



## **Raising Awareness About PFAS in Drinking Water**

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by

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## **ABSTRACT**

Per- and polyfluoroalkyl substances (PFAS) are a group of harmful chemicals contaminating drinking water all across the United States. Despite the danger, there is a sizable knowledge gap among the population about PFAS and its dangers. The goal of this project is to help inform communities in Massachusetts about PFAS contamination through infographics and posters. Our research used case studies for two towns in MA Webster and Westborough, including semi-structured interviews and the development of infographics, to develop and gain feedback on effective strategies.

## **Acknowledgment**

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# 1 INTRODUCTION

Per-, and polyfluorinated alkyl substances (PFAS), are a class of man-made chemicals that have been used for decades in various industries as necessary, underlying chemical in the manufacturing process and in consumer products. Unfortunately, PFAS is a very dangerous chemical that poses a risk to people, animals, and the environment at large (National Institute of Environmental Health Sciences, 2024). According to the U.S. Geological Survey, a recent study found that one or more PFAS substances are present in around 45% of the United States tap water. Seventy-five percent of said contamination occurred in rural areas with unregulated wells and the remaining 25% was in urban areas with public water systems (Communications and Publishing, 2023). Because of PFAS's wide use, it can never be fully eliminated; it continues to bioaccumulate and cause various health effects. Unfortunately, many people are unaware of the danger of PFAS contamination.

PFAS contamination has been a global issue since the chemical was invented, but there have been strides in keeping public water systems safe. Multiple states including Massachusetts have regulations on PFAS levels in public water systems and the federal government has plans on establishing a national average in public water systems (Mass.gov MA DEP, 2024). Despite these efforts many people are not fully aware of what PFAS is and do not understand the importance of addressing the issues.

The overarching goal of this project was to educate, raise awareness, and address the knowledge gap for the contamination of PFAS in both private and public water wells in Massachusetts. We have worked with the MA DEP to create two sets of infographics to inform two communities in Massachusetts, Webster and Westborough, about the concerns and need to address PFAS. This report includes background discussion on what PFAS is, including its regulations and treatment, health effects on humans and the environment, outreach strategies, previous informational campaigns. It also provides information on the interviews, development, and feedback on the infographics created.

## 2 BACKGROUND CHAPTER

PFAS is a harmful chemical that affects people's health and the environment and is commonly used in industries as an underlying chemical that is not often addressed by the government or the public. Concerns about PFAS have been rising in recent years, and it is important to learn the best strategies to educate people about its harmful effects. This chapter discusses the chemical and physical properties of PFAS, contamination and remediation, knowledge gaps on PFAS, and outreach strategies.

### 2.1 What is PFAS?

Per- or poly-fluoroalkyl substances (PFAS) are a group of man-made substances used in manufacturing industries for a long time. PFAS was invented in the 1930s by Dupont and became popular in the 1940s and 1950s (Brennan et al., 2021). There are long-chain PFAS and short-chain PFAS. These two types of chemicals have different properties in water and need separate ways to treat them. Different types of PFAS with more carbons are more harmful to humans (Brendel et al., 2018). Figure 1 shows a brief chart from Brendal comparing different types of PFAS and what's considered long and short chain for each, with corresponding carbon values.

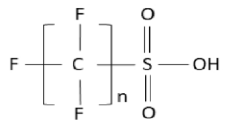
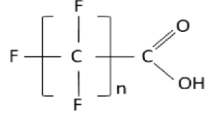
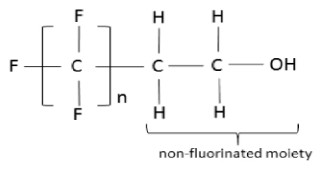
Perfluoroalkane sulfonic acids Long-chain: $n \geq 6$ Short-chain: $n < 6$ Example short-chain representative: PFBS ( $n = 4$ )	
Perfluoroalkyl carboxylic acids Long-chain: $n \geq 7$ Short-chain: $n < 7$ Example short-chain representatives: PFBA ( $n = 3$ ), PFHxA ( $n = 5$ )	
Example of short-chain precursors 4:2 fluorotelomer alcohol ( $n = 4$ ) 6:2 fluorotelomer alcohol ( $n = 6$ )	

Figure 1: PFAS Chemical Characteristics a visual for different types of PFAS with their corresponding levels of long and short chain, and carbon values

PFAS are often used to make materials that resist heat, oil stains, grease, and water. PFAS can be found in many household products such as nonstick cookware, cleaning products, personal hygiene products like shampoo, water-resistant fabrics like raincoats and umbrellas, and many more (National Institute of Environmental Health Sciences, 2024). Firefighting foam is also one of the products that is often used that contains PFAS which later becomes one of the major sources of PFAS contamination in the environment (National Institute of Environmental Health Sciences, 2024).

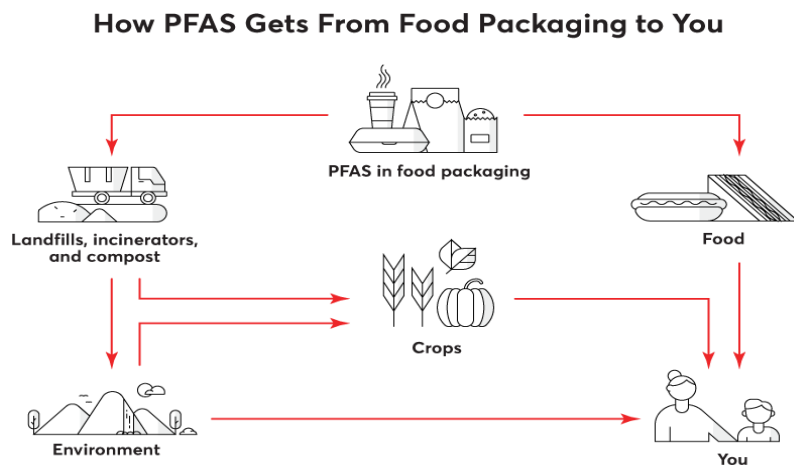
From the heavy usage of PFAS in multiple industries, it was common for PFAS to leak out and contaminate drinking water and soil from both their products and from waste generated. In 1960, the companies 3M and DuPont found that PFAS held many health risks and found that it contributed to a higher rate of cancer in their employees (Hayes & Faber, 2024). The government was not informed of the dangers of the chemical until 1998 after a lawsuit was filed against DuPont. The lawsuit exposed that the companies knew what PFAS could do to people and brought attention to it from the world (Hawthorne, 2022). He and his lawyer Rob Bilott started a lawsuit against Dupont and found out that the factory already knew that PFAS was toxic to humans and animals but did not publish the result. Building on the historical emergences and PFAS's usage in many products and industries worldwide, it is vital to know PFAS exposure routes and their harmful effects to humans.

## 2.2 PFAS Exposure

People ingest PFAS daily in part to its wide usage in many common products. PFAS is in things such as food packaging, personal care products, cleaners, furniture, and appliances (Responsible Purchase Network 2023, Chen, 2022). PFAS contaminates the environment by migrating into soil, the air, water during production, usage of the products, and disposal of their products, and the full picture of this cycle is demonstrated in Figure 3 below (Responsible Purchase Network, 2023). Humans spend most of their time indoors, so ingesting PFAS comes largely from the air people need to breathe to survive, dust, and carpets too which poses a huge risk for young children (Morales-McDevitt, 2021).

