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**Portsmouth and Pease International Tradeport  
Drinking Water Status Report  
2021 Year in Review – February 17, 2022**

**Highlights of 2021**

The following report provides a summary of the water system operations for the Portsmouth and Pease International Tradeport drinking water systems. Highlights from 2021 for both water systems include:

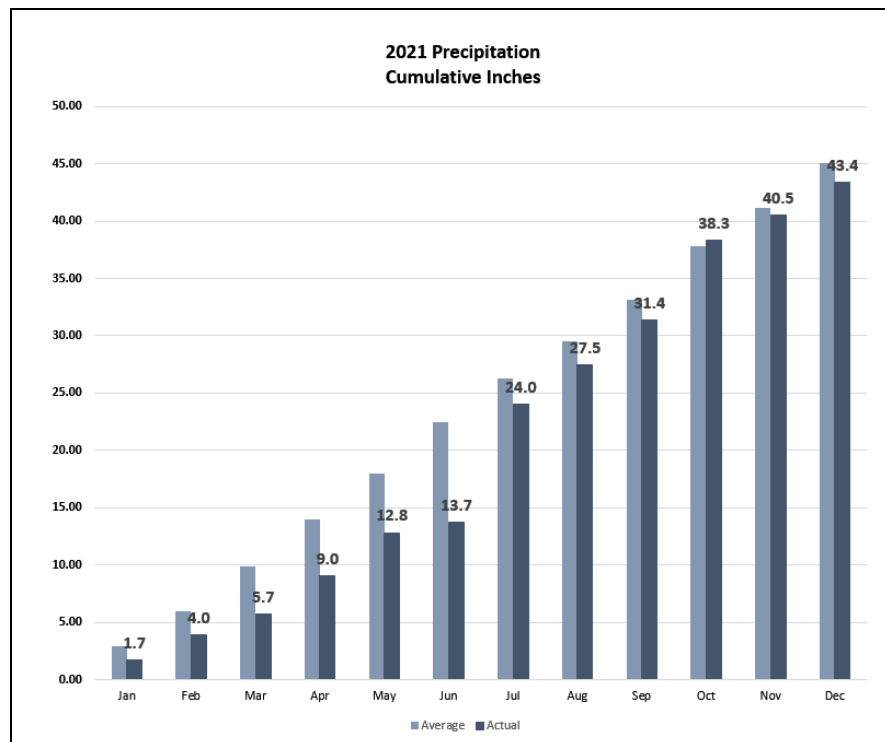
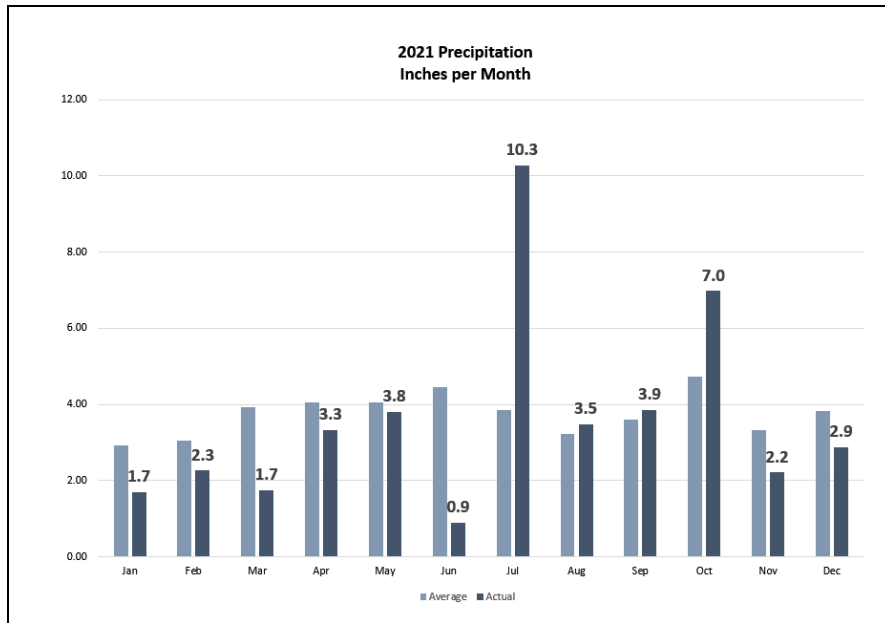
- The Portsmouth and Pease drinking water systems had no drinking water quality violations in 2021.
- Water Production:
  - 3.6 Million Gallons – Average Day
  - 6.2 Million Gallons – Maximum Day
  - 2.5 Million Gallons – Minimum Day
- Drought conditions continued into July when ten inches of precipitation occurred
- Construction of a new water filtration system to treat PFAS contamination at Pease was completed during the summer of 2021 and the Haven well was reactivated in August

Water supplied to Portsmouth water system customers comes from a combination of surface water and groundwater sources. The surface water supply is the Bellamy Reservoir, which is located in Madbury and Dover. Water flows from the reservoir to the Water Treatment Facility (WTF) in Madbury, where it is treated before distribution to our regionally served water customers.

Water supplied to Pease Tradeport water system customers comes primarily from the groundwater wells located on the Tradeport (Harrison, Smith and Haven wells). Portsmouth water system supplies water to the Pease Tradeport water system as needed.

