

# AYER DRINKING WATER UPDATE ON PFAS CONTAMINATION

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Superintendent of  
Public Works

April 23, 2019

- Per- and Poly-FluoroAlkySubstances (PFAS)
- PerFluoroOctanoic Acid (PFOA)
- PerFluoroOctaneSulfonic Acid (PFOS)

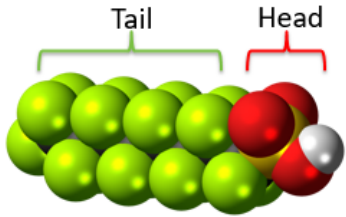



Diagram illustrating the structure of PFAS molecules, showing a long hydrophobic tail (labeled 'Tail') and a hydrophilic head (labeled 'Head').

Chemical structures are shown for PFOA and PFOS, highlighting the strong carbon & fluorine bond (labeled 'Strong carbon & fluorine bond') and the carboxylate group (labeled 'Carboxylate') for PFOA, and the sulfonate group (labeled 'Sulfonate') for PFOS.



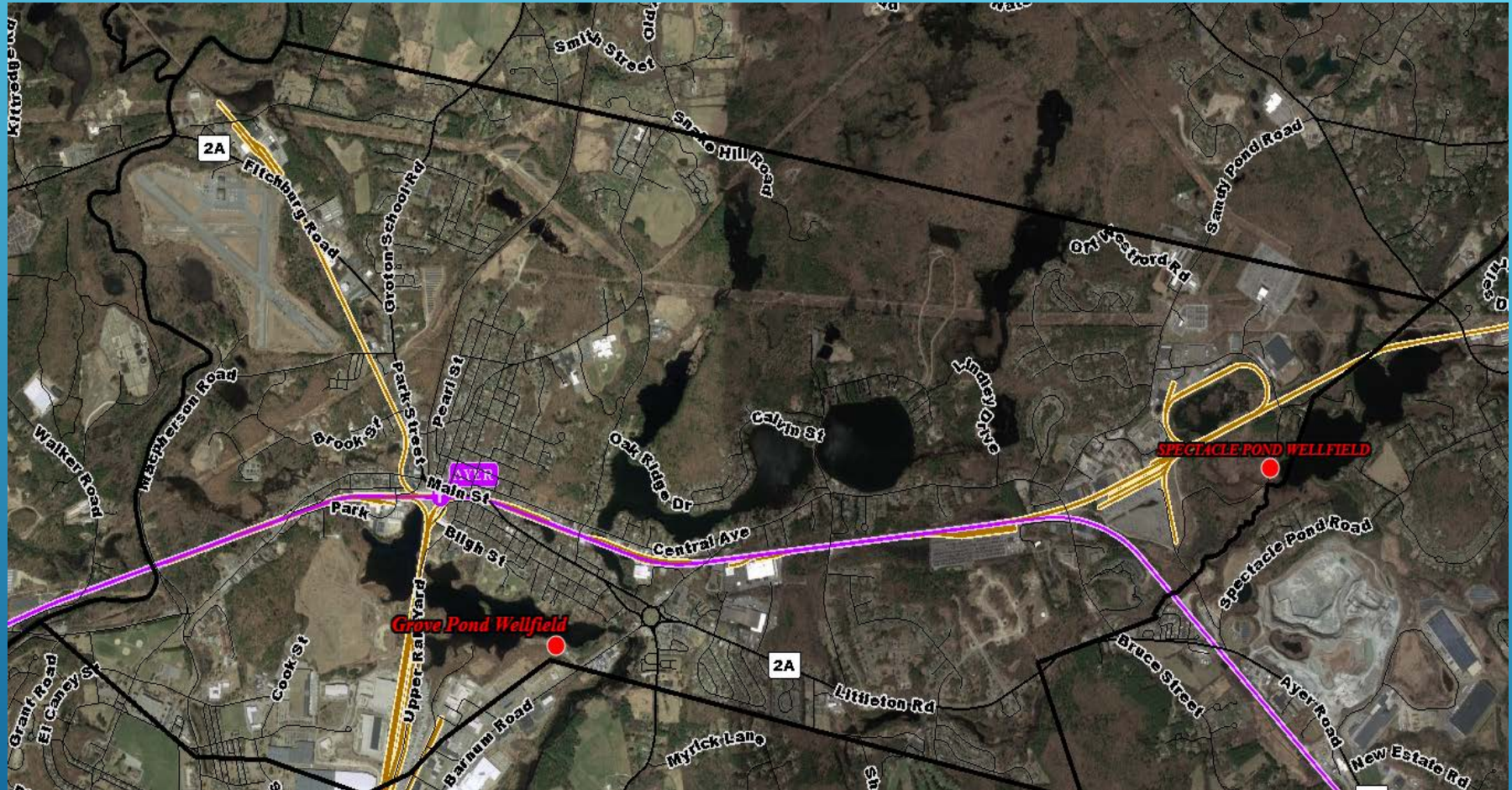
# AYER'S WATER SUPPLY

- ▶ 5 wells – 3 at Grove Pond, 2 at Spectacle Pond
- ▶ Average Day Demand – 1.4 MGD
- ▶ Maximum Day Demand – 2.7 MGD
- ▶ 70 % of water use is commercial / industrial
- ▶ Total Yield – 3.7 MGD

