City of Portsmouth

Department of Public Works

September 5, 2018

Portsmouth Water Supply Status Report

Overview

While significant rainfall at the end of July into August was beneficial at the time for Portsmouth's water supply, the current warm and dry conditions increases water supply demands and places further stress to treat quality issues due to added organics within the water. Additionally, the annual precipitation average remains below normal due to the dry spring and the City continues to operate without the support of the Haven Well.

Water Use Restrictions

Customer Water Restrictions
N/A
None
Odd # Day Watering Only
Two-Days per Week Watering
No Lawn Watering
Essential Water Use Only

Precipitation events during the last couple weeks of July and first two weeks of August reduced water demands on the system. This rainfall resulted in slightly higher than normal stream flows, reservoir levels and recharge to our water supplies. It also stirred up the Bellamy Reservoir which caused system operators to reduce flow at the Madbury Surface Water Treatment Facility in order to assure good water quality. Additionally, the dissolved oxygen level of the Bellamy source water is very low, causing reduced surface water treatment capacity. Therefore, system operators have shifted to relying on more groundwater for our source of supply until the treatment facility flows can be increased.

We continue to ask our water customers to please use water wisely, minimize waste, and incorporate water efficient fixtures and appliances whenever possible.

Water operations staff continue to assess the supply conditions and will provide updates as needed.

Current Customer Water Demand

Current Water Demand
Below Normal
Normal
Above Normal
High
Very High
Historic High

Water demand during the first two weeks of July increased dramatically as a result of the hotter drier weather and associated demand for irrigation water. This demand reached an annual daily high of 6.7 million gallons per day (MGD) on July 12th. The precipitation events over the last couple weeks of July and early August help to relieve the water demands. Currently, water demands are normal for this time of year.

The average daily water demand for July was 4.92 MGD, which is about 9% less than the 10-year average for August.

Month	Monthly Demand (Million Gallons per Day (MGD))	Historic Average Demand (ten-year average (MGD))
August 2017	5.34	5.43
September 2017	4.45	4.92
October 2017	4.00	4.19
November 2017	3.64	3.94
December 2017	3.81	3.86
January 2018	4.36	4.03
February 2018	4.06	4.15
March 2018	4.08	4.11
April 2018	4.03	4.12
May 2018	4.22	4.67
June 2018	5.35	5.05
July 2018	5.55	5.40
August	4.92	5.43

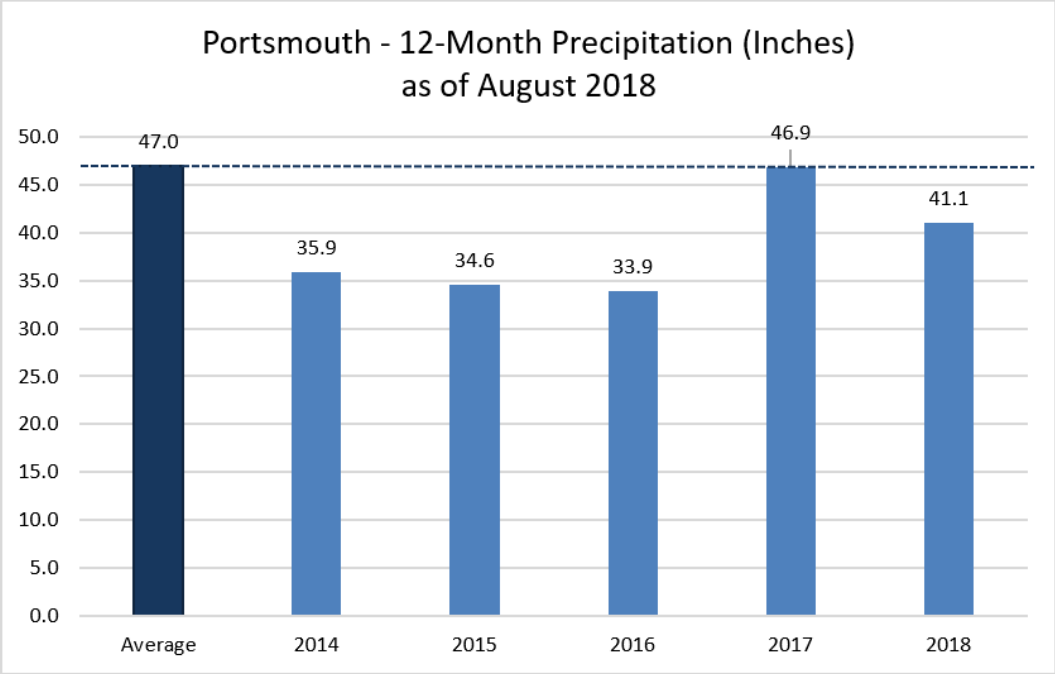
Water Demand is a factor in the supply status assessment that is measured by the amount of water delivered through the water system. This factor reflects customer usage and variations caused by daily, weekly and seasonal changes in business, residential and irrigation demands.