The disposal of products with PFAS contaminates our landfills, soil, and water supply once again. PFAS chemicals are persistent in the environment because they do not readily break

down. So, the cycle continues when crops are grown in the ground, and then people eat these crops, or they become wrapped up in packaging once again with PFAS in it. As shown in Figure 2 below it demonstrates a visual of this cycle from ConsumerReports.org.



Source: ToxicFreeFuture.org

Figure 2 The Cycle of How PFAS Gets from Food Packaging to You

*Note.* How PFAS Gets from Food Packaging to You, From *Dangerous pfas chemicals are in your food packaging*, by Loria, K. L. and Bergmann, D. L. (2024), From Consumer Reports in 2024

There are many ways that the human body can be exposed to PFAS, such as through skin contact with cosmetic items containing PFAS like lotion or makeup (Chen, 2022). Another method is through contaminated foods like eggs, fruits, vegetables, and drinking water (Chen, 2022). People can end up consuming contaminated drinking water from infected sources like public or private wells. When exposed to PFAS, the chemicals begin to accumulate in the body. Over time with continued exposure, the PFAS that is coming into the body begins to exceed the amount that is being removed in a process known as bioaccumulation (Chen, 2022). Seen in

Figure 3 is a map that shows sources of PFAS and how it is a never-ending transmission cycle.

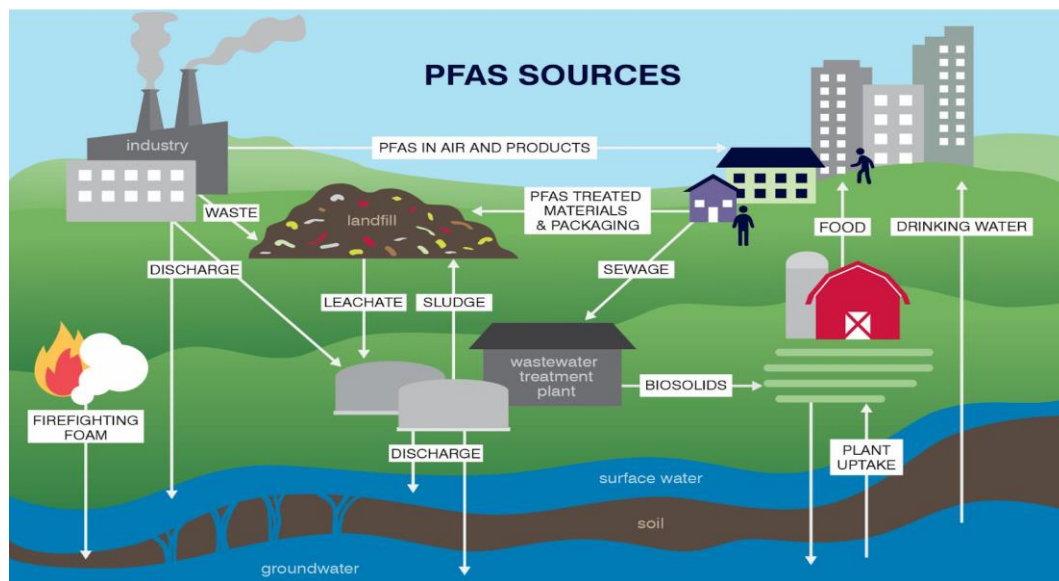


Figure 3: PFAS Never Ending Transmission Cycle in our Society

Note. PFAS Never Ending Transmission Cycle in our Society, From *Pfas and emerging contaminants.*, by Weston and Sampson (2023)

## 2.3 Effects on the Public's Health and Environmental/Wildlife Health

PFAS is an extremely prevalent contaminant in the environment due to their chemical structure. Their chemical structure has very strong bonds between molecules, so they do not easily degrade in the environment, leading to greater PFAS levels in the environment and easier exposure to people and animals (National Institute of Environmental Health Sciences, 2023). After ingestion, PFAS can be found throughout the body in blood, the heart, muscles, and even the brain. PFAS has been linked to many adverse health effects like some cancers, worsened reproductive health, weakened central nervous system, and PFAS-induced neurobehavioral and cognitive disorders (Cao & NG, 2021). Although some of these disorders are worse than others to contract, PFAS causes a wide range of issues.

## 2.4 PFAS Treatment on Drinking Water

Due to the adverse health effects of PFAS, new treatment measures have been developed and implemented worldwide. When treating PFAS in drinking water there are several common treatments such as ion exchange and absorption (Li et al., 2020). There are several treatment techniques such as advanced oxidation such as pyrolysis and oncolysis, but these treatments are expensive (Li et al., 2020) and not feasible in public water systems. However, the different properties of long-chain and short-chain PFAS, these two methods are more efficient for long-chain PFAS than for short-chain PFAS (Li et al., 2020). Since long-chain PFAS has been proven to be very harmful to humans, industries are replacing long-chain PFAS with short-chain PFAS which has been proven to be less toxic to humans in the short-term (Rahman et al., 2014). The long persistence of the short-chain PFAS can still stay in the human body for a long time, and considering the long-term exposure, it is hard to determine the long-term adverse effects in organisms. Although there are several ways to remediate PFAS from drinking water and the government is distributing grants for improving treatments, it is still a challenge to improve efficiency and lower the cost of maintenance (Trahan House, 2022). In Massachusetts the most common treatment method used by public water suppliers are carbon absorption methods, another method used by several communities like Wellesley is the ion exchange method. When PFAS is detected in the water communities must install treatment methods and to help cover costs the MassDEP awards grants for remediation (*Per- and poly-fluoroalkyl substances (PFAS) in drinking water*, 2020). In addition to Massachusetts' higher PFAS standards and treatment resources, many local organizations and communities in the state have imposed efforts to address the contamination issues and raise awareness of PFAS.

## 2.5 Knowledge Gap Among the Public on PFAS

Stemming from limited public awareness and insufficient education, there is a large knowledge gap surrounding PFAS. Regardless of PFAS becoming an increasing issue nationwide, many have still never heard of it (Berthold et al., 2023). A study was conducted to see how big this knowledge gap really is in the United States. Nearly half of the people surveyed in the study held by Berthold and their associates (45.1%) never heard of PFAS, and 31.6% said that they have heard of PFAS but did not know what it is (Berthold et al., 2023). In addition, almost all of the respondents (97.4%) also responded that they did not believe their drinking water had been impacted by PFAS (Berthold et al., 2023). Only communities that have made it known to the people that PFAS was an issue did people know about it, and therefore make changes to their daily lives and habits such as using items that were free of PFAS contamination (Berthold et al., 2023). However, due to the number of gaps remaining in this area, it's hard to truly assess the situation and inform the public (De Silva, 2020). It's difficult for officials to raise awareness nationwide if they aren't even sure of the full situation. The previous IQP addressing the knowledge gap of PFAS among the communities shows that most of the public do not know about PFAS and do not regularly attend the town meetings (how should we cite previous IQP). Implementing targeted awareness campaigns, educational programs, and accessible resources are options to properly educate the people on what they know. Despite the lack of public knowledge on PFAS, there are still ways that the public can become more informed on the dangers of PFAS. Through proper strategies for outreach to the public, we can bridge this gap and make people feel more informed on the crucial topic of PFAS.

## 2.6 Outreach Strategies

An outreach strategy encompasses a range of tactics used to raise awareness of products or services and to disseminate information effectively. There are multiple different ways one can perform outreach, some of these channels are through email outreach, phone call outreach, and social media outreach (Grigoryev, 2024).

