Metropolitan Water Tunnel Program

Meeting Minutes

Contract No.: N/A **Contract Name: N/A**

Meeting Title: Advisory Board (AB) Operations Committee July 2024 Meeting

Date	July 18, 2024	Version	Final
Time	8:15 AM to 12:00 PM	Version Date	July 18, 2024
Location	MWRA Needham Core Storage Facility	Recorded By	Gina Mician (MWRA)

Attendees:

Kathy Murtagh (MWRA)	KMM	Valerie Moran (MWRA)	VM	Kareen Sud (MWRA AB Staff)	KS
Paul Savard (MWRA)	PVS	Richard Raiche (AB OPs Committee Member)	RR	Christine Bennett (MWRA AB Staff)	CB
Vivian Chan (MWRA)	VC	Michael Rademacher (AB OPs Committee Member)	MRA	Matthew Romero (MWRA AB Staff)	MRO
Brad Miller (MWRA)	BAM	Sam Stivers (AB OPs Committee Member)	SS	Nathan Coté (MWRA AB Staff)	NC
David Abt (MWRA)	DA	Chase Berkeley-Milton (AB OPs Committee Member)	CBM	Susan Herman (Municipal Insights)	SH
Gabby Tool (MWRA)	GT	Carmine DeMaria (MWRA)	CD	Lou Taverna (MWRA BOD)	LT
Gina Mician (MWRA)	GM	Jenn Jordan (Schnabel)	JJ	Lisa Bina (MWRA)	LB

Purpose:

The purpose of this meeting was for the Massachusetts Water Resources Authority (MWRA) Tunnel Department to provide the MWRA Advisory Board (AB) Operations Committee with an update of the Metropolitan Water Tunnel Program (MWTP) and give a tour of the Needham Core Storage Facility located at 116 Gould Street, Needham Heights, MA 02494.

Summary:

On Thursday, July 18th 2024, The AB Operations Committee held their July Meeting at the Needham Core Storage Facility (Core Storage Facility). From approximately 8:30 AM to 9:00 AM, the AB conducted their internal meeting in the Tunnel Department's conference room. Afterward all attendees sat down for a round of presentations provided by the MWRA to give an update on the progress of the MWTP.

The following is a summary of items covered including questions raised by attendees. **Attachment 1** includes the presentation slides projected during the discussion.

1. Introductions and Program Overview
    a. Paul Savard (PVS) began the presentation by welcoming the AB to the Core Storage Facility and allowed for an introduction between the MWRA staff and the AB Operations Committee members.
    b. Brad Miller (BAM) provided a safety minute to discuss the layout of the Core Storage Facility including emergency exits and safety concerns.
    c. Matt Romero (MRO) noted the AB's staff would be recording portions of the presentation and taking photos during the tour to provide access and awareness to other AB members and the public about the MWTP project.
    d. PVS reviewed the MWTP goals as presented to the Board of Directors (BOD) at the March 2024 BOD meeting.
        i. PVS emphasized the need for redundancy of the water distribution system. The May 2010 watermain break in Weston, MA demonstrated the importance of providing this redundancy. The economic loss was estimated at $360 million dollars a day (2024 dollars). The MWRA's Metropolitan Tunnel System, consisting of the City Tunnel, City Tunnel Extension, and the Dorchester Tunnel, have not been taken off-line for maintenance and repair since they were built in the 1950s to 1970s. The goal of the Tunnel Program is to protect the public health and provide uninterrupted service in the event of an emergency shut down.
        ii. The MWTP started in 2017 and follows a two-tunnel concept (North Tunnel & South Tunnel). PVS gave an overview of the preliminary tunnel alignment and noted the importance of making a connection to the MWRA WASM 3 (Weston Aqueduct Supply Main 3) pipeline in Waltham, and a connection to the surface pipelines in the vicinity of the Dorchester Tunnel Shaft 7C in Mattapan along with other connections to communities served by MWRA along the tunnel alignment.

2. Summary of Ongoing Interim Improvements
    a. Lisa Bina (LB) reviewed some of the projects that the MWRA is currently working on to supplement and aid the MWTP.
    b. LB started with the Commonwealth Ave Pumping Station (PS) modifications in Newton, MA. The Commonwealth Ave PS supplies 80 percent of Newton's water supply. MWRA provided pipeline interconnections to the pumping station from the WASM 1 and 2 pipelines, which provide water to Boston in the low service area. With these improvements, the pumping station can take water from the City Tunnel in normal operation, but can also take water from these low service pipelines to feed the pumping station if the City Tunnel connection were not available. These provide redundancy to the pumping station.
    c. LB then described corrosion protection using various methods that has been added to existing valves and chambers, examples of which included:
        i. Using carbon wrap on valves
        ii. Waterproofing shaft chambers
        iii. Shaft 8 interim repairs showing conditions before and after an epoxy coating was applied
        iv. Shaft 9A air valve installation of an encapsulated coupling to provide hardening to protect the valve from failure
        v. Shaft 5 interim repairs were noted to be under construction
    d. WASM 3 is being rehabilitated in several construction packages (CP). CP1 was completed a couple years ago. CP2 will completely replace a section of WASM 3 pipeline. Other aspects of the rehabilitation were also described. The importance of both rehabilitation of the WASM 3

pipelines in conjunction with construction of the new tunnels to provide the full redundancy needed for this section of the MWRA service area was emphasized.

e. Low service Pressure Reducing Valve (PRV) improvements at Nonantum Rd and Mystic Ave were described. The PRVs need to provide up to 45 million gallons per day (MGD) through these pipeline networks. The interim improvements included installing new vaults and SCADA at these locations. Site work was completed recently. Testing of the SCADA system is expected to be done by end of summer.
f. The MWRA Section 101 pipeline extension is underway and will address excessive headloss issues through the Waltham system that it serves.

3. Preliminary Design and Environmental Impact Report (EIR) Update
    a. PVS reviewed major milestones achieved recently. The 30 percent design was completed and the Massachusetts Environmental Policy Act (MEPA) process was completed with receipt of the Secretary's certificate in April 2024.
        i. Both the preliminary design and the environmental impact analysis needed to proceed together so that the design could be improved to minimize environmental impacts identified and develop appropriate mitigations.
        ii. Locating shaft sites and development of the tunnel alignment were described as important steps of the process. MWRA worked with its Working Group members and other stakeholders to identify shaft sites that met specific constraints for construction. This included considering how trucks would travel to the shaft sites for removal of excavated material. It also included describing how the sites would be used with infrequent access needed once the new tunnel system was in service.
    b. Gabrielle Tool (GT) reviewed how the existing tunnels and the new tunnels would operate once they were in service. She described how the MWRA's hydraulic model was used to identify how the system would operate during a high day demand. Flows in the tunnels and the surface pipelines connecting to communities in the metropolitan Boston area were discussed.
        i. When the new tunnels are online they are designed to supply flow to meet each community's demands under high day demand conditions. The water demands included consideration of population forecasts, employment projections, and water use efficiency. The high day demand of 283 MGD was considered as the base high day demand used for the design of the new tunnels.
        ii. The importance of the WASM 3 work being done together with the North Tunnel in service was again emphasized as necessary elements before rehabilitation of the Metropolitan Tunnel System could take place.
        iii. The South Tunnel would serve the Blue Hills reservoir and the communities in the southern high and southern extra high service areas.
        iv. The hydraulic modeling helps understand how both the existing and new tunnel systems will operate in tandem together or can be operated independently if one or more tunnel segments are off-line.
    c. PVS provided an overview of the tunnel construction sequence and construction contract packages planned for the work.
        i. An animation was shown of the sequence of tunneling including the contractor mobilizing to the site, excavation of the shafts by controlled drill and blast techniques, tunnel excavation by tunnel boring machine (TBM), excavated material removed by conveyor back to the launch shaft where it is taken to the surface and loaded onto trucks for disposal.

ii. PVS highlighted the importance of the launch shaft being close to the highway to help reduce traffic impacts on local roadways. Other aspects of groundwater control, handling, treatment, and disposal were discussed.
iii. After tunnel excavation, tunnel lining is expected to take a couple more years to complete. Tunnel lining using mostly unreinforced concrete along with some stretches of reinforced concrete and some stretches of steel pipe lining depending on ground conditions were described.
iv. The tunnel would be put into service after it is filled with water, disinfected, pressurized, and tested.

d. Other aspects of tunneling were described including:
   i. The excavated diameter of the tunnel is expected to be about 15-foot based on the cutter head diameter of the TBM.
   ii. Groundwater infiltration into the tunnel would be controlled by probing ahead of the TBM in areas of poor ground conditions and grouting to cut off groundwater infiltration. The goal would be to seal off as much groundwater as possible.
   iii. Intermediate connections may be constructed by raise bore excavation where ground conditions are suitable.
      1. A 12-inch diameter pilot hole is drilled through bedrock that will penetrate through to the top of the tunnel. The shaft diameter is reamed upward from the tunnel to the surface following the pilot hole. The excavated material drops into the tunnel below where the contractor can remove it back at the launch shaft where the operation to handle the excavated material is set up.
e. Environmental and community impacts as well as permits and approvals needed for construction and operation of the tunnels was described.
   i. The MWRA website provides links to the final EIR.
   ii. Carmine DeMaria (CD) of MWRA is the community coordinator for the Tunnel Program.
f. The following questions were raised relative to the tunnel construction:
   i. Susan Herman (SH) asked how many shaft sites are in Needham.
      1. PVS noted the cloverleaf includes two shafts and that the temporary work may extend to the four clover leafs.
      2. SH asked about traffic and whether impacts of the Bulfinch project planned for the site of the former Muzi Ford Dealership located at 557 Highland Ave, Needham were considered.
         a. PVS noted the Program is continuing community outreach and following developments related to this site.
      3. SH asked where the trucks would go to dispose the excavated material.
         a. PVS noted excavated material could be reused or brought to a landfill for disposal. A suitable location will be determined during final design.
      4. SH asked whether construction vehicles would travel through the center of Needham.
         a. PVS clarified that the launching sites are near highways, so trucks would primarily leave the sites directly onto the highways.
      5. SH asked about the construction period, specifically if work would be done during the day.
         a. PVS responded that tunnel work will be done underground primarily expected to be a 24/7 operation, but that surface work would typically be during the day.

4. Look ahead to the final design and construction steps
    a. Kathy Murtagh (KMM) noted the MWRA expects to bring the final design consultant on-board by the end of the year 2024.
    b. The importance of land acquisition was discussed
        i. Land acquisition will include pipeline easements and other land acquisition
        ii. MWRA owns some of the properties at shaft sites (e.g., School Street in Waltham, St Mary's St shaft site in Needham, and the Newton Street Pumping Station shaft site in Brookline.)
        iii. MWRA is working closely with the Massachusetts Department of Transportation (MassDOT) and the Department of Conservation and Recreation (DCR) on other shaft sites as well as communities of Waltham and Wellesley.
        iv. Permanent easement limits will be finalized during final design.
        v. Subterranean easements will be obtained along the tunnel alignment.
    c. Community emergency response is another major topic to be developed during final design. This will require coordination with each town/community.
    d. Power supply will be needed at the tunnel launch shafts before construction begins.
        i. MWRA is working closely with Eversource on this as it is an early action item.
        ii. Eversource is working with MassDOT to install a limited conduit segment during an upcoming roadway improvement project.
    e. Memorandum of Understandings (MOUs) are expected to be developed when needed to cover topics such as;
        i. Work hours that will be vetted out with communities if travelling through local roadways
        ii. Noise and vibration controls
        iii. Emergency response that is expected to follow a similar framework as the MWRA MetroWest Water Supply Tunnel project
        iv. MWRA will work with communities ahead of time
    f. The design schedule and one possible construction sequence was discussed.

5. Following a break at the end of the presentation, the group moved to view the MWRA Core Storage Facility. Figures showing the 13 shaft sites were reviewed for both construction and final conditions.
    a. David Abt (DA) reviewed each site's land ownership, tunnel program needs for permanent facilities and temporary easements.
    b. DA reviewed some of the preliminary design drawings for the shaft chambers and valves structures.
        i. SH asked whether the Needham Highland Northeast and Northwest shaft site construction timeline would overlap with each other. In addition, SH asked about the proximity of the Highland shaft sites to the Muzi Ford property.
            1. PVS noted the sites would be occupied concurrently because the tunnel operations, such as tunnel excavation and tunnel lining, will overlap in order to complete the work in the shorter timeframe.

6. BAM and Vivian Chan (VC) gave a tour of the Core Storage Facility, described how the facility is being used to review the rock cores collected and asses rock characteristics so that tunnel construction considerations will be better understood. They reviewed geologic maps and rock types in relation to the tunnel alignment and showed the current design plan and profile for the tunnels.

a. BAM highlighted the current and future activities for the Core Storage Facility and the proximity of the facility to the Highland Ave shaft sites.
    i. BAM and KMM noted the valuable data that will be included in geotechnical database reports. The United States Geological Survey (USGS) may update their geologic maps with this data.
    ii. MRO asked about Naturally Occurring Asbestos (NOA) being found within a boring or two.
        1. KMM explained that this is being assessed as part of the design. Procedures developed in conjunction with Massachusetts Department of Environmental Protection (MassDEP) have been established for the field investigation work.
    iii. Michael Rademacher (MRA) asked how many more borings are planned for the geotechnical investigation.
        1. The Tunnel Program expects approximately 100 deep rock borings to be completed and more near surface borings along pipeline routes and at valve chambers will be needed. Approximately 60 percent of the deep borings would be completed by the end of 2024.

Action Items:

1. MWRA to send AB staff digital copies of the figures posted on the walls of the Core Storage Facility.

Abbreviations (if applicable):

Advisory Board (AB)

Board of Directors (BOD)

Department of Conservation and Recreation (DCR)

Environmental Impact Report (EIR)

Environmental Justice (EJ)

Massachusetts Department of Environmental Protection (MassDEP)

Massachusetts Department of Transportation (MassDOT)

Massachusetts Environmental Policy Act (MEPA)

Massachusetts Water Resources Authority (MWRA)

Metropolitan Water Tunnel Program (MWTP)

Memorandum of Understanding (MOU)

Million Gallons per Day (MGD)

Naturally Occurring Asbestos (NOA)

Operations (OPs)

Pressure Reducing Valve (PRV)

Pumping Station (PS)

Tunnel Boring Machine (TBM)

Weston Aqueduct Supply Main (WASM)

Attachment 1. MWTP AB Operations Committee July 2024 Meeting Presentation Slides

Metropolitan Water Tunnel Program

Tunnel Program Update

Presented to MWRA Advisory Board

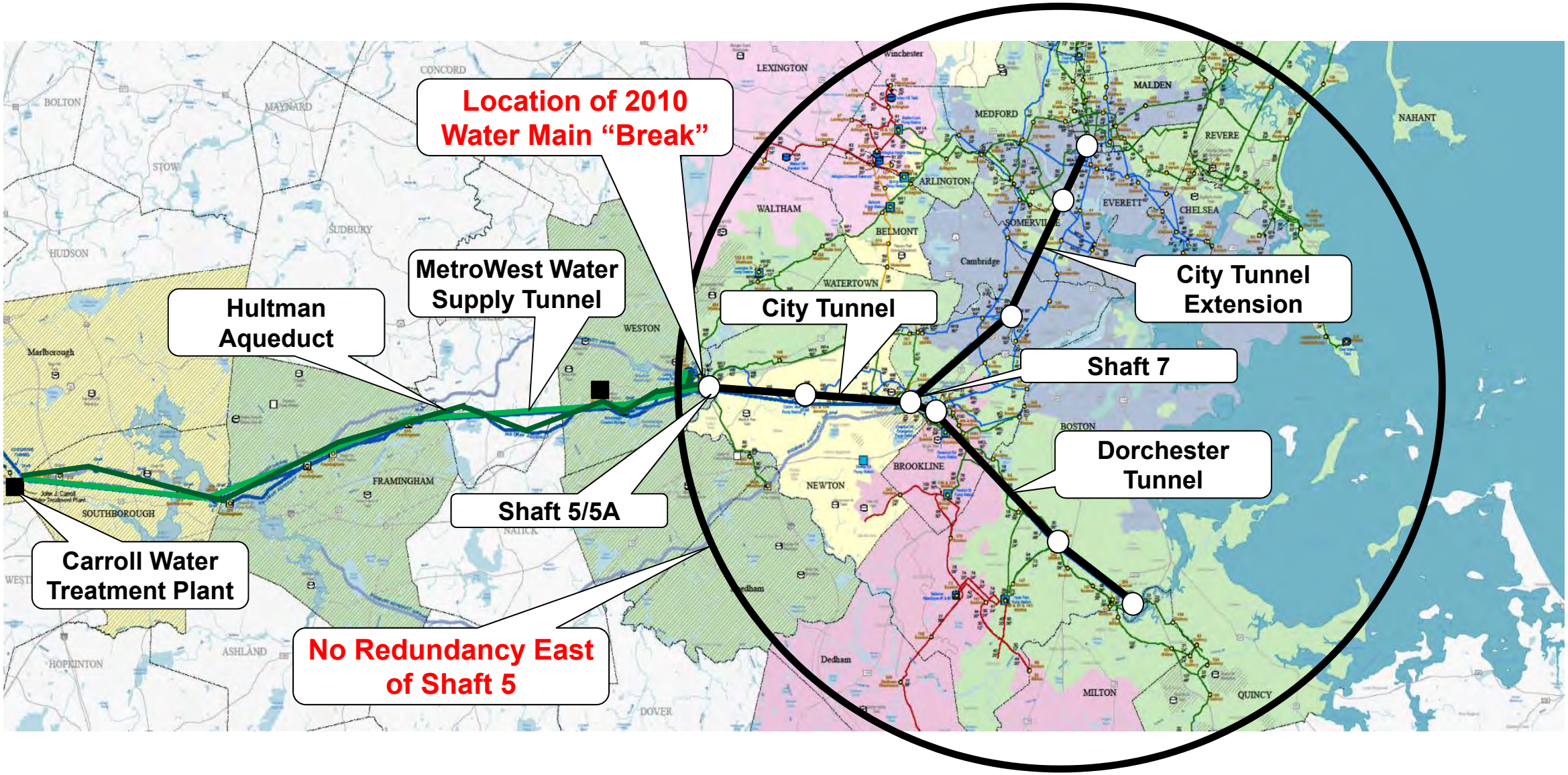
July 18, 2024

Agenda

- Advisory Board Operations Committee Business
- Introductions
- Safety Minute
- Tunnel Program Needs and Overview
- Metropolitan Redundancy Interim Improvements Projects Update
- Preliminary Design and Environmental Impact Report
- Tunnel Program Look Ahead
- Break
- Shaft Site Figures
- Core Storage Tour
- Q&A/Closing

Tunnel Program Needs and Overview

Metropolitan Tunnel System Serves About 60 Percent of Water Demand in Metropolitan Area