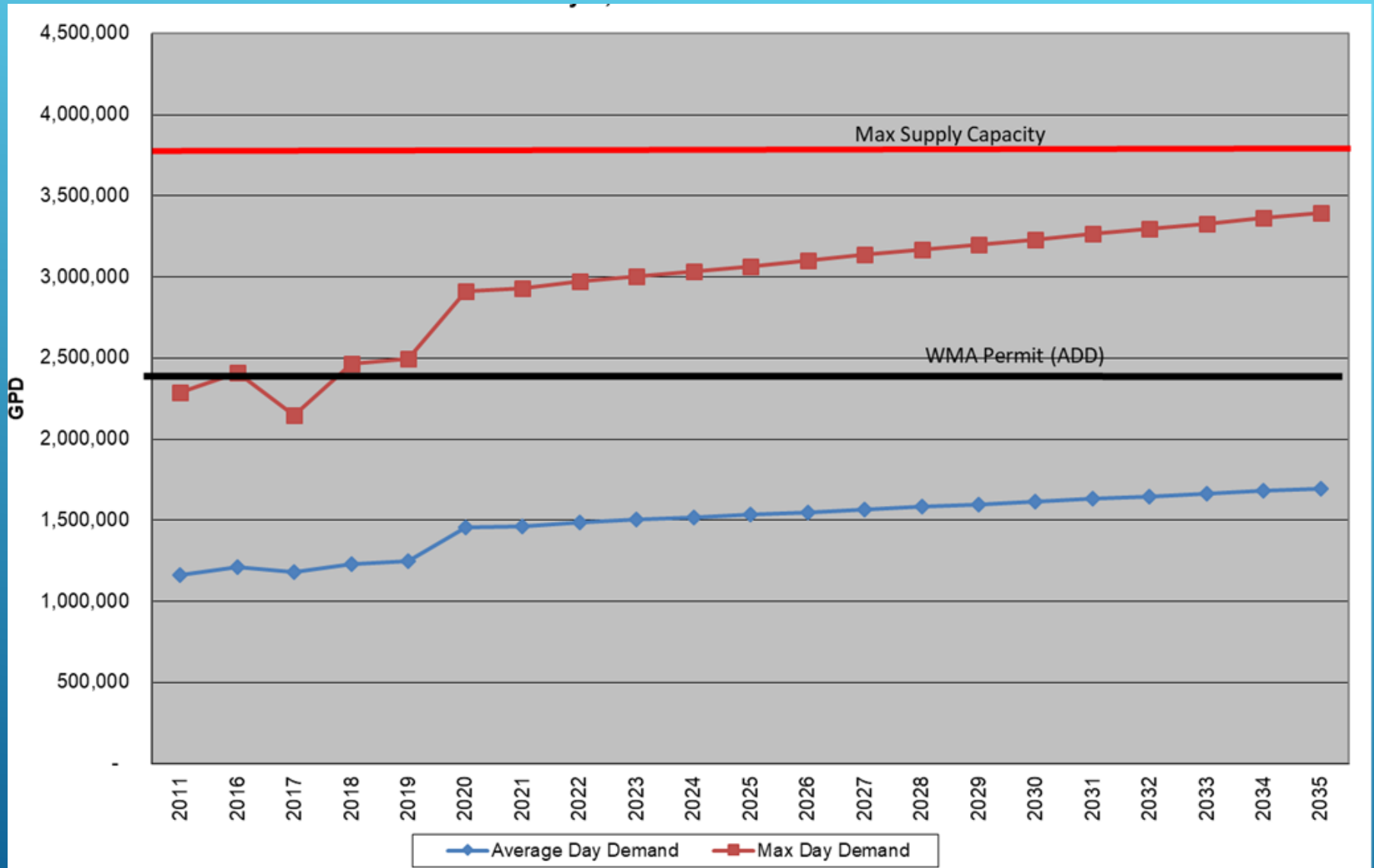




# Water Supply Locations



# PROJECTED WATER DEMAND





# AYER'S WATER SUPPLY CHALLENGES

- ▶ Very high iron (2.5 to 3.4 ppm)
  - ▶ Secondary MCL 0.3 ppm
- ▶ Very high manganese (0.85 to 5.66 ppm)
  - ▶ Secondary MCL – 0.05 ppm
- ▶ Arsenic – 0.007 to 0.069 ppm
  - ▶ MCL – 0.01
- ▶ Lead and Copper Rule
- ▶ Total Coliform Rule
- ▶ Aging infrastructure





