

Duxbury PFAS Update

WSAB Meeting
August 21, 2023



AGENDA

- PFAS Regulations and Treatment Technologies
- Duxbury PFAS Background
- Duxbury Future PFAS Planning Schedule
- Pre-Submitted Q&A
- Open Q&A



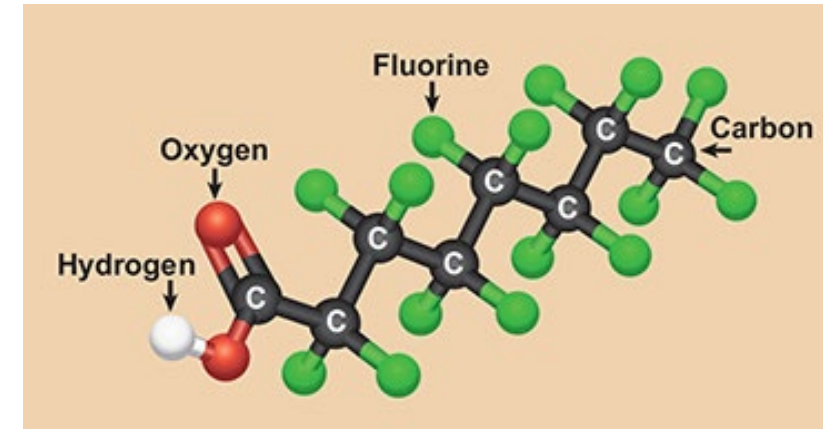
PFAS REGULATIONS AND TREATMENT TECHNOLOGIES

PFAS

PER- & POLYFLUOROALKYL SUBSTANCES

What are they?

- A class of chemicals engineered for use in commercial and industrial applications since the late 1940s.
- Chemical properties make it an effective surfactant for stain-resistant, water repellant, and non-stick coatings.
- “Forever Chemical” – water soluble and non-reactive
- PFOA, PFOS, and GEN-X



PFOA Chemical Structure

SOURCE: NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES

MASSDEP REGULATIONS

- Finalized October 2020 (310 CMR 22.07G)
- Enforceable Maximum Contaminant Level (MCL) for a summation of six PFAS compounds (PFAS6)
 - PFOA
 - PFOS
 - PFNA
 - PFHxS
 - PFHpA
 - PFDA
- PFAS6 MCL = 20 ppt



EPA PROPOSED DRINKING WATER REGULATION

- Draft regulation published March 29, 2023
- Enforceable Maximum Contaminant Levels (MCLs) for PFOA and PFOS
 - 4 ppt
- Enforceable Hazard Index for four PFAS compounds
 - PFHxS
 - PFNA
 - PFBS
 - HFPO-DA (GenX Chemicals)
 - Hazard Index (HI) = 1

EPA PROPOSED DRINKING WATER REGULATION

- Public comment period closed May 30, 2023. Final regulation expected end of 2023.
- Until a final regulation is published, there is **no action required** by public water utilities to meet the proposed MCLs
 - Public water utilities will have three years to conform with the new regulation (end of 2026)
- MassDEP expected to follow with similar, or possibly more stringent, regulations

PFAS TREATMENT OPTIONS

PFAS6 TREATMENT TECHNOLOGIES – GRANULAR ACTIVATED CARBON

Pros

- Commonly used for PFAS6 removal
- Can be reactivated and reused
- Multiple media approved by MassDEP
- Simplistic operation

Cons

- Fe/Mn and dechlorination pre-treatment
- Larger equipment footprint
- Backwash may be required



HYANNIS – AIRPORT WELLS (INSTALLED 2020)



EASTON – WELL #2 (INSTALLED 2023)

WATER TREATMENT OPTIONS

PFAS6 TREATMENT TECHNOLOGIES – ION EXCHANGE (IX)

Pros	Cons
<ul style="list-style-type: none">• Smaller equipment footprint• Backwash not required• Multiple media approved by MassDEP• Simplistic operation	<ul style="list-style-type: none">• Fe/Mn, dechlorination, and bag filtration pre-treatment• Potential for fouling