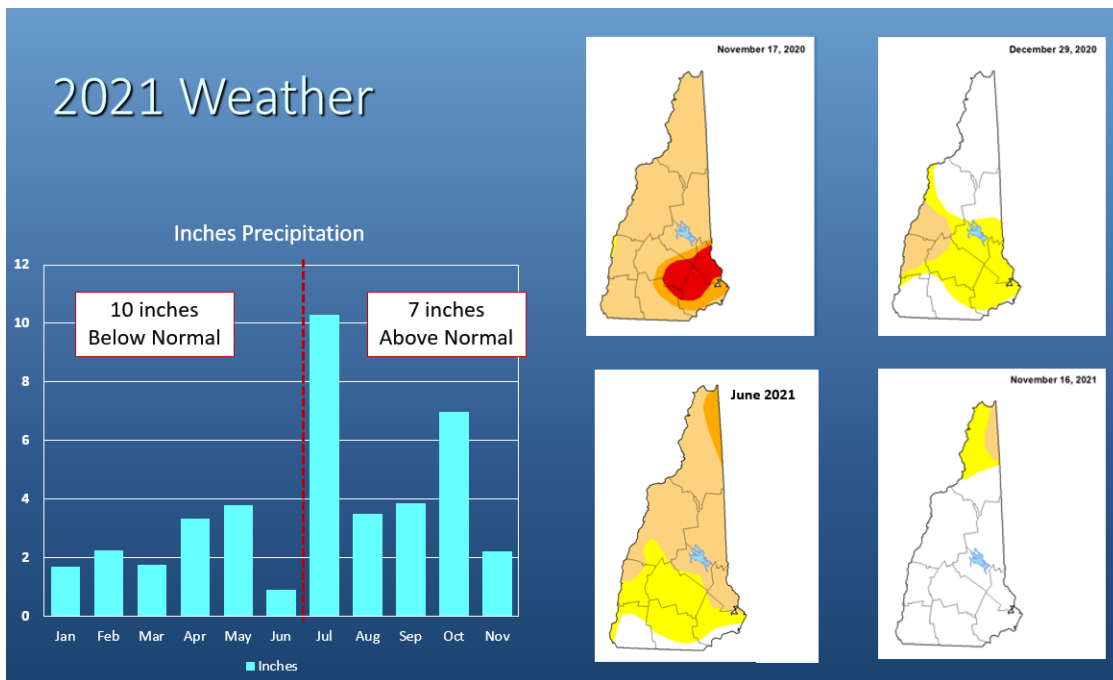
## Precipitation and Weather

At year-end, the overall water supply conditions for the Portsmouth and Pease water systems had recovered from a very dry period experienced throughout 2020 and the first half of 2021. The following graphics show the monthly precipitation as recorded at the Pease NOAA weather station and the cumulative precipitation through the year. At year-end, the total precipitation of 43.4 inches was near the normal of 45 inches.



The State of New Hampshire active their Drought Management Plan and convened their Drought Management Team during the summer of 2020. City water operations staff participated in the meetings. The Team consisted of state, federal, regional and municipal agencies, including the Portsmouth DPW Water Division. Actions included: assessing reservoir impacts and adjusting operations, working with drinking water systems statewide and ensuring the public is informed of the impacts and conservation measures that should be employed now to avoid serious problems later in the summer. Throughout the drought our water system provided updates and encouraged water users to “Think Blue” and consider water-saving measures at home, including participating in the City’s water efficiency rebate program. The team was getting ready to reconvene meetings in 2021 when the rains came in July.

The following graphics, from the U.S. Drought Monitor, show the progression of the drought during the summer of 2021 and the recovery after rains occurred in July through October:

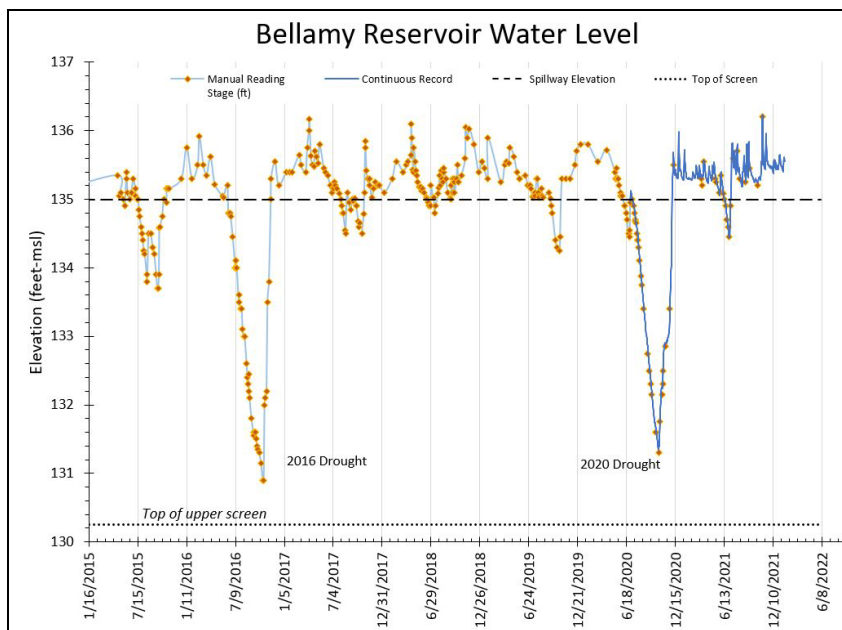
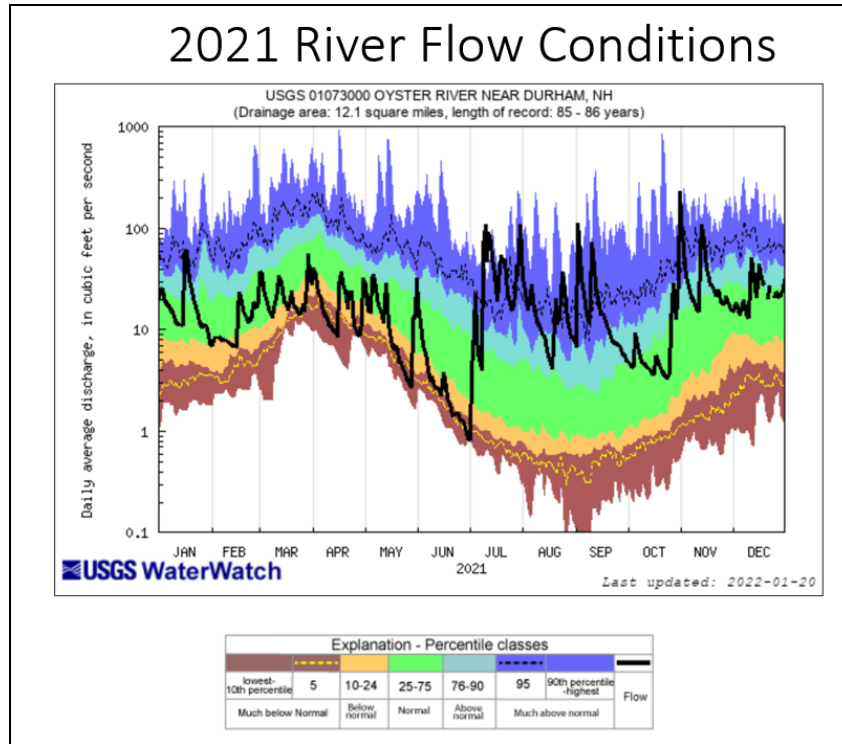