Metropolitan Water Tunnel Program Purpose

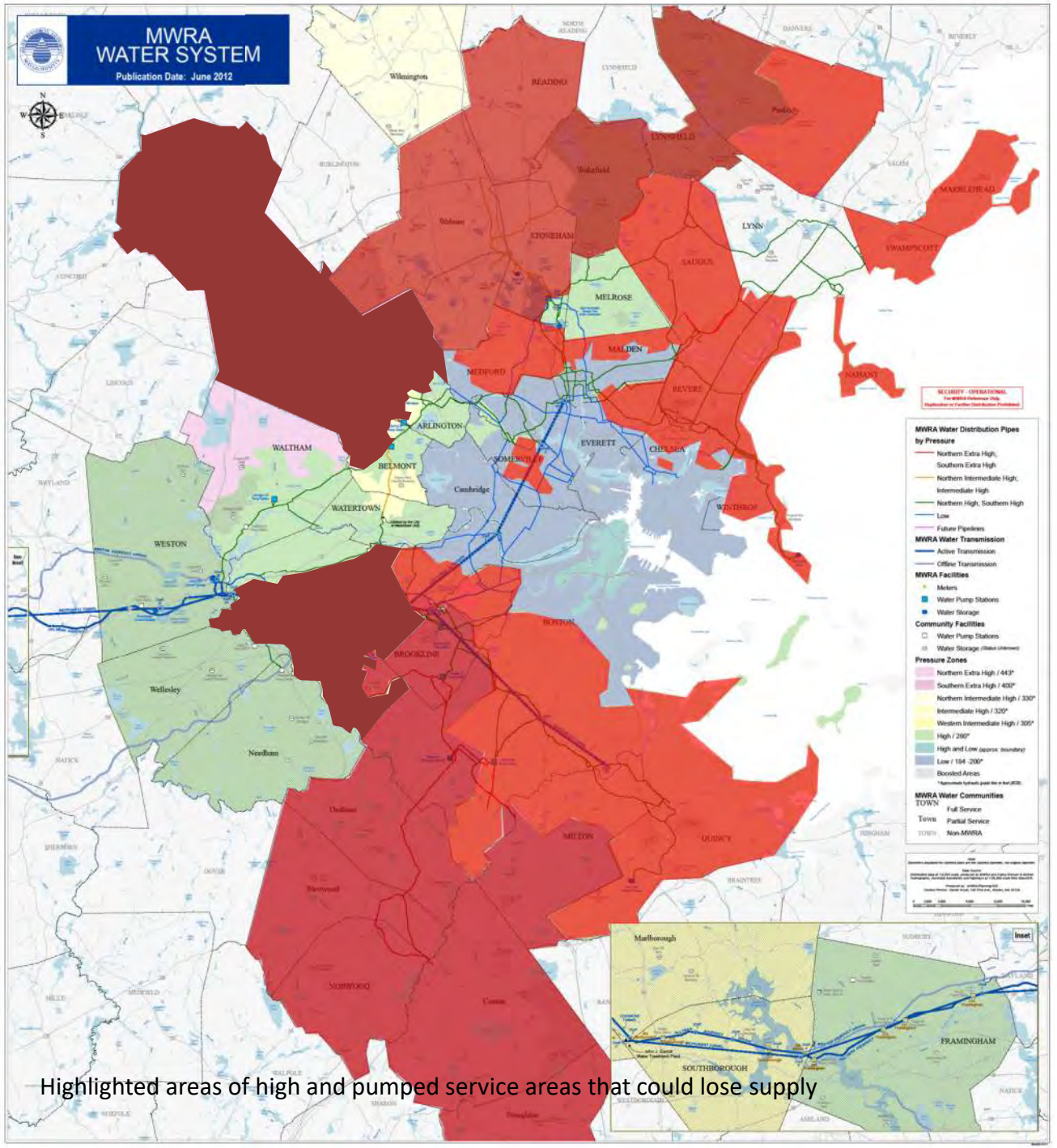
- Our current Metropolitan Tunnel System, servicing the Boston area, is in need of repair
- The tunnels, valves, chambers & pipelines are between 50 – 80 years old

- Currently we cannot maintain our tunnel system east of Shaft 5 in Weston because a shutdown of the entire Metropolitan Tunnel System would be required
- The **Metropolitan Water Tunnel Program** will solve that problem by creating a redundant water tunnel system allowing the old system to be completely taken offline for inspection, maintenance, and repair

Wide-Spread Impact

- Sudden shut down of Metropolitan Tunnel system
- Loss of supply to high service areas
- Pumped Service Areas lose supply as tanks empty
- Whole system would be on boil order

- Economic Impact for Total Water Loss - One Day:
  - $360 million (2024)
- Economic Impact for Total Water Loss - Three Days:
  - $1.1 billion (2024)



Highlighted areas of high and pumped service areas that could lose supply

For discussion only

Metropolitan Water Tunnel Program Goals

Protect Public Health, Provide Sanitation and Fire Protection

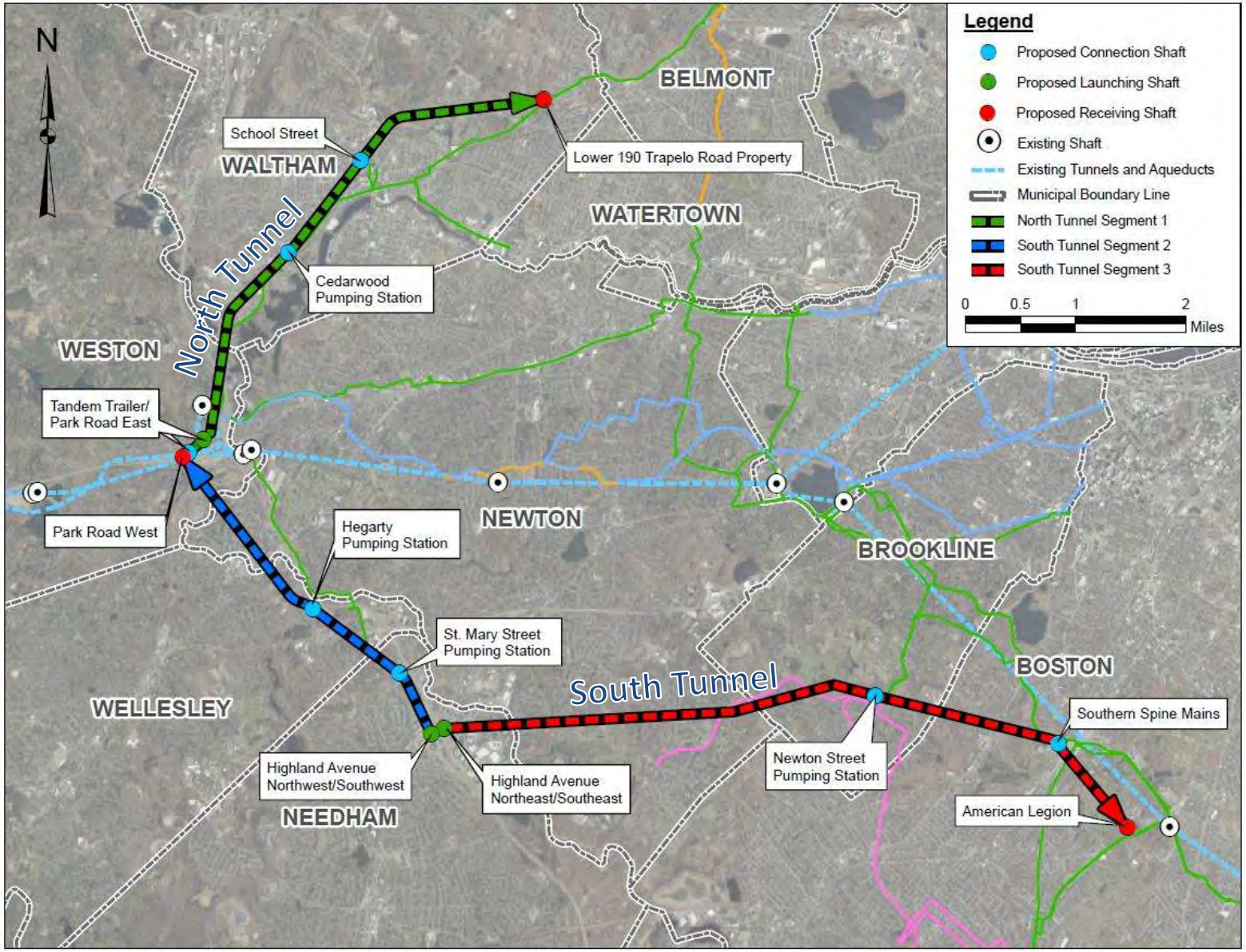
- Provide full redundancy for the Metropolitan Tunnel System:
  - Provide normal water service and fire protection when the existing tunnel system is out of service
  - Provide the ability to perform maintenance on existing tunnels year-round
  - Provide uninterrupted service in the event of an emergency shut down
  - Meet high day demand flow with no seasonal restrictions
  - Avoid activation of emergency reservoirs
  - Meet customer expectations for excellent water quality
- Result in no future boil orders!

Tunnel Program – Since 2017

- 2017 – Board approves Two-Tunnel Concept
- 2018 – Tunnel Department established
- 2019 – PSS consultant and Expert Review Panel
- 2020 – Began preliminary design and environmental review process
- 2021 – Purchased School St property
- 2022 – GSS consultant began an expanded geotechnical program
- 2023 – Completed preliminary design, first bottom-up cost estimate
- 2024 – Completed environmental review process
- 2024 – Begin final design

Metropolitan Water Tunnel Program

- ~15 miles of deep, hard rock, pressure tunnel
- Tunnels will begin in the Weston (I-90/I-95 vicinity)
- Northern Tunnel - ~5 miles, ends in Waltham
- Southern Tunnel - ~10 miles, ends in Mattapan near American Legion Hwy
- Six intermediate connections to existing water infrastructure
- Construction anticipated between 2028 and 2040

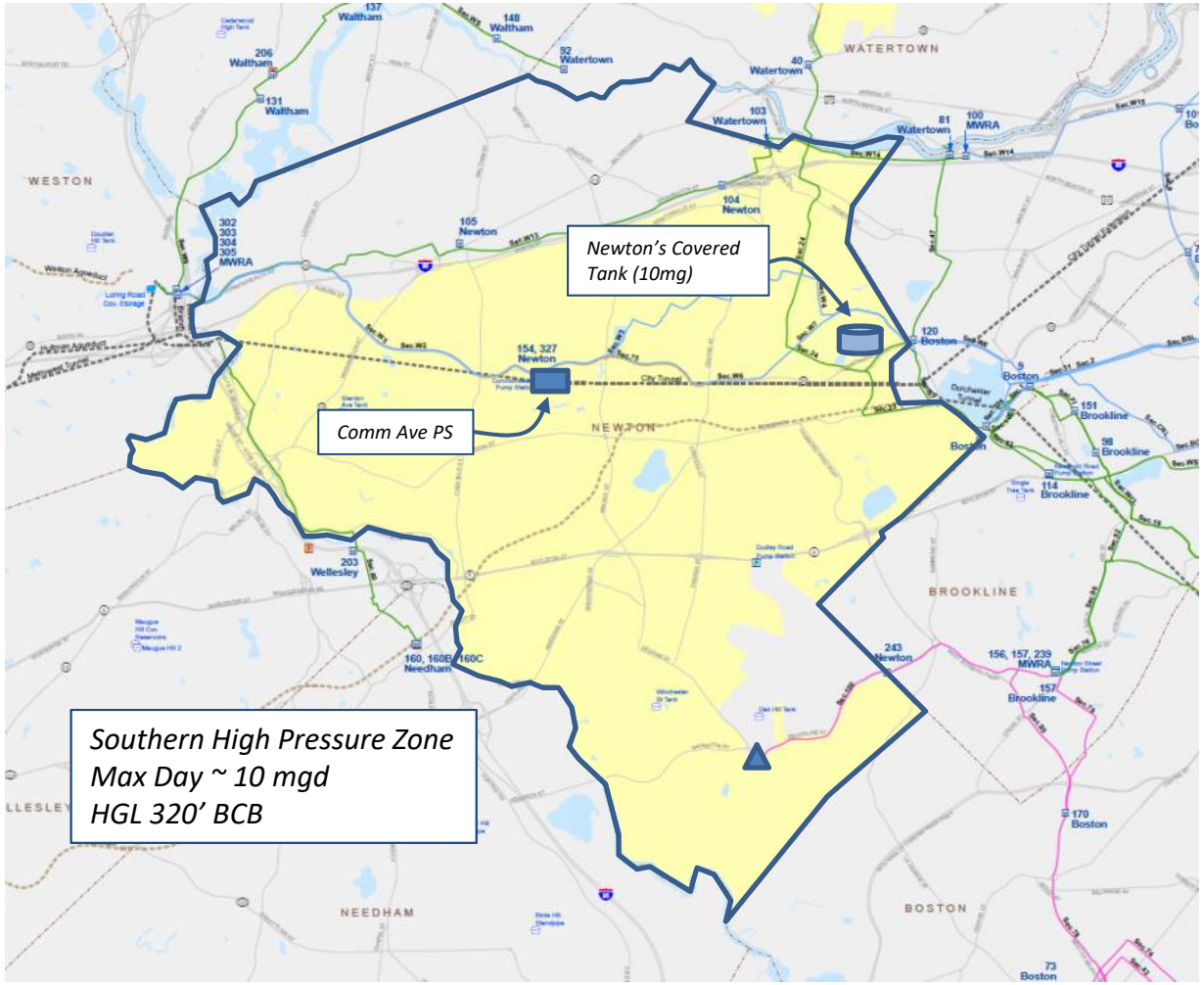


For discussion only

Metropolitan Redundancy Interim Improvements Projects Update

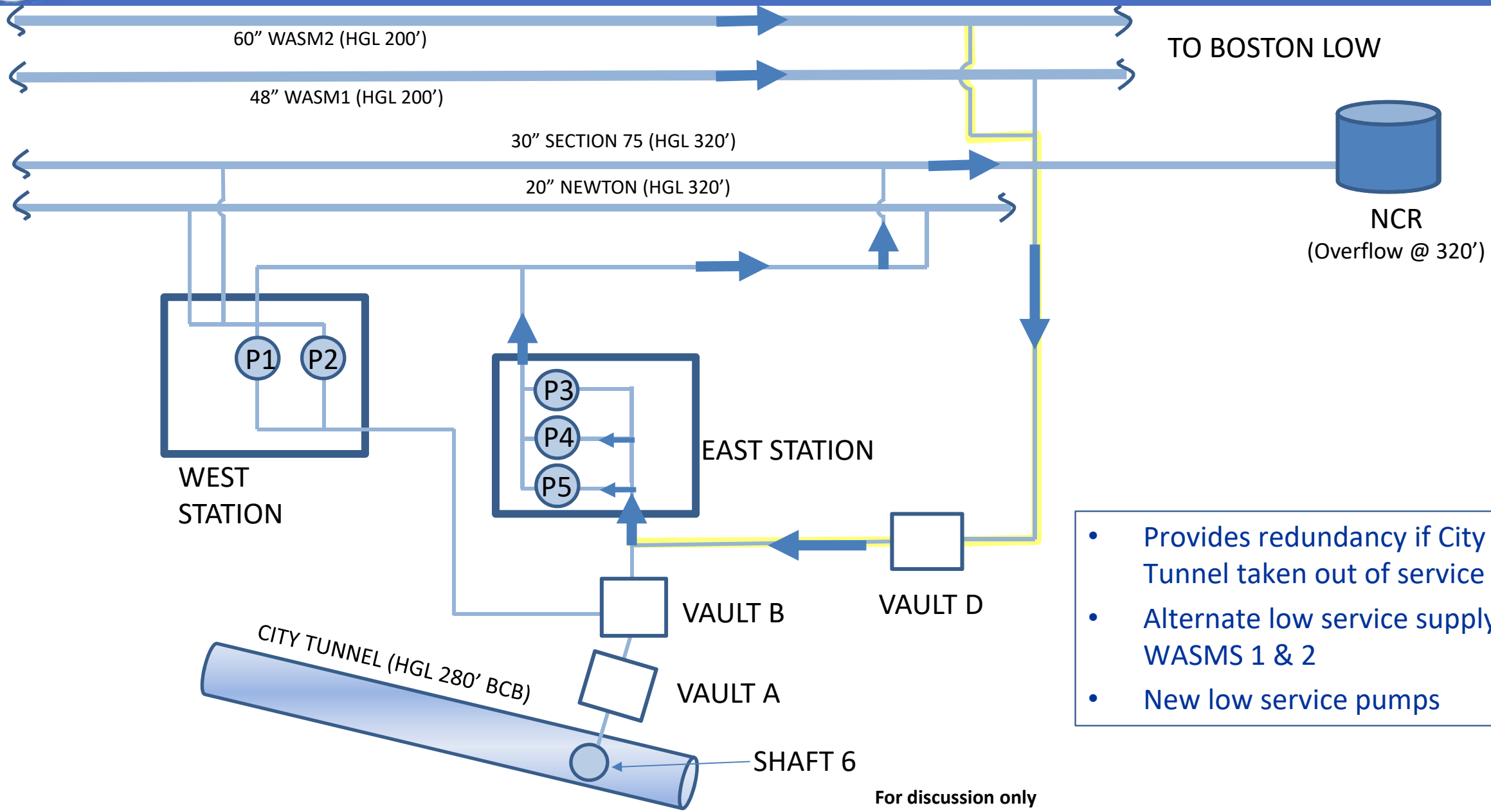
Commonwealth Avenue Pumping Station Modifications

Commonwealth Avenue Pump Station



- Prior to the completion of the project there was a single supply to the pump stations from the City Tunnel at Shaft 6
- Main goal of the project was to provide a redundant supply

