

STAFF SUMMARY




TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 13, 2024
SUBJECT: Metropolitan Redundancy Interim Improvements Projects Update

COMMITTEE: Water Policy and Oversight

X INFORMATION
 VOTE

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Preparer/Title


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

RECOMMENDATION:

For information only. This staff summary provides an update on the Metropolitan Redundancy Interim Improvements projects. These projects are being implemented to reduce the risk of failure of surface pipe components of the three Metropolitan Tunnels (City Tunnel, City Tunnel Extension and Dorchester Tunnel) and to improve MWRA’s ability to respond in the event of a failure that requires an isolation of any part of the Metropolitan Tunnel system.

DISCUSSION:

Each of the existing Metropolitan Tunnels consists of concrete-lined deep rock tunnel sections linked to the surface through steel and concrete vertical shafts. The tunnels and shafts themselves require little or no maintenance and represent a low risk of failure. The shafts are located in Weston, Chestnut Hill, Allston, Somerville, Malden, West Roxbury, and Dorchester. At the top of each shaft, cast iron or steel pipe and valves connect to the MWRA surface pipe network. These pipes and valves are accessed through subterranean vaults and chambers. The piping and many of the valves are in poor condition. Interim improvements as detailed below are being implemented to strengthen the physical assets at top of shaft structures and to provide additional flow capacity and redundancy to the existing supply system in the event of an emergency due to a tunnel failure.

Commonwealth Avenue Pumping Station Improvements

This project provides a means for the Commonwealth Avenue pumping station, located in the City of Newton, to continue to operate, independent of the City Tunnel, by adding a pipeline connection to MWRA’s Low Service system and two new pumps capable of pumping from the Low Service grade line. This project was completed in 2021 at a final cost of \$8.0M.



New Pumps at Commonwealth Avenue

Tunnel-Shaft Pipeline Improvements

Modifications are being implemented to protect the valves and piping in the chambers at the tops of the tunnels shafts and to reduce water infiltration that is contributing to corrosion and can require significant pumping of ground water in order to access valves for operation. Construction was completed in 2020 at Shafts 6, 8, and 9A at a cost of \$2.2M. This provided protection of all exposed piping, shaft caps, end caps, nuts, bolts, and valve bodies with corrosion protection tape or exterior carbon fiber wrapping; removed and replaced corroded nuts and bolts; and reduced or eliminated water infiltration in eight vaults through waterproofing and grouting.



Shaft 9A before improvements

After improvements

Construction of similar improvements in the Shaft 5 building for valve and piping was awarded at the February 2024 Board meeting at a cost of \$5.4M. In addition to corrosion control, Shaft 5 work includes the abandonment of a pump room at the bottom of a 400-foot-deep shaft. Design of similar work at Shafts 7, 7B, 7C, and 7D is anticipated to start in 2026 is estimated to cost \$8.6M.



Shaft 5 - Electrical Switchgear to be replaced

Improvements to the Shaft 5 building in Weston will upgrade and bring existing utilities to code, replace dewatering and sump pumps and upgrade instrumentation and control systems at an estimated cost of \$3.3M. This will allow better access to valves and equipment and provide better remote monitoring. The design is currently underway with an anticipated construction award in April 2026. Similar upgrades to the Shaft 9 building in Somerville will be designed at a future date (2028) and is estimated to cost \$13.6M.

Weston Aqueduct Supply Main (WASM) 3 Rehabilitation

This eleven-mile steel pipe, installed in the 1920s and 1930s, is a critical supply line to over 250,000 customers in the Northern High, Northern Extra High, and Intermediate High pressure zones. In the event of a loss of the City Tunnel or City Tunnel Extension, this large diameter pipe will be depended on to provide emergency flow to the Gillis Pump Station, which would serve the Northern High and Northern Intermediate High communities. The first of three contracts was substantially complete in May 2023 that rehabilitated over 2.5 miles of 56-inch and 60-inch pipe at an estimated



WASM 3 - cement-mortar lined steel pipe



WASM 3 – pipe replacement

cost of \$20.5M. The second phase of the WASM 3 rehabilitation will repair 0.6 miles of 60-inch pipe in poor condition with a history of leaks. CP-2 is currently under design with an anticipated construction award in August 2025 and at an estimated cost of \$13.8M.

