

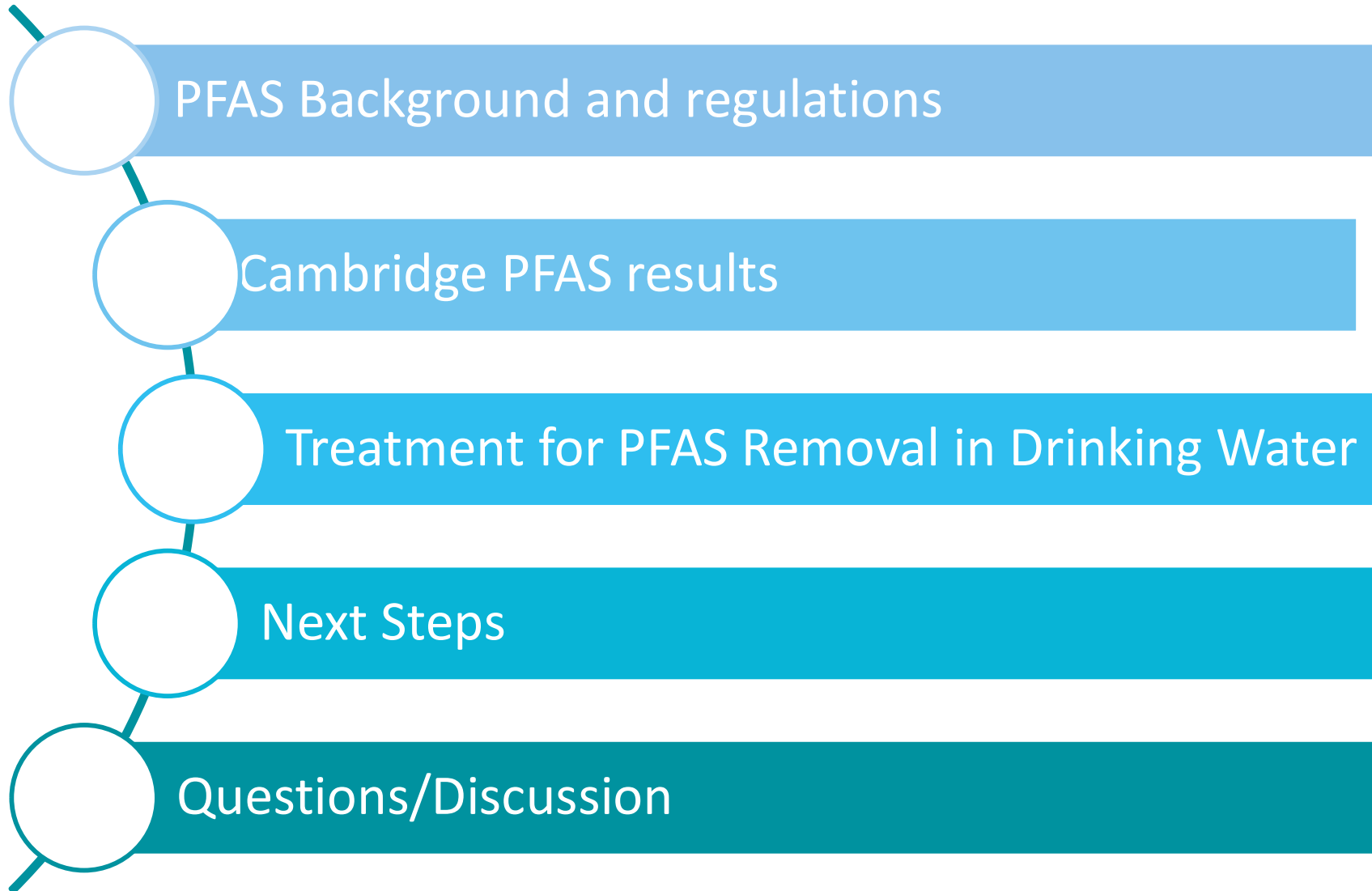
# PFAS Update

City of Cambridge  
Water Board Meeting

May 10, 2022



# OUTLINE



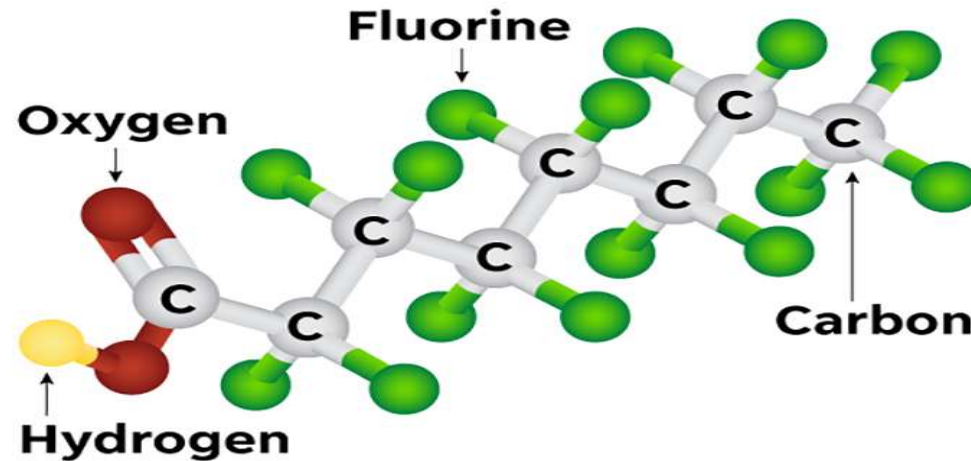


# PFAS Background and regulations



# What are PFAS?

## Per- and Poly Fluoro Alkyl Substances



- A group of persistent synthetic compounds used to make fluoropolymer coatings and products that resist:

**HEAT**

**GREASE**

**OIL**

**STAINS**

**WATER**

# Characteristics



# PFAS in Manufactured Products

They were once thought of as a “*miracle substance*” especially for commercial applications such as:

- Stain & water-resistant fabrics
- Non-stick products & coatings
- Polishes
- dental floss
- cosmetics
- firefighting foams
- fast food packaging
- waxes

## Early History of PFAS

- Invented in the 1930s
- First produced by 3M in 1949
- Approved for food packaging in 1967
- Production of aqueous film forming foams (AFFF) increased in the late 1960s
- 2002 3M voluntarily phases out long chain PFAS (PFOS and PFOA)



# Other Industrial Sources

- Facilities using or storing aqueous film forming foams (AFFF)
  - Airports
  - Oil refineries
  - Fire training facilities
  - Fire stations
- Manufacturing air emissions
- Chrome plating
- Other areas where detected:
  - Landfill leachates
  - Wastewater
  - Biosolids