Overall, the weather was also warmer than normal. The following statistics were taken from an annual summary in the Boston Globe:

- Average Temperature was 54.6 degrees
  - 2.5 degrees above normal
  - Second-warmest year since 1872
- Warmest June on record
- Second warmest August on record
- Second warmest September on record
- Fourth warmest October on record

## Reservoir Levels and Flow

The following graphic shows the flow trend, according to the gauged Oyster River, which we use to assess the flow into the Bellamy Reservoir, for 2021. The low flow conditions that persisted until July are highlighted. Flows picked up after those rainfall events and continued through the rest of the year.

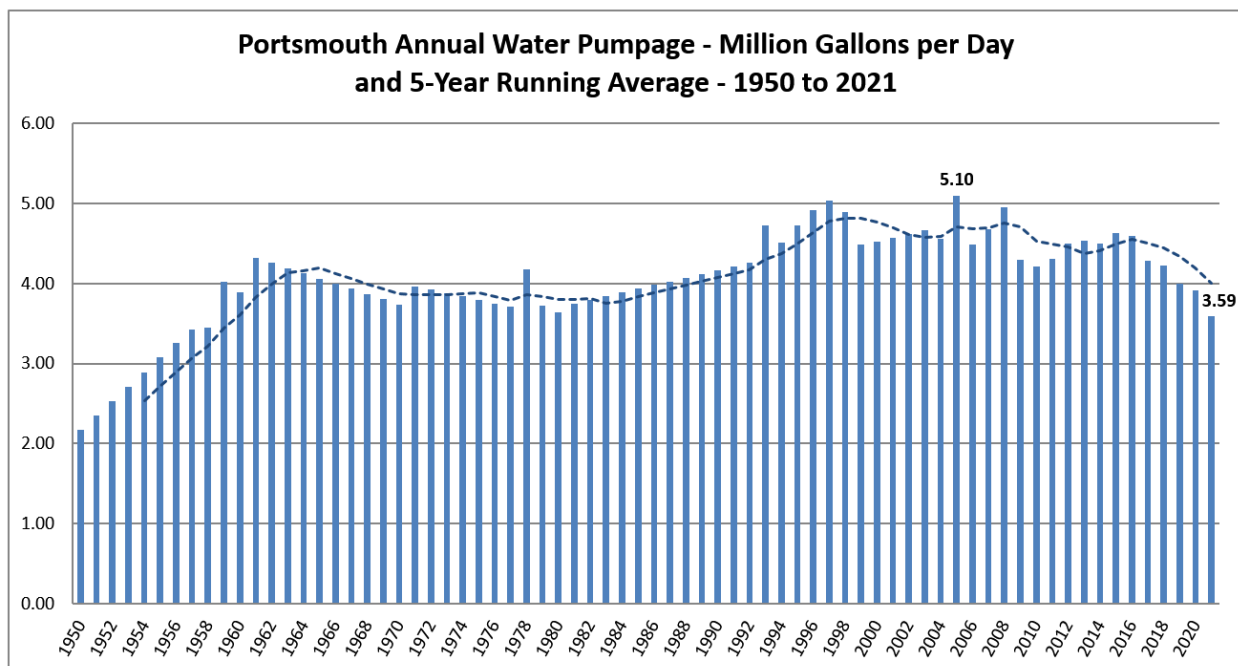


## Groundwater Levels and Status

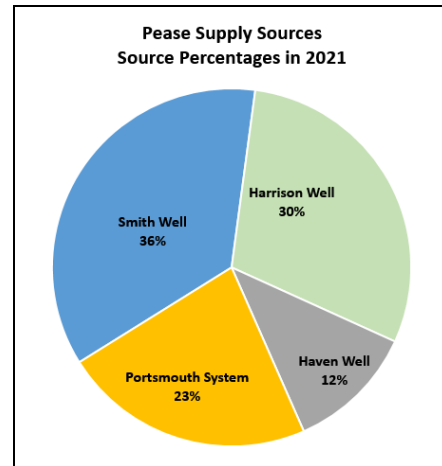
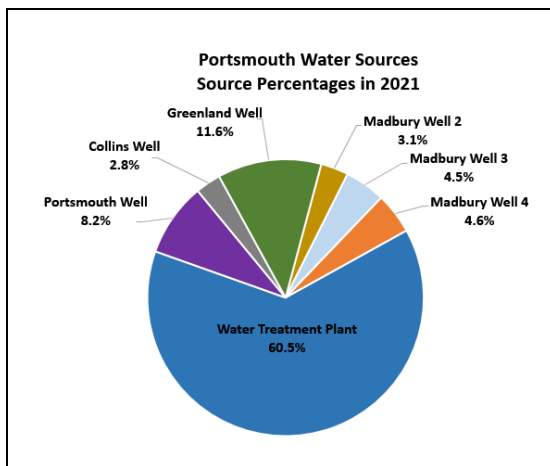
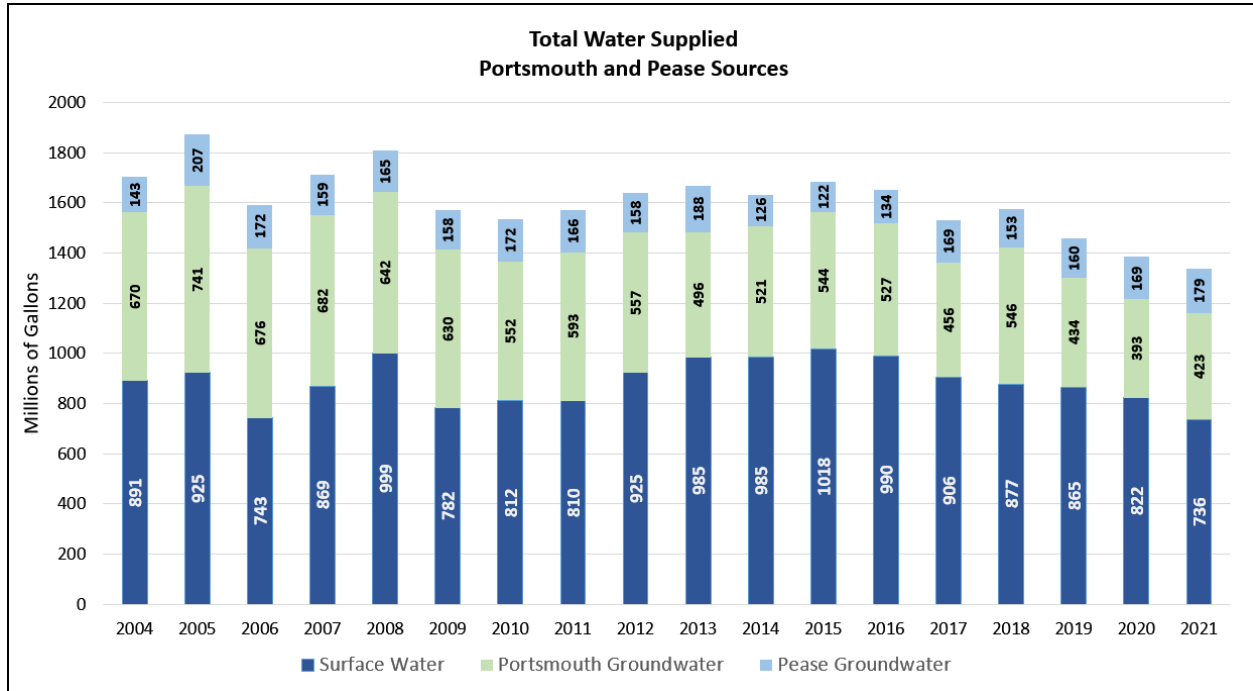
Groundwater levels in most of our water sources are much better than normal. In fact, some of the well levels are higher than they have been in years. This can be somewhat attributed to the way we received precipitation, however, it can also be attributed to our water operations staff's optimization of the use of surface water versus groundwater. Cutting back our groundwater withdrawals has allowed well levels to be maintained in a sustainable manner and more water availability for the system to meet peak demand. Each well has a continuous water level meter and the water pumped is also metered. This allows system operators the capability of assessing groundwater level trends and we are able to determine overall source of supply capability.

## Water Production

The water produced by the combined Portsmouth/Pease water system averaged 3.59 million gallons per day. This is the lowest average production in nearly 40 years. Through diligent management of our water distribution system and service pipelines we have been able to identify and fix a number of leaking pipes. The reduction of water lost in these pipes has reduced the overall water production needs in the systems. It is now standard practice for our staff to continually inspect our water system for leaks. With 200 plus miles of water pipelines this is a lot of effort. The following graphics show the monthly and annual trends in water supply production for the Portsmouth and Pease Tradeport water systems:

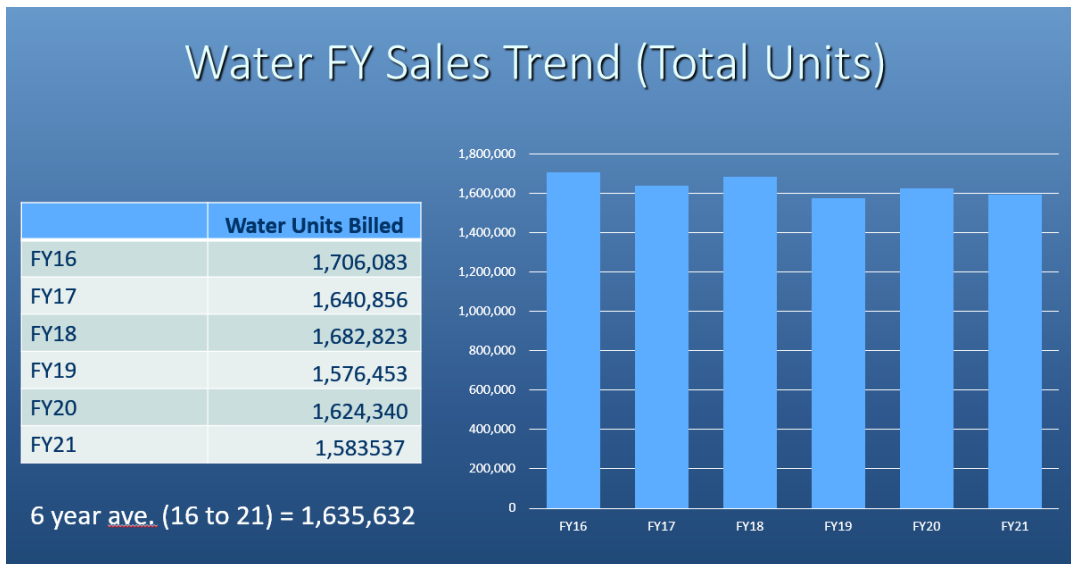


The following graphic provides a breakdown of the supply sources for our surface and groundwater systems together with graphics showing the percentage of supply sources serving Portsmouth and Pease customers:



## Water Sales

Water sales remained fairly consistent with past years. Re-development and additional customers on the system are generally efficient water users, with newer, low-flow fixtures. The radio-read system for customer water meters allows daily access to water use trends and also allows staff the ability to notify any users that have excessive water use, noting potential leaks within customer plumbing. The following graphic shows the water sales trend for the last 6 years. The graphic after that shows the efforts by the metering staff to change out older meters and notify customers of potential leaks. We continue to change out at least 10% of meters in the system and are also downsizing meters where appropriate, which helps to increase system accuracy.



## Customer Water Meter Replacements And Notifications of Leaks

### 2021 Data:

- 1038 - meters changed out
- 647 - new meter radios installed
- 531 tagged events for Le60 (leak code)
- 110 direct communications with customers notifying of leak
- 450 Unique locations notified of leaks



Example of Daily Reading with Leak Code



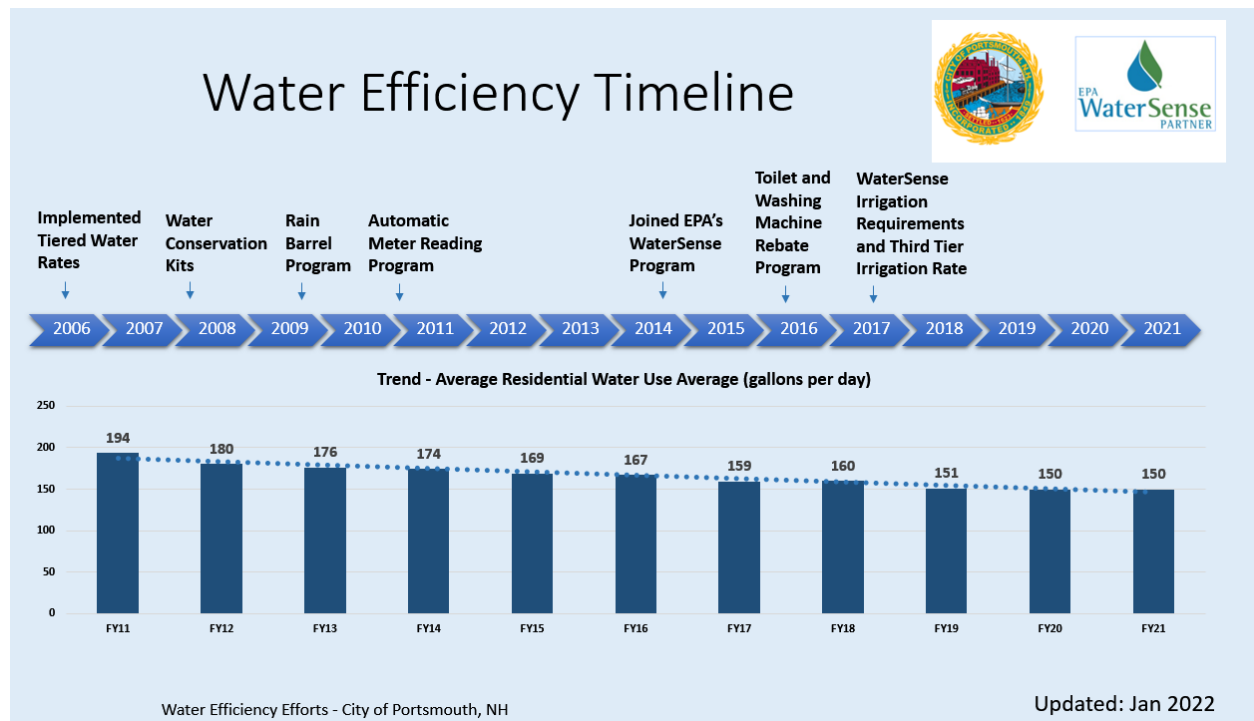
## Water Efficiency Rebates

The City also continues to offer water efficiency rebates of \$100 per low flow toilet and \$150 for the purchase of a high efficiency washing machine. These are available to all residential customers, including multi-family customers. To date, over 1,000 rebates have been issued. According to the NHDES we are currently the only public water system in New Hampshire offering these rebates.

