

STAFF SUMMARY

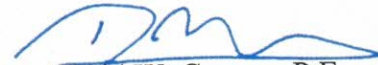
TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: February 15, 2023
SUBJECT: Report on 2022 Water Use Trends and Reservoir Status



COMMITTEE: Water Policy & Oversight

INFORMATION
 VOTE

Carolyn Fiore, Deputy Chief Operating Officer
 Daniel Nvule, Senior Program Manager
Stephen Estes-Smargiassi, Director, Planning and Sustainability
 Preparer/Title


David W. Coppes, P.E.
 Chief Operating Officer

RECOMMENDATION:

For information only. At the beginning of each year, staff provide the Board with a review of the previous year's water use data and discuss trends.

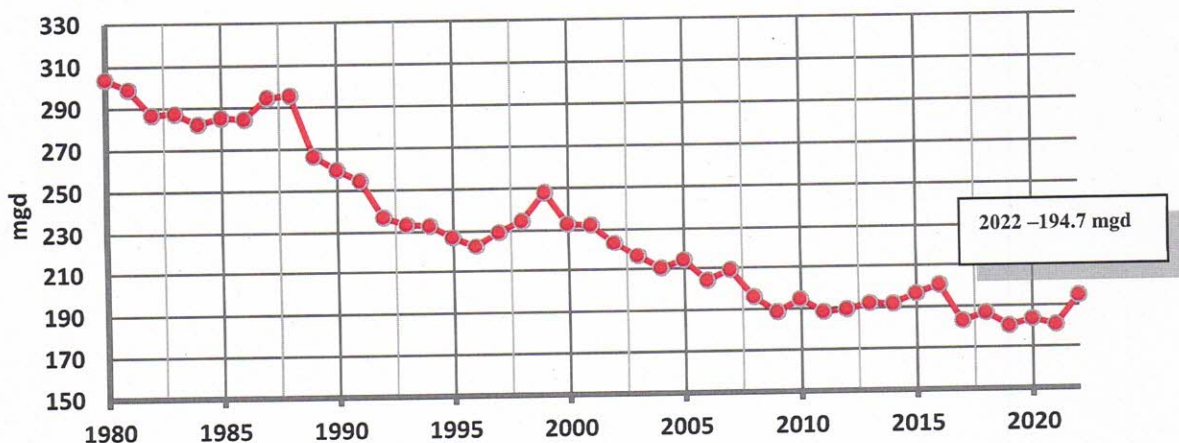
DISCUSSION:

This staff summary provides an overview of water consumption by communities; base and seasonal water use trends; use by MWRA's partial and emergency customers; and reservoir withdrawals and reservoir status.