The steps for creating an effective outreach strategy are as follows; establish the objective and goal you want to achieve, identify and prioritize the target audiences, identify any and all



partners, develop and pretest outreach plans, implement the strategy and then monitor the result and assess the effectiveness of the strategy (EPA, 2023). The goal is one of the most important aspects because it's what determines everything about the outreach strategy, the message or overall plan. The target audience is important because the strategy is for those who aren't aware of what's being shared. Developing the plan for outreach is needed because of the multiple methods that can be taken, some being more effective than others. For instance, using phone calls could be ineffective due to most people not answering unknown callers. Lastly, going through the strategy and monitoring is important to make sure if the plan played out successfully or if alterations will need to be made to make the strategy more effective (Cabasso, 2022).

Regardless of the end goal, successful community outreach is rarely easy. It involves knowing exactly whom to reach and how to engage with them (Narayanan, 2024). It is very important to learn about outreach strategies such as how to reach and engage with the community, which Massachusetts has started doing by addressing regulations for their communities.

## 2.7 PFAS Contamination in MA, Current PFAS Regulations

Examining how PFAS contamination impacts local communities, particularly the vulnerable communities in Massachusetts, highlights the importance of regulations and restrictions on PFAS usage. The Massachusetts Department of Environmental Protection (MassDEP) requires the Public Water Systems to test all new sources of drinking water for PFAS, including both replacement sources and satellite sources. They use EPA method 537 or method 537.1, which tests for 14 compounds and 18 compounds respectively, and reports all results (Mass.gov MADEP, 2024). Another regulation in MA is that they have established a maximum contaminant level (MCL) in drinking water for PFAS. According to MassDEP, the MCL is 20 parts per trillion or nanograms per liter for the sum of 6 PFAS in drinking water (Per- and polyfluoroalkyl substances (PFAS) in drinking water, 2020). EPA released new PFAS regulations on 10th April stating that the MCL of PFOA and PFOS is 4ppt, MCL of PFHxS, PFNA, and HFPO-DA is 10ppt, and mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS has a hazard Index of 1 (EPA, 2024). To accomplish this regulation, many drinking

water departments will need to add additional treatment for PFAS. It is very important to also educate people about these harmful chemicals and why these treatment processes are needed.

Table 1 PFAS regulation from Massachusetts and from EPA

Chemical	EPA Max Contaminant Level Goal (MCLG)	EPA Max Contamiant Level	Current MassDEP Regulations
PFOA	0	4ppt	20ppt sum of 6 PFAS compounds
PFOS	0	4ppt	
PFHxS	10ppt	10ppt	
HFPO-DA(GenX chemicals)	10ppt	10ppt	
PFNA	10ppt	10ppt	
Mixture of two or more PFHxS PFNA, HFPO-DA and PFBS	Hazard Index of 1	Hazard Index of 1	

## 2.8 Organizations working on educating PFAS in the public.

Various organizations, including government and non-profit organizations, are working on regulating and spreading awareness of PFAS. Out of all 50 states, Massachusetts has some of the nation’s most stringent limits on PFAS in drinking water.

There has been a recently proposed act known as the Act to Protect Massachusetts Public Health from PFAS, HD 3324 & SD 2053 filed by Representative Kate Hogan and Senator Julian Cyr for the new 2023-2024 legislative session, which would be one of the nation strongest bills to protect the public from PFAS contamination if it passes, and there are many organizations that are on board with the bill (Clean Water Fund, 2023). There are other states tackling PFAS. Some examples are in Michigan where they have the Michigan PFAS Action Response Team which was established in 2017 to help in dealing with PFAS threats in Michigan (Michigan PFAS Action Response Team (MPART), n.d.). New York has multiple adopted and proposed bills like A 09279 which prohibits the sale of carpets containing PFAS substances and makes a carpet collection program beginning on 12/31/24 (Bill Tracker, 2023). It’s important to know what other states and countries are doing against PFAS, but for the sake of the report, our focus is on Massachusetts in particular, not on other states.

Northeastern University researchers have also put a great effort into investigating PFAS and its remediation treatment. Northeastern University is home to the PFAS Project Lab, a team of researchers and activists working on PFAS (Clean Water Fund, 2022). Their project lab also hosts many resources like a database of government actions related to PFAS to help inform

anyone interested in PFAS policy and many links to articles on PFAS-related articles and studies.

## 2.9 Examples of efforts to address PFAS.

Many communities in Massachusetts have already been working to address PFAS in their water supplies. One example is in Hudson, MA. Hudson's issue with PFAS was first detected in 2019 when the town's groundwater supply levels of PFAS were well above the federal Health Advisory Level (MetroWest Daily News, 2022). Almost every community in the Third District has been impacted by PFAS contamination, but Hudson was the first to properly address it and implement change (Trahan House, 2022). Hudson's Chestnut Street PFAS Treatment System received \$1 million in federal American Rescue Plan Act (ARPA) funding, which was a huge help in their steps towards making change. (MetroWest Daily News and Trahan House, 2022). Since January 2019, Hudson has worked to regulate PFAS levels of more than 70 parts per trillion (ppt) in its water, which is well above federal guidelines against PFAS of 20 ppt (MetroWest Daily News, 2022). During this process, the Hudson DEP came to the realization that the high PFAS levels originated from the Cranberry Bog well, along with three companies in the area called Precision Coating Co. Inc., Boyd Coating Research Co. Inc. and Dylan, LLC, which settlements were imposed against (MetroWest Daily News, 2022 & PFAS Project Lab, 2021). The contaminant was introduced into the town's water system through the groundwater via the companies' septic system and the air through the heating, ventilating and air conditioning system (PFAS Project Lab, 2021). After these sources of error were addressed, current PFAS ratings in Hudson are no longer traceable in the water supply (MetroWest Daily News, 2022). Although Hudson imposed their own treatments against PFAS, many communities nationwide still need to take action.

## 2.10 MA DEP and MWROC Partnership

Throughout this project, the Massachusetts Water Resource Outreach Center (MWROC or WROC) will be working with the Massachusetts Department of Environmental Protection (MA DEP) on developing a campaign to raise awareness of this toxic chemical, PFAS. This mutually beneficial partnership between educational initiatives and governmental bodies

assumes a central role in addressing the prevention and awareness of this dangerous chemical. Consequently, our project involves collaborating with MassDEP and the MWROC to create an awareness-raising campaign to address the PFAS issue in public and private wells across Massachusetts. Further elaboration on our methodological approach is provided in the following chapter.

## 3 Methodology

The overarching goal of this project is to educate, raise awareness, and address the knowledge gap for the contamination of PFAS in both private and public water wells in Massachusetts. We want to provide viable information to the public to educate them on the topic of PFAS and suggest solutions using infographics to target communities that are impacted by PFAS contamination. To accomplish this, we have two primary objectives:

1. Understand Community Solutions and Innovations to Address PFAS Contamination
2. Create and get feedback on an informational campaign to raise awareness of PFAS facts and treatments

### 3.1 Understanding Community Solutions and Innovations to Address PFAS Contamination

This objective included exploring the innovative technologies used in public wells and developing an understanding of solutions to combat PFAS contamination. It included a review of the literature on PFAS, which is summarized in Chapter 2. It also included case studies on two Massachusetts towns, Webster and Westborough, to understand their plans for addressing PFAS and their associated outreach methods and needs.