Schematic of supply from Low Service (WASM's 1 & 2) to East Station

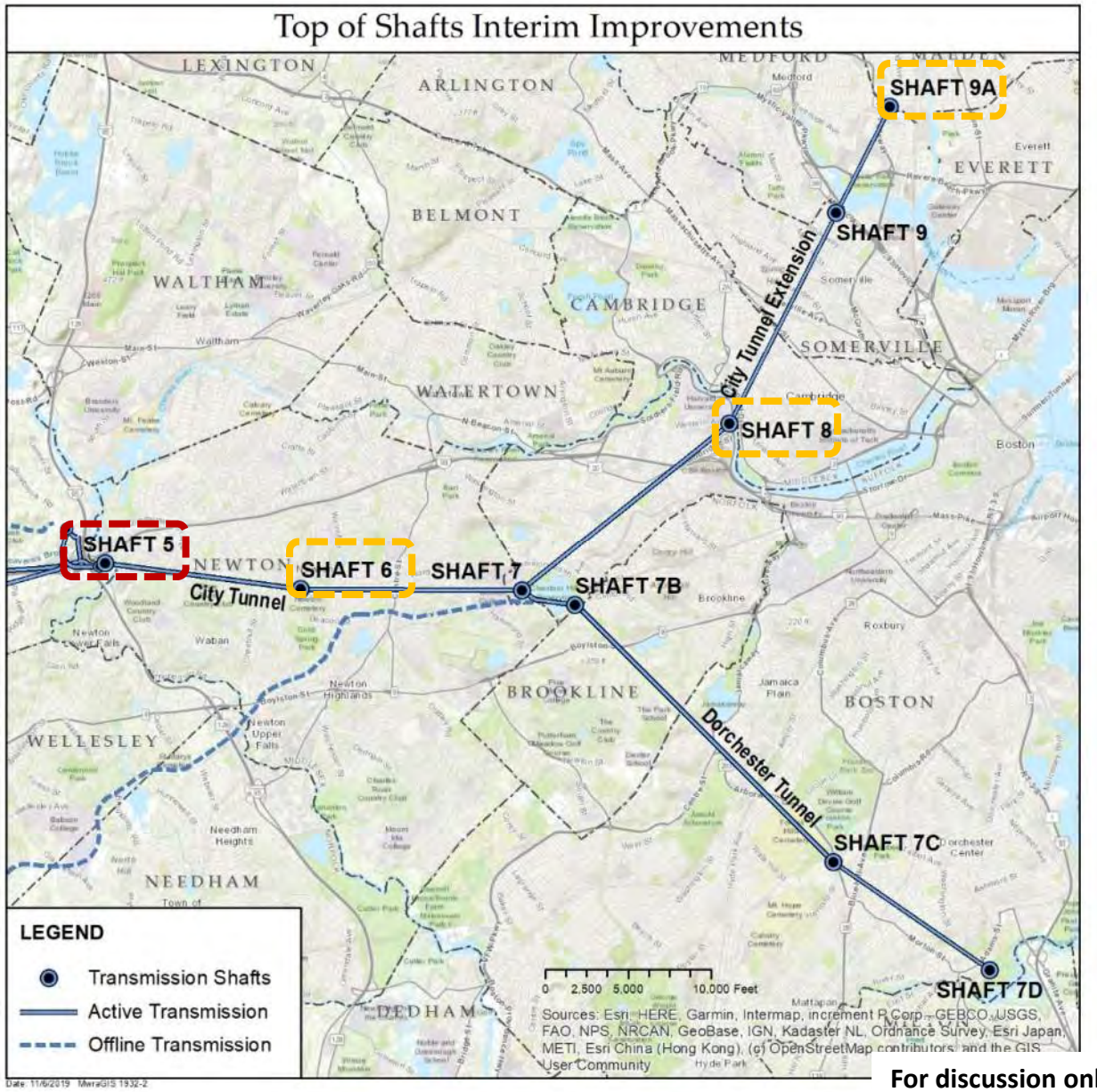


- Provides redundancy if City Tunnel taken out of service
- Alternate low service supply from WASMS 1 & 2
- New low service pumps

New Pumps #4 & #5 with VFDs

For discussion only

Location of Metropolitan Tunnel Shafts



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

7671 Shaft 5 – Under Construction

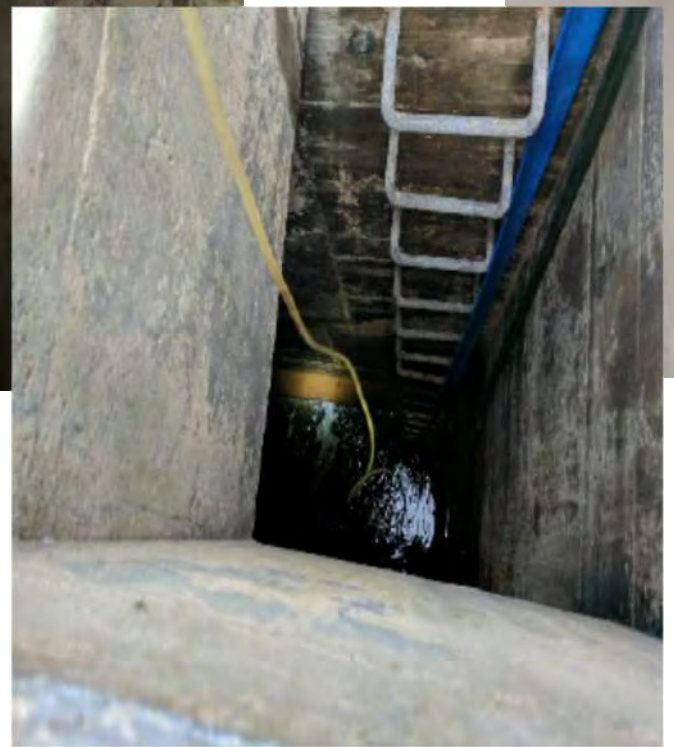
Completed work:

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

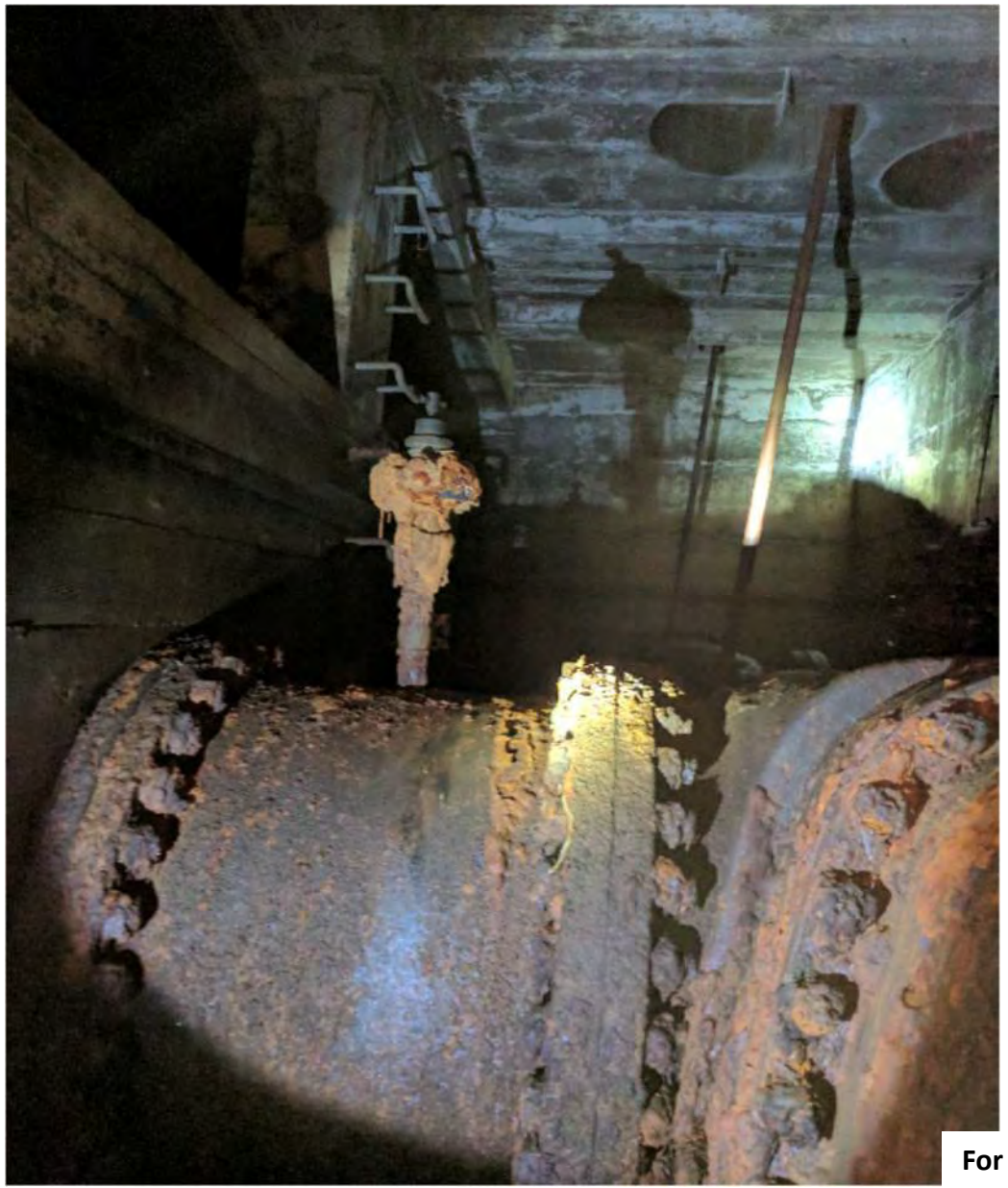
Future work:

- 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)



For discussion only

Contract 7671 Top of Shaft 5 Interim Improvements

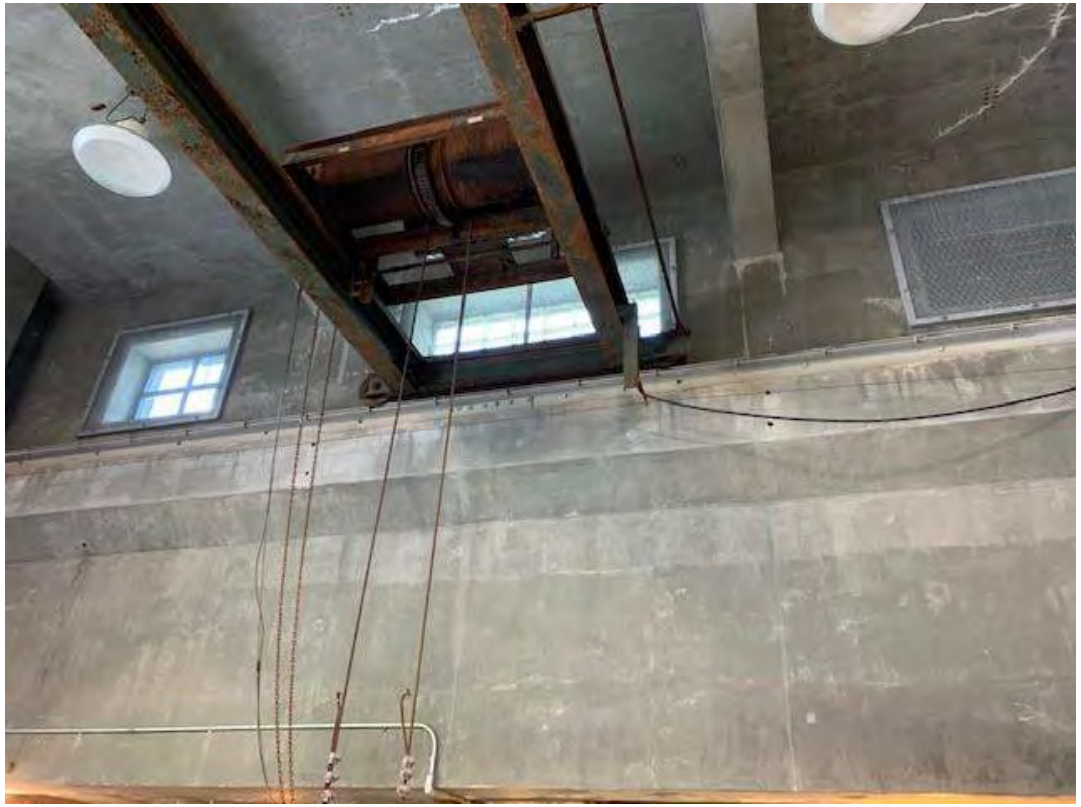
Multiple valve vaults (corrosion protection, bolt replacement, and vault waterproofing)

Underground pump room (abandoned with fill)