Water Consumption by MWRA Communities

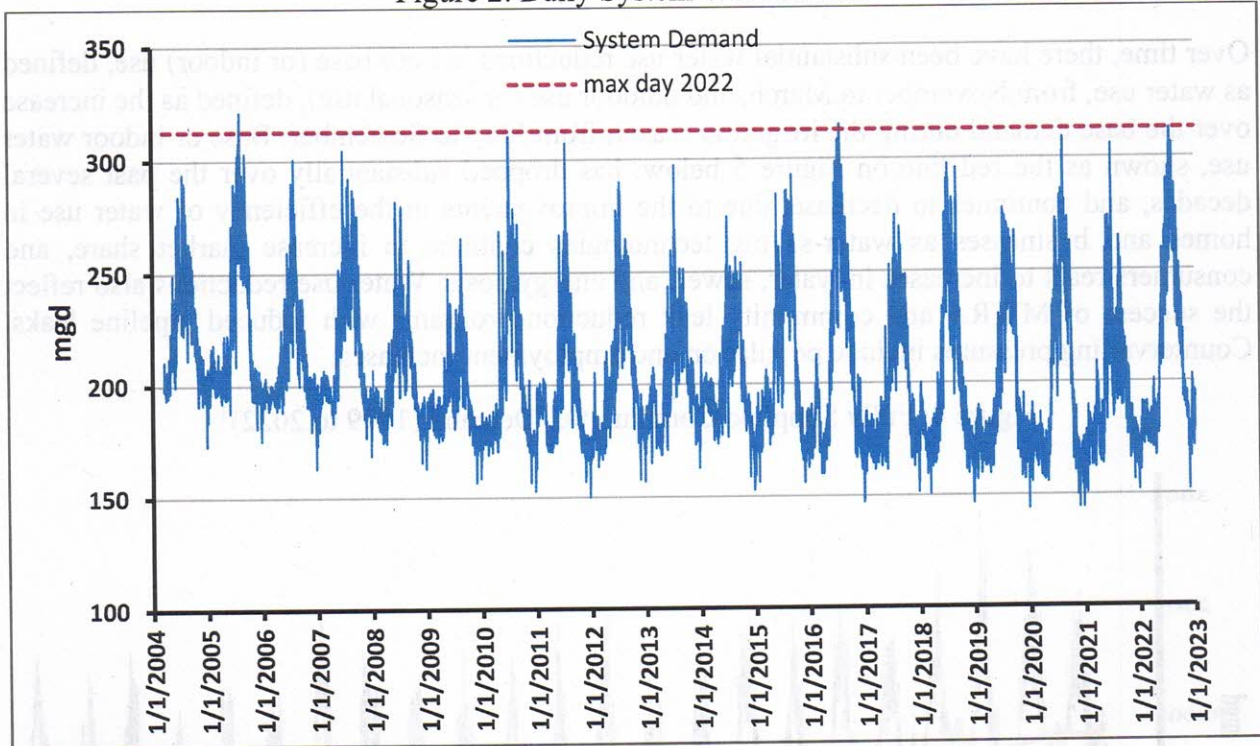
Water consumption by all MWRA communities of 194.7 million gallons per day (mgd) was about 14.1 mgd (7.8 percent) higher than 2021, as shown on Figure 1, due in part to the drought, and in part to additional use as communities responded to elevated PFAS levels. Reservoir withdrawals, the metric to be compared with the system's safe yield of 300 mgd, are discussed on page 5.

Figure 1 – Total Consumption by MWRA Communities (1980 to 2022)



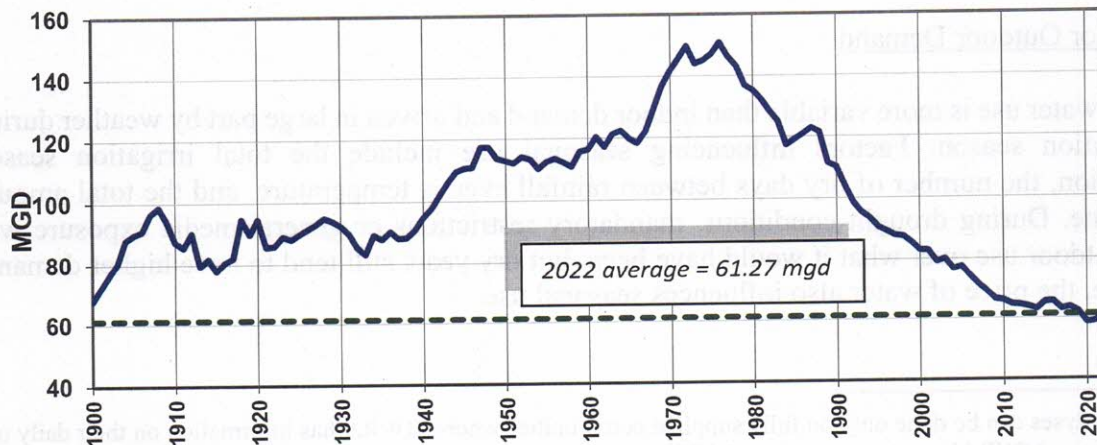
System wide, 2022 had a maximum day reservoir withdrawal of 312.75 mgd on July 22 (2.2 percent higher than 2021, but lower than during the drought in 2016). At the opposite extreme, Thanksgiving Day at 152 mgd was the lowest day of the year. Figure 2 below shows daily system withdrawals since 2004.