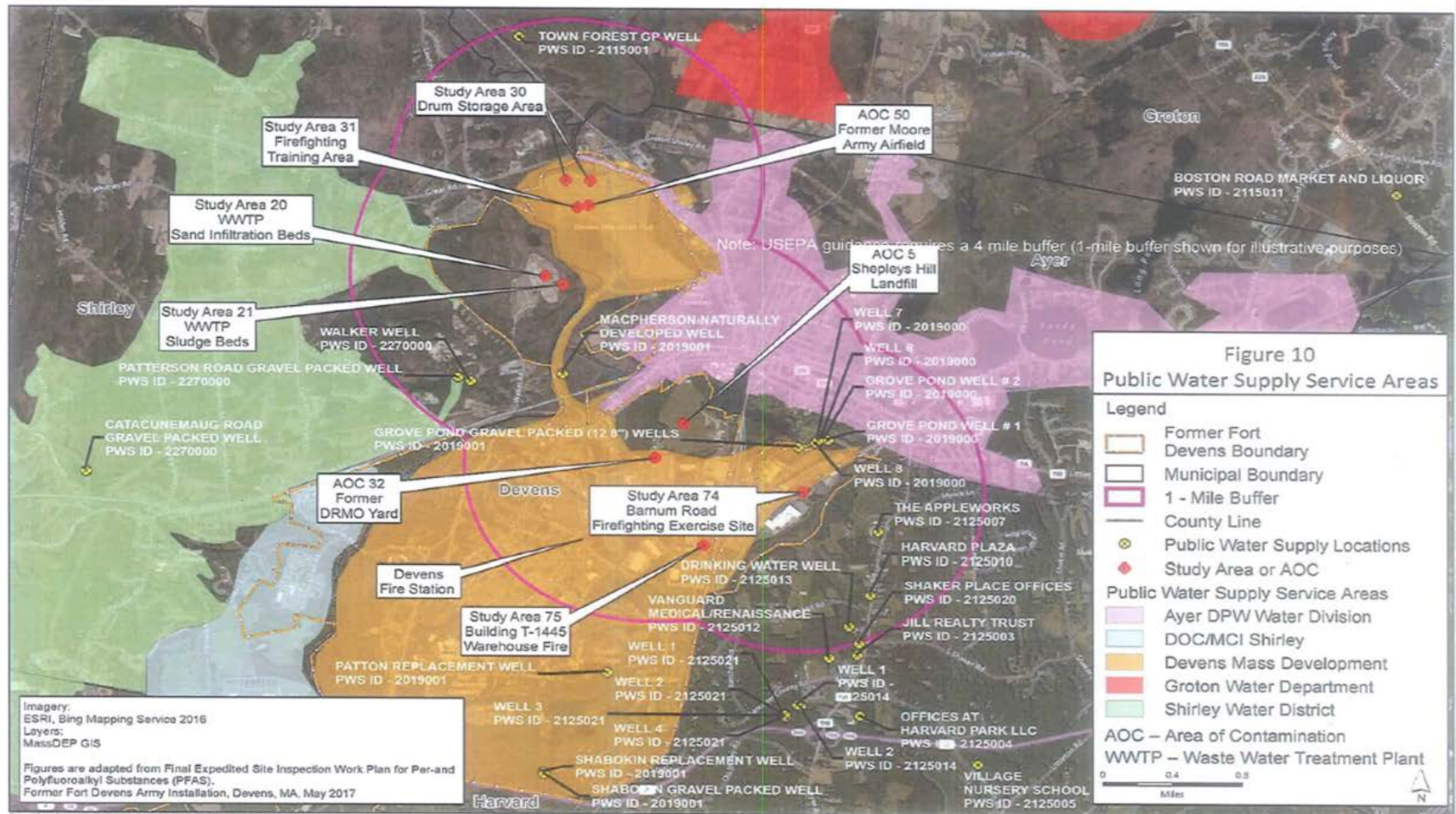
AYER'S DRINKING WATER  
BEFORE AND AFTER TREATMENT

# WHY IS IT IN AYER'S DRINKING WATER?

- ▶ Grove Pond Wellfield and Spectacle Pond Wellfield are Towns only water supply sources
- ▶ Wellfields are in different watersheds
- ▶ Due to proximity to Fort Devens, MassDEP required Ayer to test Grove Pond Well water for unregulated contaminants PFOA and PFAS in September 2016
- ▶ Grove Pond wells tested positive and GP Well 8 was over the 70 ppt level
  - ▶ Contamination appears to be from past Ft Devens activities
  - ▶ Army Corp of Engineers is investigation extent of groundwater contamination
- ▶ Sampled Spectacle Pond Well 1A and 2A and both had levels of PFAS in 20s and 30s
  - ▶ No identified source of contamination



# WHY IS PFAS IN AYER'S DRINKING WATER?






# HOW MUCH PFAS IS IN AYER'S WATER?

## 5 "LONG CHAIN" PFAS

▶ Grove Pond Well 1	24.11 ppt
▶ Grove Pond Well 6	22.53 ppt
▶ Grove Pond Well 7	74.20 ppt
▶ Grove Pond Wells 6&7	48.41 ppt
▶ Grove Pond Well 8 (inactive)	250.26 ppt
▶ Spec Pond Well 1A	26.02 ppt
▶ Spec Pond Well 2A	34.43 ppt

▶ February 2019 Sample Results

# IS PFAS IN DRINKING WATER REGULATED BY THE EPA AND DEP?

- ▶ EPA required PFAS sampling of some water supplies under the Unregulated Contaminant Monitoring Rule in 2013 (UMCR3)
  - ▶ In 2016 EPA issued Health Advisory for PFOA and PFOS limit of 70 ppt
  - ▶ EPA has developed PFAS Action Plan to begin developing a Drinking Water Standard for PFAS
  - ▶ Several States including Mass have established PFAS drinking water limits / advisories
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## EPA's PFAS Action Plan: A Summary of Key Actions

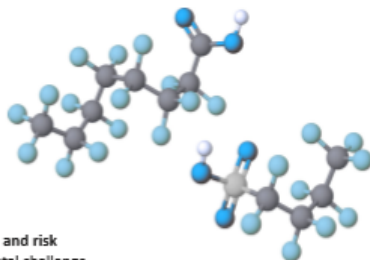


EPA's PFAS Action Plan outlines concrete steps the agency is taking to address PFAS and to protect public health.

### EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan:

- Demonstrates the agency's critical national leadership by providing both short-term solutions and long-term strategies to address this important issue.
- Provides a multi-media, multi-program, national research and risk communication plan to address this emerging environmental challenge.
- Responds to the extensive public input the agency has received over the past year during the PFAS National Leadership Summit, multiple community engagements, and through the public docket.

EPA is taking a proactive, cross-agency approach to addressing PFAS. The key actions EPA is taking to help provide the necessary tools to assist states, tribes, and communities in addressing PFAS are summarized below.



# EPA ACTION PLAN

### DRINKING WATER

EPA is moving forward with the Maximum Contaminant Level (MCL) process for PFOA and PFOS—two of the most well-known and prevalent PFAS chemicals. The Agency is also gathering and evaluating information to determine if regulation is appropriate for a broader class of PFAS.