Low Service Pressure Reducing Valve Improvements

This project is nearing the completion of construction at a cost of approximately \$12.2M. The project has increased the size of existing pressure reducing valves (PRVs) on the WASM 4 pipe at Nonantum Road in Boston and the WASM 3 pipe at Mystic Valley Parkway in Medford, increasing the capacity of flow from the High Service pressure zone to the Northern Low pressure zone. They will ultimately supply the Spot Pond and Gillis Pumping Stations in an emergency condition with either the City Tunnel or the City Tunnel Extension out of service. With this increased capacity, these stations will be capable of supplying the Northern High and Northern Intermediate High pressure zones.



WASM 3 42-inch diameter PRVs

WASM 3 pipe at Mystic Valley Parkway in Medford, increasing the capacity of flow from the High Service pressure zone to the Northern Low pressure zone. They will ultimately supply the Spot Pond and Gillis Pumping Stations in an emergency condition with either the City Tunnel or the City Tunnel Extension out of service. With this increased capacity, these stations will be capable of supplying the Northern High and Northern Intermediate High pressure zones.

Section 101 Waltham Pipeline Extension

The project consists of installing 9,000 linear feet of new 36-inch diameter water main and appurtenances extending from Waltham’s Meter 182 at the Waltham/Lexington town line down Lexington Street to Totten Pond Road, where it will connect to Waltham’s existing water system. This new water main will provide redundancy for MWRA’s Lexington Street pumping station during the anticipated isolation of MWRA’s WASM 3 pipeline discussed for the construction projects mentioned above or in the event of a WASM 3/Lexington Street pumping station failure. This project is currently in construction and is approximately 40% complete at an approximate cost of \$32.7M.



36” pipe & thrust block @ Lexington St & Totten Pond Rd

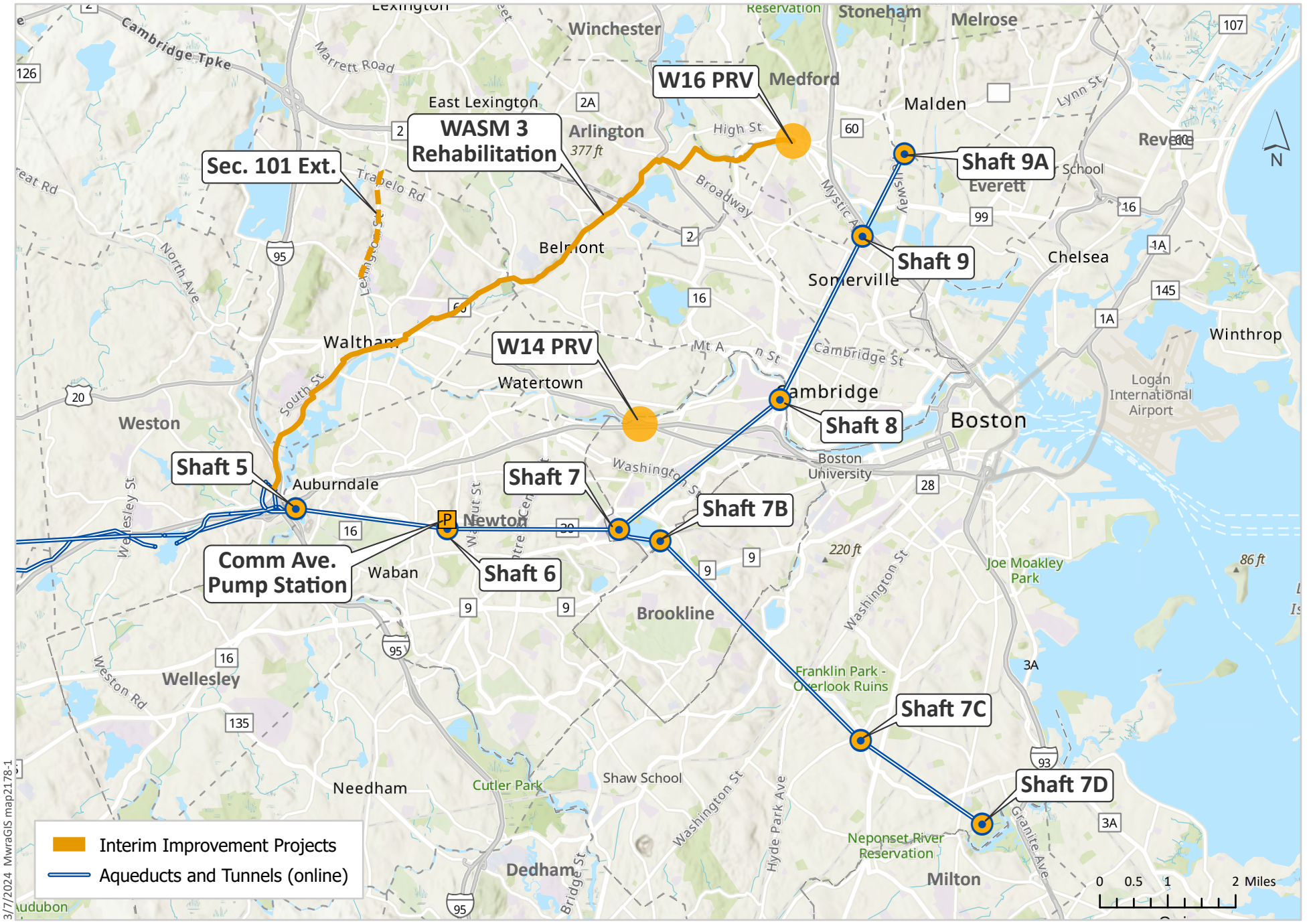
BUDGET/FISCAL IMPACT:

The cost of these projects is \$120.3M and is included in the Capital Improvement Program budget.

ATTACHMENT:

Figure 1 - Metropolitan Interim Improvements Projects

FIGURE 1: Metropolitan Interim Improvement Projects





Presentation to

MWRA Board of Directors

***Metropolitan Redundancy Interim
Improvements Projects Update***

March 13, 2024



Commonwealth Avenue Pumping Station Modifications



- Provides redundancy if City Tunnel taken out of service
- Alternate low service supply from WASMS 1 & 2
- New low service pumps

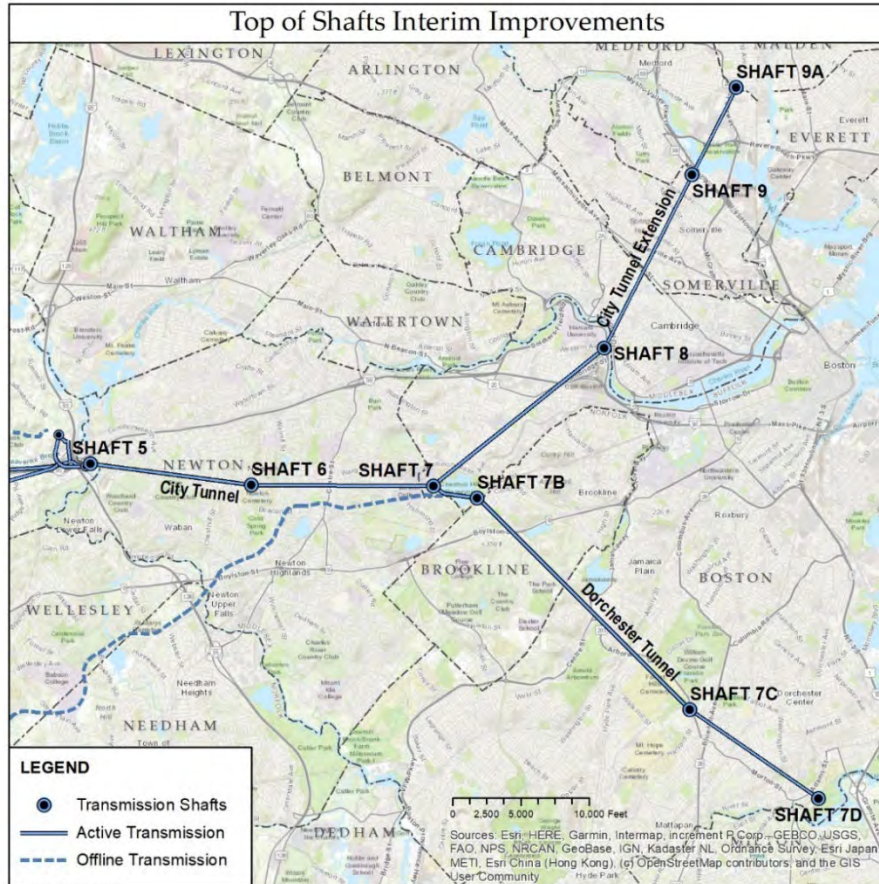


New Pumps #4 & #5 with AFDs





Location of Metropolitan Tunnel Shafts



Improve and protect critical facilities related to the existing tunnel system.

7671 Shaft 5 – Weston (awarded 2/21 BOD)

Completed work:

- Shaft 6 – Newton
- Shaft 8 – Brighton
- Shaft 9A – Malden

Future work:

- Shaft 7 – Boston College
- Shaft 7B – Chestnut Hill
- Shaft 7C – Dorchester
- Shaft 7D – Dorchester.
- Shaft 9 – Somerville



Shaft 8 Before and After Epoxy Coating





Shaft 9A Air Valve – before and after (installed by Ops)





Contract 7671 Top of Shaft 5 Interim Improvements



Multiple valve vaults (corrosion protection, bolt replacement, and vault waterproofing)



Underground pump room
(abandoned with fill)