IX PRESSURE VESSEL



IX RENTAL TRAILER INSTALLED AT WELL STATION 4

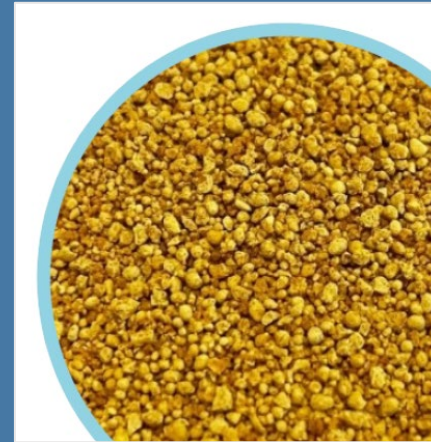
WATER TREATMENT OPTIONS

PFAS6 TREATMENT TECHNOLOGIES – ALTERNATIVE ADSORPTIVE MEDIA

Pros	Cons
<ul style="list-style-type: none">• Potential for longer bed life• Dechlorination not always required• Can be piloted	<ul style="list-style-type: none">• Largely unproven• Some approved by MassDEP



FLUORO-SORB BY CETCO



DEXSORB BY CYCLOPURE

WATER TREATMENT OPTIONS

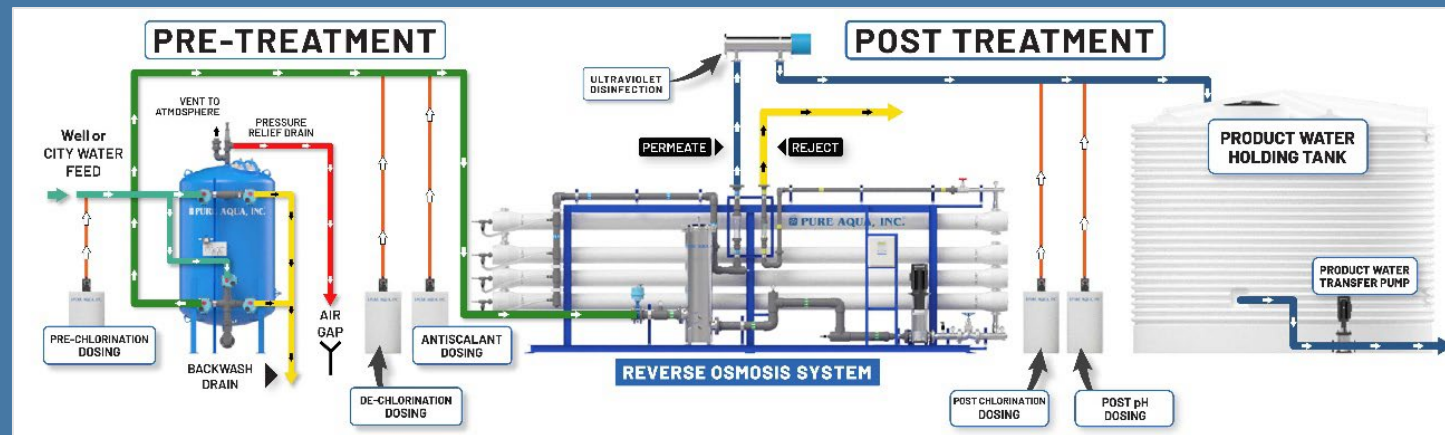
PFAS6 TREATMENT TECHNOLOGIES – REVERSE OSMOSIS

Pros

- Remove Fe/Mn and PFAS6
- High pH operating range (2-11 S.U.)

Cons

- Complicated operation
- Brine waste treatment required
- Requires chemical cleaning
- High feed pressure (>150 psi)
- Requires post-treatment remineralization
- May require metals pretreatment to reduce load
- Not eligible for NPDES discharge permit



REVERSE OSMOSIS SCHEMATIC

DUXBURY PFAS BACKGROUND

PFAS

- EPA occurrence (2013-2015) testing – non detect
- Massachusetts PFAS6 MCL = 20 parts per trillion
- Impacted sources
 - Partridge Well = as high as 75 – 105 ppt
 - Depot Street Well = 10 – 15 ppt, below PFAS6 MCL