#### 3.1.1 Semi-Structured Interviews

We conducted semi-structured interviews with the public works teams in Westborough and Webster to learn more about how they dealt with the problem of PFAS contamination. Before starting the interviews, we had an oral introduction and consent form (shown in Appendix C) to ask if we could use the information they provided us in our report, along with if we could record the interviews and note their names and occupations in the PFAS project. The semi-structured interviews took about an hour and were held at a place of their choosing, in this case a town or city hall meeting room, or their organization's building. Using our background research as a starting point, we asked them questions on how they tackled this issue. We asked them about what plan they had for PFAS treatment and any challenges they faced. Detailed questions of this interview are in Appendix C. Based on the information we gathered from these interviews, we

analyzed what these people accomplished with PFAS for their communities, what went well and didn't, and how they raised awareness for the issue and used similar techniques for our outreach methods. Gathering the techniques and strategies of other communities gave us the necessary information for our infographics and educational campaign.

## 3.2 Creating and obtaining feedback on an informational campaign to raise awareness of PFAS facts and treatments.

After the information was gathered, it was incorporated into our outreach methods for the targeted communities. This included two sets of infographics with PFAS information on them, and a poster for each town with a QR code in the middle that directs to our infographics.

### 3.2.1 Outreach materials

We have used the information we gathered in Objectives 1 and 2 to create infographics that would be helpful for the towns. The infographics included an introduction to PFAS, its health effects, and what the town is doing to keep the public water safe. We also provide links in the infographic lead to the town website, DEP website, and EPA website about PFAS. The infographics were posted on the WROC website. The poster we created has a QR code in the middle which links to our infographics. We sent our infographics and posters to each town and ask for some feedback on the design and content.

### 3.2.2 Final Meeting/Focus Groups

We presented our project with MaDEP staff and public works and water departments from both the town of Webster and town of Westborough. This meeting essentially served as a focus group to gain and discuss the best approaches for communicating with the public on . This final meeting included a final presentation followed by a discussion session.

## 4 RESULTS AND ANALYSIS

The main objective of this project was to develop an approach to inform, raise awareness, and bridge the informational gap regarding PFAS pollution by considering case studies using the public water systems of Webster and Westborough, Massachusetts. The EPA recently released an updated drinking water standard for PFAS in drinking water, specifying that the Maximum Contaminant Level (MCL) for PFOA and PFOS is 4 ppt, the MCL for PFHxS, PFNA, and HFPO-DA is 10 ppt, and mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS have a Hazard Index of 1 (EPA, 2024). With consideration to these new regulations and the risks of PFAS, it is especially important for communities to be aware of the impacts of PFAS and the need for treatment systems to address these impacts.

We aim to provide accessible information to the general public and educate them about PFAS by visually depicting relevant information using infographics and posters. To achieve this, we have outlined two key objectives:

1. Understand Community Solutions and Innovations to Address PFAS Contamination
2. Create and get feedback on an informational campaign to raise awareness of PFAS facts and treatments

This chapter summarizes the results associated with these two objectives.

### 4.1 Understanding Community Solutions and Innovations to Address PFAS Contamination

#### 4.1.1 Massachusetts Department of Environmental (MassDEP) perspective on outreach methods with the public

To understand the community's current situation and how the state regulates PFAS, we interviewed members of the Massachusetts Department of Environmental (MassDEP) press team (Ed Coletta and Fabienne Alexis), and the drinking water team (Lauren Sullivan and Stacy Johnson). We asked about the outreach methods, current regulations, and financial problems in addressing PFAS in Massachusetts. The full summary of each interview is in Appendix C.

The MassDEP team identified Instagram, LinkedIn, and Twitter as their primary platforms for outreach. Among these platforms, Instagram and LinkedIn received higher interactive engagement than Twitter, which often appears to serve as more of a platform for protest. Additionally, the MassDEP

agency website and YouTube channel were noted as effective outreach tools. MassDEP recently started using videos in their outreach efforts. While these videos gain significant views, they are contingent on content quality. Infographics play a crucial role in MassDEP's outreach strategies, and they are used across all platforms: Instagram, Twitter, and LinkedIn. The MassDEP staff stated that Instagram and LinkedIn receive more attention and interactive engagement and Twitter serves more as a protest platform where followers often have more questions and debates. They also mentioned that local governments engage more on LinkedIn and Twitter compared with other platforms. Besides the mentioned social media platforms, the agency website and YouTube channel are effective.

Suggestions about infographic formatting were vital to understanding how to create viable and reusable infographics for the public. Optimizing the sizing of infographics was key while transferring from platform to platform because the sizes of Instagram squares, PowerPoints, and LinkedIn are all different. MassDEP press team mentioned that Instagram has a special shape requirement which needs all the infographics to be square. We decided to make our infographics square to make sure that the infographics can be used with Instagram and most other types of social media. The MassDEP press team also mentioned that language can be a barrier to communication. Communities in Massachusetts have small populations that cannot read English. They suggested that we should ask each town about language considerations for communications. With this information on the MassDEP's perspective, we able to obtain additional information from our case study towns to gain their progress and perspectives on PFAS.

#### 4.1.2 Webster's Progress with PFAS Treatment

It is important to understand the water treatment plant and the current situation on PFAS in Webster. We interviewed the staff members from the Town of Webster's Water Department - Tom Cutler, Earl Gabor, and Danielle Teixeira. We also received information on the town water supply system and included an overview to provide context for the nature of the issues.

##### 4.1.2.1 Current Water Treatment Systems in Webster

Webster's water supply includes seven groundwater wells and two water treatment facilities - the Bigelow Road Site and Memorial Beach Site. After treatment, the water flows to the distribution system which includes water mains, a booster pump station, and two storage tanks. Both treatment facilities include iron and manganese treatment. The iron and manganese treatment systems were installed in 2019. A photo is included in Figure 5.





*Figure 4 Webster water treatment facility on Memorial Beach Site*

Webster started to test PFAS on 4/6/2021 and in the third quarter of 2021 they found higher levels of PFAS6 at the Bigelow Road site, so they notified all consumers that the PFAS levels had exceeded the MA MCL. The well was moved out of service in September of 2021 such that the average level of PFAS in water could be maintained under the state MCL. With one less well in service, this was difficult because of a water shortage during the following summer. As mentioned in our background section, EPA released new regulations in April 2024 stating that the maximum contaminant level (MCL) of PFOA and PFOS to be 4ppt. The PFAS concentrations in all wells and stations will comply with both regulations from Massachusetts and EPA (Webster, 2024), with the exception of one well at Station 3, which would exceed the level of PFOA - the EPA regulation of 4 ppt. To solve this problem, Webster is designing a new treatment facility for treating PFAS.

#### 4.1.2.2 PFAS Treatment

The town is planning to build a granular activated carbon (GAC) filtration facility to treat PFAS. The new PFAS treatment system will lower the level of PFOA and help provide the town with a safe water supply that complies with both the state and EPA regulations. In parallel with these efforts, Webster is actively engaged in remediation strategies to address the pervasive presence of PFAS in the local water sources. These strategies include the blending of PFAS-contaminated public water wells to mitigate the levels of harmful chemicals and retrofitting the existing facilities to incorporate PFAS treatment

capabilities. However, the complexity of designing standards-compliant processing systems presents significant challenges. This process is not only time-consuming but also costly.

#### 4.1.2.3 Financing

A preliminary cost estimate for the addition of PFAS to Webster's water treatment system was noted as \$43 million. While working in close collaboration with the Massachusetts Department of Environmental Protection (MassDEP), Webster has been diligently exploring various funding opportunities to secure the necessary resources for their project like interest-free loans and grants. The town has borrowed a State Revolving Fund (SRF) loan which aims to offer affordable financing options to cities, towns, and public water utilities to improve the water supply to cover the cost of building the PFAS treatment plan. The large amount of required funding is prompting Webster authorities to seek additional financial support from the public to ensure the facility's timely installation and operation.