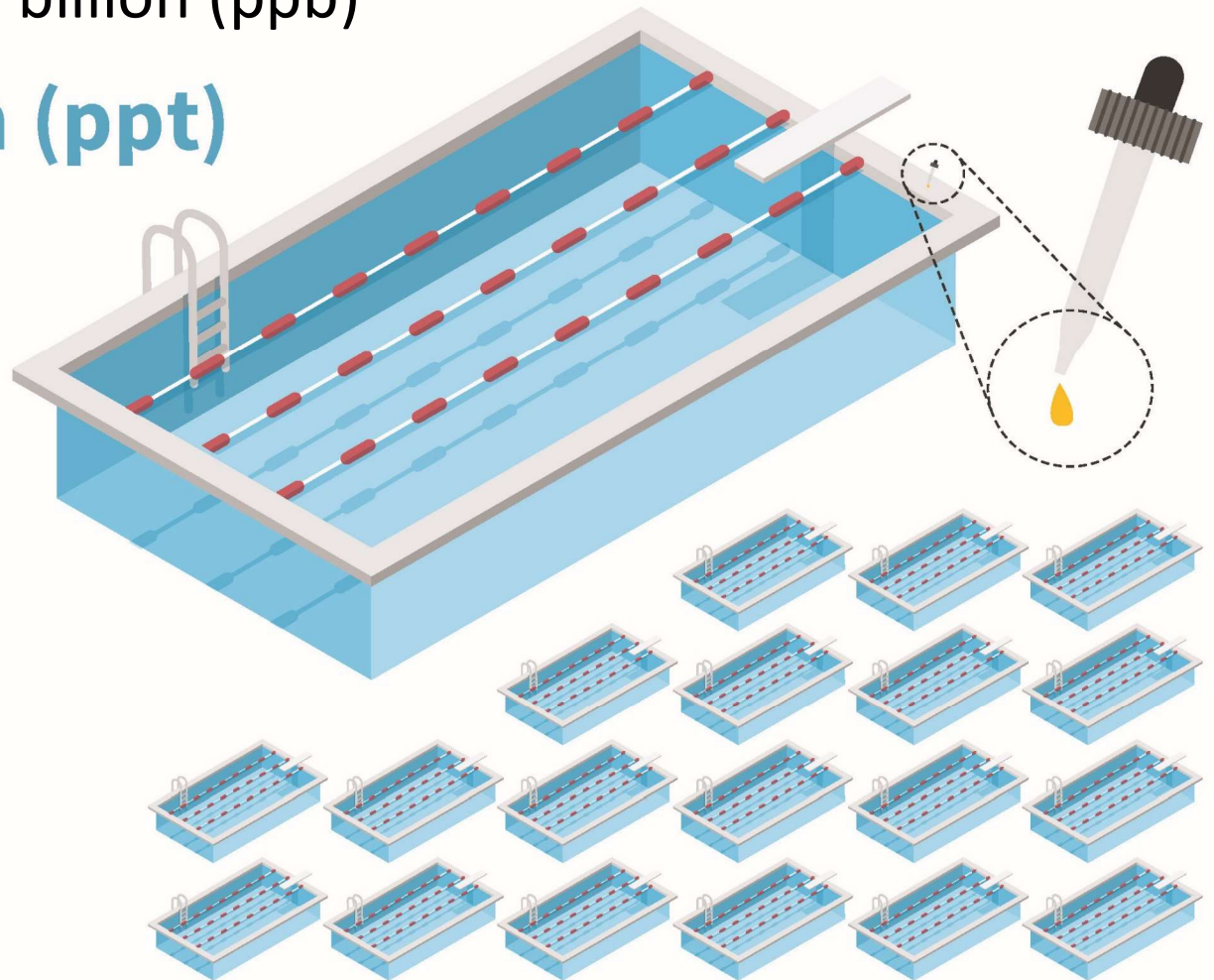
# PFAS Analysis

- Part per trillion (ppt) = nanogram per liter (ng/L) = 1/1000<sup>th</sup> of a part per billion (ppb)

## 1 part per trillion (ppt)

IS EQUIVALENT TO A  
SINGLE DROP OF  
WATER IN

20 olympic-sized  
swimming pools





# PFAS Maximum Contaminant Level (MCL)

- Massachusetts Department of Environmental Protection (MassDEP) drinking water standard = **Maximum Contaminant Level (MCL)**

PFOS+PFOA+PFHxS+PFNA+PFHpA+PFDA =

# PFAS6

Its maximum contaminant level (MCL) is **MCL=20 ppt**



- Pregnant women
- Nursing women
- Infants
- Compromised Immune Systems

- MassDEP recommends individuals from sensitive populations avoid consuming water with PFAS6 above the MCL
- CWD has not had a PFAS6 MCL exceedance

# PFAS Drinking Water Regulations

- Currently - No Federal Standard
- EPA Health Advisory Level = 70 ppt
- EPA “PFAS Strategic Roadmap” announced October 2021
- Proposed rule Fall 2022
- Final rule Fall 2023