Figure 2: Daily System Withdrawals



Demand from MWRA's largest customer, the Boston Water and Sewer Commission, was 61.27 mgd, which was higher than last year by 2.43 mgd (4.1 percent). Current Boston demand continues to be lower than demand before 1900 as shown on Figure 3 below.

Figure 3: Boston Water Use (1900-2022)

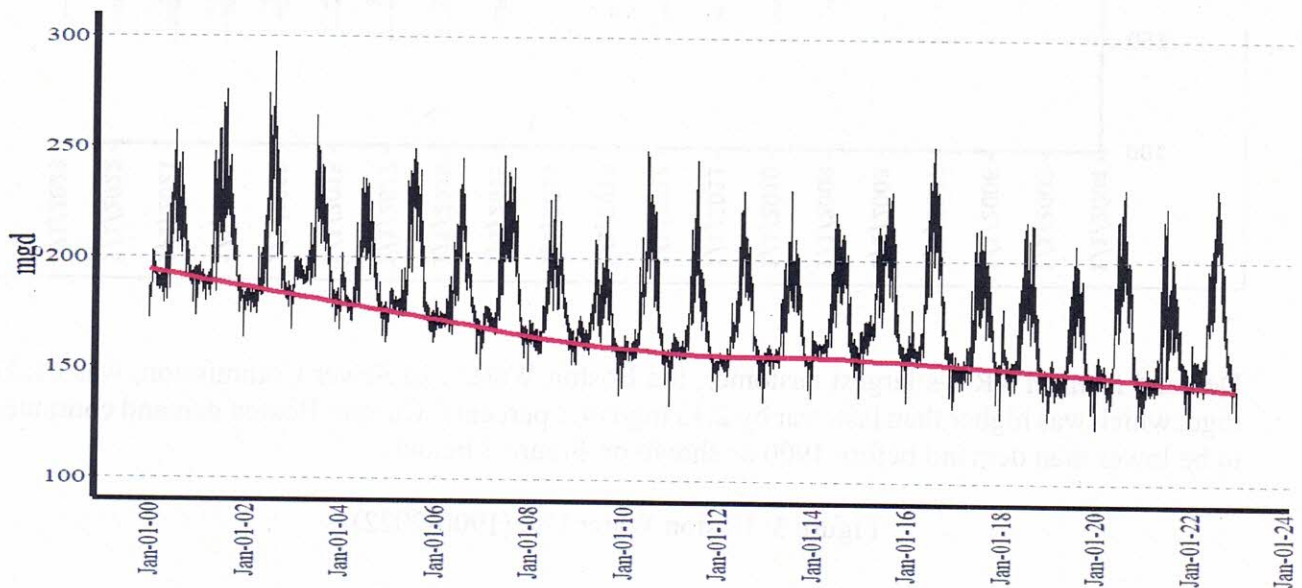


Many communities, including Boston, saw increases in demand. Despite the increase, Boston's change in flow share decreased by 1.9 percent, as demand from more suburban communities and partially supplied communities increased by a higher percentage. See Attachment A for community demands and system share data.

Base or Indoor Demand

Over time, there have been substantial water use reductions in both base (or indoor) use, defined as water use, from November to March, and outdoor use (or seasonal use), defined as the increase over the base demand during the irrigation season from May to September. Base or indoor water use, shown as the red line on Figure 5 below, has dropped substantially over the past several decades, and continues to decrease, due to the improvements in the efficiency of water use in homes and businesses as water-saving technologies continue to increase market share, and consumers react to increases in water, sewer, and energy costs. Water use reductions also reflect the success of MWRA and community leak reduction programs with reduced pipeline leaks. Countervailing pressures include population and employment increases.

Figure 4: Fully Supplied Communities Demand (1999 to 2022)¹



Seasonal or Outdoor Demand

Seasonal water use is more variable than indoor demand and driven in large part by weather during the irrigation season. Factors influencing seasonal use include the total irrigation season precipitation, the number of dry days between rainfall events, temperature, and the total amount of sunshine. During drought conditions, mandatory restrictions or general media exposure will reduce outdoor use over what it would have been, but dry years still tend to have higher demand. Over time, the price of water also influences seasonal use.