*The next step in the Safe Drinking Water Act process for issuing drinking water standards is to propose a regulatory determination. This provides the opportunity for the public to contribute to the information the EPA will consider related to the regulation of PFAS in drinking water.*

### CLEANUP

EPA continues strengthening enforcement authorities and clarifying cleanup strategies through actions such as designating PFOA and PFOS as hazardous substances and developing interim groundwater cleanup recommendations.

*This important work will provide additional tools to help states and communities address existing contamination and enhance the ability to hold responsible parties accountable.*

### TOXICS

EPA is considering the addition of PFAS chemicals to the Toxics Release Inventory and rules to prohibit the uses of certain PFAS chemicals.

*The Toxics Release Inventory would make information about certain PFAS releases reported by certain industrial sectors and federal facilities available. Additionally, the TSCA new chemicals program will help manage and, as necessary, reduce risk to human health and the environment from new PFAS.*

### MONITORING

EPA will propose nationwide drinking water monitoring for PFAS under the next UCMR monitoring cycle.

*Monitoring results will improve understanding of the frequency and concentration of PFAS occurrence in drinking water, which can be used to inform regulatory action.*

### RESEARCH

EPA is rapidly expanding the scientific foundation for understanding and managing risk from PFAS.

*Improved detection and measurement methods, additional information about PFAS presence in the environment and drinking water, better understanding of effective treatment and remediation methods, and more information about the potential toxicity of a broader set of PFAS will help EPA, states, and others better manage PFAS risks.*

### ENFORCEMENT

EPA uses enforcement tools, when appropriate, to address PFAS exposure in the environment and assist states in enforcement activities.

*EPA seeks to support communities that have PFAS releases by using federal enforcement authorities, where appropriate.*

### RISK COMMUNICATIONS

EPA will work collaboratively to develop a risk communication toolbox that includes multi-media materials and messaging for federal, state, tribal, and local partners to use with the public.

*This will help ensure clear and consistent messages to the public and will help address concerns related to PFAS.*



# Drinking Water Values for PFAS

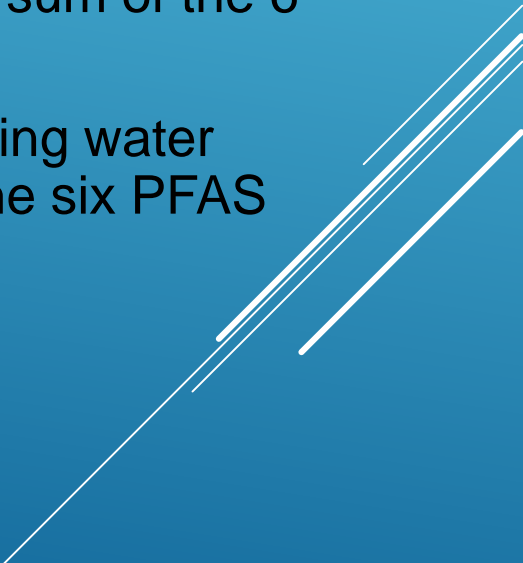
(parts per trillion) (4/9/2019)

	PFOS	PFOA	PFNA	PFHxS	PFHpA	PFDA
<b>USEPA</b> Health Advisories	<b>70</b> Sum of two		NA	NA	NA	NA
<b>ATSDR</b> Based on ATSDR toxicity value	<b>7</b>	<b>11</b>	<b>10</b>	<b>70</b>	NA	NA
<b>NY</b> Recommended MCL	<b>10</b>	<b>10</b>	NA	NA	NA	NA
<b>NJ</b> MCL or proposed	<b>13</b>	<b>14</b>	<b>13</b>	NA	NA	NA
<b>VT</b> Health advisory/ emergency rule	<b>20</b> Sum of five					NA
<b>MA</b> Current ORSG	<b>70</b> Sum of five					NA
<b>CT</b> Action Levels	<b>70</b> Sum of five					NA
<b>CA</b> Interim notification levels	<b>13</b>	<b>14</b>	NA	NA	NA	NA
<b>MN</b> Drinking water guidelines	<b>15</b>	<b>35</b>	NA	<b>47</b>	NA	NA
<b>NH</b> Proposed MCLs	<b>70</b>	<b>38</b>	<b>23</b>	<b>85</b>	NA	NA
<b>Most other states</b> (EPA value by default)	<b>70</b>		NA	NA	NA	NA