Contract 7599 Shaft 5 Building Improvements-Existing Exterior

Contract 7599 Shaft 5 Building Improvements Equipment Upgrades

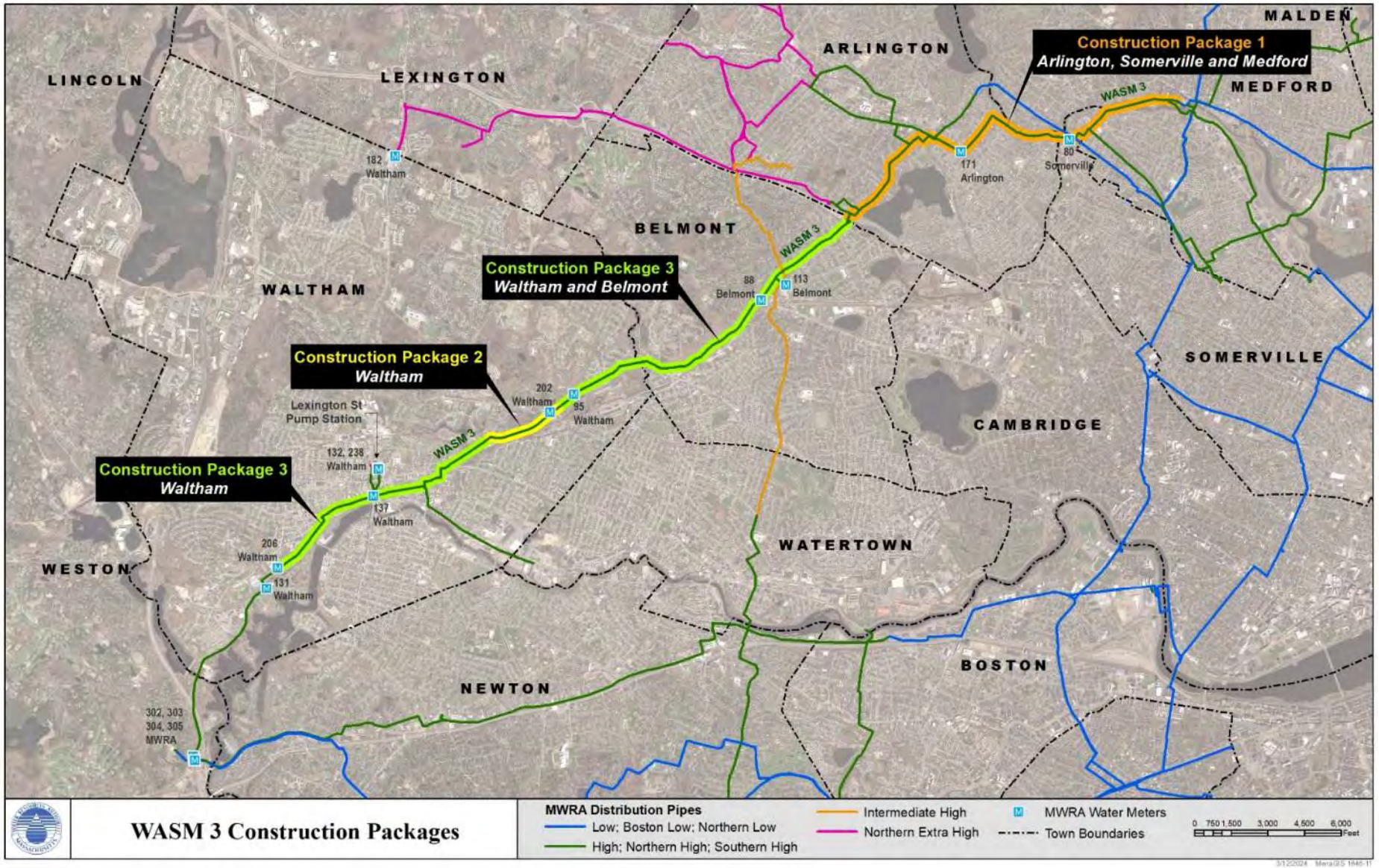
Existing Switchgear



Existing Overhead Crane

For discussion only

WASM 3 Rehabilitation



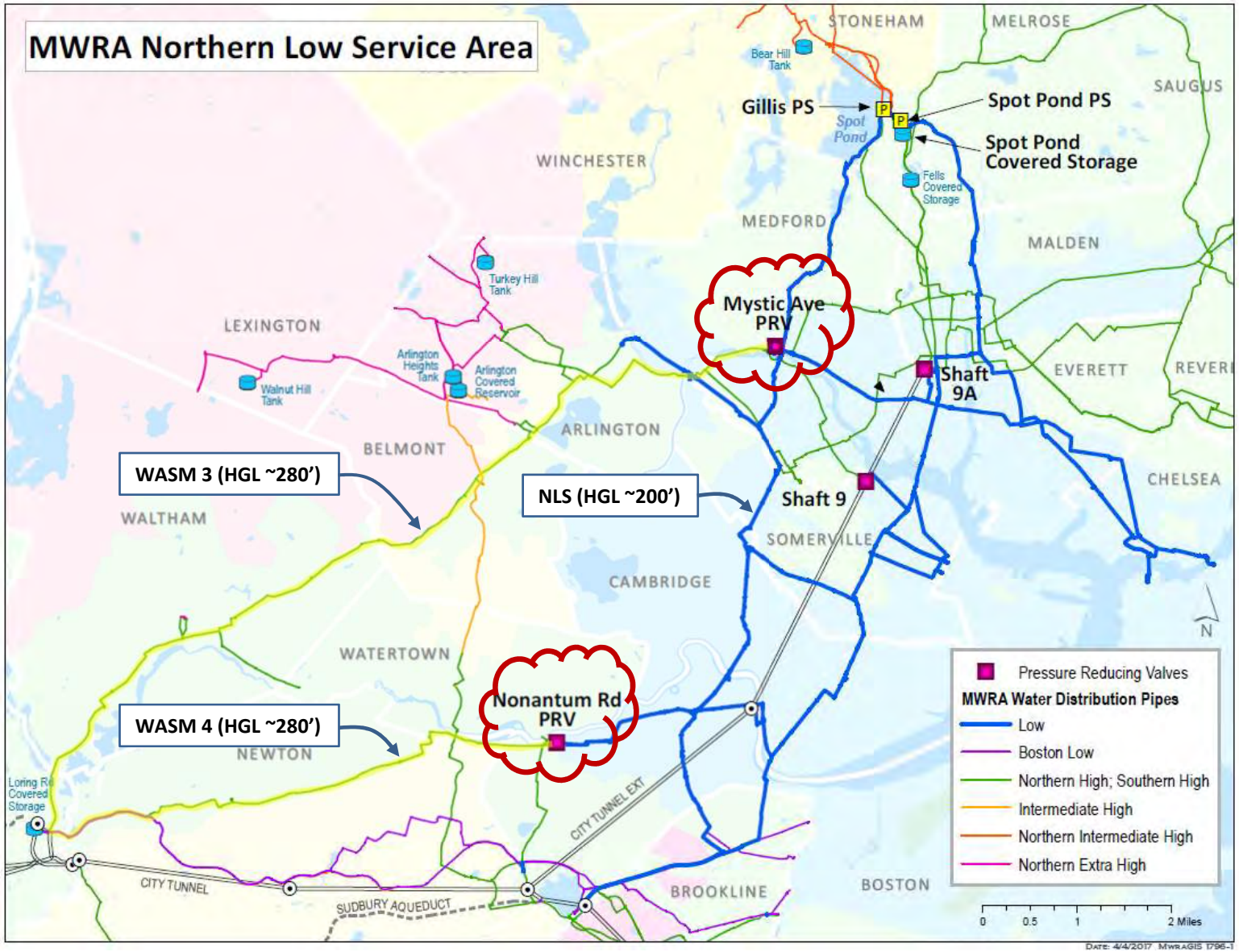
For discussion only

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

WASM 3 - Installation of New 60” Steel Pipe

For discussion only

Low Service Pressure Reducing Valve Improvements



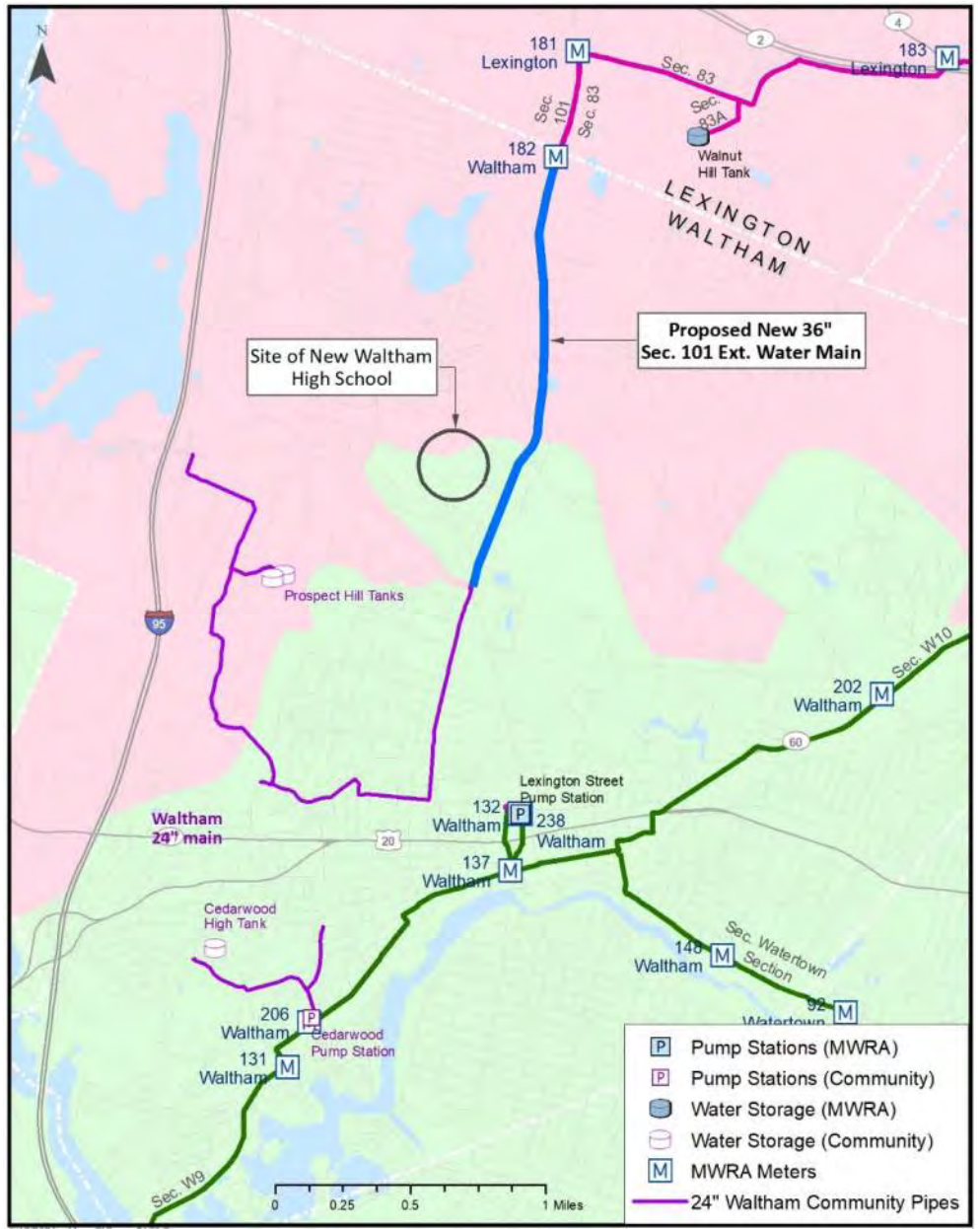
- Increase capacity of water supply via WASM 3 and WASM 4 to Northern Low Service
- Gillis and Spot Pond pumping stations can supply Northern High and Northern Intermediate High services in event of a tunnel failure
- Construction nearing substantial completion, Start-up Summer 2024

For discussion only

W14 Nonantum Road PRV Old vs New

W16 Mystic Valley Parkway PRV Old vs New

Section 101 Extension Waltham – Project Overview



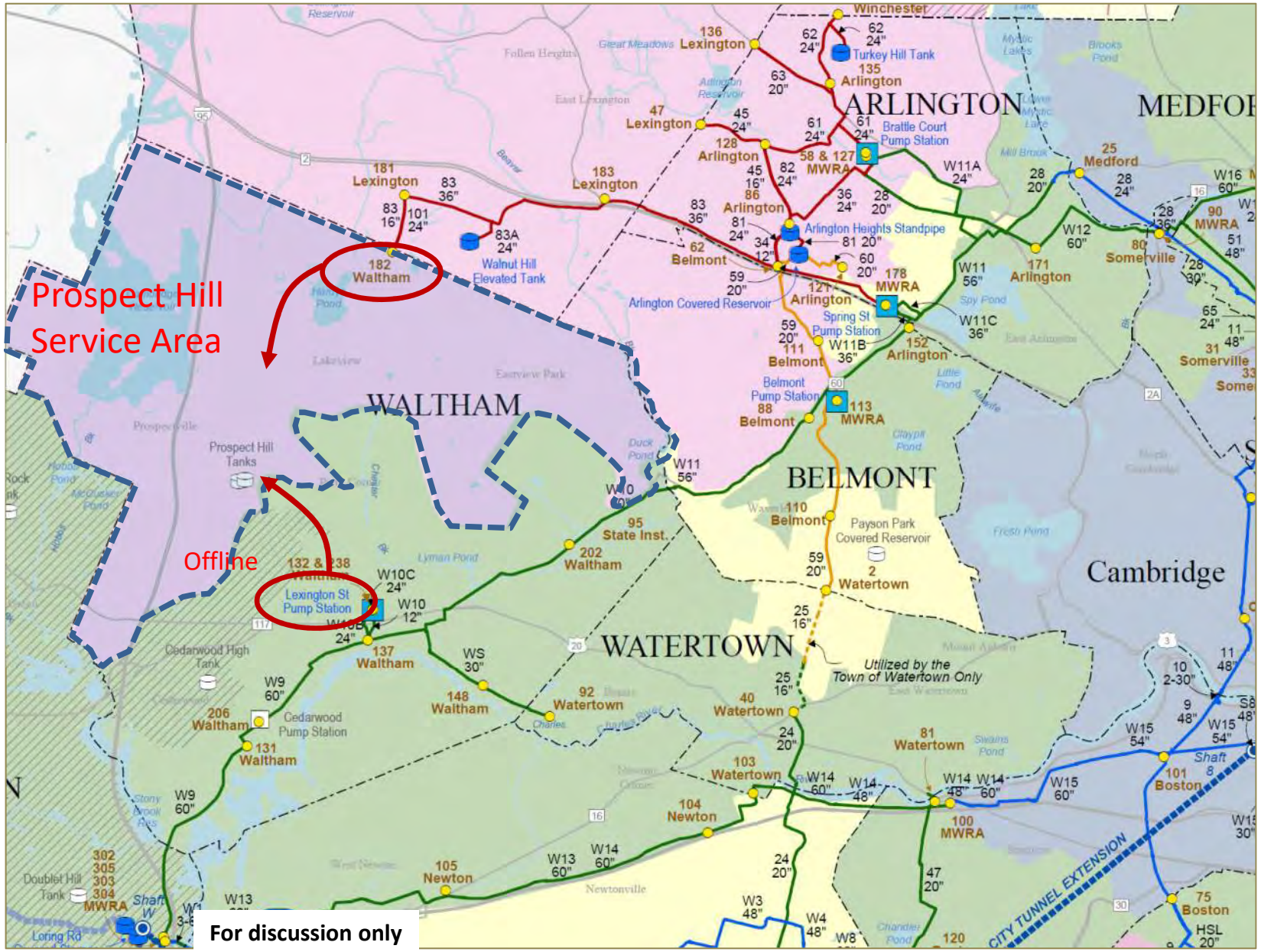
For discussion only

Section 101 Extension Waltham

Prospect Hill Service Area

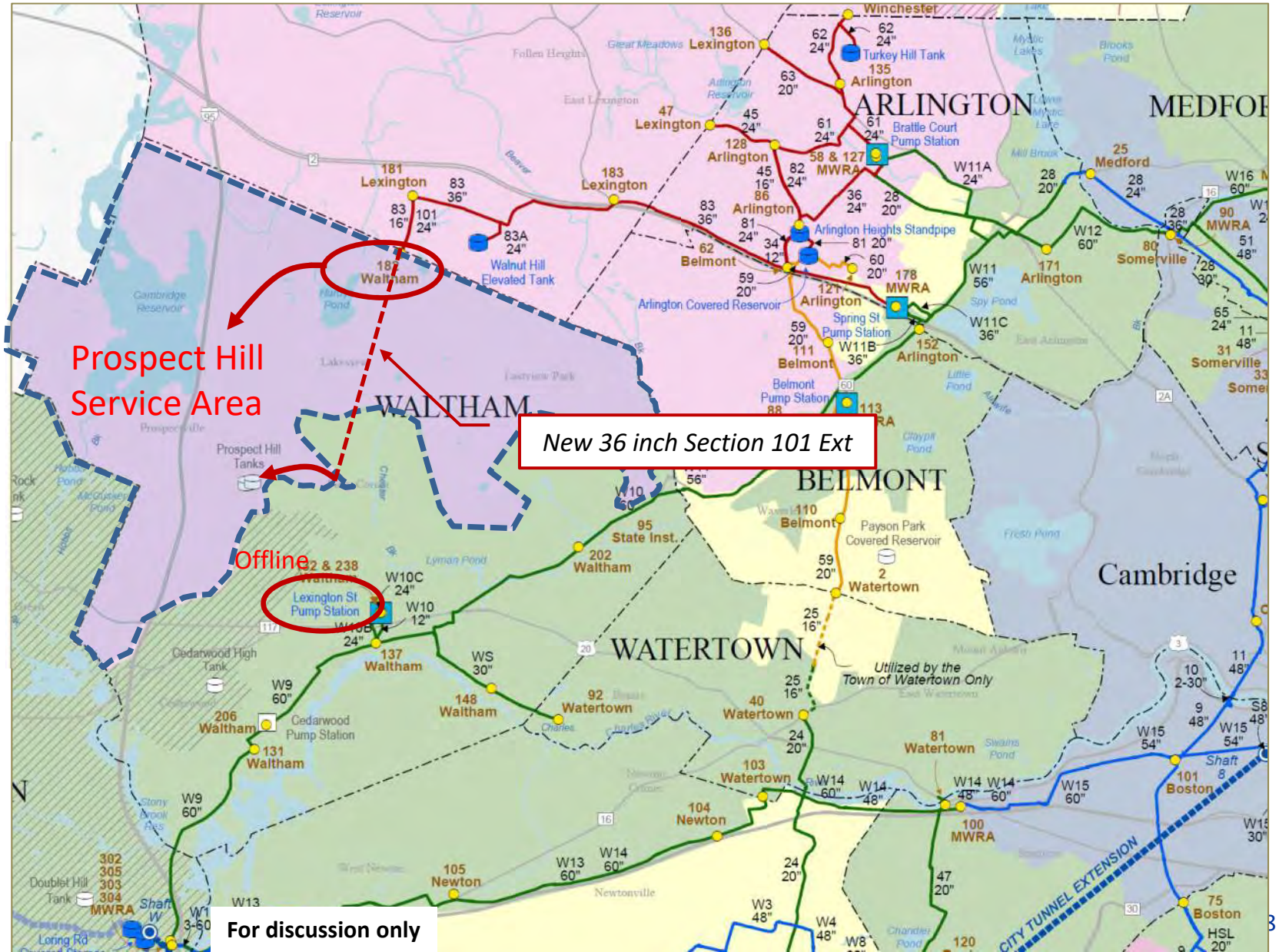
- 2- 4 MG Tanks – Waltham's Prospect Hill Tanks
- ~75% supply from MWRA's Lexington Street Pump Station
- ~25% of the supply from meter 182 – MWRA's Northern Extra High Service Area
- Max Day Demands ~ 4 mgd

Loss of MWRA's Lexington Street PS requires all of the supply to come from meter 182 – Northern Extra High Service Area



Section 101 Extension – Redundancy for Lexington St Pump Station

New 36 inch pipeline from meter 182 to the heart of Waltham's Prospect Hill Service Area increases the hydraulic capacity from MWRA's Northern Extra High System to Waltham's Prospect Hill tanks



For discussion only

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

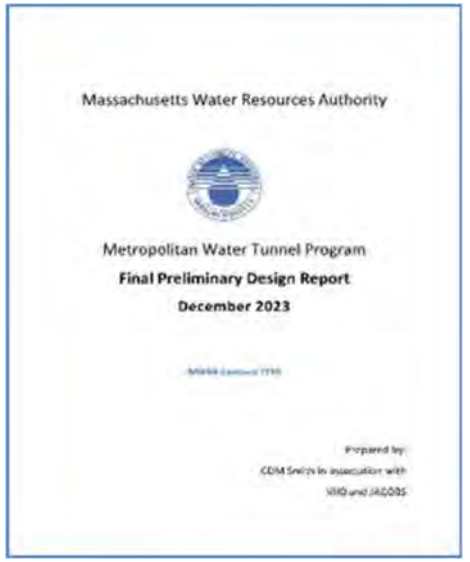
Conclusion

- 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

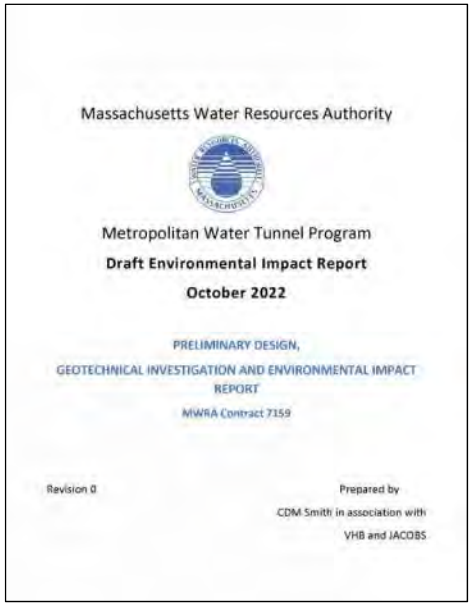
Preliminary Design and Environmental Impact Report

Preliminary Design and Environmental Impact Report

- Preliminary Design Report
  - 15 miles of deep rock tunnel
  - 100 Year Service Design Life
  - Preliminary tunnel alignment and profile, valve chambers and surface pipeline connections
  - Construction contract packaging and sequence approach
  - Updated construction cost estimate and construction schedule



- MEPA filings and Environmental Impact Reports
  - Environmental Notification Form
  - Draft Environmental Impact Report
  - Supplemental Draft Environmental Impact Report
  - Final Environmental Impact Report
  - FEIR Certificate received April 2024



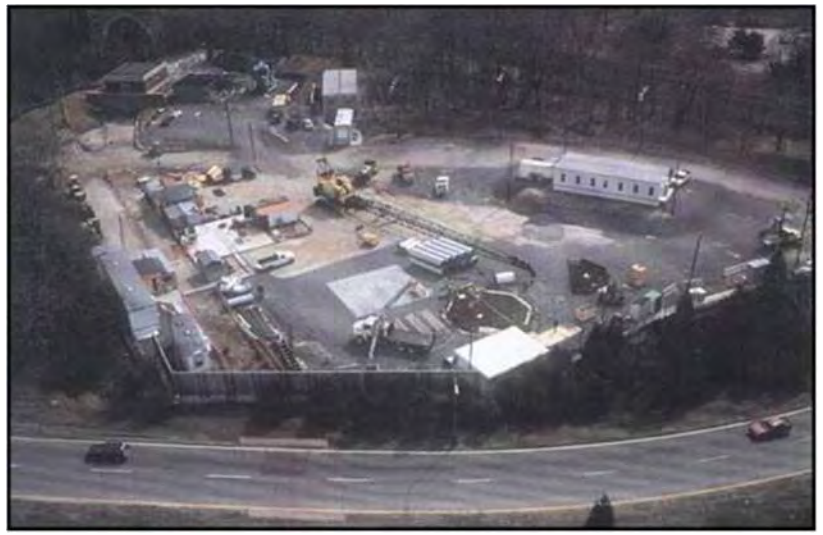
Preliminary Design & EIR – Performed in Parallel

Key Objectives:

- Shaft site selection
  - Meet system hydraulic requirements, provide full redundancy
  - Provide sufficient space for temporary construction staging and permanent infrastructure
- Establish tunnel alignment (both horizontal and vertical)
  - Minimize overall tunnel length
  - Avoid geo-hazards when possible
  - Maximize length of unreinforced concrete liner
  - Establish readily constructible tunnel segment lengths
- Avoid, minimize, and mitigate impacts to the environmental and communities to the maximum extent practicable
- Establish construction sequence and packaging
  - Promote good competition by qualified bidders
  - Balance risks

Shaft Site Selection Objectives

- During Construction
  - Sufficient size for construction
  - Locate away from sensitive receptors and abutters
  - Close to major highway
  - Near receiving water
- After Construction
  - Landscaped and secured
  - Periodic site visits and maintenance
  - Good neighbor



