam was used on the plane crash.
 - Estimated 34 gallons of PFAS foam/ mixed with about 1000 gallons of water discharged
- Disposal: Contaminated soil was held on Broomfield property for 5 months and just last week it was hauled off to a proper disposal site.



Questions?

Contacts:

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