# MASSACHUSETTS DRINKING WATER ADVISORY

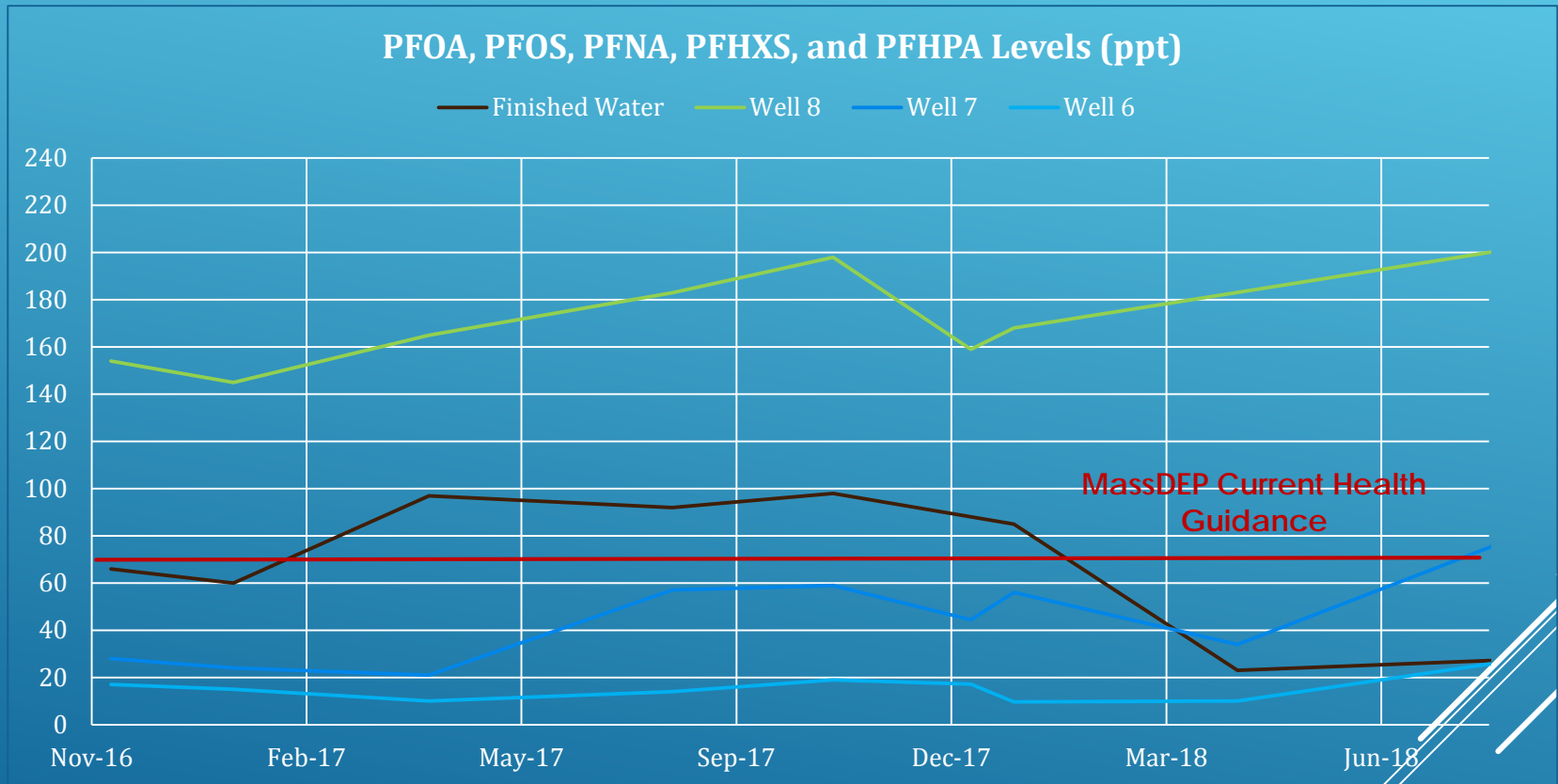
- ▶ MADEP contacted Ayer in early 2018 to advise on the upcoming change in health advisory and worked closely with the DPW to take well 8 off-line
- ▶ June 2018, MADEP issued public health guideline to address five PFAS chemicals
- ▶ Office of Research and Standards Guideline (ORSG) set limit to protect against adverse health effects for long and short term exposure
  - ▶ consumers in sensitive subgroups (pregnant women, nursing mothers and infants) not consume water when the level of the five PFAS substances, individually or in combination, is above 70 ppt
  - ▶ public water suppliers take steps expeditiously to lower levels of the five PFAS to below 70 ppt for all consumers.

# RECENT MASSDEP ACTIONS

- ▶ MassDEP published draft amendments to hazardous waste cleanup regulations (Massachusetts Contingency Plan) for PFAS
  - ▶ Proposed Method 1 GW-1 Standard – groundwater protected for current or future use as drinking water – 20 ppt for the 5 compounds plus Perfluorodecanoic acid (PFDA) (6 total)
  - ▶ MassDEP's Office of Research and Standards is convening its Health Effects Advisory Committee to provide scientific input on the technical basis of the proposed MCP standards and implication regarding a potential revised ORSG with a limit of 20 ppt for the sum of the 6 PFAS compounds
  - ▶ MassDEP has initiated the process to develop drinking water standard, Maximum Contaminant Level (MCL), for the six PFAS compounds
- 



# DISCOVERY OF PFAS VS. MASSDEP GUIDANCE LEVEL



# AYER DPW ACTION TO DATE

- ▶ DPW worked closely with MassDEP to minimize exposure of PFAS chemicals
- ▶ Initially blended Well 8 with Wells 6&7 to keep levels of PFOA and PFOS below 70 ppt
- ▶ DPW stopped using Well 8 in late February 2018
- ▶ DPW issued public notification to all residents in March 2018
- ▶ Completed treatment study in spring 2018
- ▶ Re-activated Grove Pond Well 1 for summer demand
- ▶ Completed construction of Spec Pond Well 2 replacement – tested at 900 gpm
- ▶ Cleaned and redeveloped SP Well 1A, GP 6&7
- ▶ Cleaned filter media at both WTPs

# DPW ACTIONS CONT'D

- ▶ Continue quarterly sampling of Grove Pond Wells
- ▶ Town Meeting Approved \$4.2M for PFAS removal treatment system at Grove Pond – Army has agreed to cover cost
- ▶ Completed bench scale rapid column testing
- ▶ Completed design of treatment system – Bid in May
- ▶ Working with Army to install temporary treatment for GP Well 8
- ▶ Constructed emergency interconnection with Devens

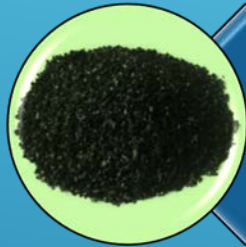


# HOW WILL AYER MEET 20 PPT

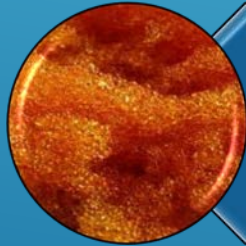
- ▶ All wells are over 20 ppt
- ▶ With temporary GAC treatment at Well 8, Grove Pond wells can be operated to stay below 20 ppt
- ▶ Beginning evaluation of treatment options, costs and schedule for Spec Pond Wellfield
- ▶ Mailing Public Notification to all water customers
- ▶ Recommending that sensitive population not drink / cook with Ayer water until levels are below 20 ppt
- ▶ Evaluating Point of Use filter and if effective, DPW will provide filters to sensitive population
- ▶ Continue to provide updates at Selectmen's meetings and on web site