Contract 7599 Shaft 5 Building Improvements - Existing Exterior





Contract 7599 Shaft 5 Building Improvements Equipment Upgrades



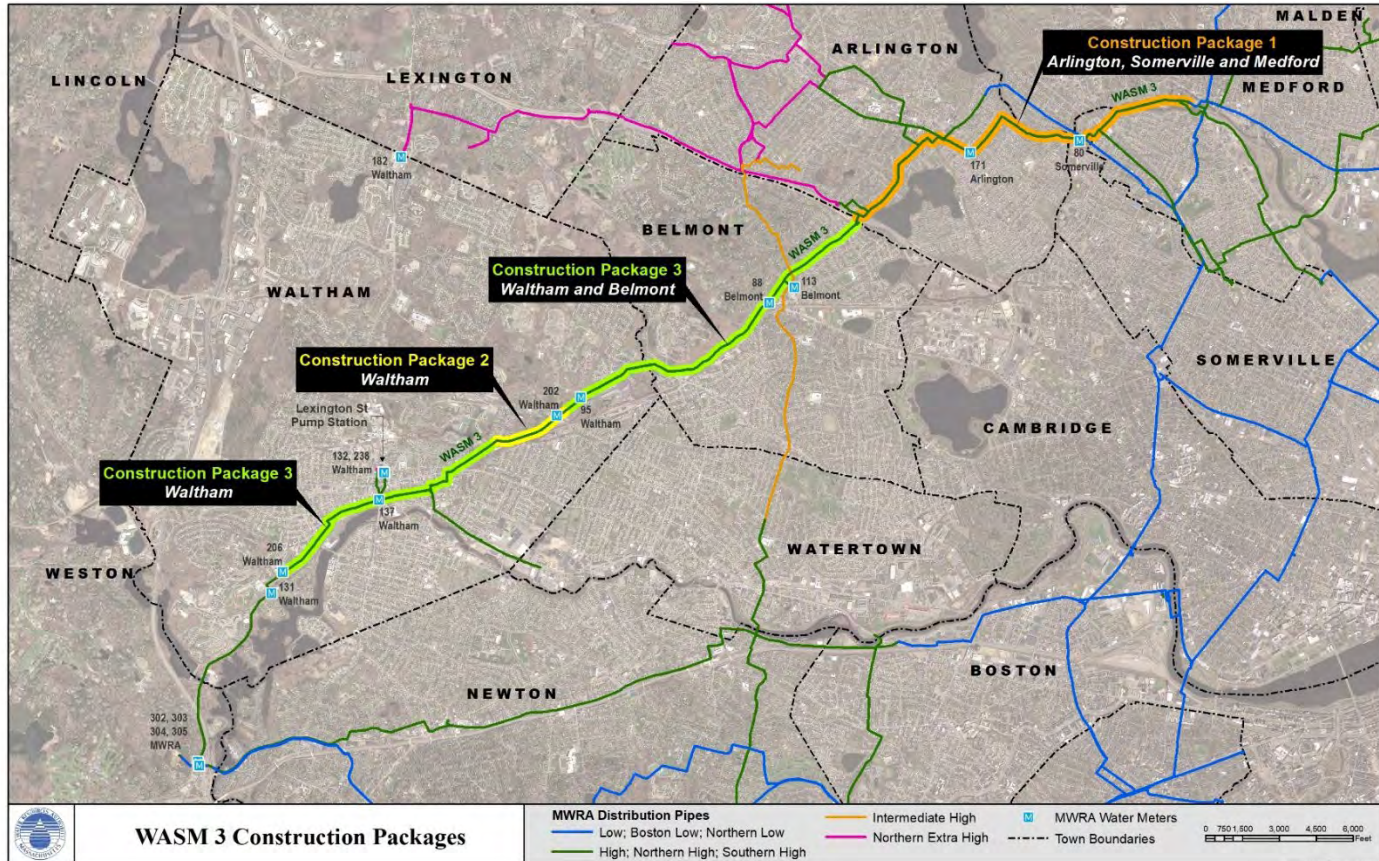
Existing Switchgear



Existing Overhead Crane



WASM 3 Rehabilitation





WASM 3 - Existing Pipe, Cleaned Pipe, New Cement Lining



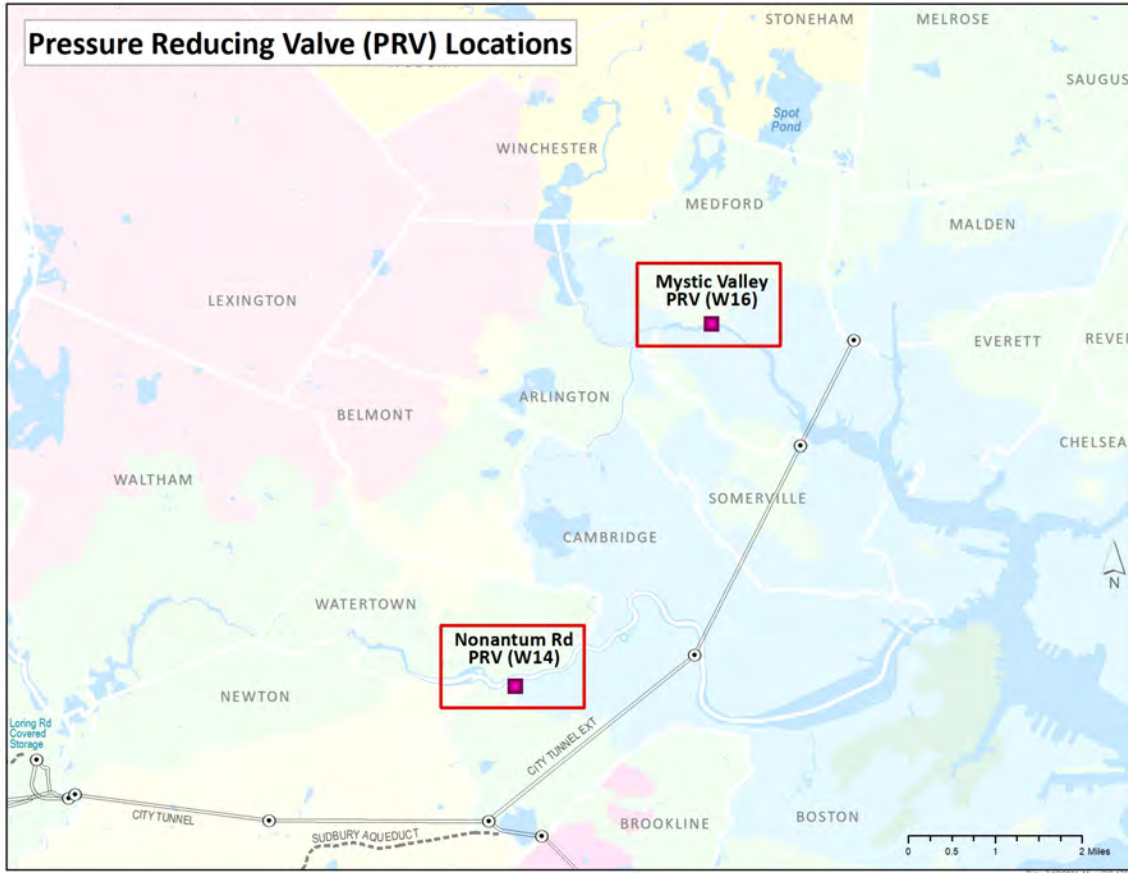


WASM 3 - Installation of New 60" Steel Pipe