# What are the health risks related to PFAS?

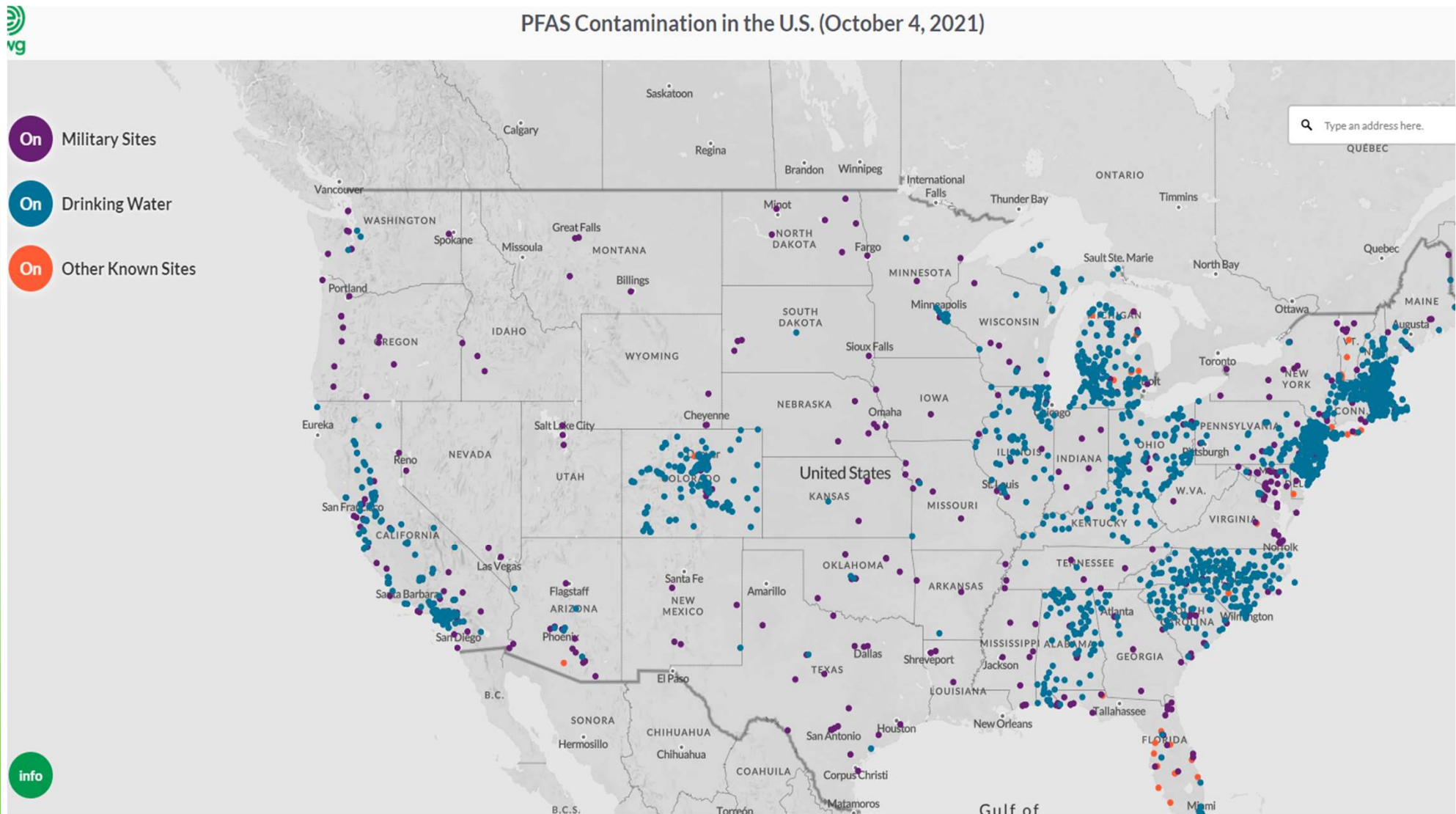
- Consuming water with PFAS above the recommended limits does **NOT** mean that adverse effects will occur.

## **RISK DEPENDS ON:**

- How much PFAS is in the water
  - Which PFAS chemicals are present in the water
  - How long you are exposed to the water
- Potential links between high levels of PFAS exposure and negative health effects:
    - Increased cholesterol
    - Changes in liver enzymes
    - Small decreases in birth weights or vaccine response in children
    - High blood pressure or pre-eclampsia in pregnant women
    - Increased risk of certain cancers

# This is a National Issue: Monitoring for PFAS in Public Drinking Water Systems

PFAS Contamination in the U.S. (October 4, 2021)



[https://www.ewg.org/interactive-maps/pfas\\_contamination/map/](https://www.ewg.org/interactive-maps/pfas_contamination/map/)  
Accessed 11/12/21



# Cambridge PFAS results



# Cambridge PFAS results

Below, is an example of PFAS data that appears on the City's web page for 2021

Updated: 02/09/22

Cambridge Water Department Per- and Polyfluoroalkyl Substances (PFAS) Monitoring - Analytes detected  
Entry Point to the Distribution System (EPDS) aka Finish Water