#### 4.1.2.4 PFAS Outreach Methods

The Town is working to raise awareness of its water supply system and the current needs for PFAS mitigation, the Webster Water Department uses Facebook to share information with the public. The other way they share information on PFAS is through the annual consumer confidence report, which is mailed to everyone in the community who is using public water systems. Webster has not held any information campaign and has not distributed any educational material about PFAS as of this project. The Town also has a website about the PFAS information in their public water system. The website includes the PFAS level for each month in each of the wells. Staff from the town mentioned that people in the community might have heard references to PFAS or "the forever chemical", but the public might not understand what PFAS is and why they should be concerned about it. Besides educating people about PFAS itself, they also mentioned that they want the public to know more about the public water treatment process. This would help the community to understand more about where the town's money is being spent. We also asked about the language problem mentioned by the MassDEP press team. Some populations do not read English. The top foreign languages spoken in Webster are Spanish, Polish, French, and Portuguese. On the website of Webster, they also publish notifications in Spanish.

### 4.1.3 Westborough's Progress with PFAS Treatment:

To understand the progress related to PFAS in Westborough, we interviewed the Westborough Publics Work team, including Chris Poyant, and the technical members of his team to get more information about how the public water system works and what they are planning on to address PFAS. We also interviewed the Westborough town manager and select board and financial team. From them, we learned more about the financial situation for water treatment and their perspectives on how we can communicate with the public.

#### 4.1.3.1 Current Water Supply System in Westborough

Westborough has 10 wells in total including groundwater supplies and one surface reservoir. All the current wells have iron, manganese, and pH treatment to meet the safety requirements. PFAS was detected in two of the wells - the Indian Meadows and Chauncy Wells. The Indian Meadows Well had to be shut down due to its high concentration of PFAS. Multiple wells in Westborough were affected by PFAS contamination, necessitating treatment measures including GAC filters to reduce the concentration in the public water system.

#### 4.1.3.2 PFAS treatment

Since PFAS has been detected in their groundwater supply wells, the town is planning to build a granular activated carbon (GAC) filtration facility to treat PFAS. The new treatment facility will be built in an unused water treatment facility. The unused treatment facility was built for iron and manganese treatment, but its use was discontinued after a period due to its design. The town plans to extend the old facility and add GAC treatment into that building, such that it will work as a PFAS treatment facility. The new PFAS treatment system will reduce the PFAS concentration and help provide the town with a safe water supply that complies with both the state and EPA regulations. The use of the existing treatment facility will help reduce the expense of building PFAS treatment plants, although maintenance costs will still need to be considered.

#### 4.1.3.3 Finance

As indicated above, the Town of Westborough needs to add a PFAS treatment process such as activated carbon filters to reduce the concentration of PFAS in the public water supply system. Building a

new PFAS treatment plant would be costly, but the town has a water treatment facility that can accommodate the PFAS process. The town plans to convert this facility into a PFAS treatment plant. Renovation is much less expensive than building an entirely new facility. Despite the significant cost savings with his plan, the Westboro Public Works team remains cautious and plans to carefully review the long-term maintenance costs required to operate this facility to make sure they are manageable.

#### 4.1.3.4 Outreach Methods

Westborough shares information via Facebook and via the annual consumer confidence reports, which are mailed to everyone in the community who is using public water systems. The Town has not held any information campaigns or distributed any educational materials related to PFAS as of this report's completion.

During the interview, Westborough town officials mentioned that they believe many people in the town have heard about PFAS, but most don't know where it comes from. Westborough staff also would like people to know that the town will care for its public water system so that the community does not need to worry about it. They mentioned that it would be important to also educate the community about the public water system and the treatment process so that the public would have a better sense of why the water rates need to be raised. With a better understanding of the system, they feel that the number of people complaining about the public water system would be reduced. They indicated it is also important to be careful about the language on the poster and infographics. The Westborough town manager and public works employees believe that the infographics should use carefully chosen language and not frighten people. Overall, Westborough staff emphasized the importance of communicating appropriately to communicate the plans for addressing PFAS.

#### 4.1.4 Summary:

Webster and Westborough Water Department and Public Works are working hard to keep the drinking water safe. They have faced challenges such as a lack of financial support. Both towns believe that it is inevitable to raise the water rates to offset the financial burdens associated with PFAS remediation efforts. They also understand that it would be important to educate the public about PFAS, including where it comes from and how it would affect people's health, such that people would start to be concerned about it and pay attention to the problem. They also do not want to unnecessarily create fear among people in the town about the water quality. It is very important to find an effective way to

communicate with the public. Both towns suggested that an infographic and poster put in a library or public event would be a suitable way to inform people about these harmful chemicals.

## 4.2 Creating and obtaining feedback on the infographics and poster

### 4.2.1 Creating infographics

To assist the communities in communicating about PFAS and the plans to mitigate it, we developed a set of infographics with PFAS information, and a poster linked to our infographics. We created the first version of infographics. This included 6 pages (or slides) with information.

While creating the infographics, we carefully considered the important information we need to share with the community. Major topics we researched included PFAS exposure, its effects on human health and the environment, PFAS treatment in drinking water, the knowledge GAP among the public in the United States, and efforts to address PFAS and PFAS contamination in MA and the Town of Webster and Town of Westborough. However, this had to be paired down to the key points that needed to be conveyed. After a great deal of discussion, the key items to be presented included: a cover page, what is PFAS page, a health effect page, a PFAS source page, a town information page, and a website link page. The locations where we should place our posters was also an important consideration. The town library and community events such as town meetings were considered good places to locate the posters and share information, because the large populations at those events can help them draw much attention.

Upon completion of the first set of infographics and posters, we contacted the towns to get feedback from both Towns. We sent the relevant slides to both the towns of Webster and Westborough, and they replied with some feedback. Webster suggested removing the detailed budget information from the town information page because it still is an estimate, and the final number will come out. Until a later time. Due to our schedule, we did not have time to wait for the final budget, so we changed the language to indicate that we are still identifying funding sources. Westborough noted that specifics such as type of filtration process might be better on subsequent graphics, with a more generalized overview graphic for these slides. We added a page to introduce the public water system for both towns because this information would also help the community members understand the situation of PFAS contamination. The final version of infographics and posters are included in a consolidated graphic in figure 6 and are shown in complete form Appendix D.



Figure 5 poster(left) and part of infographics(right 6 graphs). The infographics here are part of the whole set of our infographics. The complete set of infographics is in Appendix D.

#### 4.2.2 Focus group discussion

We held a final presentation in MassDEP on April 27, 2024. During the final presentation, we held a group discussion about our infographics, posters, and methodologies. In this final presentation, we gathered 10 to 15 staff from different departments in MassDEP such as solid waste and public works and water department staff from the towns of Webster and Westborough. We presented the approaches for interviews, and the work that we did during the project, and explained our infographics and poster. The participants provided much helpful feedback and discussion, such as asking if the language in the infographics is too mild or if we should consider more blunt language to force people to focus on the PFAS problem. They mentioned that we could communicate with the public in those two towns about PFAS, which could be the first thing to do in the next project. They also raised some questions that we had not thought of during our project, such as how we can raise the discussion on PFAS without any political and other effects. The posters will be posted at community events and libraries where people can access and the QR code can allow people to read the infographics anytime they want. This could lead to discussion at home or in the neighborhood where conversation can remain private. This could help people discuss the PFAS problem without social effects.