PARTRIDGE ROAD WELL PUMP STATION

PFAS6 TESTING DATA – AUGUST 2023 UPDATE

PFAS6 Compliance Sampling Results

Source	4/28/2021	5/20/2021	6/15/2021	10/20/2021	1/24/2022	2/8/2022	9/20/2022	1/24/2023	4/25/2023	7/2/2023
Millbrook Well	-	6.56	-	3.67	5.93	-	7.04	6.46	-	6.49
Partridge Well	75.93	5.10	105.21	-	83.15	-	56.90	72.70	71.01	not tested
Depot Well	10.40	0.86	-	11.96	14.88	-	11.40	7.57	6.90	not tested
Lakeshore Well	6.43	6.56	-	8.60	8.97	-	2.56	6.45	-	6.67
Tremont Wells No. 1 and 2	0.0000	-	-	0.72	0.00	0.00	0.00	0.00	-	2.12
Evergreen Wells No. 1 and 2	1.88	0.00	-	3.85	4.39	-	2.27	0.00	-	2.00
Mayflower Wells No. 1 and 2	4.11	4.50	-	2.80	6.26	-	2.17	4.58	-	4.85
Damon Wells No. 1 and 2	6.48	7.66	-	6.39	7.83	-	6.71	7.24	-	6.16

* PFAS6 summation excludes compound levels below the Method Reporting Level (MRL) for the compound



DUXBURY FUTURE PFAS PLANNING SCHEDULE

CURRENT PFAS ACTIONS

- Master Plan Recommendations
 - PFAS removal at Partridge Well
 - Reserve space for PFAS treatment for Depot Well
- Wright Pierce selected for Partridge Well PFAS Treatment Project
- Metals and PFAS Treatment Project beginning for Depot Well and Tremont Wells (recommended in Master Plan)
- Future PFAS Project Planning (discussed next)



FUTURE PFAS PROJECTS

EP developed the following PFAS treatment projects, prioritized based on water quality, location, flow rate, pressure zones, etc.

1. Partridge Well (in progress) (LPZ)
2. Depot Well & Tremont Wells (beginning) (LPZ)
3. Mayflower Wells (HPZ)
4. Damon Wells & Millbrook Well (LPZ)
5. Evergreen Wells (HPZ)
6. Lakeshore Well (HPZ)

Source	MassDEP Approved Pumping Rate (gpm)	Current Operational Rate (gpm)
Tremont Wells No. 1 and No. 2	700.0	375 205
Evergreen Well No. 1	550.0	400
Evergreen Well No. 2	550.0	350
Damon Well No. 1	277.8	250
Damon Well No. 2	277.8	420
Mayflower Well No. 1	500.0	365
Mayflower Well No. 2	500.0	390
Lakeshore Well	350.0	105
Millbrook Well	347.2	325
Depot Well*	400.0	260
Partridge Well*	240.3	186

* Facility is currently not in use.



FUTURE PFAS PROJECTS

1. Partridge Well (in progress) (LPZ)
 - Currently offline
 - Highest PFAS6 levels
 - Included in WSMP
2. Depot Well & Tremont Wells (LPZ)
 - Depot Well offline for high iron and manganese
 - Tremont Wells have high operational flow rate
 - WTP siting included in WSMP
3. Mayflower Wells (HPZ)
 - Best option to begin treatment compared to other high pressure zone wells (Evergreen Wells and Lakeshore Well) in terms of flow and PFAS6 levels



FUTURE PFAS PROJECTS

4. Damon Wells & Millbrook Well (LPZ)

- Combined treatment facility at Damon Wells site
- Requires pretreatment of iron and manganese