Compound Name	1/6/2021 ng/L (ppt)	2/3/2021 ng/L (ppt)	3/29/2021 ng/L (ppt)	4/1/2021 ng/L (ppt)	5/3/2021 ng/L (ppt)	6/2/2021 ng/L (ppt)	7/7/2021 ng/L (ppt)	8/4/2021 ng/L (ppt)	9/1/2021 ng/L (ppt)	10/4/2021 ng/L (ppt)	* n/a ng/L (ppt)	** 12/20/2021 ng/L (ppt)
Perfluorooctane Sulfonic Acid (PFOS)	1.7	1.7	1.9	2.2	2.4	3.0	4.3	4.3	4.7	3.5	n/a	2.40
Perfluorooctanoic Acid (PFOA)	6.9	6	8.5	7.9	6.8	7.8	7.9	8.3	9.6	8.5	n/a	7.65
Perfluorohexane Sulfonic Acid (PFHxS)	2.1	2.3	3.03	3.57	2.5	3	2.8	2.9	3	2.9	n/a	3.10
Perfluorononanoic Acid (PFNA)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a	0.00
Perfluoroheptanoic Acid (PFHpA)	3.2	3	2.4	3.4	2.3	2.9	2.9	3	3.4	2.9	n/a	3.15
Perfluorodecanoic acid (PFDA)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a	0.00
Sum of PFAS6	12.2	11.3	15.8	17.1	14.0	16.7	17.9	18.5	20.7	17.8	n/a	16.30
Quarterly Compliance Average	13.1			15.9			19.0			17.1		

ng/L = nanograms per Liter or ppt, parts per trillion

2.0 ng/L Minimum Reporting Limit (MRL) The lowest quantitated value for a target analyte in a sample.

Typically the lowest calibration standard used.

\* November data lost by contract lab

\*\* December data is average of two samples collected in December (Pace Lab and Eurofin Lab)

# Cambridge PFAS results 2022

Updated: 4/12/22

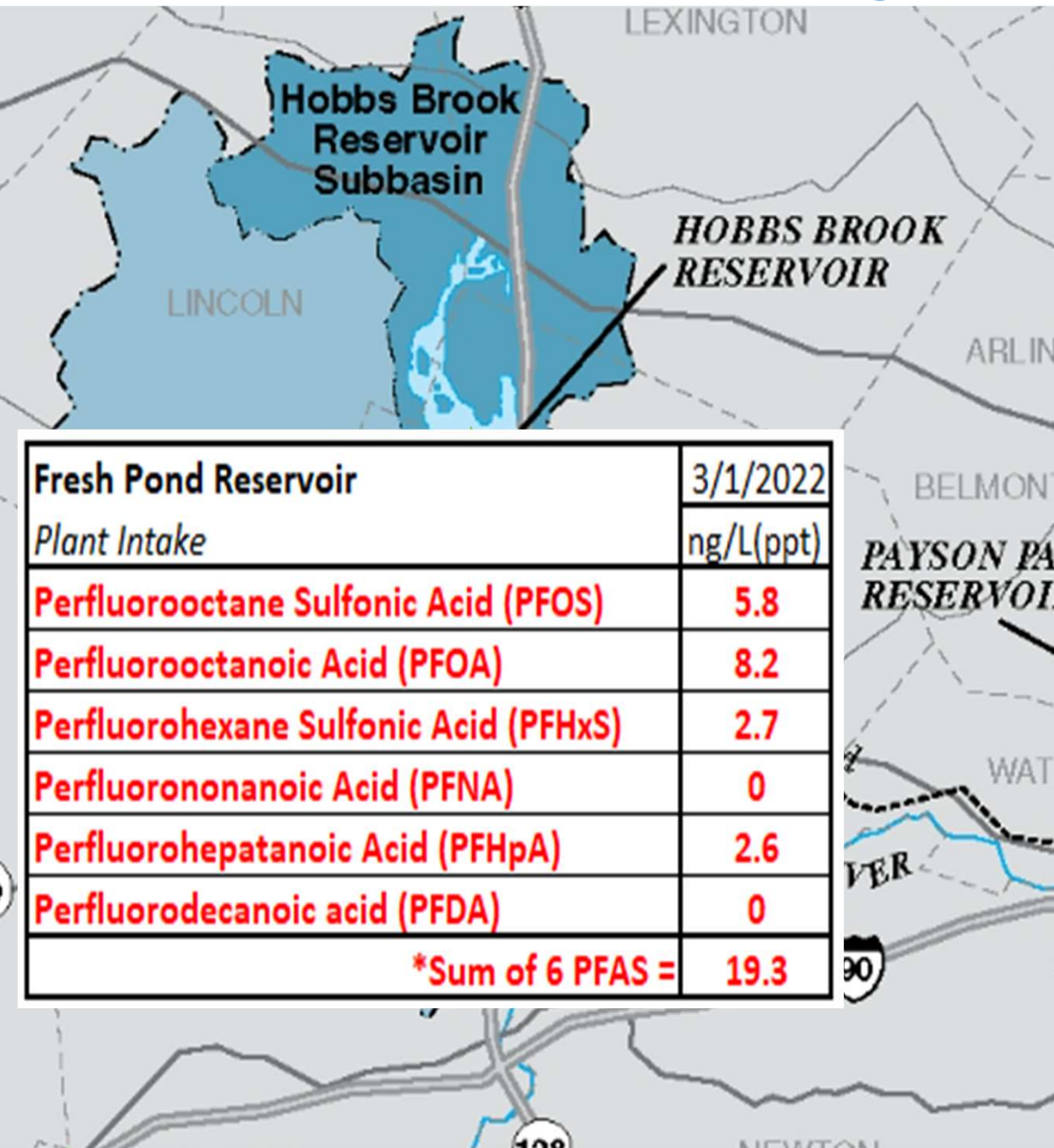
## Cambridge Water Department Per- and Polyfluoroalkyl Substances (PFAS) Monitoring - Analytes detected Entry Point to the Distribution System (EPDS) aka Finish Water