¹ Certain analyses can be done only on fully supplied communities where MWRA has information on their daily use available from MWRA's revenue meters. MWRA receives data on monthly total use for partially supplied communities, but not until they provide that data to DEP in their Annual Statistical Reports in March. Fully supplied communities represent almost 90 percent of the total annual demand.

Figures 5 and 6 show the variation in seasonal water use in fully supplied communities over time, and both the longer-term decline in both base and total use and the relatively small impact that seasonal demand has on total water use. Seasonal use in 2022 of 24.2 mgd was the third highest since 2000 on a volume basis (seasonal use during the 2015/2016 drought was higher) and the highest (14.5 percent) on a percentage basis (reflecting in part the continued reduction in base demand). Most of the outdoor use season was affected by a significant to critical drought over much of the service area, although as discussed below, MWRA's reservoirs remained in Normal Operating Range throughout the drought.

Figure 5: Fully Supplied Communities Annual Base and Seasonal Demand

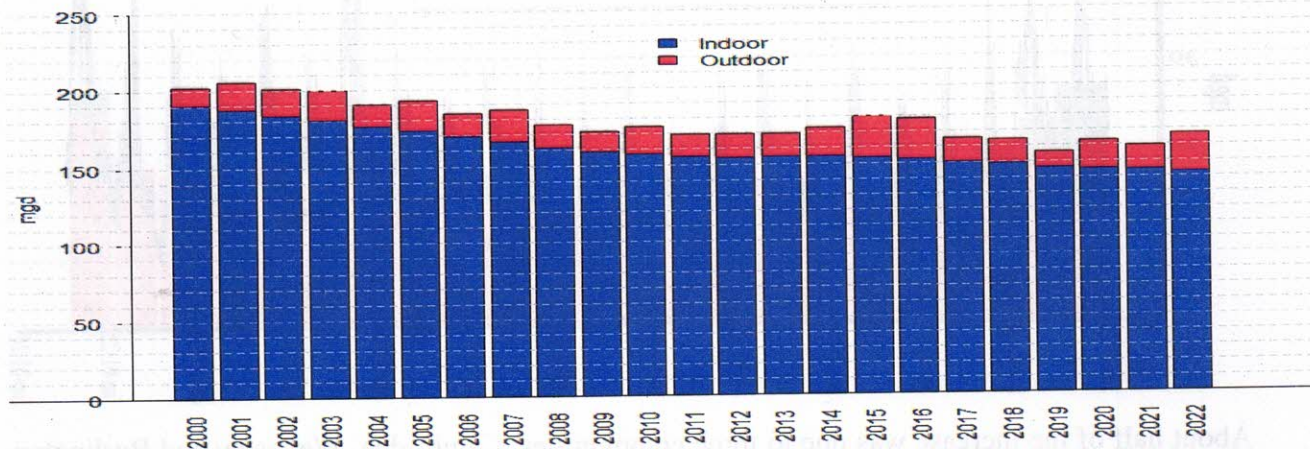
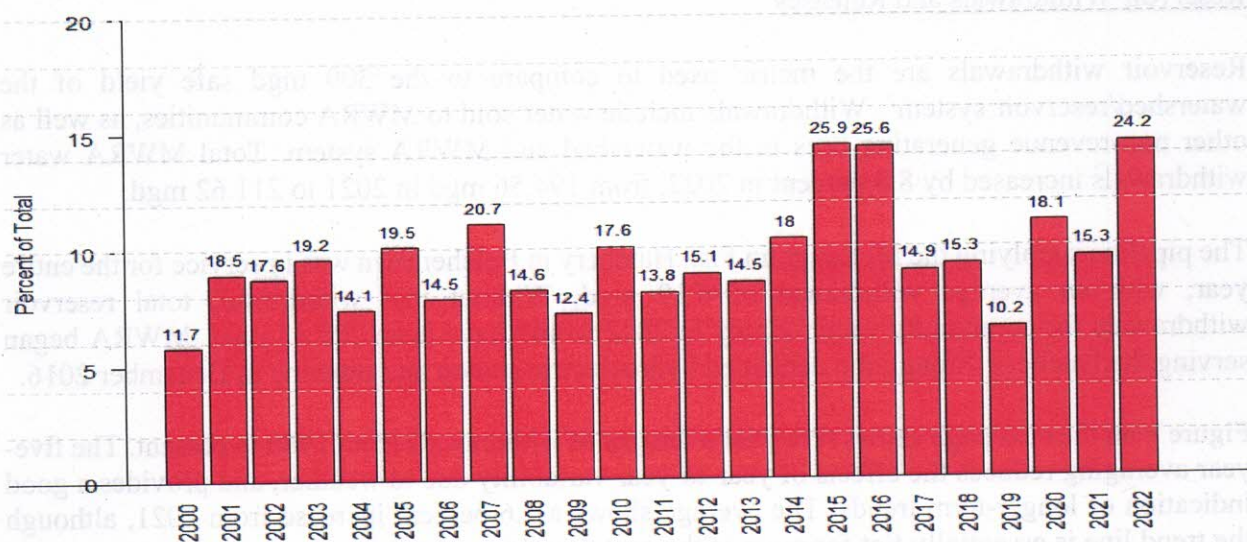