Shaft Site During Construction

Shaft Site After Construction

Shaft Sites

Construction Shaft Sites

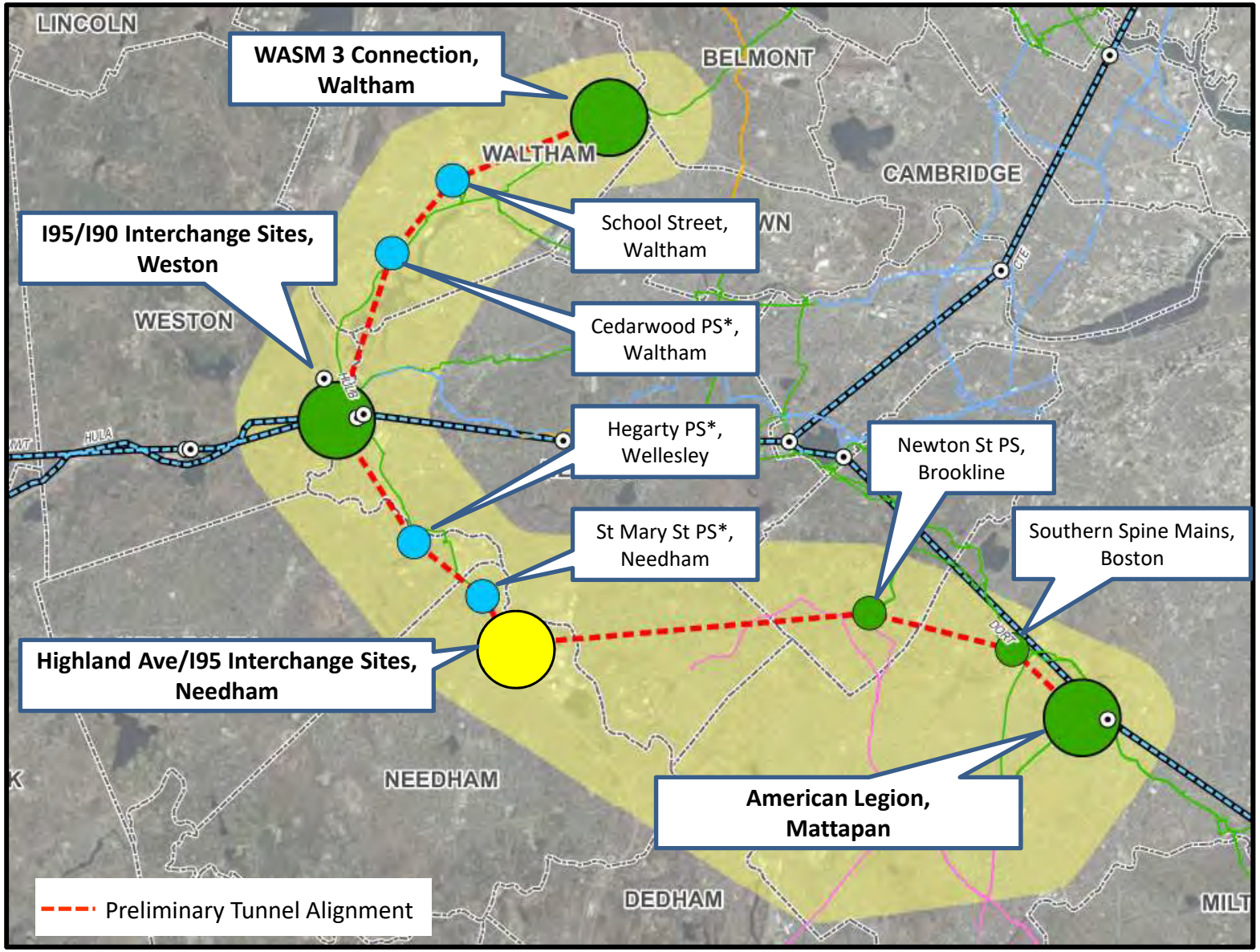
- WASM 3 Connection, Waltham
- I90/I95 Interchange, Weston
- Highland Ave/I95 Interchange, Needham
- American Legion, Mattapan

Connection Shaft Sites

- Lexington St Pump Station, Waltham
- Cedarwood Pump Station, Waltham
- Hegarty Pump Station, Wellesley
- St. Mary Street Pump Station, Needham
- Newton Street Pump Station, Brookline
- Southern Spine Mains, Boston

Final shaft locations subject to permits and real estate acquisition

* Non MWRA Pump Station

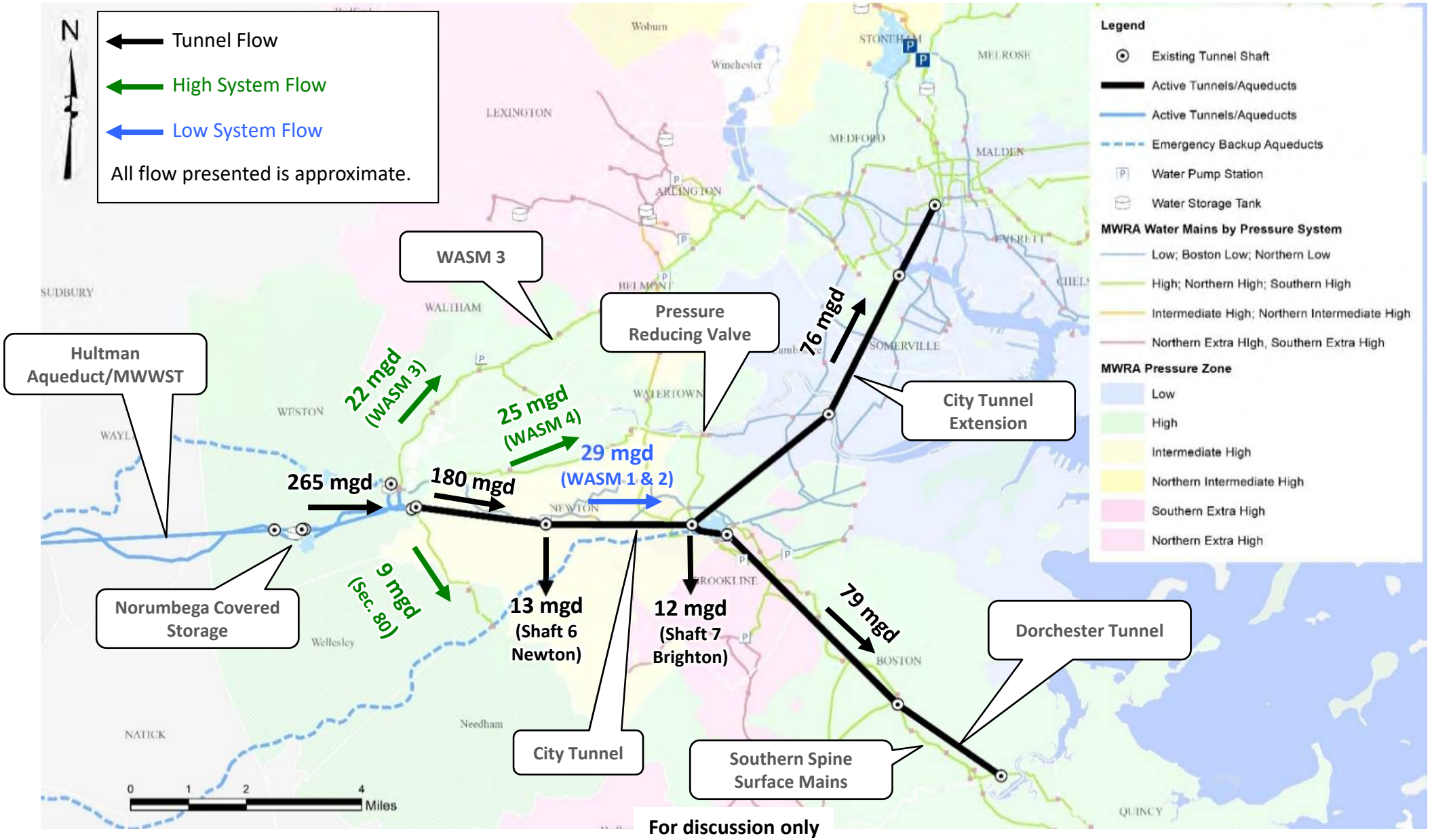


Required Connection (required for system redundancy)
Secondary Connection (provides local benefit)
Construction Shaft (South Tunnel Isolation)

For discussion only

Existing Tunnel System

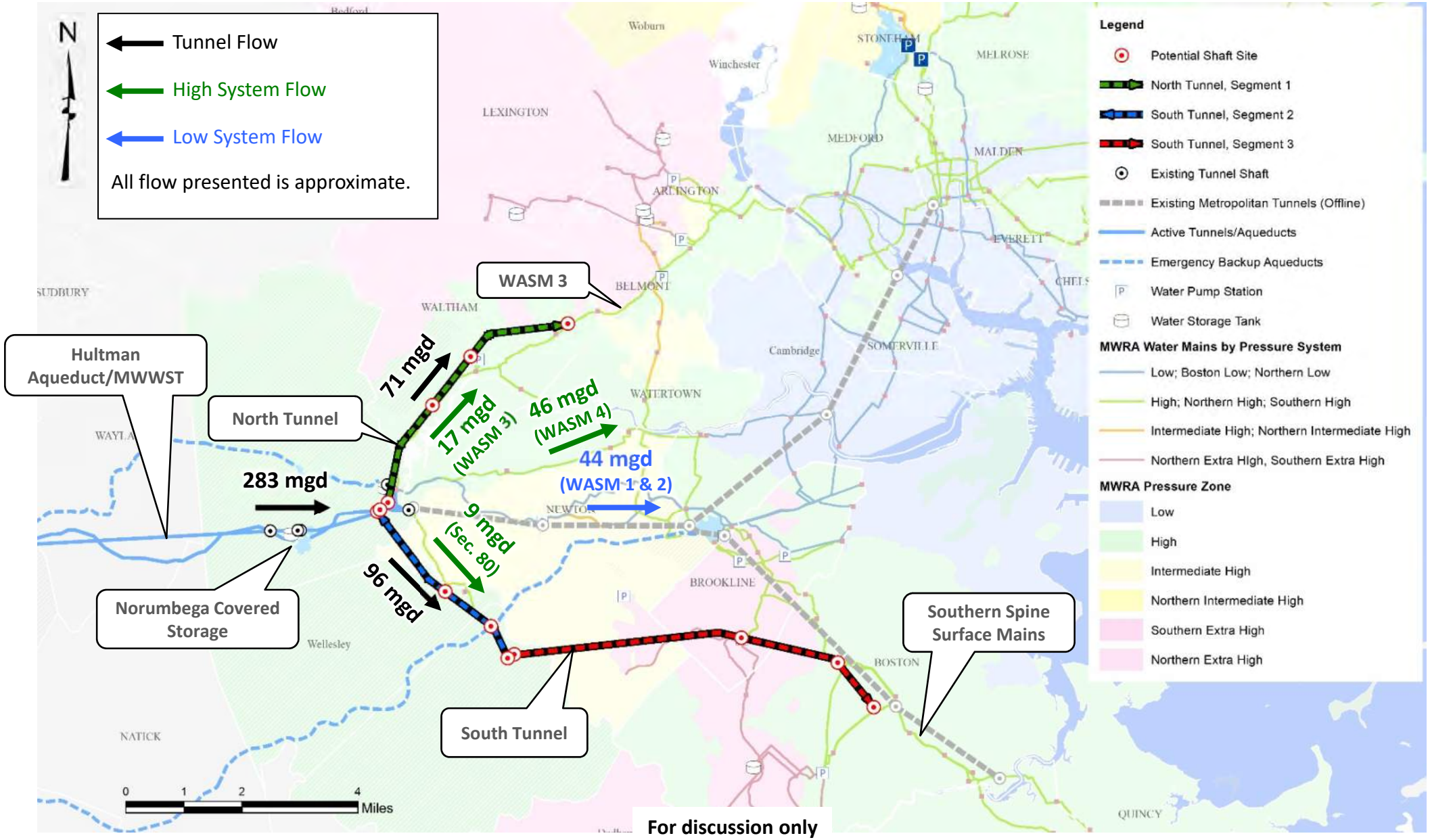
Current High Day Demand 265 mgd East of Norumbega



For discussion only

New Tunnel System (Existing Tunnel System Offline)

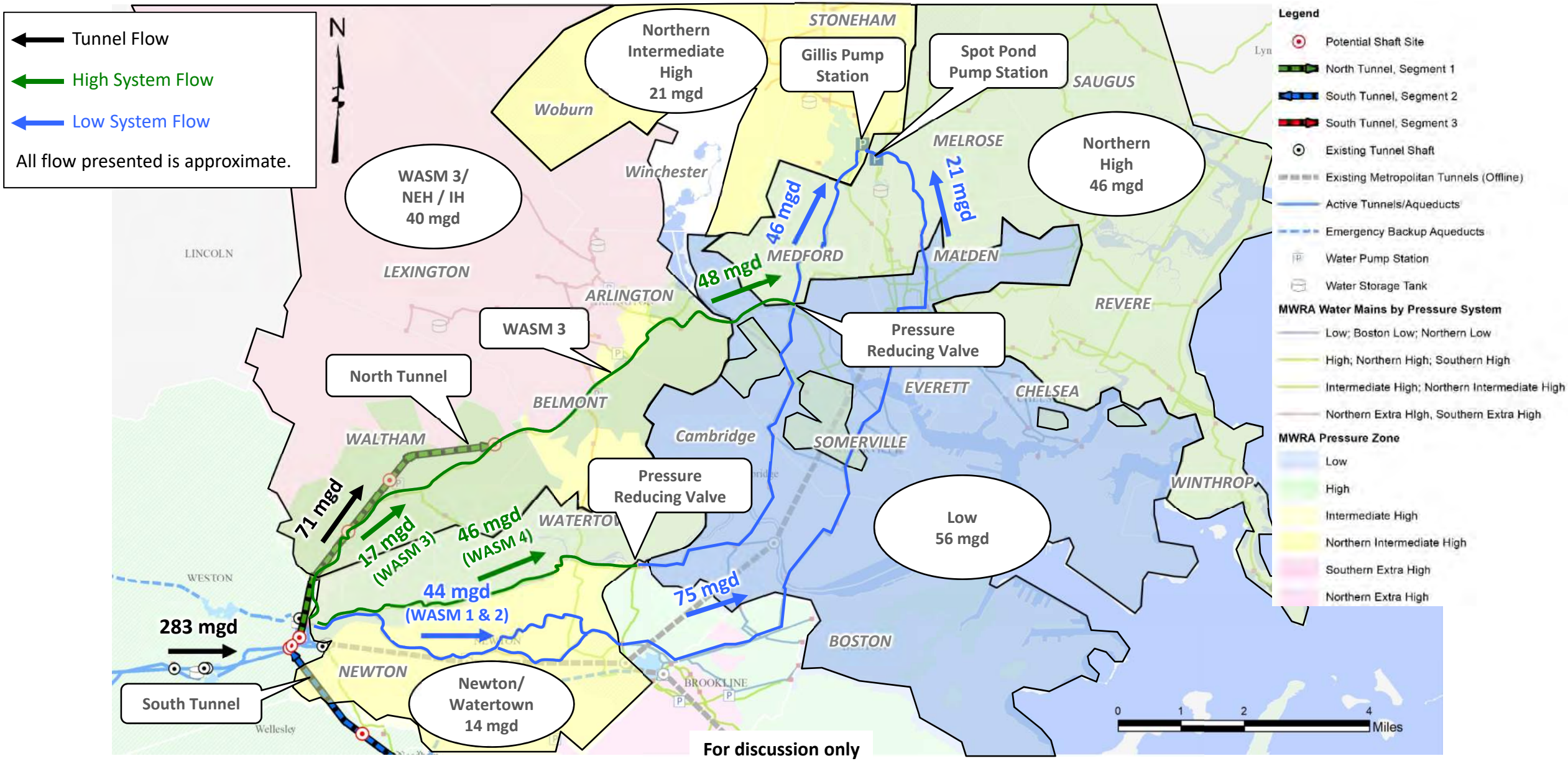
Projected High Day Demand 283 mgd East of Norumbega



For discussion only

New Tunnel System (Existing Tunnel System Offline) – North

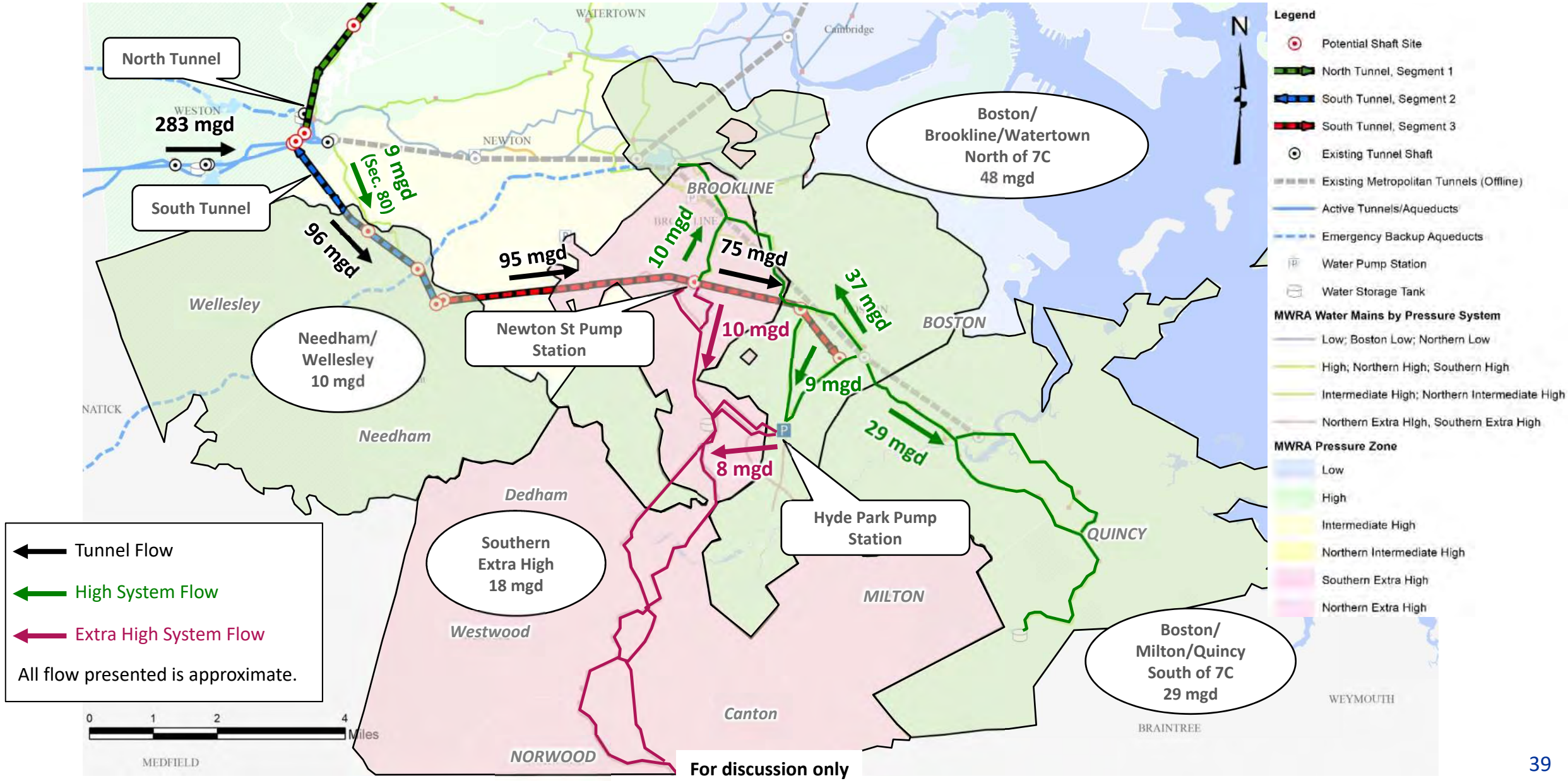
Projected High Day Demand 283 mgd East of Norumbega