# PFAS TREATMENT

- Available treatment technologies for PFAS removal:



Granular Activated  
Carbon (GAC)



Anion Exchange  
(AIX)



Membrane

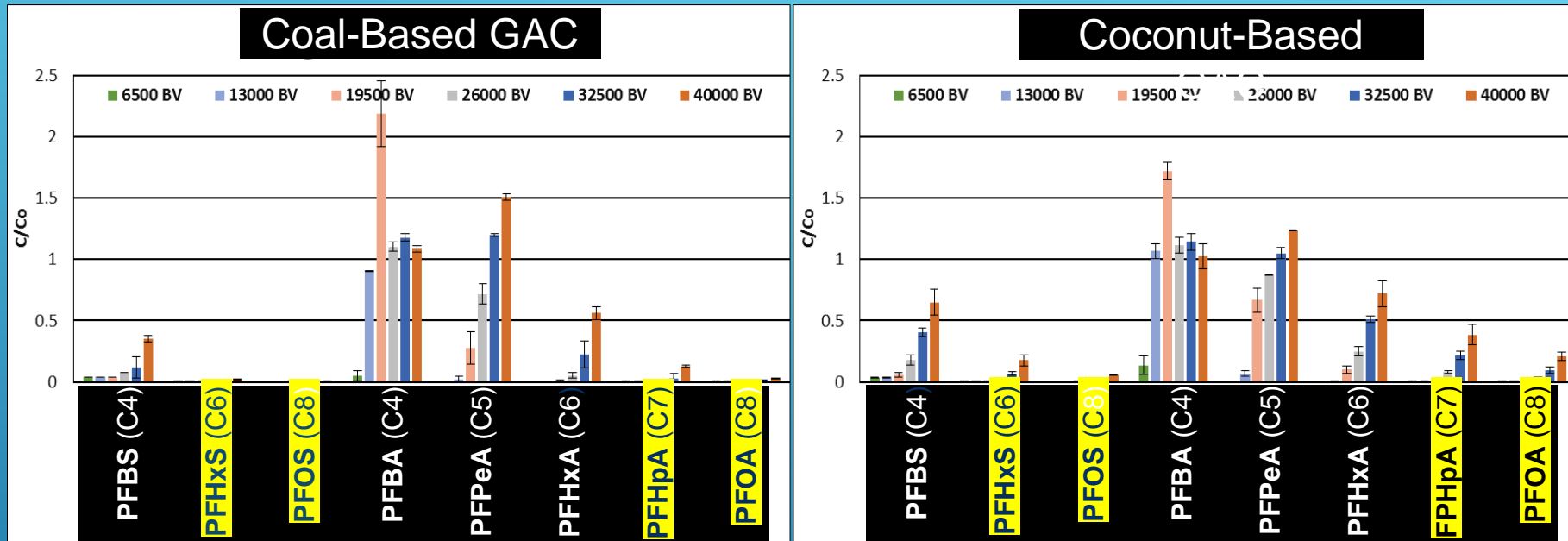
# BENCH SCALE TESTING: GAC VERSUS ANION EXCHANGE

Bench-scale testing to investigate:

- ▶ Two (2) GAC media
  - ▶ coal-based vs. coconut-based
- ▶ Two (2) AIX resin media
  - ▶ gel vs. macroporous
- ▶ GAC followed by AIX
- ▶ Impact of chlorine residual on PFAS removal



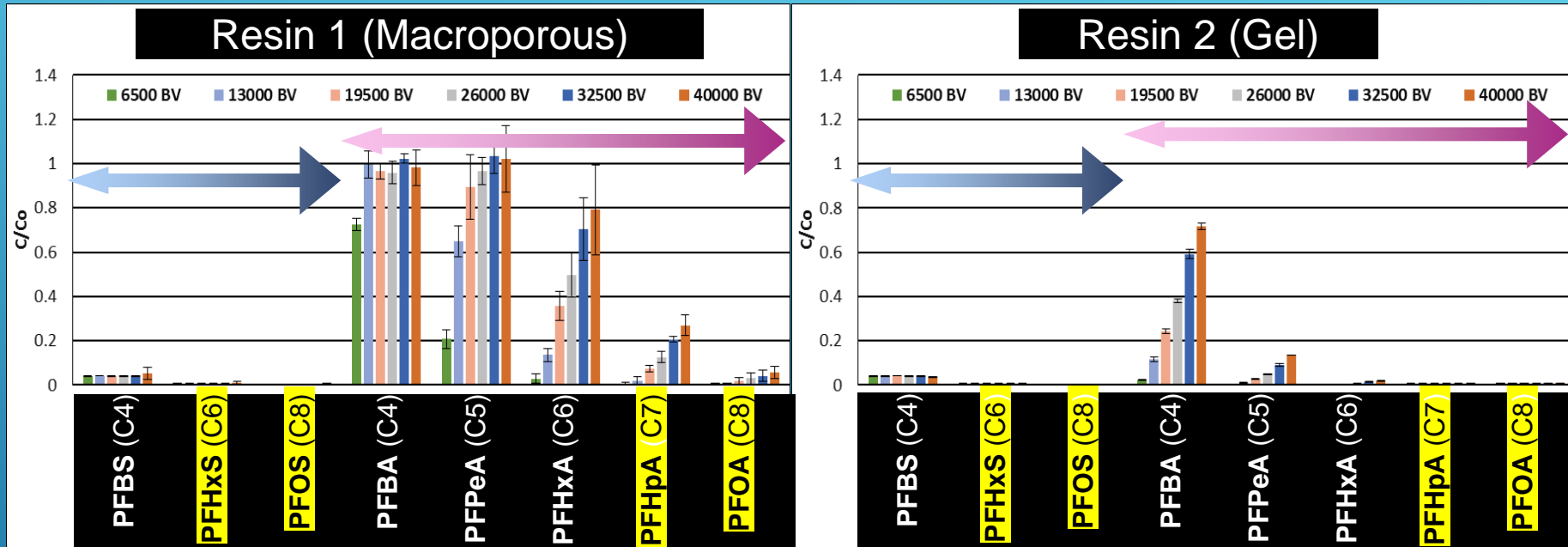
# GRANULAR ACTIVATED CARBON (GAC)