Compound Name	MasDEP MCL	1/5/2022	2/2/2022	3/1/2022	4/4/2022		
		ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)		
<b>Perfluorooctane Sulfonic Acid (PFOS)</b>	x	2.2	2.0	2.1	1.9		
<b>Perfluorooctanoic Acid (PFOA)</b>	x	6.7	5.7	6.2	8.0		
<b>Perfluorohexane Sulfonic Acid (PFHxS)</b>	x	2.5	2.1	2.4	2.4		
<b>Perfluorononanoic Acid (PFNA)</b>	x	0.0	0.0	0.0	0.0		
<b>Perfluorohepatanoic Acid (PFHpA)</b>	x	2.2	1.9	2.6	2.7		
<b>Perfluorodecanoic acid (PFDA)</b>	x	0.0	0.0	0.0	0.0		
Sum of <b>PFAS6</b> detected		13.6	11.7	13.3	15.0		
<b>Quarterly Compliance Average</b>			<b>12.9</b>				

ng/L = nanograms per Liter or ppt, parts per trillion

2.0 ng/L Minimum Reporting Limit (MRL) The lowest quantitated value for a target analyte in a sample. Typically the lowest calibration standard used.

# Where's our PFAS coming from?



<b>Fresh Pond Reservoir</b>	3/1/2022
<i>Plant Intake</i>	ng/L(ppt)
<b>Perfluorooctane Sulfonic Acid (PFOS)</b>	<b>5.8</b>
<b>Perfluorooctanoic Acid (PFOA)</b>	<b>8.2</b>
<b>Perfluorohexane Sulfonic Acid (PFHxS)</b>	<b>2.7</b>
<b>Perfluorononanoic Acid (PFNA)</b>	<b>0</b>
<b>Perfluorohepatanoic Acid (PFHpA)</b>	<b>2.6</b>
<b>Perfluorodecanoic acid (PFDA)</b>	<b>0</b>
<b>*Sum of 6 PFAS =</b>	<b>19.3</b>

<b>HOBBS BROOK RESERVOIR</b>	3/1/2022
<i>Below dam outlet</i>	ng/L(ppt)
<b>Perfluorooctane Sulfonic Acid (PFOS)</b>	<b>2.9</b>
<b>Perfluorooctanoic Acid (PFOA)</b>	<b>5.3</b>
<b>Perfluorohexane Sulfonic Acid (PFHxS)</b>	<b>1</b>
<b>Perfluorononanoic Acid (PFNA)</b>	<b>0</b>
<b>Perfluorohepatanoic Acid (PFHpA)</b>	<b>2.1</b>
<b>Perfluorodecanoic acid (PFDA)</b>	<b>0</b>
<b>*Sum of 6 PFAS =</b>	<b>11.3</b>