For discussion only

New Tunnel System (Existing Tunnel System Offline) – South

Projected High Day Demand 283 mgd East of Norumbega

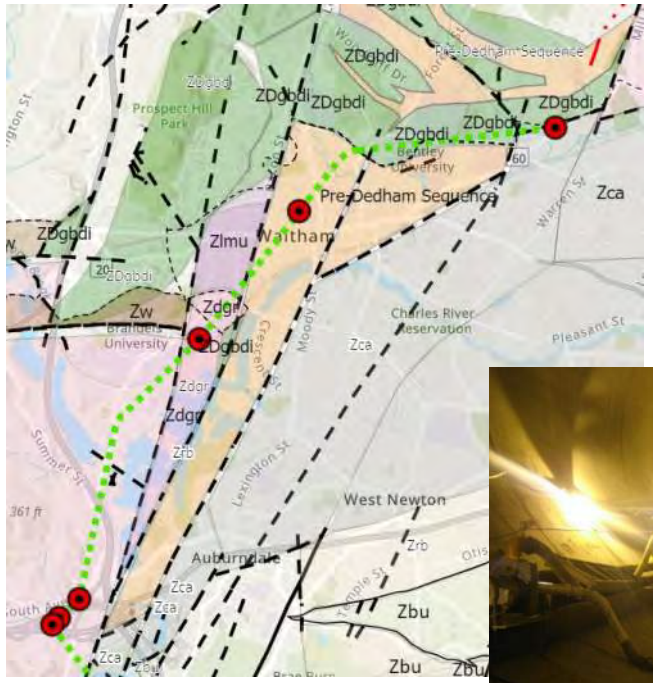


For discussion only

Tunnel Alignment & Segments

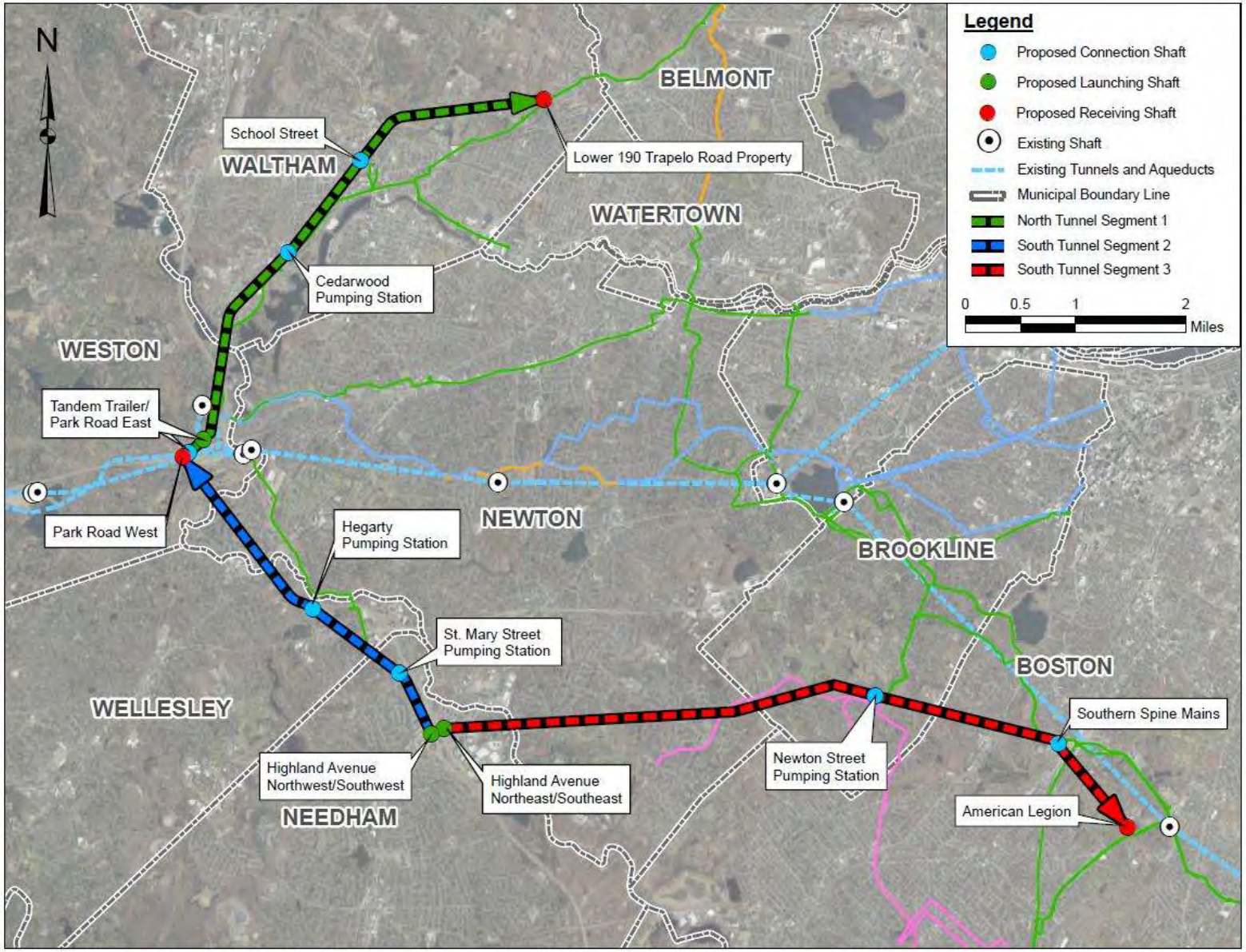
Objective:

- Establish tunnel alignment (both horizontal and vertical) to minimize overall length and maximize unreinforced concrete permanent liner system
- Avoid/minimize mining through difficult ground conditions where possible
- Select segment lengths to shorten overall construction duration and provide added operational flexibility
- Control construction costs by combining tunnel segments into contract packages that minimize contract interfaces and encourage construction flexibility



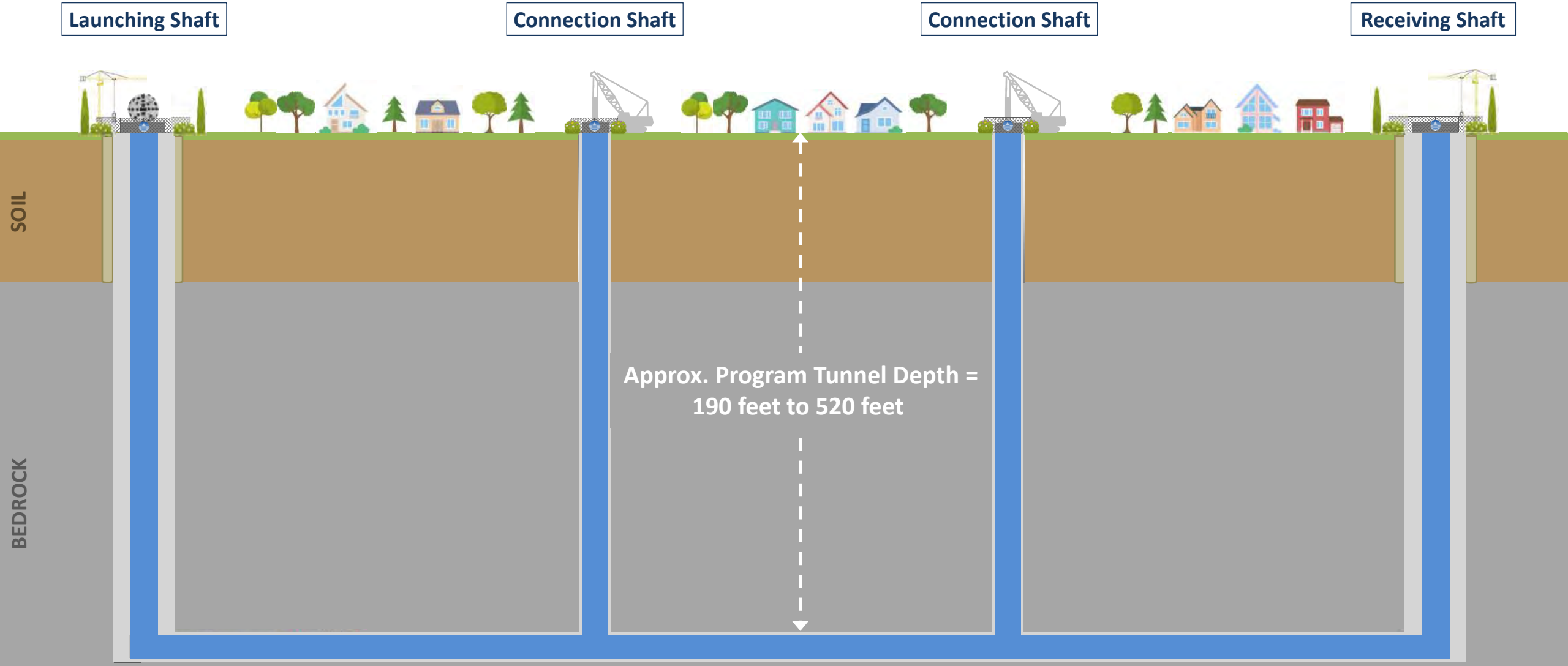
Tunnel Alignment, Segments, and Contract Packaging

- 15 miles of deep, hard rock, pressure tunnel, 250 to 500 feet deep
- Three launching and three receiving shafts
- Three tunnel segments (4.8, 3.4 and 6.8 miles long)
- Six intermediate connection shafts
- Alignment has been adjusted to avoid known geo-hazards
- Two tunnel construction packages
  - North Tunnel (Segment 1)
  - South Tunnel (Segments 2 & 3)
- Contract package sizes should promote good competition