- Data in  $C/Co$  = Final Conc. / Initial Conc. = Removal Efficiency
- $C/Co = 1$  means no removal & Lower  $C/Co$  = better PFAS removal
- The two GAC products behaved similarly
- Better removal efficiency with sulfonates than carboxylates
- Better removal efficiency with longer chain compounds

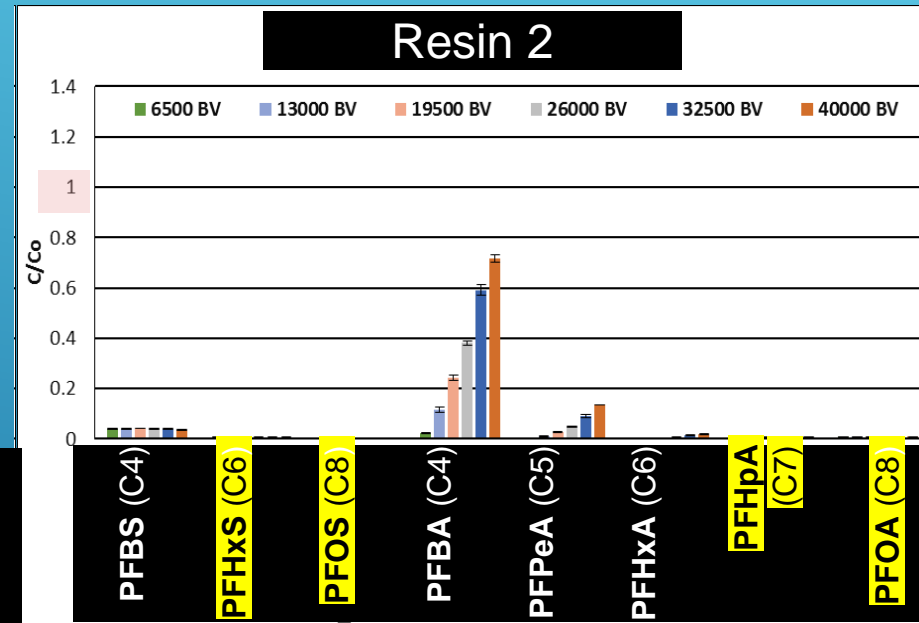
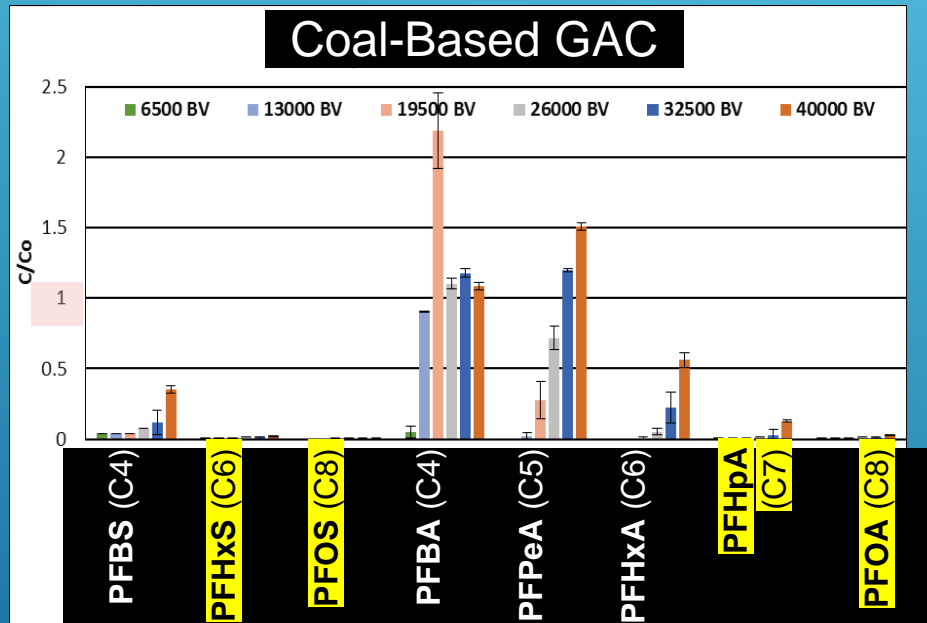


# ANION EXCHANGE (AIX)



- Resin 2 is specific for PFAS removal
- Significant differences in PFAS removal efficiency between the two resins tested
- Harder to remove shorter chain carboxylates