Precipitation Status

Precipitation
Above Average
Average
Below Average
Dry
Very Dry
Drought

Total August precipitation in Portsmouth was 4.83 inches. However, most of the rainfall occurred in the first two weeks of the month, with only an inch of rain falling on the Seacoast since August 14th. This warm and dry weather resulted in water demands going back up in our system at the end of the month.

Precipitation over the past 12-months has totaled just over 41 inches, which is 87% of the mean annual amount of 47 inches. Weather patterns continue to be fairly dry for the Seacoast of New Hampshire with the exception of occasional storms. Overall, precipitation over the last five years has averaged 38.5 inches, which is only 85% of normal with only 2017 reaching 47 inches. All of these factors result in an assessment for the water system's precipitation to be "Below Average." The following graphic highlights the current 12-month precipitation versus totals for the last five years:



Groundwater Levels

Groundwater Levels
Above Average
Average
Below Average
Low
Very Low
Drought

Previous operational changes which optimized the use of surface water have helped the water system preserve available water in our wells. Currently the groundwater levels are considered average despite the lower than normal precipitation. Groundwater levels in the Madbury aquifer are typical for this time of year. Water levels in our Portsmouth supply wells are slightly below average, but still within expected levels for this time of year. By utilizing a greater proportion of surface water from the Bellamy Reservoir during the winter and spring, we have been able to reserve the groundwater for the drier periods.

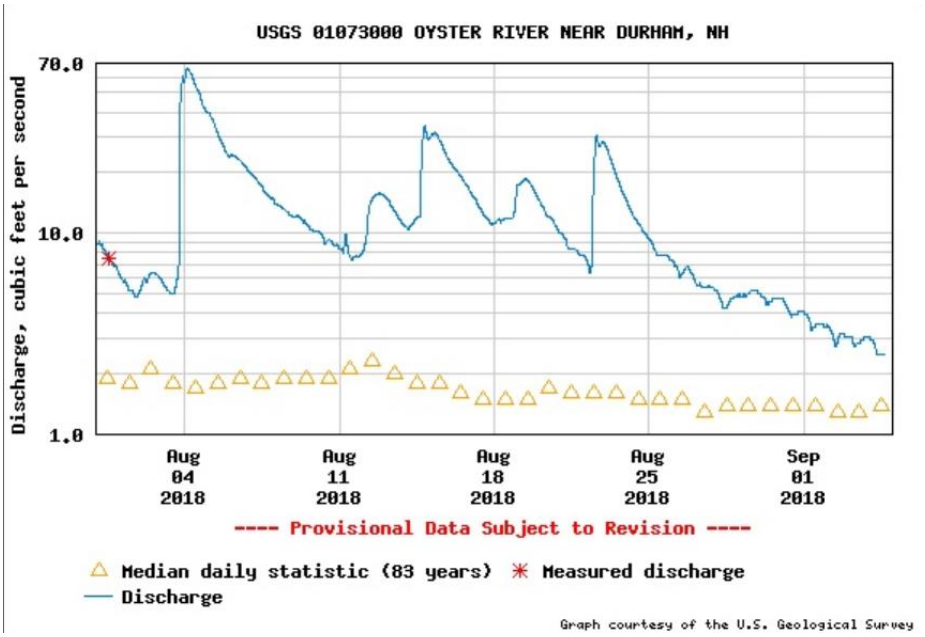
Groundwater from wells in Madbury, Portsmouth, Greenland and the two Pease wells (Smith and Harrison) typically provide between 23% and 42% of the water supply to Portsmouth customers, with the remaining 58% to 77% from the Bellamy Reservoir. Due to weather conditions and the surface water treatment capability, the following percentage of supply in August 2018 was derived from:

- 47% from the Bellamy Reservoir/Madbury Surface Water Treatment Facility
- 41% from the Madbury, Portsmouth and Greenland wells
- 12% from the Pease wells.

River Flow

River Flow
Above Average
Average
Below Average
Low
Very Low
Drought

The precipitation events over the last couple weeks of July and early August caused substantial increases in stream flow. As the graphic below shows, flows for the entire month of August 2018 were above average. However, by the end of the month flows were back to a more normal level, therefore, current conditions are assessed to be average for this time of year.