<b>STONY BROOK RESERVOIR</b>	3/1/2022
<i>Boat Ramp</i>	ng/L(ppt)
<b>Perfluorooctane Sulfonic Acid (PFOS)</b>	<b>15</b>
<b>Perfluorooctanoic Acid (PFOA)</b>	<b>8</b>
<b>Perfluorohexane Sulfonic Acid (PFHxS)</b>	<b>2.5</b>
<b>Perfluorononanoic Acid (PFNA)</b>	<b>1.7</b>
<b>Perfluorohepatanoic Acid (PFHpA)</b>	<b>1.8</b>
<b>Perfluorodecanoic acid (PFDA)</b>	<b>0</b>
<b>*Sum of 6 PFAS =</b>	<b>29</b>

Updated 3-16-2022

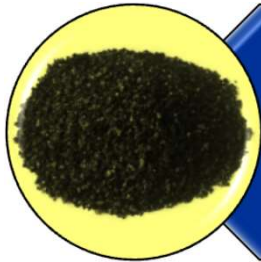


# PFAS Treatment for Drinking Water

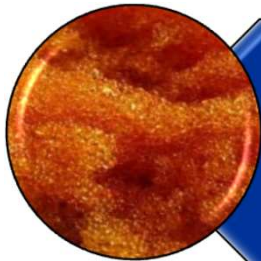


# PFAS Treatment for Drinking Water

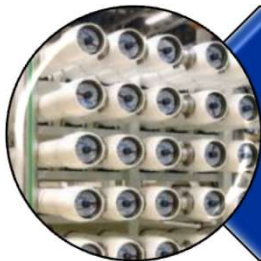
Available technologies for PFAS removal:



Granular Activated  
Carbon (GAC)

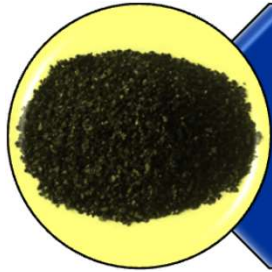


Anion Exchange (AIX)



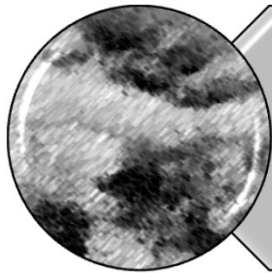
High Pressure  
Membranes

# Most Suitable Treatment Option for Cambridge



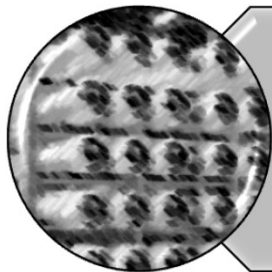
Granular Activated Carbon (GAC)

✓ Water quality (e.g., low organics)



Anion Exchange (AIX)

✓ Compatible with existing treatment



High Pressure Membranes

✓ City's familiarity with GAC operation

✓ Comparatively lower cost

# What does that mean for CWD?

- Cambridge has been in full compliance with state and federal regulations since we started PFAS sampling.
- CWD performed a pilot study focusing on 3 different Granular Activated Carbon (GAC) medias to reduce PFAS in our finished water.
- Recommendations to remain in compliance and to reduce our values to be consistently under 10ppt
  - replacing the 20+ year-old granular activated carbon(GAC) filter media on a regular basis

# Granular Activated Carbon Treatment Facility Filters

- Granular activated carbon is made from organic materials with high carbon contents such as:



- Filtering with granular activated carbon(GAC) is the most common form of treatment used for PFAS removal.
- Activated carbon is commonly used to adsorb:
  - natural organic compounds
  - taste and odor compounds
  - synthetic organic chemicals

# PFAS Timeline

- ✓ August 2019, CWD began proactively monitoring the drinking water at Fresh Pond.
- ✓ August 2020 – CWD began testing alternative types of GAC media
- ✓ October 2020 - MassDEP enacted a standard of 20 parts per trillion (ppt) for the sum of six PFAS (PFAS6) compounds
- ✓ Results indicated that replacing the GAC filter media is expected to reduce PFAS by 50% or more
- ✓ Project design & Bid specifications – complete
- ✓ Advertised in the Cambridge Chronicle on Thursday, March 24, 2022
- ✓ Invitation for bid prior to: 11:00 a.m. on Thursday, April 7, 2022
- ✓ Calgon – only bidder
- ✓ Calgon contract issued – awaiting final signatures and contract
- ☐ Projected work towards replacement of the media to start June 2022
- ☐ Expected completion – September 2022



## Questions/Discussion



Thank you and good night!