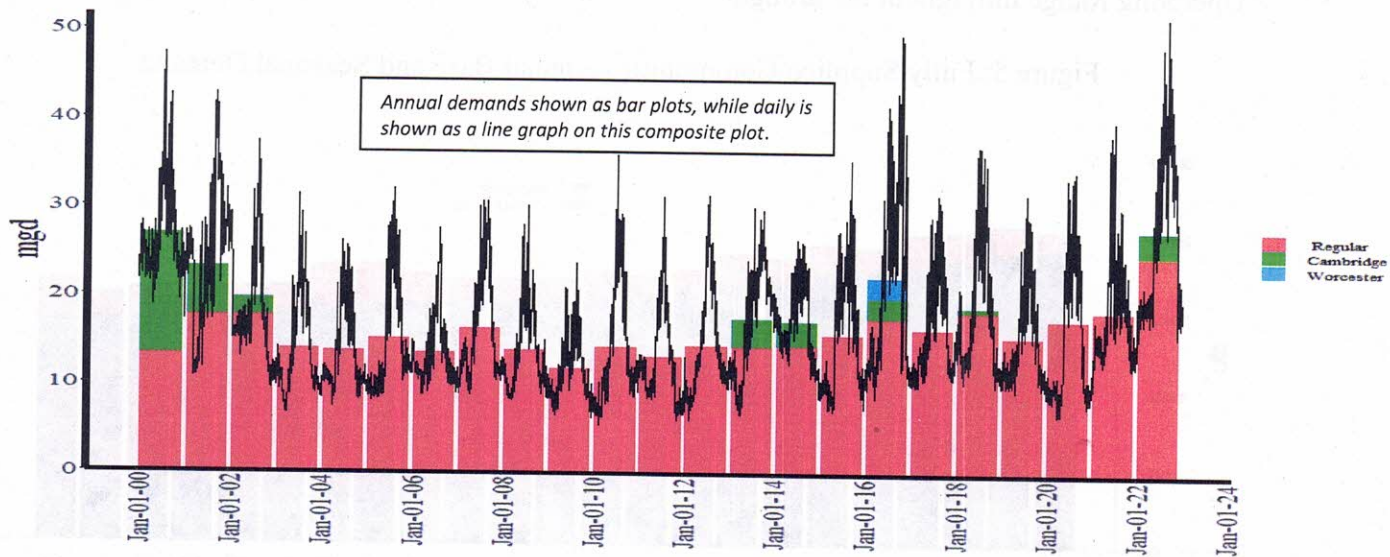
Figure 6: Fully Supplied Communities' Annual Seasonal Demand (Labels show demand in mgd)



Partially Supplied Communities

Demand for the partially supplied communities, shown on Figure 7 below, was up by 6.45 mgd (30.6 percent) when compared to 2021.