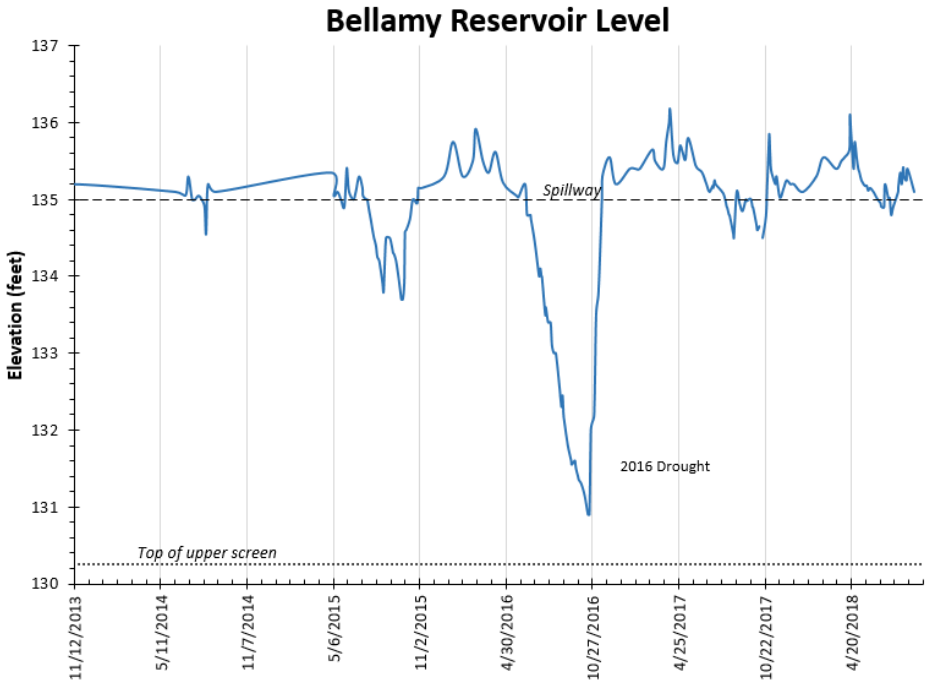
Reservoir Level

Reservoir Level
Above Average
Average
Below Average
Low
Very Low
Drought

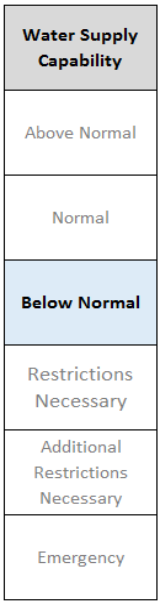
As the surface water source for the Madbury Water Treatment Facility, the Bellamy Reservoir is monitored to assess and predict the overall amount of water available for the Treatment Facility. Reservoir water levels are compared to typical monthly levels to assess the reservoir conditions.

The current stage of the reservoir is considered to be average for this time of year. Water ceased flowing over the dam spillway on June 15th, but due to storms in late June the reservoir overtopped the spillway for a week and a half in early July. Again in late July, the precipitation events caused the reservoir to rise and flow over the spillway.

The following graphic shows water levels at the reservoir and how they compare with previous years, especially the 2016 summer drought:



Water Supply Capability



Water Supply Capability is a measure used to identify any issues with the Portsmouth Water Supply System that would result in a limitation to the amount of water that could be supplied. These could be lack of supply, issues with source water quality, or mechanical failures of system components.

The loss of the Haven Well as a water source (which contributed approximately 10% of the water system's overall capability) has reduced the amount of water that can be provided to the system. Additionally, with the carbon treatment system on line for the Smith and Harrison wells, their flow has been reduced to a combined 400 gallons per minute. Once the new Pease water treatment facility is on line these wells will be capable of pumping at their capacity – 350 GPM for Smith and 225 GPM for the Harrison.

As previously mentioned, due to the reservoir's source water quality, the Madbury Water Treatment Facility's output has been reduced by approximately a third of its capacity. As a result of the combined reduced capacity of all water sources, the water supply capability is considered below normal at this time. The table below summarizes the current capability of the water system versus its maximum capability with the Madbury facility running at capacity and all of the Pease wells running at their rated capability:

Sources of Supply	Max Capability	Current Capability
Portsmouth Surface Water	3.46	2.30
Portsmouth Wells	2.80	2.80
Pease Tradeport Wells	1.59	0.58
Total Portsmouth-Pease	7.85	5.68

Further Updates and Information

This information will be distributed electronically on the City of Portsmouth's website at: http://www.cityofportsmouth.com/publicworks/water

Additional information can also be obtained by directing questions to Al Pratt, Water Supply Operations Manager at 520-0622.