Overall, the participants provided lots of positive feedback and helped to indicate the next step. They highlighted that we should carefully choose the content in our infographics and need to get more feedback from the public in the communities. They also emphasized that the locations where the posters and infographics are placed are very important.

# 5 CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

This project's main goal has been to develop an approach to help close the knowledge gap and increase public awareness regarding PFAS contamination in Massachusetts public water wells. We have created two sets of infographics in partnership with the Massachusetts DEP to educate the towns of Webster and Westborough on the serious issues related to PFAS and the need for action. Initiatives to address PFAS issues through new facility designs or constructions are underway in these towns. Our infographics offer clear and concise information that is based on interviews and feedback from each town and our sponsors. Also, they are made to be reusable resources that may be adjusted for usage in other areas dealing with similar issues related to PFAS contamination in their water sources.

Moving forward, we believe that communities can significantly enhance public understanding of PFAS pollution by adopting clear and engaging communication strategies. It is important for all towns to improve their communication about water systems, particularly considering the presence of PFAS pollutants. Using visually appealing infographics and modern technologies can facilitate efficient information sharing. Our infographics serve as a foundational resource for these communication efforts.

## 5.2 Recommendations

For future work on the topic of raising awareness of PFAS problems, we recommend people take these posters and infographics and get more feedback from the public. The infographics are created and revised under the advice of professionals; it is also very important to know the perspective of the public who has zero knowledge on these topics. With feedback from the public, people can further improve the infographics and make them more effective and useful.

On the other hand, we recommend that both towns Westborough and Webster post the infographics and posters in their library or other public events so that people can see them. This could help the public learn about the PFAS and how the public water system works in each town. We carefully chose the wording on the infographic and poster to help the public get information while not having lots of fear about the contamination of PFAS.

We also recommend that all communities should work to improve their strategies for communicating the aspects of their water systems. Utilizing modern technologies and effective infographics is essential for raising PFAS awareness by visually depicting the sources, health risks, and preventative measures



concisely and engagingly. The infographics developed for this project can easily be adapted for use in other communities to raise awareness of their efforts to address PFAS in their respective water supplies. These approaches can help to educate and support all members of their communities to the greatest extent possible. Furthermore, we encourage people across various disciplines to harness the potential of these modern technologies to engage with the public. These technologies play an important role not only in raising awareness of PFAS contamination but also in other topics about human sustainability. Through these effective innovative communications methods, people can create a more sustainable future.

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## 7 Appendices

### 7.1 Appendix A: Semi-structured Interview Informed Consent, introduction, and questions for objective 1

#### Introduction

Hi! Our names are Adam Flores, Anthony Gonzales, and Yunxin Li. We are conducting research for our junior year research project at WPI. We are working with the Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Water Resource Outreach Center (MWROC) to raise awareness of a toxic chemical we are ingesting every day called PFAS. It is a harmful chemical that is in our everyday food supplies, appliances, and air, but specifically, we are targeting the water sources. We want to raise awareness for different communities with diverse types of water systems and provide some facts on PFAS, and how people can treat their water systems and prevent it.

However, right now we are looking to gather information on how your community tackled this issue and what you recommend we do to pursue our outreach methods. The data collected from the interview will be used to help us understand community solutions and the water treatment technology used.

#### **Consent form for Semi-structured interviews**

1. You may stop answering questions or change your mind at any time.
2. We can be reached at gr-WROC@wpi.edu or mathisen@wpi.edu if you have any questions or would like to reach out to us.
3. Do we have permission to record your name, age, and occupation?

#### **Interview Questions for Understanding Community Solutions**

1. What is your name and role in your organization?
2. How long have you been working with PFAS?
3. What other projects have you worked on with PFAS?
4. What was the most helpful in community outreach of PFAS?



5. How did you get the funding to implement your project? How did you get other people to care about this issue to want to help you and gain demand for the project?
6. Are there any challenges you faced during the remediation process and during the work?
7. Who do you think should be responsible for the contamination of PFAS?
8. What was the goal?
9. What was the solution?
10. Do you have any diagrams of the solution?
11. How was the solution achieved?
12. If you were to do this project again, what would you do the same or differently?
13. Do you have any other suggestions?

General questions (Westborough):

1. How long have you worked for the town?
2. How many wells does the town have in total?
3. Two wells not used for drinking water/
4. Try to get a fund
5. Do you think people know about PFAS chemicals, specifically what products they are found in and how they get into drinking water?
6. Has the Town developed or distributed materials aiming to educate residents about PFAS
7. How many people are on private wells versus public water in Westborough?
8. If there is a public water supply; We don't see a public website on the Westborough website about PFAS levels and other PFAS treatment information, how do you share the PFAS data you get?
9. Do you think people in Westborough know about PFAS? about PFAS treatment?
10. Has Westborough had to add other kinds of treatment to its water system when PFAS was above regulation?

Question for public work (Westborough)

1. What do you think are some of the challenges facing us today related to water contamination?
2. Once the Town identified PFAS in their drinking water, what short-term measures did you take to address it?

3. What long-term measures are being taken to address PFAS in Westborough drinking water?
4. Has the Town identified the source of the PFAS contamination in its drinking water supply?
5. Have you ever developed or distributed educational material related to PFAS in private wells?

Webster General questions about PFAS (for both):

1. How long have you been in the town?
2. Do you think people know PFAS, where are they?
3. Have you put any effort into educating people on PFAS
4. How many people are on private wells and public wells?
5. PFAS has been a very hot water contamination problem, how do you think it has become so popular? Because people know about it and ask for clean water?
6. If private well owners find out that their water has way too much PFAS in it, they want to put treatment.
7. What treatment could they put on?
8. How much does that cost?
9. Will they get any financial help?

Webster Question for Tom(treatment):

1. Does all the water supply public or private?
2. If the is the public well, then ask for treatment
3. If private, how they know
4. What do you think would be the largest problem in water contamination?
5. What treatment is used in Webster to remediate PFAS?
6. We have heard that Webster's PFAS contamination is over 20ppt. What measures did you take or are you going to take to solve it?
7. What do you think is the main reason that causes the PFAS contamination?
8. What do you think would be the largest challenge to solving the PFAS problem?

Webster Question for Earl(financial):

1. How much did it cost to solve the PFAS contamination?

2. Where does all the funding to solve the PFAS problem come from? Grant? Tax?  
Responsible company?
3. Which part costs more money? Sampling? Treatment? Or something else?
4. Which part do you spend your money on? Sampling? Treatment? Or something else?  
How much is that?
5. Do you think the money you get from the government or company will be enough to solve the issue?
6. If you are going to raise the tax to solve the PFAS problem, do you think people will be willing to pay it?
7. The PFAS concentration went above 20ng/L in 2022 from July to December. Who covers the cost of improving water quality?
8. What is the biggest concern in awareness?

## 7.2 Appendix B: Informed Consent, introduction, and questions for objective 2

### Introduction

Hi! Our names are Adam Flores, Anthony Gonzales, and Yunxin Li. We are conducting research for our junior year research project at WPI. We are working with the Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Water Resource Outreach Center (MWROC) to raise awareness of a toxic chemical we are ingesting every day called PFAS. It is a harmful chemical that's in our everyday food supplies, appliances, and air, but specifically, we're targeting the water sources. We want to raise awareness for different communities with different types of water systems and provide some facts on PFAS, and how people can treat their water systems and prevent it.