For discussion only

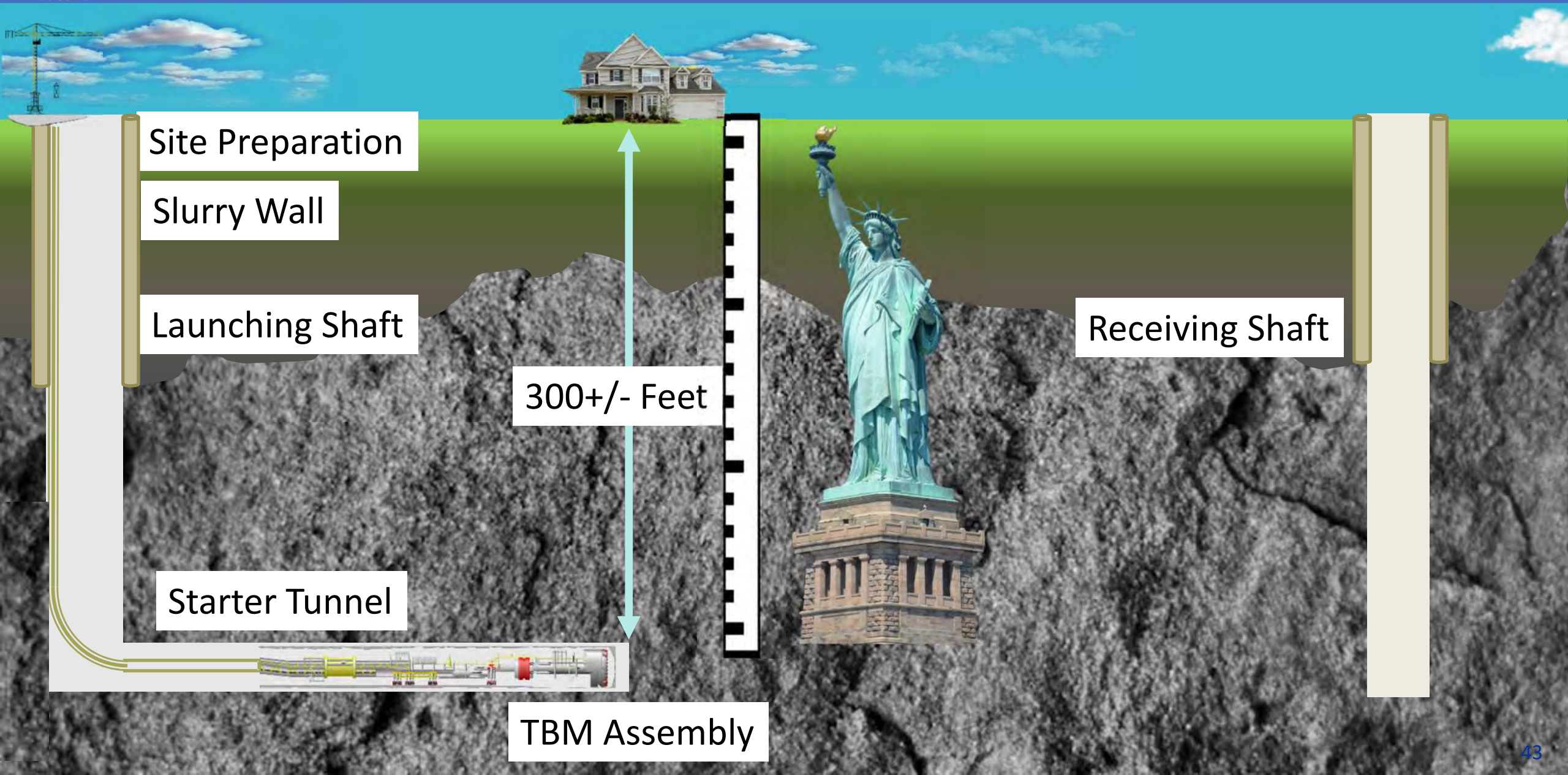
Conceptual Construction



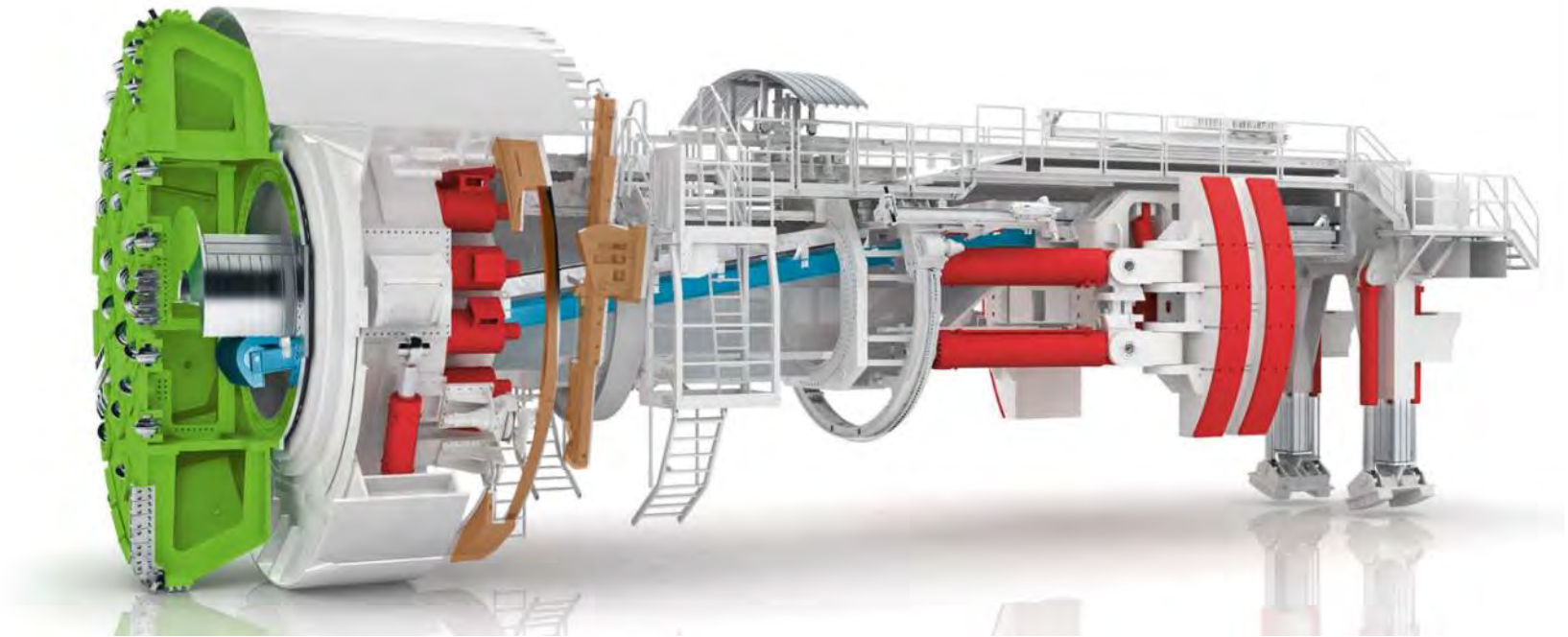
NOT TO SCALE

For discussion only

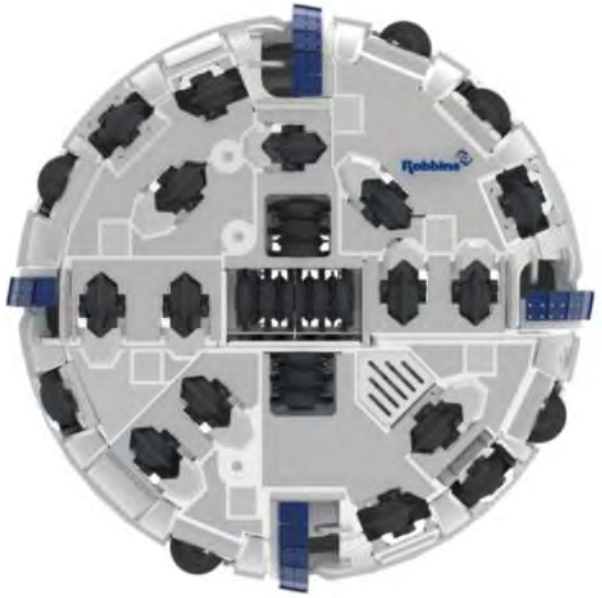
Tunnel Construction



Tunnel Boring Machine

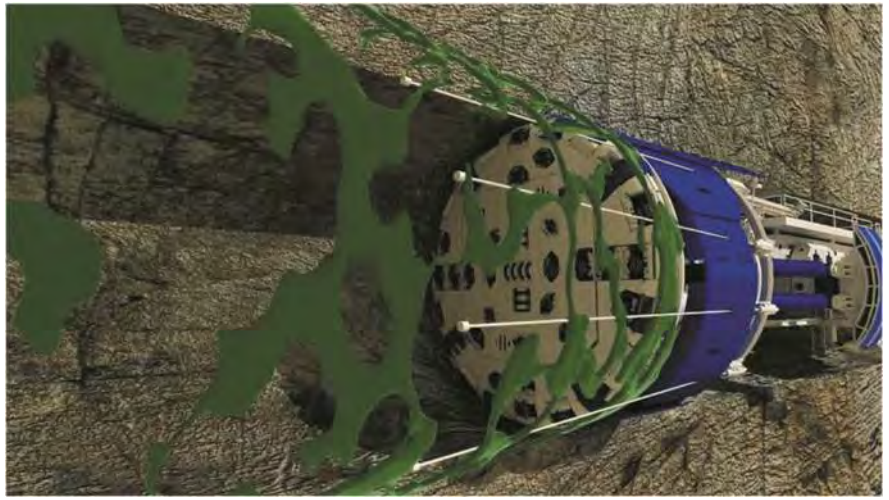


Source: www.herrenknecht.com

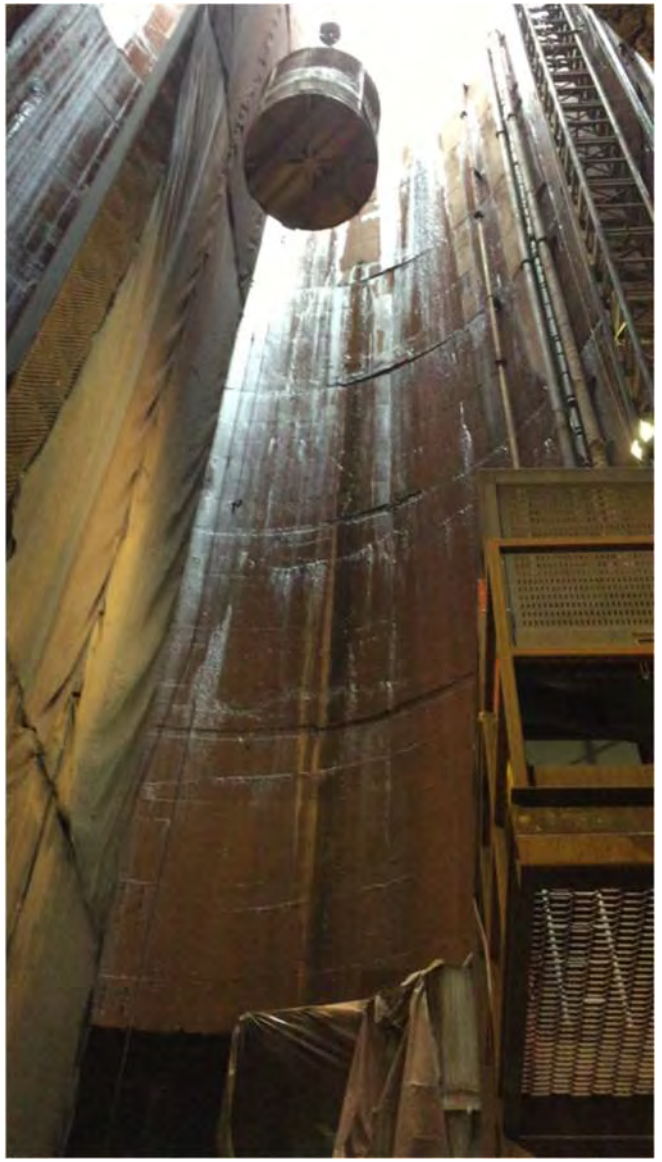


Source: www.robbins.com

- Cutterhead grinds the bedrock into small pieces
- Conveyors move the broken rock to the back of the TBM
- Self propelled grippers push to side of tunnel, jacks propel forward
- Bedrock is self supporting or supported with rib (rib erector), rock bolts (rock drill), and shotcrete
- Probing and grouting is used to control groundwater



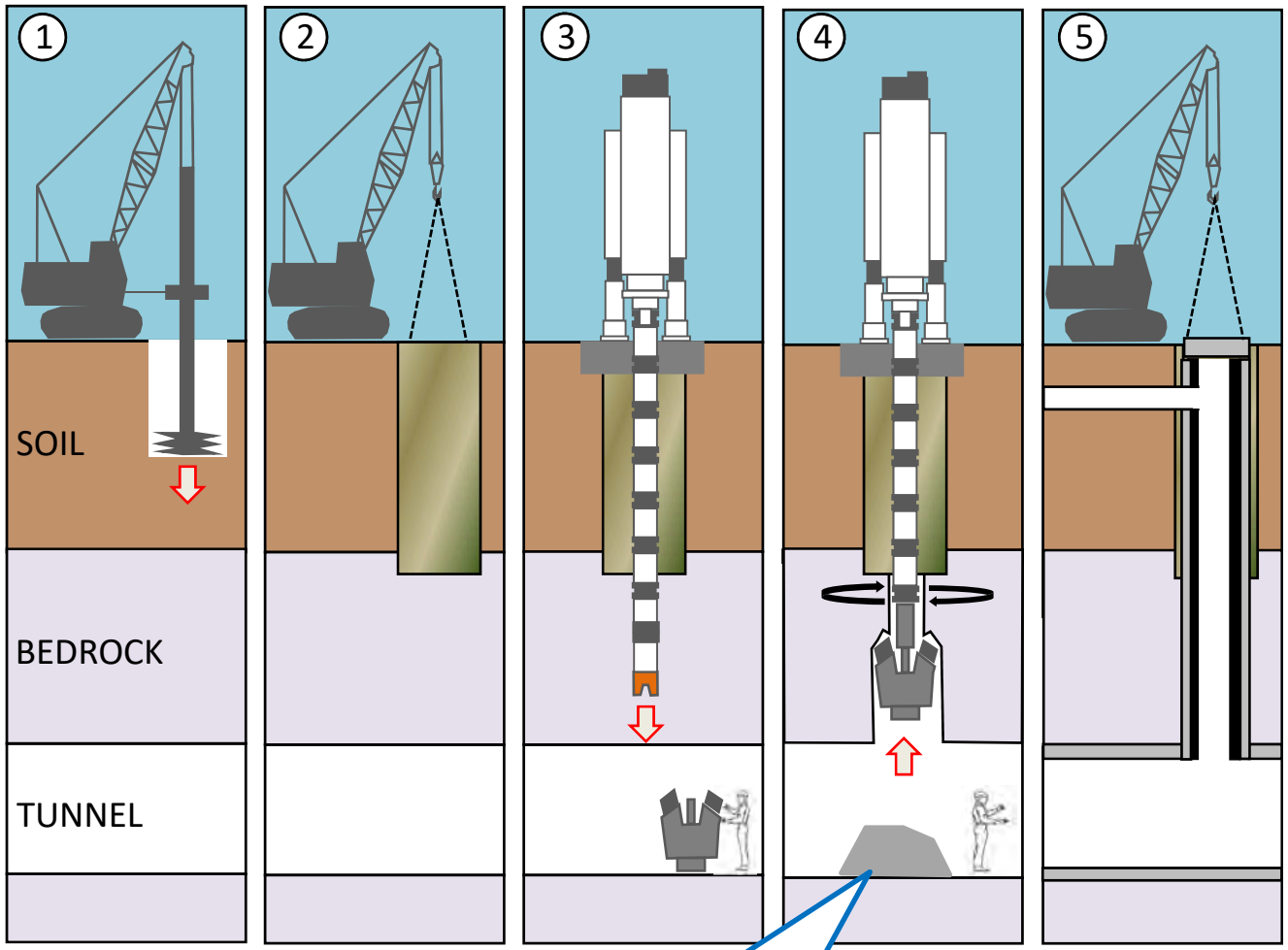
Launching / Receiving Shaft Construction



- ~25’ – 40’ diameter, ~250’ – 400’ deep
- Launching shaft is the only access to the tunnel until breakthrough into the receiving shaft
- Constructed by drill and blast methods
- “Cavern” at the bottom of launching shaft is where TBM will be assembled

Intermediate Shaft Construction

- Intermediate connection shafts are smaller diameter
- Use raised bore shaft construction method where possible
- Sequence of Construction (after tunnel has passed below):
  - (1) Auger drill through soil
  - (2) Install steel casing through soil
  - (3) Drill pilot hole in rock
  - (4) Ream larger hole in rock – **spoil drops into and is removed from the tunnel**
  - (5) Install shaft lining
- Benefits of Raised Bore Shaft Method:
  - Smallest footprint at the surface
  - Most excavate is removed from inside the tunnel which limits hauling from the site
  - No blasting
  - Not 24/7



Potential Permits and Approvals

Federal

- National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP)
- NPDES Dewatering and Remediation General Permit (DRGP), if needed
- Section 404 Department of the Army Permit (General and Preconstruction Notice)

Commonwealth of Massachusetts

- Massachusetts Environmental Policy Act (MEPA) Review
- Massachusetts Historical Commission (Massachusetts General Law Ch. 9, Section 26-27C)
- Highway Access/Construction Access Permits
- MBTA Right of Way Access License Agreement
- Natural Heritage Endangered Species Program
- Water Management Act Permit
- Chapter 91 Licenses
- Superseding Order of Conditions, upon appeal
- Section 401 Water Quality Certificate
- Distribution System Modification
- Land disposition/easements
- Article 97 Land Disposition Legislation

Municipal

- Wetlands Protection Act Order of Conditions
- Roadway Access Permits/Street Opening Permit
- Hydrant Permit
- Drainage Discharge Permit

Environmental and Community Impacts

Avoid, minimize, and mitigate impacts to the environmental and communities to the maximum extent practicable:

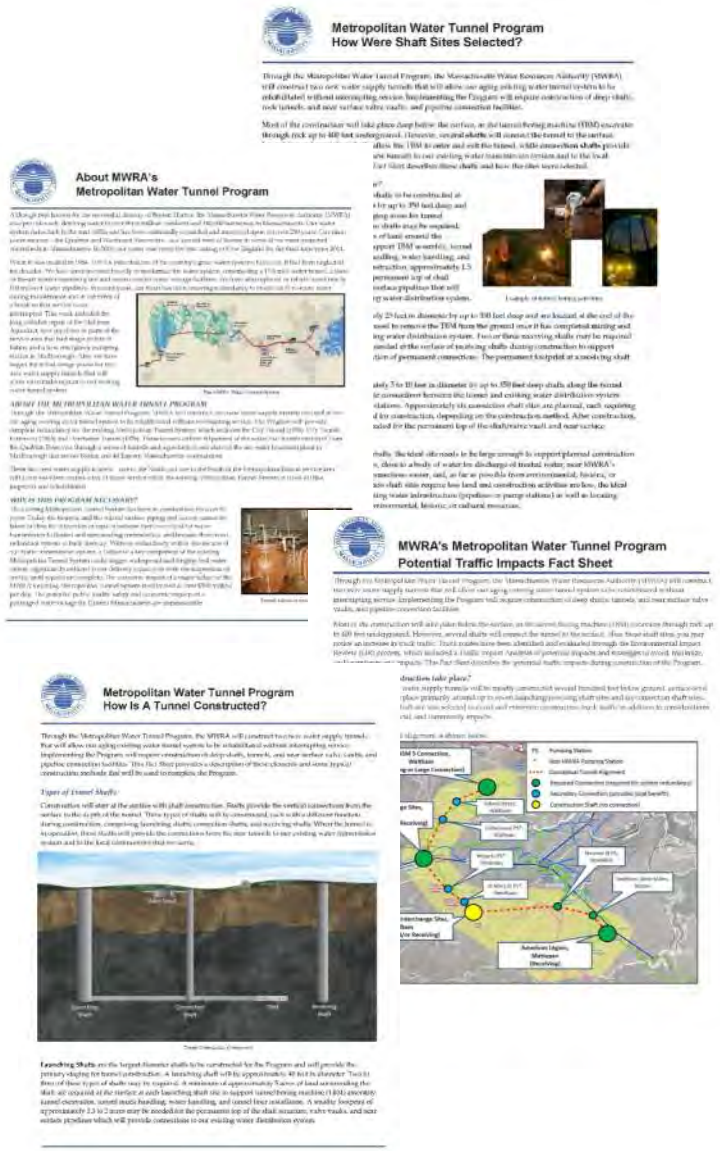
- Shaft site selection considered land use, traffic, noise, hauling routes, proximity to sensitive receptors, EJ communities, etc.
- Prioritized public land (MWRA, DCR, MassDOT) and communities that directly benefit from the Tunnel Program
- Construction methods selected to minimize impacts where possible (e.g., TBM, raise bore shaft construction method)
- Solicited stakeholder input throughout the process to help understand impacts and inform decisions
- Locating launching shaft sites along major highways and near receiving water was key to minimizing impacts
- Shaft sites selected should avoid the need for costly mitigations

Construction impacts are temporary

Redundant water supply is a long-term benefit

Community & Stakeholder Outreach

- Met with 10 communities in the study area
- Established a Working Group with representative from each community
- Numerous meetings with the 7 communities in which the tunnel will be constructed:
  - Town Management, Public Works, Public Safety/Fire, Conservation Commission, etc.
- Multiple meetings with key stakeholders and permit agencies:
  - EEA, DEP, MassDOT, DCR, DPH, DYS, UMass and DCAMM
- Met with numerous organizations, businesses & private property owners to coordinate field work
- Met with community interest groups
  - WLT, CRWA, neighborhood groups and others
- Established a Website https://www.mwra.com/mwtp.html and email address (for questions) Tunnels.info@mwra.com
- Created multiple Fact Sheets – available in 4 languages
- Outreach will continue throughout design and construction



Key Characteristics of the 2017 Two-Tunnel Concept Maintained

- Hard rock pressure tunnels
- Two separate tunnels:
  - One begins in Weston and ends in Waltham (North Tunnel)
  - One begins in Weston and ends in Mattapan (South Tunnel)
- TBM excavation with two pass construction method
- Set horizontal and vertical alignment to maximum unreinforced concrete liner, limit steel liner
- Probing and grouting to control ground water
- Buried top of shaft structures and valve vaults
- Meets goal of full redundancy

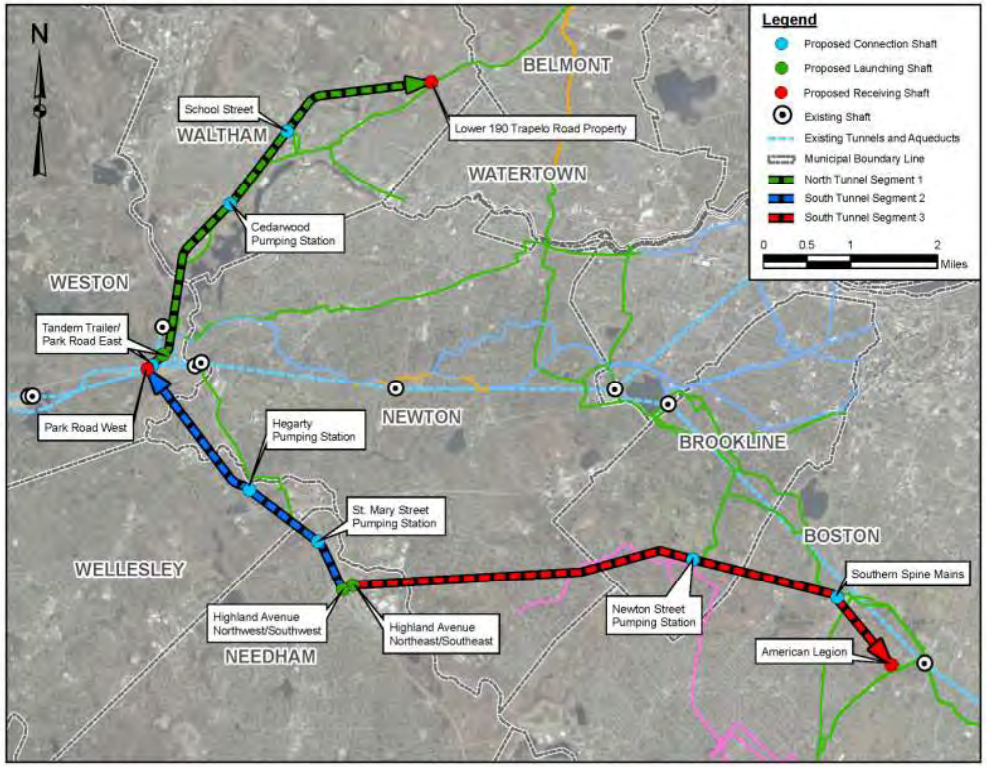
Key Changes Since 2017 Concept

2017 (Two-Tunnel Concept):

- 14 miles, 2 segments, 2 TBM's
- Four intermediate shaft
- One double launching shaft site at I90/I95
- Two receiving shafts (Waltham & Mattapan)

2023 (Preliminary Design / FEIR):

- Accounts for land availability and environmental impacts
- Accounts for geologic conditions
- 15 miles, 3 segments, 2 or 3 TBM's
- Six intermediate shafts, 1 large connection shaft, 2 connector tunnels
- Two launching shaft sites at Highland Ave, one at I90/I95
- Three receiving shafts (Waltham, I90/I95, Mattapan)



For discussion only

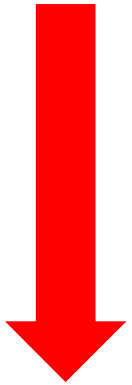
2017 Two-Tunnel Concept vs. 2023 Preliminary Design/FEIR

- Benefits of 2023 Configuration:
  - Improves construction packaging
  - Reduces construction schedule
  - Reduces construction contract interfaces
  - Reduces risks
  - Improves community supply resilience
  - Provides added long-term operations capability
- Accounts for land availability
- Accounts for geologic conditions
- Avoids/minimizes/mitigates environmental and community impacts, to the extent practical
- Prioritizes construction sequence to match largest need for redundancy (South Tunnel first)
- Establishes construction contract packaging that should promote good competition
- Constructible tunnel system that will meet redundancy goals

Tunnel Program Look Ahead

Critical Path Tasks

- Geotechnical Investigations (Core Storage Tour)
- Land Acquisitions
- Community/Stakeholder Agreements (MOU's)
- TBM Power Supply