Figure 7: Partially Supplied Communities – MWRA Supplied Demand (Daily and Annual)



About half of the increase was due to three communities: Cambridge, Wellesley and Burlington. Cambridge used 1,018 million gallons between September and November as its treatment plant was being upgraded to handle PFAS contamination. Wellesley relied more heavily on MWRA as it worked to add temporary PFAS treatment for some of its wells, as did Burlington. Burlington will continue to draw more water from MWRA as MWRA and the town strengthen the pipe network supplying them.

Reservoir Withdrawals and Releases

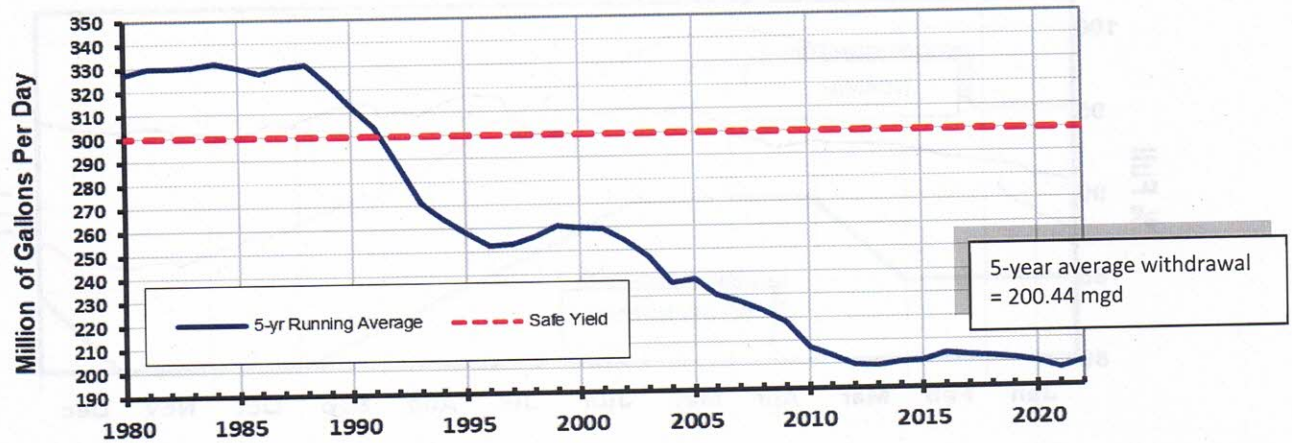
Reservoir withdrawals are the metric used to compare to the 300 mgd safe yield of the watershed/reservoir system². Withdrawals include water sold to MWRA communities, as well as other non-revenue generating uses in the watershed and MWRA system. Total MWRA water withdrawals increased by 8.8 percent in 2022, from 194.56 mgd in 2021 to 211.62 mgd.

The pipeline supplying the McLaughlin Fish Hatchery in Belchertown was in service for the entire year, with an average withdrawal of 6.19 mgd. Without that withdrawal, total reservoir withdrawals for community water supply in 2022 would have been 205.43 mgd. MWRA began serving the hatchery through the dedicated hydroelectric station and pipeline in December 2016.

Figure 8 on the next page shows five-year averages of withdrawals from 1980 to present. The five-year averaging reduces the effects of year-to-year variability due to weather, and provides a good indication of longer-term trends. The average shows a 1.6 percent increase from 2021, although the trend line is essentially flat for most of the past decade.

² The 300-mgd safe yield is based on the drought of the 1960s. Use of a less conservative 20-year recurrence drought, as allowed by DEP, would result in a safe yield as high as 350 mgd. MWRA's Water Management Act registration is for 312 mgd.

Figure 8: Total Reservoir Withdrawals – Five-Year Running Average 1980 to 2022



It is worth noting that since MWRA was created, MWRA has added demand from eight additional communities and the McLaughlin Fish Hatchery, as well as the added demand from the substantial growth in population and employment within the original service area. Without the added communities and hatchery demands, the five-year average demand would have been almost nine mgd lower at 191.4 mgd. This further demonstrates the substantial improvements in water use efficiency within the MWRA service area, which have improved system reliability and allowed MWRA to provide service to additional communities in need of that reliable supply.