Additional information on this program can be obtained from the City’s water billing department or from the City’s website:

<https://www.cityofportsmouth.com/publicworks/water-efficiency-rebate-program>

The following graphic shows the success of this program:



As the graphic shows, average residential water use has gone from 194 gallons per day down to 150 in the last 10 years, a 22% reduction. We intend to continue with the rebate program and expand our outreach efforts to focus on ways that customers can be more efficient with summertime water use for irrigation and cooling needs.



## **Water Quality Information**

The Portsmouth Water Division routinely monitors water quality parameters and performs water quality sampling and analysis as directed by the Federal Safe Drinking Water Act and the New Hampshire Department of Environmental Services. Water sources are monitored for radioactive, biological, inorganic, volatile organic, or synthetic organic contaminants. Critical water treatment parameters for turbidity, pH, chlorine, orthophosphate and fluoride are continually monitored and tracked by our system operators. The regulations require us to monitor for certain substances less often than once per year because the concentrations of these substances do not change frequently. In these cases, the most recent sample data are reported, along with the year in which the sample was taken. Annual Water Quality Reports for both water systems detail these efforts and are mailed to each water system customer annually. They are also available on the City's website at:

<https://www.cityofportsmouth.com/publicworks/water/drinking-water-quality>

- **PFAS Tracking**

Our efforts to track and treat the PFAS contamination at the Pease International Tradeport continue. PFAS stands for a broad group of perfluoroalkyl and polyfluoroalkyl substances, produced and found in many commercial products and also used in firefighting foam. Per- and polyfluoroalkyl substances (PFAS) are currently unregulated by the Safe Drinking Water Act. However, the EPA Health Advisory concentration standard is 70 parts per trillion (ppt) for perfluorooctane-sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). In response to the discovery of PFOS in the Haven Well in May 2014 at levels that exceeded the EPA Provisional Health Advisory (200 ppt at that time), the Haven Well was removed from service. With the completion of the new Pease Water Treatment Facility with resin and activated carbon filters, the Haven Well was reactivated in August 2021. The source of the PFAS at the Tradeport was aqueous film-forming foam that had been used to extinguish fires and in training exercises at the former Air Force Base. Since 2014, the Harrison Well and Smith Well on the Pease Tradeport water system, and Portsmouth Well #1 and Collins Well in the Portsmouth water system, have been routinely monitored for PFAS by the Air Force.

Activated carbon filters treated the Harrison and Smith wells at Pease from 2016 to 2021 while an entirely new treatment facility was constructed to treat those two wells together with the reactivation of the Haven well. PFAS tracking of the other Portsmouth surface and groundwater drinking sources continues on a quarterly basis and all data is posted on the city's website.



# Pease Water PFAS Treatment System Performance



## PEASE WATER TREATMENT FACILITY PFAS RESULTS - POST TREATMENT

SAMPLED	PFAS*	Gallons Treated
4/27/2021	ND	2,717,039
5/4/2021	ND	4,354,049
5/11/2021	ND	6,387,665
5/12/2021	ND	6,830,373
5/18/2021	ND	9,391,617
6/15/2021	ND	23,133,046
7/19/2021	ND	41,445,555
8/4/2021	ND	52,901,428
8/5/2021	ND	53,782,078
8/11/2021	ND	58,558,918
8/18/2021	ND	64,975,798
8/25/2021	ND	69,830,038
9/15/2021	ND	86,914,498
10/13/2021	ND	106,446,219
11/17/2021	ND	123,708,814

ND = None Detected at Method Reportable Limit (2 ppt)

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The State of New Hampshire promulgated maximum contaminant level (MCL) regulations for four compounds in 2019 – PFOA, PFOS, PFHxS and PFNA. The City has been sampling quarterly according to these regulations and periodically posts that data on the City’s website at: [www.cityofportsmouth.com/publicworks/water](http://www.cityofportsmouth.com/publicworks/water). The following graphic provides a summary of the rolling average of the quarterly sampling of the Portsmouth water supply sources:

## PFAS Average – 12 Month Rolling New Hampshire Regulated Compounds - All Sources In Compliance

	Parts Per Trillion (PPT)	NH MCL	RAW*	MADBURY WTP FINISHED	MADBURY WELL 2	MADBURY WELL 3	MADBURY WELL 4	PORTSMOUTH WELL	COLLINS WELL	GREENLAND WELL	PEASE WTP
PFHxS	ng/L	18	0	0	0	0	0	7	2	2	0
PFOS	ng/L	15	0	0	0	0	0	5	4	5	0
PFOA	ng/L	12	1	2	2	3	0	6	4	4	0
PFNA	ng/L	11	0	0	0	0	0	0	0	0	0

- **Total Trihalomethanes (TTHMs)**

Total Trihalomethanes (TTHMs) are disinfection byproducts (DBPs) which are created when chlorine, which is used for a disinfectant in the Portsmouth and Pease Water Systems, reacts with natural organic matter in the water. On average, the Water Treatment Facility in Madbury removes about 71% of the total organic carbon (TOC) through the treatment process. The EPA Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) requires TOC removal of 50% for the type of water that is typical from the Bellamy Reservoir. The TOC that remains in the water after treatment reacts with the chlorine and creates DBPs. Historically the TTHM concentration in the Portsmouth Water System has averaged 56 parts per billion (ppb).