Low Service Pressure Reducing Valve Improvements



- Increase capacity of water supply via WASM 3 and WASM 4.
- Gillis and Spot Pond pumping stations can supply Northern High Service in event of a tunnel failure.
- Construction nearing substantial completion, April 2024



W14 Nonantum Road PRV Old vs New



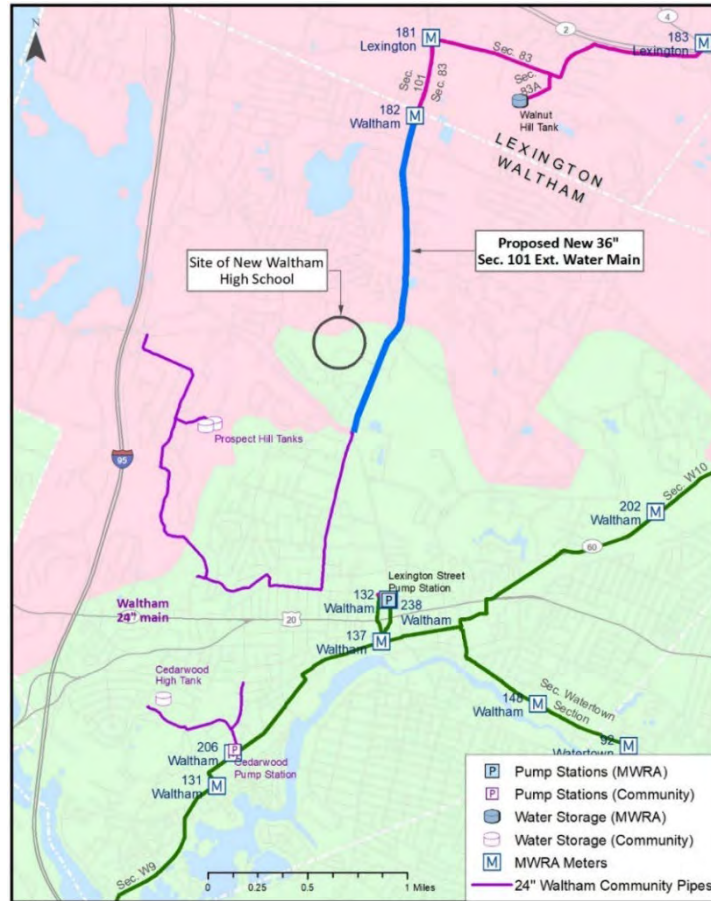


W16 Mystic Valley Parkway PRV Old vs New





Section 101 Extension Waltham – Project Overview





Sect 101 Ext. 36-Inch Valve & Manhole Installation Lexington St.





Conclusion

- Tunnel construction is a long term program
- Much work completed since tunnel authorization approved
- Projects reduce risk, improve response capability, resiliency
- Cost of projects in CIP is \$120.3M