5. Evergreen Wells (HPZ)

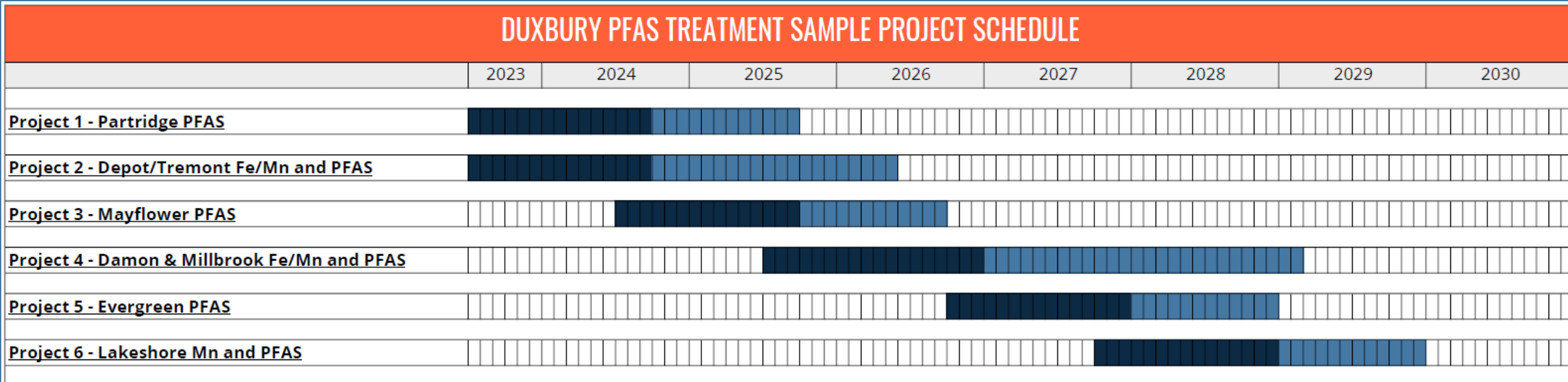
- Low PFAS6 levels

6. Lakeshore Well (HPZ)

- Requires pretreatment of manganese
- Lowest operational flow rate
- Limited land and site constraints may make treatment siting complicated



FUTURE PFAS PROJECTS SAMPLE PROJECT SCHEDULE



Notes

- Dark blue indicates the estimated design, permitting, and bidding phases of each project
- Light blue indicates the estimated construction phases of each project
- Multiple projects are being constructed in order of priority due to funding limitation



FUTURE PFAS PROJECTS ESTIMATED COSTS

- EP estimates a high-level planning cost of **\$75M - \$100M** for all treatment projects
- Funding assumed to be achieved through Town bonding or outside funding sources (e.g. MassDEP State Revolving Fund)
- If a large bond or funding is received, performing one large organized treatment project at all locations could be considered



PRE-SUBMITTED Q&A

Q/A

- **Q: Some wells produce more water yet test results lower PFAS levels. Can the Town optimize its PFAS treatment by favoring certain wells?**

Given that implementing PFAS treatment will take years. How should the wells be prioritized for PFAS?

Does the amount of water produced by a well influence the order of work?

- **A:** The Future PFAS Schedule presented earlier prioritizes PFAS treatment at each well based on PFAS6 levels, flow, and pressure zone. Water production from each well was considered when prioritizing PFAS projects, but EP more highly prioritized alternating pressure zones to prevent prolonged well shutdowns in one pressure zone.

The Partridge and Depot/Tremont PFAS treatment projects were placed as the two highest priority projects because they were recommended in the Town's Water System Master Plan.



Q/A

- **Q: The Evergreen Well supplies the high zone and is also treating its source water. It possible that this well could be the primary water source for the high zone?**
- **A:** The sources in the high-pressure zone include the Evergreen Wells, Mayflower Wells, and Lakeshore Well. EP does not recommend removing both Mayflower Wells and Lakeshore Well from service to the high-pressure zone, as they add redundancy in the event that the Evergreen Wells are offline. However, there is room to consider removing Lakeshore Well from service since site constraints at that location would make PFAS treatment complicated.

Q/A

- **Q: Testing appears to being done only at the wells and not in the distribution system. Can the water model be used to simulate PFAS levels in the system?**
- **A: Water quality modeling in a distribution system can be accomplished by identifying where the source water is contributing given the operating parameters of the system.**

Q/A

- **Q: Are there any point-of-use products that can remove PFAS?**
- A: There are some point-of-use (POU) products, such as activated carbon bricks and filters similar to Brita filters, that can treat low to moderate levels of PFAS, specifically PFOA and PFOS. However, these POU products are only required to meet the EPA's current health advisory level of 70 parts per trillion (ppt), which is higher than Massachusetts's MCL of 20 ppt for PFAS6. Additionally, these POU products will need to be reevaluated for their effectiveness of removing PFAS to the EPA's new proposed MCL of 4 ppt for PFOA and PFOS.

OPEN Q&A

THANK YOU

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