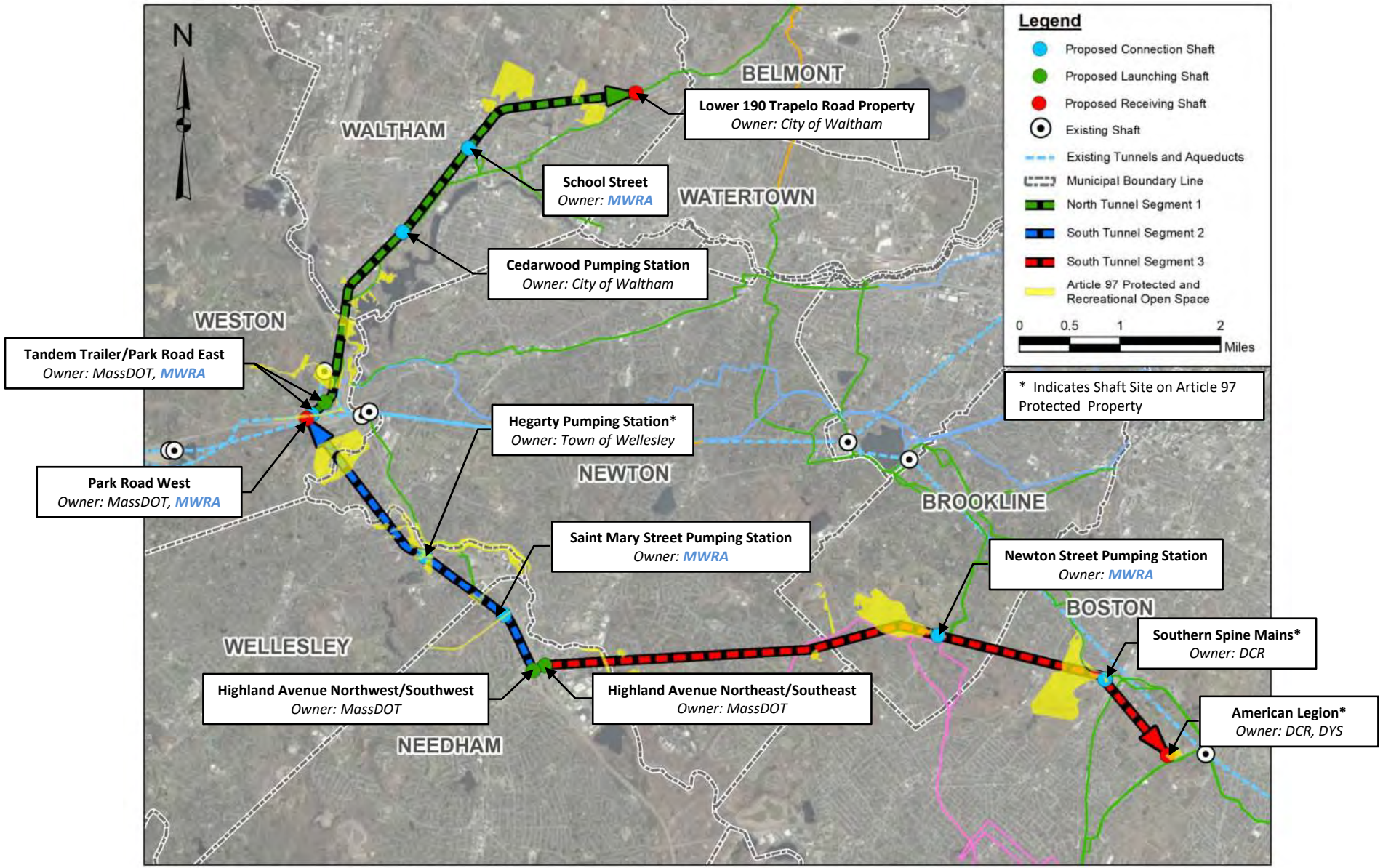


- Tunnel Construction

Land Acquisitions

- 13 shaft sites -
  - Larger temporary staging area and smaller permanent facility footprint
  - MWRA owns 3 shaft sites & has partial control of 2 shaft sites already
- Pipeline easements - ~6,000 ft
- Permanent surface access easements - ~9 sites
- Subterranean easements - ~600 individual properties
- ~3.8 acres of land for permanent facilities will require Article 97 legislation
- Land purchases/easements will be based on appraised value and negotiations
- Own in fee (most sites) or permanent easement (MassDOT)
- Land acquisitions will require MWRA Board approval

Land Acquisitions & Article 97 Properties

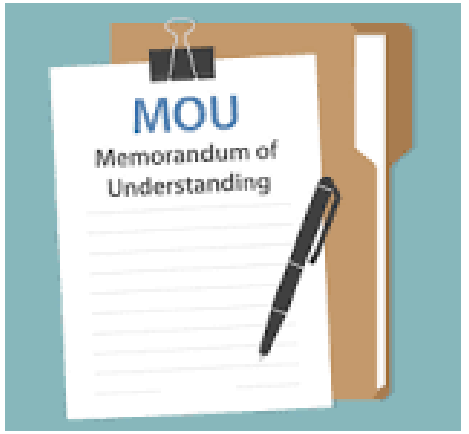


For discussion only

Community/Stakeholder Agreements (MOU's)

Topics may include:

- Land acquisitions
- Permitting and local regulations
- Public safety and emergency response
- Water supply contingency
- Work hours, hauling hours and routes, traffic management
- Dust and noise control, blasting and vibration control
- Connections to community water systems
- Mitigations and final site conditions (fencing, lighting, landscaping, etc.)



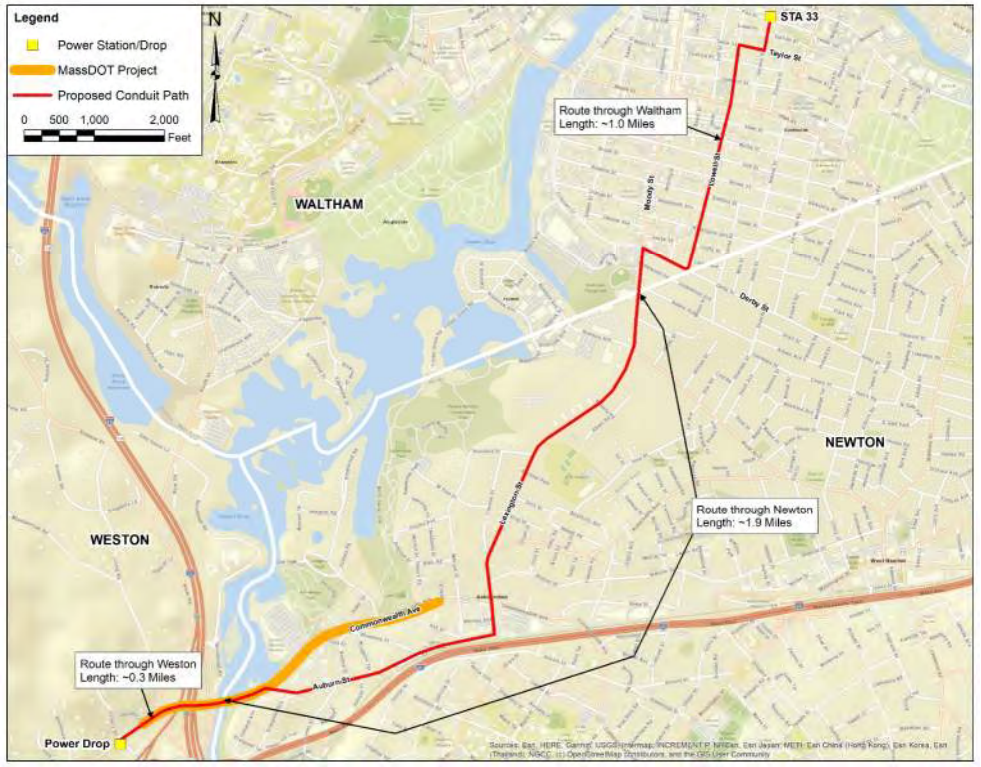
- Expect to execute MOU's with 7 communities (Waltham, Weston, Wellesley, Needham, Newton, Brookline & Boston)
- Expect to have agreements/MOU's (or similar) with DCR, MassDOT, and DYS related to land acquisitions
- All MOU's will be presented to the Board for approval

Emergency Response

- Shafts in six (6) communities, tunnel alignment beneath seven (7) communities
- Advance coordination to ensure coordinated emergency response during construction
- Staff have had three (3) meetings with community Emergency Responders:
  - Uniqueness of the underground construction environment and its hazards
  - Anticipated role and responsibilities of the MWRA tunnel contractors and community Emergency Responders
    - Tunnel Contractors to provide all OSHA required tunnel rescue resources (2 teams)
    - Community Emergency Responders assume incident commend on the surface and, if needed, support underground for extrication and medical care
  - Training and equipment needed by the community Emergency Responders throughout tunnel construction

- Emergency response coordination needs to be tailored to the supporting communities' capabilities and size
- MWRA resources will be needed to ready the community Emergency Responders
- MOU's between MWRA and each community will include emergency response support

TBM Power Supply

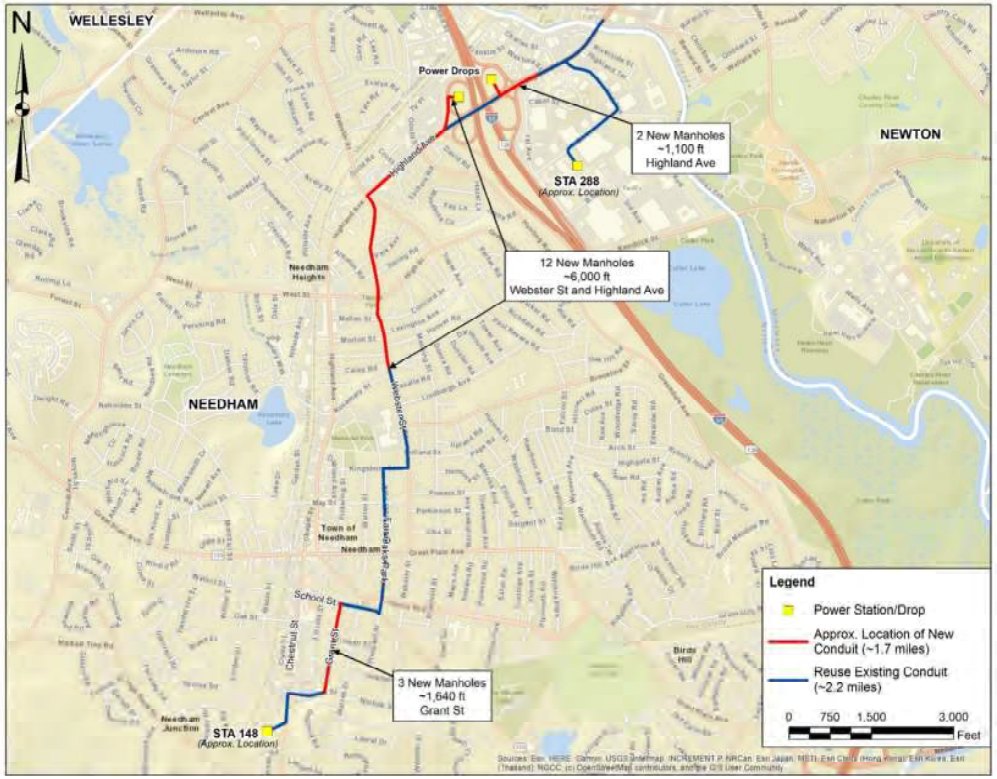


I90/I95 – Tandem Trailer Launching Shaft Site:

- ~3.2 miles of new duct bank & cable
- Coordinating with ongoing MassDOT project along Route 30
- Through Waltham, Newton & Weston

Highland Ave Launching Shaft Sites:

- ~1.7 miles of new duct bank & cable
- ~2.2 miles of reused duct bank & cable
- All within Needham



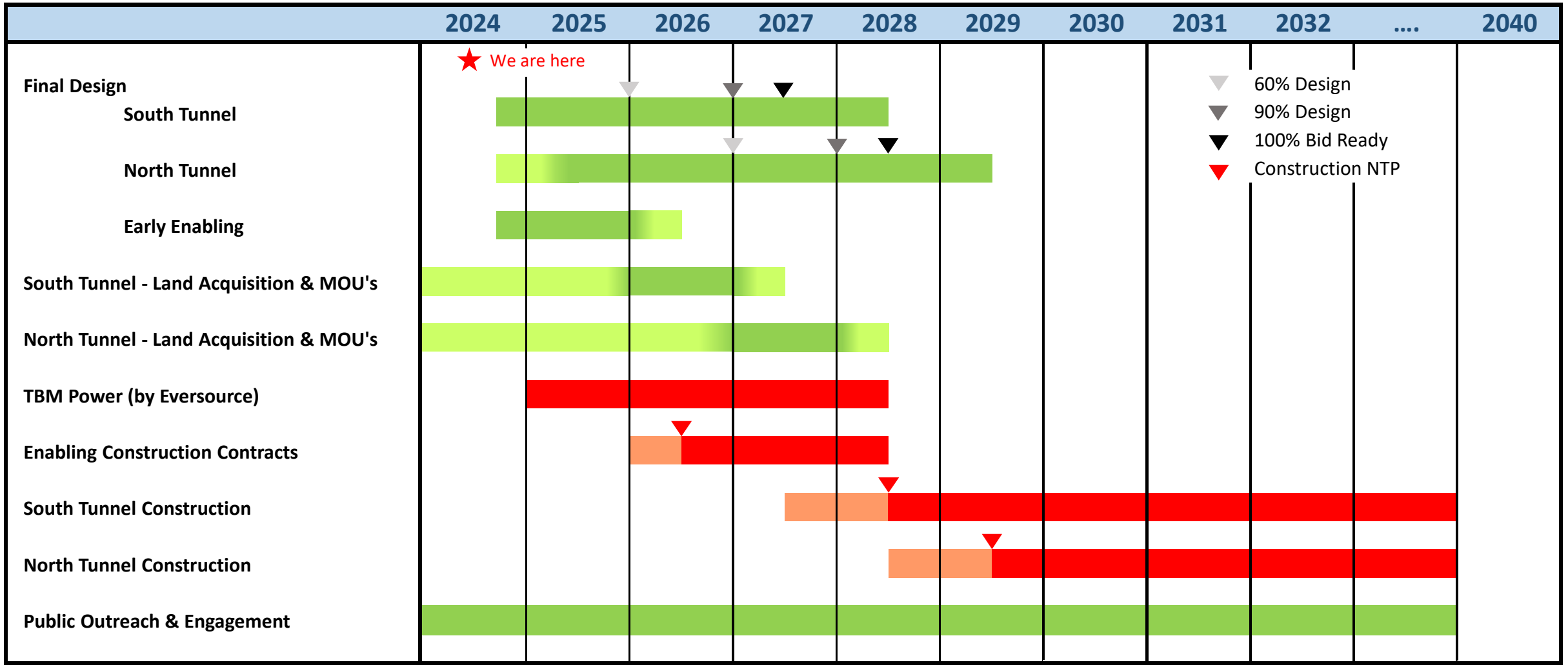
Eversource will design and install all new duct bank & cable

MWRA and Eversource will enter into an agreement addressing completion schedule and compensation, subject to Board approval

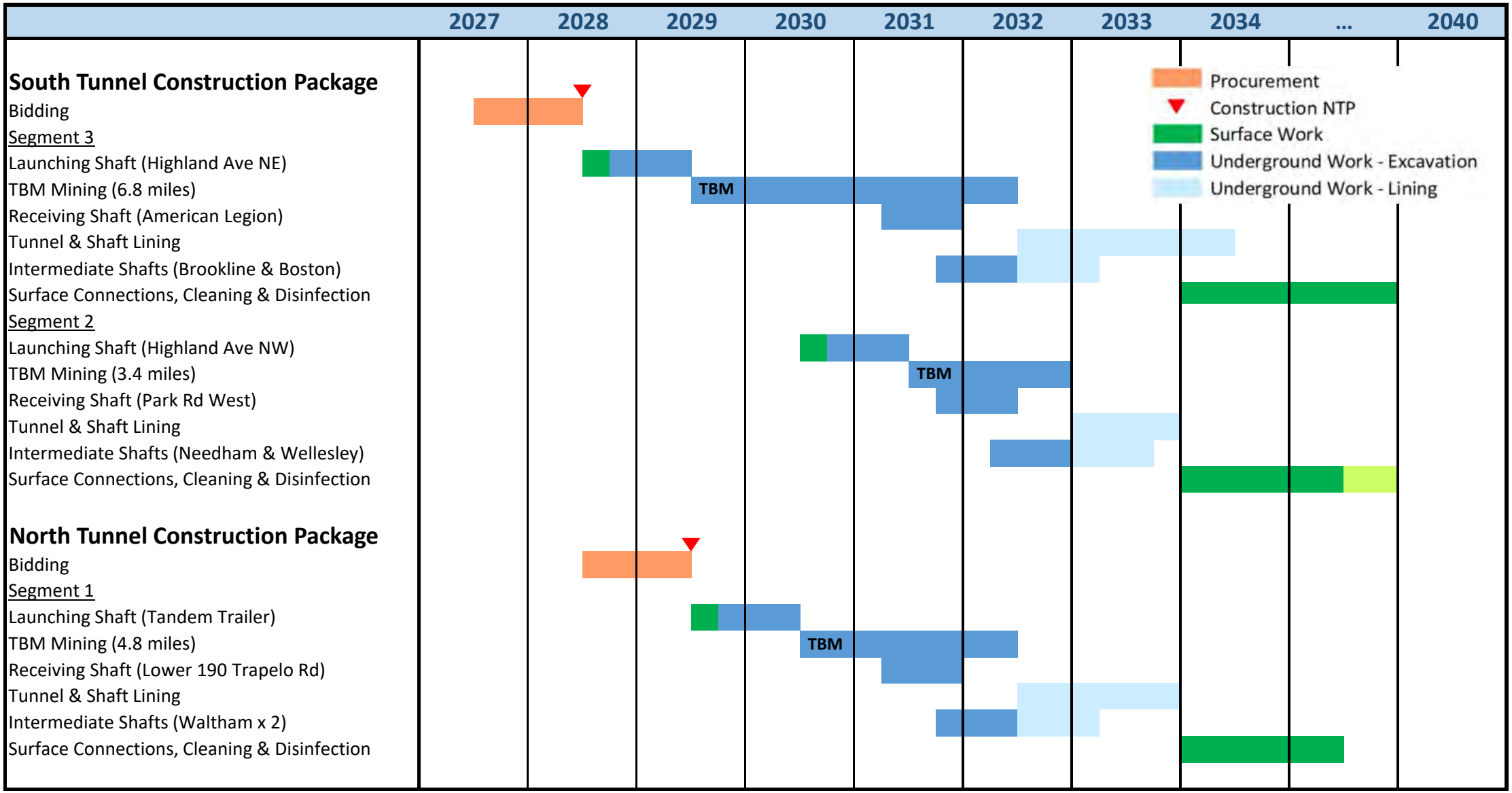
Power supply will remain and provide added resilience to the power grid

For discussion only

Tunnel Program - Critical Path Schedule



Tunnel System – Construction Schedule Look Ahead



For discussion only

Break

Shaft Site Figures and Core Facility Tour