A storage tank mixer and aeration system were installed at the Newington Booster Pumping Station as part of the upgrade to that facility. These systems became operational in September 2019. These improvements were designed to reduce the concentrations of trihalomethanes in the water distribution system. The average TTHM in the distribution system since this system has been in operation is 41 ppb. During July of 2021, extreme precipitation events caused higher than normal levels of organics in the Bellamy Reservoir. This resulted in an increase in TTHMs in the system over the summer and through the fall of 2021. TTHM levels averaged around 52 ppb during this time.

Modifications to the Bellamy Reservoir oxygen management system are currently being designed so future disturbances can be managed and the level of organics loading can be minimized. The Pease and Portsmouth Water Systems are currently in compliance with regulatory standards for these compounds and we will continue to sample quarterly in both water systems as required.

- **Lead Sampling**

Both of the water systems were sampled for lead in 2021, and they are all in compliance with the requirements for lead concentrations. The results from our lead sampling program in 2021 were below the lead action level of 15 parts-per-billion (ppb) at the 90th percentile value in each of the Portsmouth, Pease Tradeport, and New Castle water systems. Of the 31 residential samples collected in the Portsmouth system in 2021, 26 had no detected lead, 4 had less than 5 ppb, and one had higher than 15 ppb. That site was in the process of upgrading their plumbing. After the plumbing work was completed the site was resampled and the results were non detection. In the New Castle water system, there were 8 of the 12 samples that had no lead detected, 2 samples that had less than 5 ppb measured, and 2 samples that had 5 ppb.

Due to the upgrades of the Pease Water Treatment Facility, at least 40 lead and copper samples were required for compliance during the first 6 months of operation. This was double the number of samples typically required for this system. The Pease Tradeport system samples resulted in 27 of the 41 samples having no detected lead, 5 had less than 2 ppb, and 9 had between 2 and 15 ppb. These results are typical of what have been measured over the past 16 years since our corrosion control program has been in effect. This is an annual sampling program, and we will be

sampling 40 sites again in the Pease System in the spring of 2022 and 30 sites in the Portsmouth System again in the fall of 2022.

Lead is not present in the water when it leaves our treatment and well facilities, or in the water mains that run below the streets. However, lead can be present in old service line connections that tie homes to the water system or plumbing inside homes and businesses. Due to the age of many homes in Portsmouth and surrounding towns, and the associated potential for leaded plumbing components, we encourage customers to have their water tested by a certified laboratory, especially if there are children under six or pregnant women in the household. We actively adjust the water chemistry at the treatment facility and well facilities according to our Corrosion Control Program, to reduce the potential for lead in households to dissolve into the water and end up at the tap. But if lead is present in your plumbing system, and is in contact with water, some risk remains. Information about our Corrosion Control Program can be accessed online: [cityofportsmouth.com/publicworks/water](http://cityofportsmouth.com/publicworks/water).

- **Safe Water Advisory Group (SWAG)**

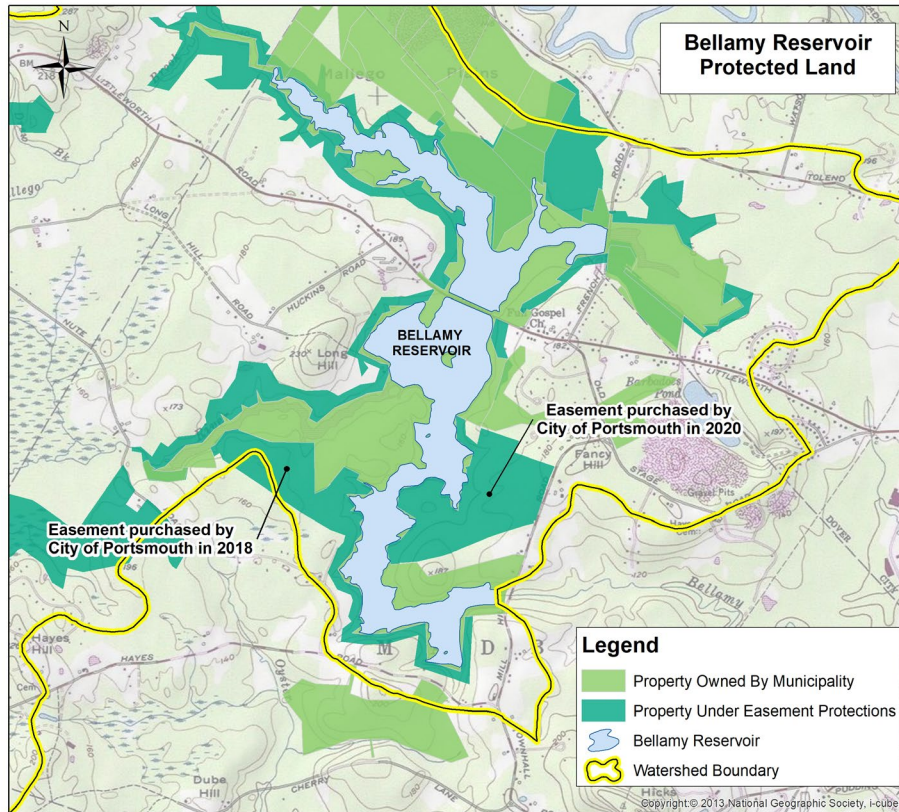
The Safe Water Advisory Group was created with the approval of City Council on October 5, 2020. Its mission is to review and communicate the latest science on the health and environmental effects of drinking water contaminants (with a heavy focus on PFAS), to monitor federal and state level legislative changes, and to anticipate policy changes that could impact the city of Portsmouth. The SWAG met five times in 2021 and discussed topics including PFAS regulations, extent, treatment, and testing programs; legislative items associated with drinking water, private well studies, climate change, and community organizing. The group also toured the Portsmouth Surface Water Treatment Facility in Madbury. Video recordings SWAG meetings are posted on the City's YouTube channel.