However, right now we're looking to gather feedback from the communities we're working with on the outreach material we've developed. We're looking for suggestions for improvement to our material. The data collected from this focus group will be used to help us improve our outreach material.

## **Consent Form for Focus Groups**

1. You may stop answering questions or change your mind at any time.
2. We can be reached at gr-WROC@wpi.edu or mathisen@wpi.edu if you have any questions or would like to reach out to us.
3. Do we have permission to record your answers to the question?

## **Focus Group Questions for Feedback on Outreach Materials**

General views on awareness and challenges: Have you heard of PFAS other than during work? From friends or family members or from neighbors? Will you talk about PFAS with your family or friends?

1. As you know, PFAS has been proven to be a dangerous chemical since the 1960s and is in drinking water. Why do you think the public still doesn't know about it?
2. What do you feel are the biggest challenges we face in educating/informing people about PFAS?
3. With the new EPA guidelines out on PFAS, what are your biggest concerns as you look forward? Do you think a raised water rate will change people's lives? Can they afford it? Do you think people rather drink water with PFAS or raise the water rate?

About the infographics:

1. What comments do you have on the infographics that have been developed here? What would be the next steps (or additional sets of information) that may be helpful?
2. The infographics developed here provide the basics to generate increased awareness. What additional items do you feel should be communicated to the public?

Communications/support?

1. How do you feel the needs (and costs) for treatment system upgrades will be received in the town? What is needed to better support/promote these initiatives?

2. What other communication approaches (and/or social media platforms) may help communicate and engage the public?
3. What additional steps can the MassDEP and/or other organizations (eg. The WROC) take to support the communities in their efforts to address the issues?

## 7.3 Appendix C: Interview Transcript Notes

### 7.3.1 MassDEP Press Team Interview

Most Common Outreach Methods:

- Instagram, Twitter, and LinkedIn are primary platforms.
- Instagram and LinkedIn receive more attention and interactive engagement.
- Twitter serves more as a protest platform; followers often have more issues.
- Local governments engage more on LinkedIn and Twitter.
- The agency website and YouTube channel are effective.

Video Engagement:

- Just starting with videos.
- Videos receive a lot of views, but success depends on content.

Infographic Formatting:

- Infographics are important and utilized across all three platforms.
- Consider breaking down infographics into varied sizes for Instagram.
- Conversion from slides to slideshow to Instagram to Twitter may be necessary.

Regional Impact:

- Some issues may only affect specific areas.
- Interest and effectiveness of press conferences vary by location.

### Miscellaneous Considerations:

- Be cautious about formatting online, especially with infographics.
- Consider language barriers in outreach efforts.
- Address specific concerns such as firefighting foam (Fabienne).

### 7.3.2 Drinking Water Program Interview

#### Notes:

- The health effects
  - PFAS is the most dangerous chemical in drinking water.
  - The long-term effect of pfas is known
- The source of PFAS contamination
  - Have not figure out where all those PFAS come from
  - Some from firefighting foam
  - Did not investigate where the PFAS is really from
  - Other sources:
    - Waste sight clean up does a lot more investigating
    - Paper in compost leaching into soil
- Testing of PFAS
  - Requires communities to test for PFAS
  - The frequency will depend on the community size
  - Most towns have four-quarters of testing,
  - If it is a small place, then only 1 test.
- If a community has PFAS contamination
  - If the above 20(mass mcl) had to notify consumers
  - The public will get a notice of noncompliance when above the levels of pfas
  - If they cannot turn off the well, they must provide customers with bottled water.
  -
- DEP action when the community has PFAS
  - Put communities with PFAS on a path to correct the contamination
  - List of approved water on the website If they do not go down the path with us there are some higher levels of enforcement
  - A lot of meetings with towns above mcl to reach out to towns.

- Every municipal system that has exceeded she has spoken to them
- Treatment method
  - Treatment methods: Two main types of granular activated carbon (GAC) and ion exchange and GAC is good for longer chain PFAS, and ion exchange is good for shorter chain PFAS, and it will break down the smaller ionic level pfas.
  - Each community will usually pick one way of treatment that fits the PFAS contamination in their community.
    - Dependent on water and type of pfas in water
  - Usually only have one treatment but some have two
- Outreach methods
  - Not everyone was that familiar with the regulations
  - Spoken and done presentations on pfas
  - Social media is a fantastic way to target people
  - Education is important and mailing them what is happening
  - Mail is required to be sent every 90 days (about 3 months)
  - Every town test water quality once a year(?)
  - Have not done education stuff on PFAS
  - Presentations is the way they have communicated to the public at town meetings
  - Town just updated their website when their treatment was expanded
- Financial problems
  - State revolving fund is an interest free loan to them to make these treatments and communities will do the upfront costs.
  - Cost is a big burden to towns sometimes
  - Recent grant awarded to us for emerging contaminants
  - Expensive but since it is a hot topic there will be more money out there soon

### 7.3.3 Webster Interview Notes

#### **Financial Implications:**

- Collaborated closely with MADEP to avoid a \$43 million loan, potentially \$60 million due to inflation.
- Federal funding from Dupont settlements received but it is unclear how communities will receive it. Estimated cost for design and construction is \$43 million.

### **PFAS Contamination and Remediation:**

- Shutdown of the largest well in Webster due to PFAS contamination, causing water shortages in recent summers.
- Class action lawsuit against Dupont; no specific source identified.
- Retrofitting of facilities for PFAS treatment, including an iron-manganese plant.
- Water replacement program under consideration, with an estimated cost of \$4 million for transport.
- Treatment building is the most expensive part, involving 4 28-foot tall tanks.
- Design challenge: State regulations call for 6 compounds, EPA calls for 2, design needs to accommodate both.

### **Community Awareness and Engagement:**

- Monthly testing of wells for PFAS, variable concentrations observed.
- News outreach efforts, public hearings, DEP involvement, and social media broadcasts for community engagement.
- Public awareness on PFAS and water contamination, evidenced by a \$33 million funding vote.
- The majority of Webster is served by public wells, some private wells exist.
- The water and sewer commission meets monthly; charter change five years ago led to more knowledgeable members.

### **Collaboration and Communication:**

- Collaboration with sister town Dudley on PFAS treatment and sewer water treatment.
- Efforts to communicate with other towns and organizations regarding water issues and solutions.

### 7.3.4 Westborough Interview (Town Manager)

#### Community awareness:

- Regularly track and communicate with the community.
- They believe that people in the town know about PFAS.
- People do not really know where PFAS comes from, just that it exists.
- The fact that PFAS is everywhere confusing for people.
- They are confident that the town will take care of it, though it is a thing that the people believe that others will take care of.



#### Funding related answers:

- Borrow money over a 20-year period for funding the PFAS project.
- They use the state and national programs for funding and from class action lawsuits against polluters they are a part of.
- The willingness to pay by people is a no-choice matter because with water people do not like paying more but it is necessary.
- Main funding issue is that the PFAS issue is not the fault of the town but instead the companies who polluted, pulling funding is difficult.

#### Community outreach:

- When they send out information to the community the languages, they focus on are English, Spanish, Mandarin, and Portuguese.
- They have a small population of people who do not speak or understand English.
- Their only used social media is Facebook and LinkedIn.
- They get feedback through Facebook.
- They also have a local tv station and use direct mailing.