# COAL-BASED GAC VS. RESIN 2

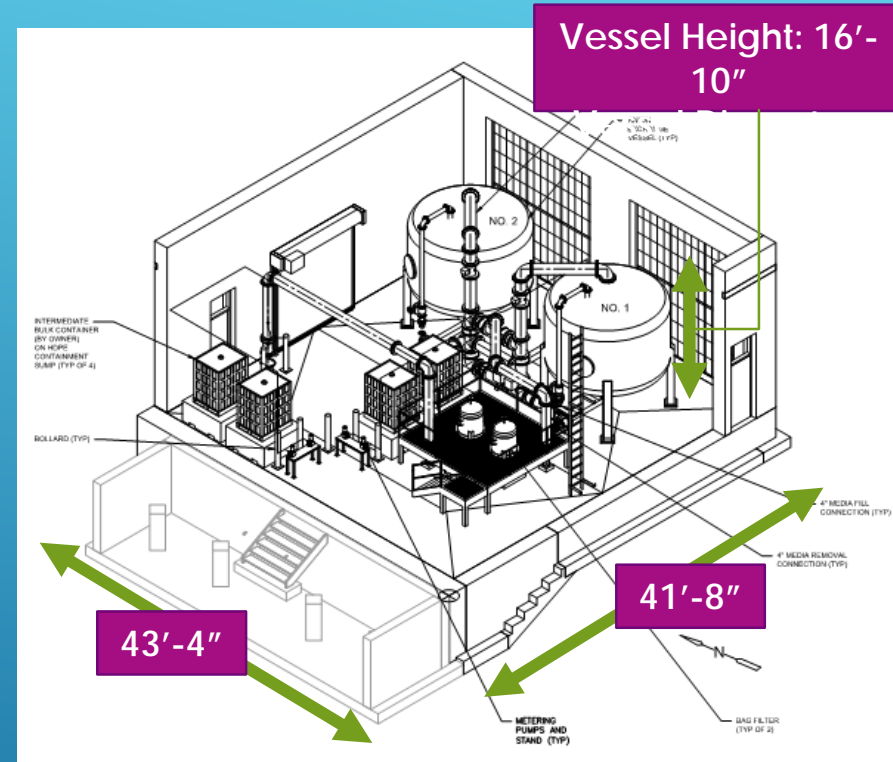
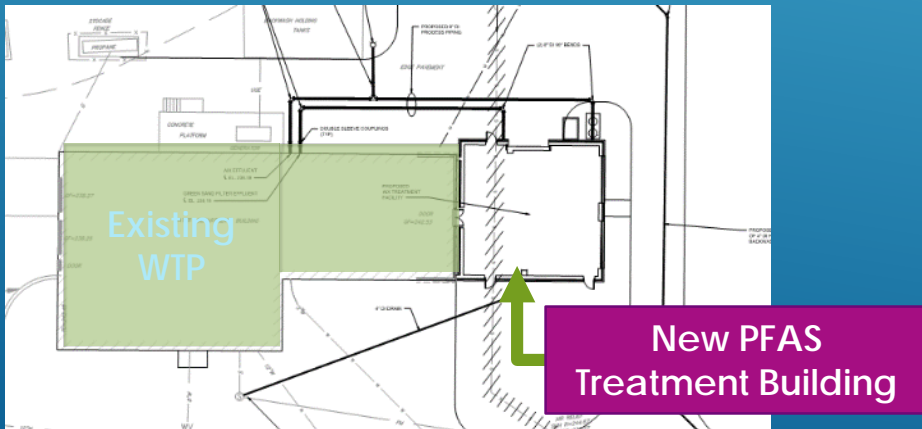


# BENCH SCALE TESTING CONCLUSIONS

- ▶ Overall, both AIX and GAC treated the MassDEP PFAS effectively, but differences in performance among the media products were observed
- ▶ AIX outperformed GAC over 40,000 bed volumes (BVs) and was chosen as the treatment technology for removing a wider range of PFAS including shorter chain compounds
- ▶ Resin 2 outperformed Resin 1, not observing breakthrough in PFOA, PFOS, PFHpA & PFHxS (MassDEP guideline)
- ▶ Resin 2 impacted CSMR over a shorter duration (<1,000 BVs) than Resin 1
- ▶ De-chlorination improved AIX's PFAS removal effectiveness
- ▶ Pre-treatment with GAC marginally improved AIX's PFAS removal effectiveness

# TREATMENT DESIGN – GROVE POND WTP

- ▶ New PFAS treatment facilities:
  - ▶ AIX for PFAS Removal
  - ▶ Calcium thiosulfate for dechlorination and bag filters prior to IX
  - ▶ Zinc orthophosphate for improved corrosion control



Approximately 1,800  
ft<sup>2</sup>





# RESOURCES:

- ▶ MassDEP Fact Sheet – PFAS in Drinking Water: Questions and Answers for Consumers  
[www.mass.gov/files/documents/2018/06/11/pfas-in-dw-fs\\_0.pdf](http://www.mass.gov/files/documents/2018/06/11/pfas-in-dw-fs_0.pdf)
- ▶ EPA's Drinking Water Health Advisories can be found at:  
<https://www.epa.gov/groundwater-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos>
- ▶ The Centers for Disease Control and Prevention's Public Health Statement for PFOS and PFOA can be found at: <https://www.atsdr.cdc.gov/pfas/index.html>
- ▶ CDC' Per- and Polyfluoroalkyl Substances (PFAs) and your health:  
<https://www.atsdr.cdc.gov/pfas/index.html>
- ▶ NSF certified filters to reduce PFOA and PFOS concentrations in drinking water:  
<http://www.nsf.org/newsroom/nsf-international-certifies-first-water-filters-pfoa>
- ▶ Town of Ayer Web Page <https://www.ayer.ma.us/water-department/pages/pfas-drinking-water>



## Cleanup of PFAS chemicals in drinking water underway in wells near Fort Devens

Updated: Mar 15, 2019 - 8:40 PM



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# QUESTIONS?