The 2022 Portsmouth City Council voted to reinstate the SWAG for another year. The public is invited to attend meetings and encouraged to be involved with the community and informed of all aspects of the City's water supply. If you are interested, please consider attending a community drinking water forum that will be held during National Drinking Water week in May 2022.

### **Source Water Protection**

- **Bellamy Reservoir**

The City continues to work with the communities of Madbury and Dover to monitor and track the land within the Bellamy Reservoir watershed. The City of Portsmouth's water division either owns or has easements around the entire reservoir. This provides a protective water quality buffer for the surface water that is piped to and treated at the Madbury Water Treatment Facility. In addition to these buffers, the water division, in cooperation with the Town of Madbury and the New Hampshire Department of Environmental Services, has historically restricted activities in and around the reservoir. The following activities are not permitted; swimming, motor boats and campfires. Kayaks, canoes and other non-motorized boats are permitted on the reservoir.



The City has acquired conservation easements in 2018 and 2020 of properties that abut the Bellamy Reservoir. Easements on these parcels, totaling 179 acres, were obtained through the combined efforts of the City, Southeast Land Trust and the Town of Madbury to coordinate due diligence activities and prepare the easement documents. The City received approximately \$487,000 in grant funds for these easements from the New Hampshire Groundwater and Drinking Water Trust Fund and approximately \$14,500 from the Great Bay Resource Protection Partnership.

The protection of the Bellamy Reservoir is a high priority for the City of Portsmouth because the Reservoir is the primary water supply for the City. The Bellamy surface water is treated at the City's Water Treatment Facility in Madbury and delivered to regional communities around the seacoast. Conserving land within the watershed and areas that abut the reservoir and surrounding wetlands, rivers, and streams, protect the water quality from the pressures of development and helps the municipal water system provide quality drinking water.

The City of Dover continues to update our water system staff about their efforts to track and remediate their closed landfill, which is in the Bellamy Reservoir watershed. Dover must comply with EPA and DES requirements regarding the level of remediation they need to perform to protect all water sources around their site. We will report any updated information about these efforts as it becomes available.



## **Water Supply Infrastructure Projects**

- **Madbury Surface Water Treatment Facility - Backwash System Upgrade**

The construction of a filter backwash water storage tank and pumping station at the surface water treatment facility in Madbury was completed in 2021. This tank and pumping station system improves the efficiency and effectiveness of the filter backwash process. It also provides additional capacity of backwash water which allows the treatment plant to maintain steady operations during periods when the reservoir water quality is degraded due to summer water quality dynamics.



- **Madbury Wells Upgrade Project**

The replacement well for the failing Well 4 in Madbury along with the newly permitted Well 5 are currently being connected to the water distribution system. This involves the construction of new water mains, a water meter and treatment building and all associated controls, metering and pumping equipment. This project is scheduled to be complete in July 2022.

- **New Water Transmission Main Under Little Bay**

This project is in final design and awaiting agreements from abutting land owners. After negotiations with the abutting land owners are complete, the project can go through the final permitting through the NHDES which includes a public hearing. This project needs to go out to bid by early summer 2022 so the selected contractor can begin to order the materials for the construction and have them delivered in time for the acceptable construction period. The construction must occur during the winter (December – April) to minimize impacts to the tidal ecosystem and fisheries.

- **Pease Water Treatment Facility**

The Pease Water Treatment Facility was completed in 2021. This facility is capable of treating up to 1,200 gallons per minute of water for the removal of per- and poly-fluoroalkyl substances (PFAS). There have been no PFAS detected in the water after being treated at this facility. Routine PFAS removal performance testing is conducted and the anion-exchange resin is performing as expected at this time. Agreements for the on-going operation and maintenance costs associated with this facility are underway with the Air Force.



- **Collins Well #2**

After investigating the geology in the area of the existing Collins Well through the drilling and construction of test wells, a hydrogeologically favorable location was identified for the construction of a new well, Collins Well #2. This well is intended to provide mechanical redundancy to the existing source as well as allow the water yield capacity to be recovered to the 450 gallons per minute that were originally available from the Collins Well. Over time the withdrawal rate from the Collins Well has declined and routine cleaning of the well screen and redevelopment of the gravel pack has resulted in only moderate recovery of the well yield.

Collins Well 2 has been drilled and constructed, and the City's consultant, Emery & Garrett Groundwater Investigations (EGGI) is preparing a pumping test plan that will be submitted to the NH Department of Environmental Services to begin the well permitting process. An extensive network of monitoring wells will be used to assess the effect of pumping Collins Well #2.



### **Further Updates and Information**

This information will be distributed electronically on the City of Portsmouth's website in the Department of Public Works > Operations > Water section. If anyone needs additional information or has questions contact Al Pratt, Water Supply Operations Manager at 520-0622 or Brian Goetz, Deputy Director of Public Works at 766-1420.