Reservoir Status

As staff briefed the Board last September, the whole of Massachusetts was impacted by a critical to severe drought during a large portion of 2022, and portions of the state were still in drought condition in January 2023. In spite of the drought, demands were well below Safe Yield and Quabbin Reservoir levels were well within normal range throughout the year. Figure 9 on the next page shows a comparison of Quabbin volume levels between 2021 and 2022. During 2022, reservoir levels displayed the expected seasonal variability. The green line on the figure shows the seasonal monthly benchmarks for the operating band under MWRA’s approved drought plan³. Levels above the line are considered normal and below the line are considered below normal. Further operating bands for varying degrees of drought status are significantly lower still.

³ In January 2023, MassDEP issued final changes to the Water Management Act (WMA) regulations. The changes affect water systems with only WMA registrations – those communities which are still using less water now than they did in the early 1980s when the WMA “registered” existing water use, setting that as the allowable withdrawal limit for the system. The changes create new requirements for registered systems when the state declares a drought in their region of the Commonwealth. As a system with large multi-year storage reservoirs, MWRA qualifies for the use of a system specific drought plan, rather than the generic limits placed on all other systems. This will require that MWRA update and submit its drought plan for acceptance by MassDEP by April of 2025. Staff have begun to work on the update.

Figure 9: Quabbin Reservoir Volumes and Drought Status for 2021 to present

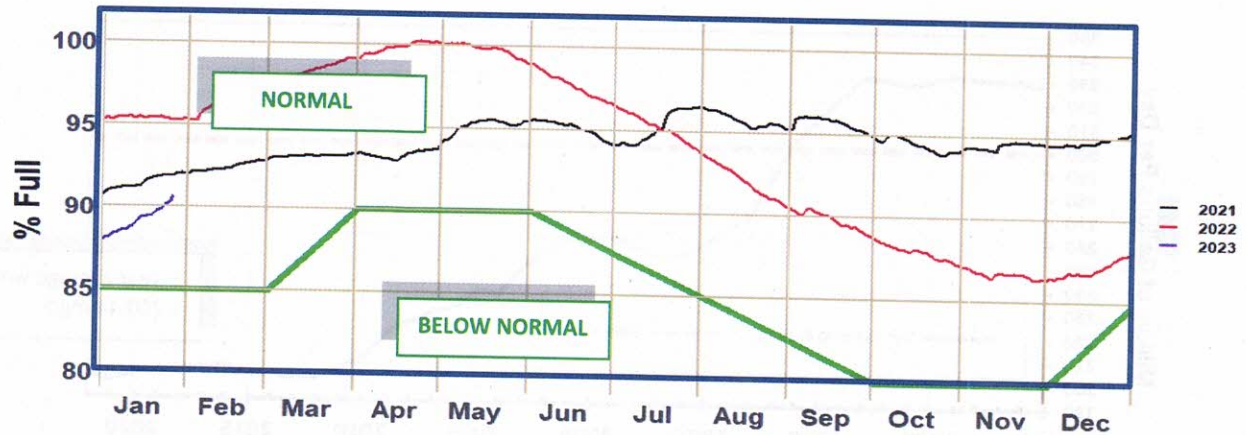
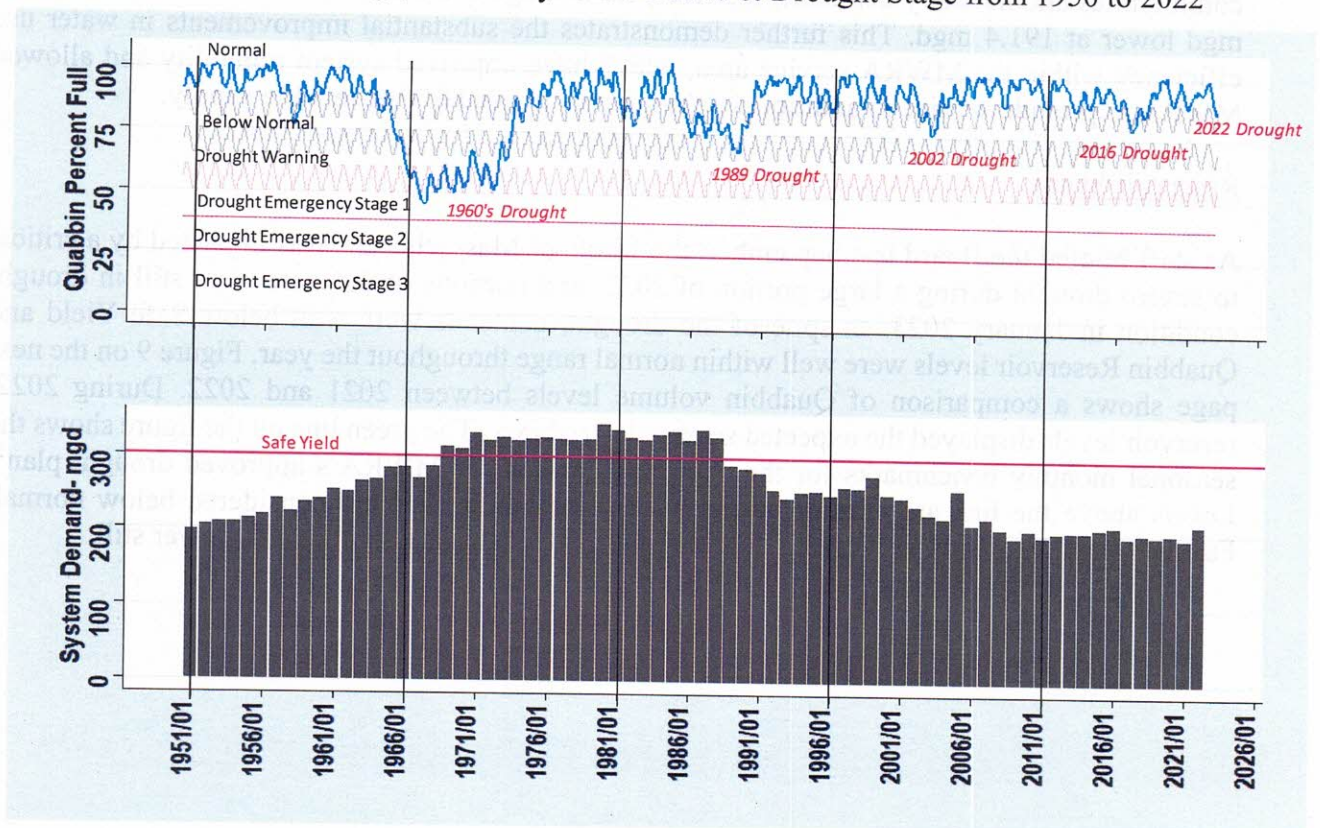