### 7.3.5 Westborough Interview (Public Works)

#### **PFAS Contamination and Treatment:**

- Two wells (Indian Meadows and Chonsey) contaminated with PFAS; Indian Meadows abandoned.
- Green sand filters iron and manganese; grant obtained for conversion to GAC filters.
- Obtained grant for PFAS system design, funded by SRF loans.
- PFAS is the primary concern due to uncertain regulations.
- UCMR testing conducted (~200 samples) for regulated contaminants.
- No drastic measures taken for PFAS treatment.
- DEP assistance appreciated for clarifying complex regulation.

#### **Regulation and compliance:**

- Concerns about changing regulations necessitating method changes.
- The majority of PFAS is from non-water sources.
- Costly sampling (\$300-\$400 per sample), significant annual expense (\$10,000).

- Estimated \$8.2 million to treat Chonsey wells; ongoing GAC filter maintenance expensive.
- The loan covers construction but not future upkeep of treatment plant.

**Community Awareness and Communication:**

- Majority aware of PFAS issue.
- Consumer confidence reports include PFAS levels.
- Limited direct outreach (phone calls, infographics) and reliance on credible sources like MADEP.
- Companies using PFAS did not identify to trace contamination source.
- Town meeting vote on treatment plant upgrade, attended by 300-500 people.

## 7.4 Appendix D: Project Outcomes

### 7.4.1 Infographics

#### 7.4.1.1 Infographics for Westborough

**DID YOU KNOW?**

**PFAS**  
HAS BEEN FOUND IN  
**WESTBOROUGH'S**  
DRINKING WATER

**DID YOU KNOW?**  
**PFAS**  
(Per- and Poly-fluoroalkyl Substances)

- Are a group of man-made chemicals used in many common products like cosmetics, food wrappers, waterproof fabrics & more;
- Are linked to multiple adverse health effects;
- Are hard to remove from the environment;
- Are commonly referred to as “forever chemicals”

**PFAS**

WESTBOROUGH MASSACHUSETTS WPI MassDEP

The infographic features a blue water drop icon at the top left. Below it, the text 'DID YOU KNOW? PFAS HAS BEEN FOUND IN WESTBOROUGH'S DRINKING WATER' is displayed in white and yellow. To the right, a section titled 'DID YOU KNOW? PFAS (Per- and Poly-fluoroalkyl Substances)' lists four bullet points. Below the text is a ball-and-stick model of a PFAS molecule, showing a central carbon atom bonded to two oxygen atoms, one of which is bonded to a hydrogen atom, and a long chain of fluorine atoms. At the bottom, logos for Westborough, WPI, and MassDEP are shown.

**DID YOU KNOW?**  
**PFAS can affect your health**

PFAS exposure has been linked to many adverse health effects, such as:

- Cancer
- Decrease in reproductive health
- Decrease in early childhood development
- Weakened immune system
- Kidney disease
- And many others

**DID YOU KNOW?**  
**PFAS is in many common products**

PFAS Products

- Fire Foam
- Water Proof Products
- Nonstick Cookware
- Food Packaging
- Cleaning Products
- Cosmetics

The infographic is split into two sections. The left section, titled 'DID YOU KNOW? PFAS can affect your health', lists six adverse health effects of PFAS exposure. The right section, titled 'DID YOU KNOW? PFAS is in many common products', features a central 'PFAS Products' hub with six surrounding icons: Fire Foam, Water Proof Products, Nonstick Cookware, Food Packaging, Cleaning Products, and Cosmetics.

## DID YOU KNOW?

### PFAS is regulated

MassDEP



**State Regulation:** Massachusetts regulates certain PFAS. Public water systems are required to test for certain PFAS and add treatment if they exceed state standards.



**Federal Regulation:** In 2024, The US EPA set even stricter standards for PFAS in drinking water. Public water systems will be required to meet these lower standards.

## DID YOU KNOW?

### Westborough is addressing PFAS in its Drinking Water

The Town must add treatment for PFAS to its public water system to meet state and federal standards.

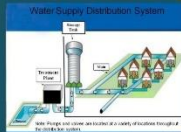


The town has selected Granular Activated Carbon (GAC) filtration to remove PFAS from its drinking water.



## DID YOU KNOW?

### How clean water reaches your home



- Groundwater is pumped from underground wells to the Town's treatment plant
- Water is treated for various contaminants, including iron and manganese, at the treatment plant
- Water is sampled and tested to ensure it meets state and federal drinking water standards before it enters the distribution system
- Carbon filtration will be added to Westborough's treatment process to remove PFAS



## Learn more about PFAS

For more information about PFAS levels in Westborough  
Visit <https://www.westborough-ma.gov/>

Visit MADEP website to learn more about state regulations:  
<https://www.mass.gov/drinking-water-health-safety>


Visit EPA Website: <https://www.epa.gov/pfas>

## ABOUT THE AUTHORS

WPI students created these infographics as part of an Interactive Qualifying Project (IQP), in collaboration with the Water Resource Outreach Center (WROC) and MassDEP.






7.4.1.2 Infographics for Webster



**DID YOU KNOW?**

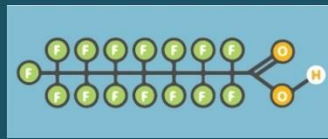
**PFAS**  
HAS BEEN FOUND IN  
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DRINKING WATER

**DID YOU KNOW?**

**PFAS**  
(Per- and Poly-fluoroalkyl Substances)

- Are a group of man-made chemicals used in many common products like cosmetics, food wrappers, waterproof fabrics & more;
- Are linked to multiple adverse health effects;
- Are hard to remove from the environment;
- Are commonly referred to as "forever chemicals"



**DID YOU KNOW?**


**PFAS can affect your health**

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- Cancer
- Decrease in reproductive health
- Decrease in early childhood development
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- Kidney disease
- Many more


**DID YOU KNOW?**

**PFAS is in many common products**




**DID YOU KNOW?**

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**DID YOU KNOW?**

**Webster is addressing PFAS in its Drinking Water**


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The Town must add PFAS treatment to its public water system to meet both state and federal standards.

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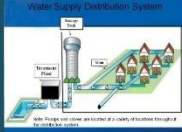


The Town is developing a plan and identifying funding sources to add treatment for PFAS to its existing water treatment plant



## DID YOU KNOW?

### How clean water reaches your home



- Groundwater is pumped from underground wells to the Town's treatment plant
- Water is treated for various contaminants, including iron and manganese, at the treatment plant
- Water is sampled and tested to ensure it meets state and federal drinking water standards before it enters the distribution system
- Carbon filtration will be added to the treatment process to remove PFAS



## Learn more about PFAS

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Visit <https://www.webster-ma.gov/>

Visit MADEP website to learn more about state  
regulations:  
<https://www.mass.gov/drinking-water-health-safety>

Visit EPA Website: <https://www.epa.gov/pfas>

## ABOUT THE AUTHORS

WPI students created these infographics as part of an Interactive Qualifying Project (IQP), in collaboration with the Water Resource Outreach Center (WROC) and MassDEP.



7.4.1.3 Posters for Webster and Westborough

**DID YOU KNOW?**

**PFAS HAS BEEN FOUND IN WEBSTER'S DRINKING WATER**

Scan the code above to learn more about PFAS :

- Health Effects
- Sources
- What Your Town Is Doing About It

Logos: MassDEP, WPI, Webster, Massachusetts

**DID YOU KNOW?**

**PFAS HAS BEEN FOUND IN WESTBOROUGH'S DRINKING WATER**

Scan here to learn more about PFAS :

- Health Effects
- Sources
- What Your Town Is Doing About It

Logos: MassDEP, WPI, Westborough, Massachusetts