Figure 10 below further shows the relationship between the historical droughts, reservoir volume and annual demand.

Figure 10: Quabbin Storage, Annual System Demand & Drought Stage from 1950 to 2022



The Quabbin Reservoir spilled 14.1 billion gallons to the Swift River in 2022, beginning on February 12 and spilling for 141 days. In order to meet metro Boston water demand and to maintain water quality, 55 billion gallons of the higher quality Quabbin water was transferred to the Wachusett Reservoir during 2022. The transfer was equivalent to about 85 percent of Wachusett's volume and about 83 percent of the water used by MWRA's customers in the metro Boston system. To maintain Wachusett Reservoir in its normal narrow operating band, MWRA released 17.9 billion gallons to the Nashua River through controlled releases.

CONCLUSION:

The reduced demand has improved system reliability and allowed MWRA to provide service to additional communities in need of that reliable supply. Despite dry conditions for a substantial portion of the year and increased demands due to communities using MWRA water as they responded to PFAS issues with their local sources in 2022, and despite the addition of hundreds of thousands of new residents and jobs to our service area over the past three decades, MWRA's sources continued to perform well in 2022. The system stayed in the normal operating range during the entire year, both the Swift and Nashua rivers received substantial releases from the reservoirs, well above their minimum requirements, and the water quality delivered to our customers was excellent. The system is well situated to provide a reliable supply of safe water to our customers, economic vitality to the region, and to be an option for communities struggling with water quality or source reliability issues.

ATTACHMENT:

Community Water Use Data

